6 Third Level Sector, Infrastructure and Regional Innovation Culture

6. Third Level Sector, Infrastructure & Regional Innovation Culture

This chapter examines factors that are external to the company yet act as barriers or stimulators to innovation within the companies. Based on the model used in this innovation audit the main factors are the Third Level education system, the physical infrastructure and the regional culture. These factors operate in two ways. On the one hand, below a commonly recognised standard they become a definite hindrance to development (e.g. lack of competitively priced broadband drives away companies that need such a service). On the other, tailored provision can stimulate specific developments such as availability of highly skilled personnel for specific technologies.

6.1 The Role of the Third Level Sector in National and Regional Development

6.1.1 Background

The Third Level sector is facing a period of great change and challenge. Traditionally, the main focus of Irish universities was on **teaching, learning, academic exploration and research.** This remains their main role in society. Over the last 30 years the level of research (as a learning process) and academic exploration has increased alongside staff and student numbers. Since the 1980s, universities and industry have worked together adding a new role to the universities' functions, i.e. **university-industry co-operation.** The Institutes of Technology (IoTs) were established to provide education and training primarily to technician level. They have expanded their role over the last decade or so, but still operate to the rules of a more restrictive remit. One could argue that the IoTs in the BMW Region are only beginning to rise above minimum standards, while the National University of Ireland in Galway (NUIG) is capable of stimulating regional development in a meaningful way.

Nationally, the Third Level sector faces two major challenges:

- To implement a government-led policy of providing lifelong learning for all adults. This is particularly important in the BMW Region, with its high agricultural based population and its more traditional industrial structure.
- To provide second chance education to Ireland's adult population.

The sector is adjusting its programmes and courses to accommodate **a declining young population.** Irish policy still differentiates between the role of universities and IoTs. But the gap is narrowing.

The **competitive environment** is also changing, as Ireland and other EU Member States face challenges from industrial development in China and the candidate states of Central Europe. These developments force the mature economies to move up the value or knowledge curve, a process in which the Third Level education sector is seen to play an ever-increasing role. The Third Level colleges are the prime suppliers of highly skilled people and trained research workers.

[15] Communication from the Commission COM/2003/0058

A recent Communication from the European Commission[15] discusses the role of universities, and defines them to include all higher education establishments, in the Europe of new knowledge:

"The knowledge society depends for its growth on the production of new knowledge, its transmission through education and training, its dissemination through information and communication technologies and on its use through new industrial processes or services. Universities are unique, in that they take part in all these processes, at their core, due to the key role they play in the three fields of research and exploitation of its results, thanks to industrial co-operation and spin-off; education and training, in particular training of researchers; and regional and local development to which they can contribute significantly."

The need to increase the universities' contribution to national and regional needs and to foster collaboration with the private sector is stressed. The latter requires a sharper focus on innovation and starting up new companies, as well as knowledge flow from universities. The Innovation Audit Survey shows that innovative firms do not regard the public sector as an important source of information. However, high-tech businesses tend to set up near the best performing universities. The Bologna Declaration of June 1999 had previously stressed this broader educational role, which was reinforced by the Barcelona European Council.

In its paper[16] on "Creating and sustaining the Innovation Society", the Higher Education Authority (HEA) stated that:

"Ireland needs to move from a situation where our economic growth relies, to a very considerable extent, on foreign direct investment and imported technology (an 'Investment-driven economy') to one where the basis for growth arises, to a much greater extent, from indigenous innovation (an 'Innovation-driven economy'). In order to achieve this goal a paradigm shift in public policy is required which puts innovation at the centre of the policy agenda. Higher education and research will be central to achieving the paradigm shift."

In a later paper[17], Professor Liam Downey pointed out the need to double the output of doctoral graduates to meet the demands of an economy driven by innovation. The Expert Group on future skills needs, and others, also signalled this increased demand.

The duties and powers of Irish Third Level extra-university colleges have been prescribed in various Acts since 1992, and are undergoing an evolutionary process[18]. Thus the role moved from being a narrow one of technical and vocational training to one of broader education of relevance to all sectors of the economy and with particular emphasis on regional needs. The HEA Steering Committee (1995) recommended further *"that the non-university sector develop... its engagement with applied research and experimental work in product development and the regional focus of its work"*[19]. Further legislative changes and integrated policies may be required when the IoTs become "Designated Institutions" under the aegis of the HEA.

The role of the non-university sector is seen to have broadened considerably over the last 25 years, but remains nonetheless distinct from that of the universities. It seems likely that a binary education system will remain in place for some time in Ireland, despite academic drift in both university and non-university sectors. This may run counter to the Bologna Declaration, which seeks major changes in the Third Level education systems in the EU. These changes would lead to longer undergraduate courses (two years more) and would cause problems for industry during the changeover period. The role and position of Irish IoTs have been examined in a recent report written for the Council of Directors of Institutes of Technology[20]. The report provides a

[16] HEA (July 2002), Creating and sustaining the innovation society. HEA Dublin.
[17] Downey, Liam, (2003) Creating Ireland's innovation society: The next strategic step. HEA and Forfás, Dublin.
[18] The regional technical colleges and the Dublin Institute of Technology Acts, 1992
[19] HEA (1995) Report of the Steering Committee on the future development of higher education, (Based on a study of the needs to 2015). HEA, Dublin.
[20] Fottrell, Patrick (2002), Institutes of Technology and the knowledge society: their future position and roles. Council of Directors of the Institutes of Technology.

far reaching overview, listing the challenges facing the sector as well as the research, infrastructural and institutional changes needed to enable the Institutes to realise their potential in contributing to regional development. But the reality is that a number of important barriers identified in the National Board for Science and Technology's report on "Barriers to research and consultancy in the HE sector" (1986) still exist.

What are the activities an IoT or NUIG could undertake to improve innovation capacity and develop a knowledge-based economy in the BMW Region? Figure 43 shows the main activities of the Third Level sector. There are many commonalties in its activities to support innovation enhancement and to contribute to the knowledge economy in the region. For example, the level of research, technology transfer and co-operation with industry are all crucial factors.

Figure 43. The Main Activities of the Third Level Sector

Main Activities	Activities - Measures
Teaching and Learning	Undergraduate and graduate Life Long Learning – adult
Research	Basic research Post-Graduate training Participation in competitive national research programmes Participation in EU research programmes
Industry & Regional Development	EI Applied Research Programmes Industrial liaison function Technology transfer expertise Incubator Centres Specialised centres for specific industries Contract research for development and industry Industry training Consultancy and information Spin-out companies

The following sections assess the sector's contribution to the above activities, beginning with its ability to attract young undergraduates, through to its spin-out companies.

6.1.2 Teaching and Learning

Third Level Institutions

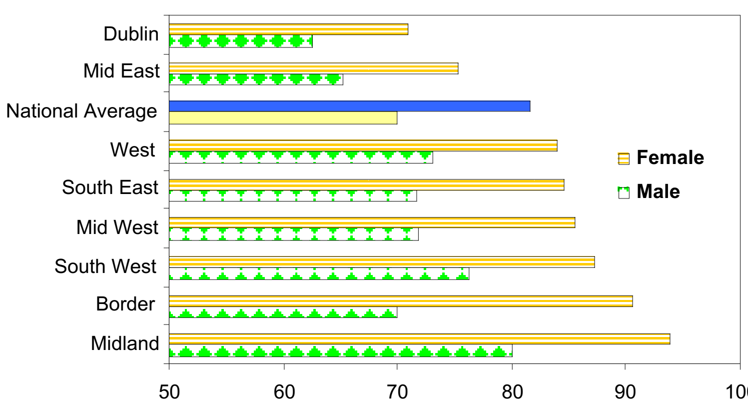
The BMW Region has one university, NUIG, and five IoTs – Galway Mayo Institute of Technology (GMIT), Athlone Institute of Technology (AIT), Institute of Technology Sligo (IT Sligo), Letterkenny Institute of Technology (LYIT) and Dundalk Institute of Technology (DKIT). In addition, St. Angela's College in Sligo is a College of Further Education, specialising in domestic science and in the near future, nursing. GMIT, unlike the other IoTs, is adjacent to a university and has three campuses –Galway, Letterfrack and Castlebar. DKIT has excellent road and rail connections and is within easy reach of Dublin and Belfast. Apart from NUIG, AIT, GMIT and DKIT, the other Institutes are relatively isolated and not served with good road or rail connections. Telecommunications, however, are set to improve.

There is an anomaly in the centre of the BMW Region: counties Laois, Offaly, Leitrim, Roscommon, Longford, Cavan and Monaghan have no Third Level institutions. Much of this area is within commuting range of an IoT in another county judged by time, not distance. But student travel patterns do not necessarily follow the most direct routes. Indeed, significant numbers of students travel from Dundalk to Tallaght IoT. DKIT is extending its sphere of influence into Cavan and Monaghan. Laois and Offaly are to some extent served by AIT and Carlow IoTs and Leitrim by I.T. Sligo. Líonra, the Regional Higher Education Network for the BMW Region, is taking some steps to alleviate this problem by bringing education to all counties, but it does not directly provide services to industry. In terms of innovative development, however, industry in those counties is at a disadvantage.

Participation Rates – School Leavers

All Third Level colleges rely on school leavers for 90% of their intake. The school-leaving cohort (16-19 age group) is declining rapidly throughout Ireland, due to falling birth rates. By 2005, the proportion of the population in this cohort will have dropped by 13% as compared to Ireland as a whole in 2000, and also in the Border and West regions; the Midland region will fall by 17%. In addition, the number of students leaving education before the Leaving Certificate is increasing (see Figure 44).

Figure 44. Male and Female Participation Rates in % to Leaving Certificate Level



Source: HEA Enrolment Statistics

Participation rates to Leaving Certificate are highest in the Border and Midlands regions and lowest in Dublin. This is forcing colleges to adapt to providing courses in continuing education, as well as part-time and modular courses. There is also a movement away from science and subjects seen as difficult (Physics and Mathematics) or laboratory based in particular. Many Third Level colleges are offering active support to Second Level schools in their area to reverse these trends.

The rate of admission to Third Level education, i.e. the percentage of the school-leaving cohort, shows considerable variation across Ireland and particularly in the BMW Region (Table 54).

These figures do not include admission to colleges in Northern Ireland, shown in parenthesis after the county name. Adjusted admission rates are also shown in parenthesis.

Table 54. Rates of Admission to Higher Education in Ireland, 1998

County	Cohort	Rate	County	Cohort	Rate
Laois (0)	1,124	.385 (.385)*	Leitrim (8)	477	.528 (.543)*
Longford(1)	699	.491 (.491)*	Mayo (7)	2,288	.557 (.560)*
Louth (66)	1,954	.426 (.458)*	Roscommon (5)	1,080	.502 (.506)*
Offaly (1)	1,370	.378 (.379)*	Sligo (22)	1,096	.556 (.574)*
Westmeath (4)	1,379	.489 (.492)*	Cavan (18)	1,076	.453 (.468)*
Galway (15)	3,788	.567 (.571)*	Donegal (315)	2,744	.351 (.456)*
Monaghan (98)	1,122	.407 (.488)*			
Dublin (25)	18,876	.377 (.378)*	State	71,808 (649)*	.444 (.453)*

Source: HEA Enrolment Statistics
*Notes: * Including admission to colleges in Northern Ireland*

The showing for Dublin here is consistent with the previous figure, but not so for Laois and Offaly. There is no obvious correlation between admission rates and the presence of a Third Level college in the county, however the location of first employment for graduates is quite regional specific.

These rates have more than doubled in every county since 1980. In 1998, 31,883 students who sat the Leaving Certificate were admitted to Third Level education in Ireland. Entries to universities and IoTs are shown in Table 55.

Table 55. 1998 Entry Rates (%) to Universities and Institutes of Technology

Region	University Rate (A)	Institute of Technology Rate (B)	A+B	B/A
West	22.7	29.5	52.2	1.3
South West	24.9	23.0	47.9	0.9
Midland	16.6	24.6	41.2	1.5
Border*	13.3	26.4	39.7	2.0
Mid East	18.0	20.6	38.6	1.1
Mid West	20.1	18.4	38.5	0.9
South East	14.4	20.1	34.5	1.4
Dublin	18.5	14.8	33.3	0.8
National Average	**19.5%**	**21.7%**	**41.2%**	**1.1**

Source: College Entry in Focus, HEA, 2001

The availability of places is shown in Table 56. The BMW Region is proportionately better supplied with IoTs than university places as compared to the S&E Region. But the BMW Region needs more university places. It only has 14.7% of the national total.

Table 56. Number of Third Level Places Available

Third level Institution	South & East Region	BMW Region	Total	BMW Region as a % of total
Universities	58,000	10,000	68,000	**14.7%**
Institutes of Technology	45,532	17,396	62,928	**27.6%**
Total	**103,532**	**27,396**	**130,928**	
%	79.1	20.9	100	

Source: HEA Enrolment Statistics

University places are important because they have a significant impact on post-graduate places. The expansion in postgraduate places has not occurred evenly (Figure 46).

Teaching and Learning

The primary role of Third Level institutions in the BMW Region is to provide educated, trained and well-rounded personnel for the socio-economic sectors. This role has changed somewhat in recent years and will change more with the reduction in Foreign Direct Investment (FDI) and the growth of indigenous industry. While skilled personnel are produced in most parts of Ireland, it is instructive to see where they first go to work. Table 57 shows the increase in graduate output in a decade, and the trend to work in Ireland rather than emigrate. Low unemployment rates are also evident.

The employment distribution of primary degree-holders, and even more so higher degree-holders, is far from uniform (see Figures 44 and 45). This demonstrates the lower ability of the Border and Midland regions to absorb graduates - one measure of the level of innovation in a region. The Western Region fares relatively well.

Table 57. First Destination Employment – Primary and Higher Degrees, 1990-2000

Primary Degree	1990	1995	2000
Number Graduating	8026	11907	16339
Gained Employment %			
Ireland	36.9	69.5	50.7
Overseas	16.0	21.5	9.0
Seeking Employment	5.1	6.4	2.1
Higher Degree			
Number Graduating	1611	2550	3475
Gained Employment %			
Ireland	61.8	57.8	64.4
Overseas	19.5	20.5	18.0
Seeking Employment	5.2	5.1	3.1

Source: HEA First Destination of Award Recipients in Higher Education 2000

Note: The following four figures relating to 'First Employment' and 'First destination' are normalised by population in their NUTS III Regions and one is the national average for the State.

Figure 45. First Employment of Primary Degree Graduates by Region 1998-2000

Source: HEA First Destination Reports

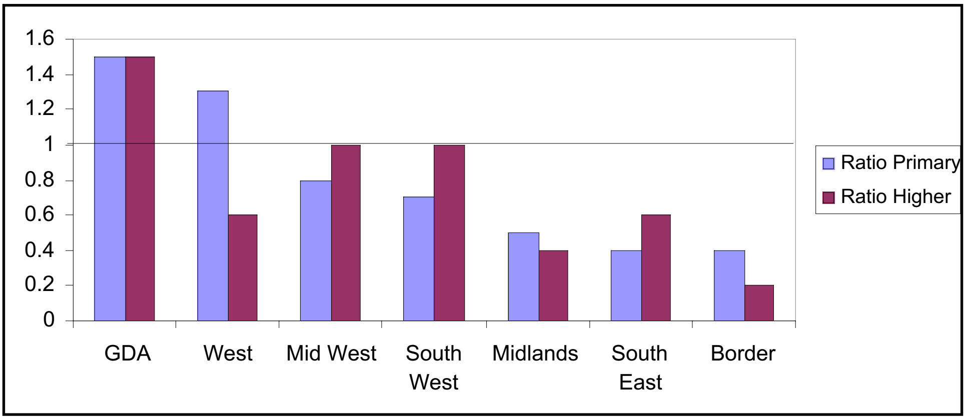
Figure 46. First Employment of Higher Degree Graduates by Region 1998-2000

Source: HEA First Destination Reports

First destinations for engineering (Figure 47) and science graduates (Figure 48) give a more detailed picture of technical innovation levels. The importance of engineering in the Western Region is obvious.

Figure 47. First Destination Employment Rates 2000: Engineering

Figure 48. First Destination Employment Rates 2000: Science



A number of area-specific linkages have developed in the BMW Region. Thus, DKIT has strong academic and research links to QUB and NUU and LYIT has similar links to Coleraine. In both cases, proximity to the border enables IoTs to obtain funding from initiatives such as the Fusion and PEACE Programmes, the International Fund for Ireland, Interreg and InterTradeIreland. An integrated plan has been developed for the NW Corridor. The position of the IoTs and NUIG in the National Spatial Strategy has been described recently[21].

Formal links exist between the BMW Region IoTs and the rest of the IoTs through TecNet and between the BMW Region IoTs and NUIG and the BMW Regional Assembly through Líonra (see next section), which facilitates course development and outreach courses. There is also a formal link between NUIG, UCC and UL through the Atlantic Universities Alliance, which carries out co-operative R&D for industry through the Technology Transfer Initiative (TTI).

The Third Level sector thus presents a tightly knit community in the BMW Region.

Life Long Learning

[21] McDonagh, Sean (2003), Higher education and National Spatial Strategy: A discussion document. Skills Initiative Unit, Dublin.

Líonra, the Higher Education Network of the Border Midlands and Western Region, was established in 2001 and is the collaborative response of the seven Third Level institutions in the BMW Region to the educational and developmental challenges facing the region. Líonra is funded by the member institutions (50%) and jointly by the HEA and EQUAL Ireland (50%), an EU programme, giving a total budget of €200,000 a year. A wide range of co-operative measures are outlined in Líonra's Operational Plan (2001-2006), "Building the learning region together". The plan focuses on four main areas:

- Developing a state-of-the-art education, research and technological infrastructure and resources to support development
- Enhancing the human resource development of the BMW Region through a series of education and training interventions
- Providing supports for indigenous resource development in key sectoral areas and a strong knowledge base to attract new industry
- Incorporating RTDI into the productive infrastructure of the region

The immediate purpose of Líonra is to harness the resources of its members to provide distance learning courses in the BMW Region. These are specifically aimed at socially disadvantaged people and those employed without Third Level education to degree level, but with work experience and who are at least 20 years of age. In the first instance, the "Access Taster Programme" is aimed at the middle of the BMW Region - Cavan, Monaghan, Longford, Laois and Leitrim. Líonra is working with SIPTU Border and Midland Regions to retrain people whose jobs are under threat. This involves collaboration with the employers in facilitating job rotation and in-house training. Prior experience will be accredited jointly with the employer via FÁS, SIPTU and IBEC.

According to an Líonra report[22], there are many opportunities for accessing lifelong learning within the BMW Region. There are many different organisations and institutions offering a wide range of courses, mainly national bodies and the Open University, U.K. But they are often 'fragmented and the uptake is uneven'. The Líonra report also states that, 'from available data, it was not possible to discern the numbers from the BMW Region currently undertaking distance learning courses. However, anecdotal evidence suggests people living in the most disadvantaged areas may not be availing of the many opportunities available for further study. The majority of courses available were in Arts, Science (aimed at upskilling professionals) and Business (aimed at management primarily). They are of a general nature, and not targeted at specific sectors or designed to address specific problem areas.

Specific problems identified by the Líonra report were:

1) Only counties Galway, Sligo and Louth had female employment rates higher than the national average and nearly all those without a Third Level institution had considerably lower female employment rates. Líonra believes greater access to lifelong learning would go some way to addressing this problem.

[22] Líonra, (2002), Report on BMW Demographics, Current Availability of Distance Learning courses, ICT Connectivity and Learning Centres in the BMW Region, NUIG.

2) The need for entrepreneurial skill development was identified by many counties as a critical development need.

3) Líonra also argued that people in areas of high employment in low skill industries see little value in further education. These areas tend to experience a brain drain, particularly of young people, who leave for education reasons and then take their first job elsewhere.

4) Líonra identified the need for "better co-ordination of effort between institutions, and better liaison between business and education, to ensure relevance and to establish opportunities for progression and certification".

5) In the final section of its conclusions Líonra briefly overviews each county, states its employment situation and lifelong learning priorities, and comments on their availability. FÁS and the VECs were also covered by this assessment.

6) Líonra's recommendations included:

- Fact finding for industry needs
- Upskilling – short modular training programmes
- A focus on both industry needs and self-development
- Links with outreach centres
- Specific initiatives for women in disadvantaged areas
- Initiatives for specific sectors – high quality green/gourmet food, seafood and alternative energy
- Education related – raising quality, community learning experiment, progression issues, flexibility and access.

Líonra has good relations with CHIU via NUIG (on national policies), CODIT (through the Directors of the IoTs), the Atlantic Alliance, the Technology Transfer Initiative, SIPTU, FÁS, the VECs and with IBEC via EQUAL. At a local level, there is interaction with EI and Udarás. Líonra also has links to Skillnets and works with the social partners. Links to industry work through members' ILOs, although Líonra does not directly provide services to industry.

6.1.3 Research

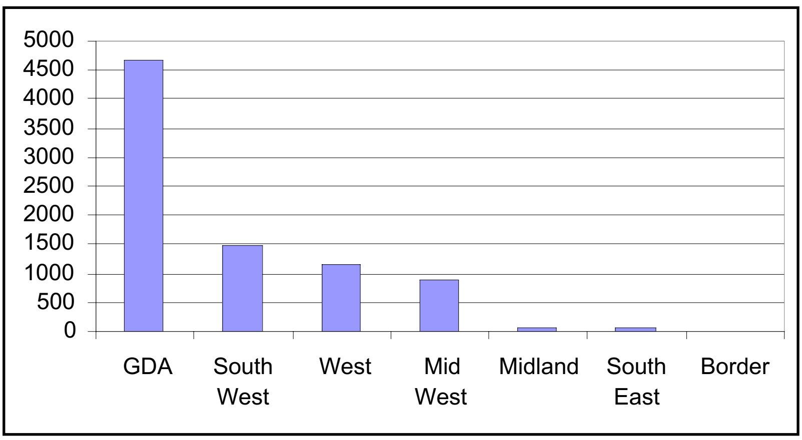
This section examines two areas: the education and training of post-graduate students (mainly PhDs) and the level of Third Level research in the BMW Region.

Training of PhD Students

It would seem that there is a 'knowledge drain' of undergraduates and postgraduates to the Greater Dublin Area, whose young people are neither finishing school nor going to Third Level education at the national rates (see Figure 49).

Strategic plans for the institution as a whole are in place in almost all of the Third Level institutions. Some plans include research; other institutions have a separate research strategic plan. These include a clear vision of the development of research activities and relations with the private sector. Not all institutions have a clear formal policy on intellectual property rights (IPR) and their exploitation, as in some cases the issue has not yet arisen. Even where intellectual property (IP) has been developed, there has been little attempt to commercialise it. The view was expressed by one institution that exploitation is 5-10 years away.

Figure 49. New Postgraduate Places in 2001/2002



Source: HEA Enrolment Statistics

Research Management

There are fundamental differences between universities and IoTs arising from historical developments. The former were always charged implicitly with education and the pursuit of knowledge. Most university staff actively pursue academic research and scholarship, but not often of an applied nature.

The IoTs by contrast have their genesis in the VEC colleges, with an emphasis on craft and technician training. Teaching was their prime function and research played no part in the life of the college. IoT staff now have a formal contract which stipulates set teaching hours (16 hours a week for a Principal Lecturer and 18 for an Assistant Lecturer) with no further commitments in or out of term. Of course, IoT staff have to prepare course material, set and mark examinations and take part in the administration of the IoT. A member of IoT staff is credited with two hours a week for supervising a post-graduate student, up to a maximum of three students. There is little or no surplus time in term for research or other industrial activity. The IoTs therefore find it hard to grow organically as they find it hard to compete with the established universities.

I.T. Sligo is unique in that it has a Research Department that spans the whole Institute and is administered by the Head of Research, the only such arrangement in Ireland. The department has five contract staff, who are active in 25 research projects. These do not include co-operation with industry.

Participation in Basic Research Programmes

Public funding for Third Level research comes from a number of sources (Table 58). The major funding agencies are:

- Department of Education and Science – under HEA – Programme for Research in Third Level Institutions (PRTLI)
- Irish Research Council for the Humanities, and Social Sciences (IRCHSS)
- Irish Research Council for Science, Engineering and Technology (IRCSET)

Nine smaller organisations also fund research in the Third Level sector. These include the Forestry Research Council (COFORD), Environmental Protection Agency (EPA), Health Research Board (HRB), the Marine Institute (MI) and Sustainable Energy Ireland. All funds are competitive and research excellence is a key criterion.

NUIG dominates the research 'winners' in the BMW Region through PRTLI. The more applied research carried out by the IoTs carries little weight with PRTLI. The BMW Third Level sector received 12.6% of the basic research funds between 2000 and 2002. This is considerably less than its pro rata share of these funds.

The more applied State research funds are discussed in the next section on industry.

Table 58. Summary of Funding and Approvals for the Third Level Sector 2000-2002 (€M)

Agency	S & E Region	BMW Region	% to S & E	% to BMW	Comments
COFORD – Forestry R&D	0.9	0.1	90.0%	10.0%	Actual expenditure 2000-Q3 02
EPA: 01/2000 to 02/2003 Mainly HE	5.1 154 projects	0.9 35 projects	82.2% 81.5%	17.8% 18.5%	Dublin and Limerick cities got 2.4
HRB	19.3	4.5	81.1%	18.9%	1999-2002
Marine Institute HE only	2.1	2.0	52.2%	48.8%	Funds contracted over 2000-2006
PRTLI	531.5	73.0	87.9%	12.1%	Contract values
IRCHSS					Very little to BMW Region
IRCSET Scholarships Starting 01-02	Applied 896 Offered 172 Accepted 140	Applied 156 Offered 41 Accepted 36	85.2% 80.7% 76.5%	14.8% 19.3% 20.5%	
Basic Research grants	Applied 513 Awards 52	Applied 56 Awards 7	90.2% 88.1%	9.8% 11.9%	
Totals	€558.9	€80.4	87.4%	12.6%	Grand Total: €639.3M
Sustainable Energy Ireland	*95.2*	*90.2*	*51.3%*	*48.7%*	*NDP figures for 2000-06. No funds have been disbursed to end of 2002*
Note: It can be difficult to apportion some of the funds between the BMW Region and the S&E Region, as they relate to joint projects. In addition, it should be noted that some projects are supervised in one region but executed in another, for the immediate benefit of the host region.					

Source: The Funding Agencies, 2003.

The low level of research funding is influenced by the number of university research places in the BMW Region, which are proportionally less than in the S&E Region. The BMW Region has one university and the S&E Region has six universities. Four of those are in the greater Dublin area. The possibility of locating a new university has been under discussion for some time. The most recent discussion has centred on a university of the North West, which could encompass the IoTs of Sligo and Letterkenny and the University of Ulster at Derry. Discussions are at an early stage.

PRTLI is the major fund. It provides funding for projects of a nature strategic to the institutions, which are of an outstanding quality in any discipline. The submissions were assessed by a high level group of foreign academics. There have been three funding phases or cycles. Participation as leaders and partners is shown in Table 59 below.

Table 59. Institutions funded by PRTLI

Institution	Cycle 1 1999	Cycle 2 2001	Cycle 3 2003
Athlone IT	1	1 partner	1 partner
GMIT		2 Partner	
NUIG	1	2 leader, 3 partner	5 leaders, 6 partner
Sligo IT		1 Leader, 1 Partner	1 Leader, 1 partner
Total BMW	**2**	**3 Leaders, 7 Partners**	**6 Leaders, 8 Partners**
Total S&E Region	15	10 Leaders, 22 Partners	25 Leaders, 42 Partners

Source: The Funding Agencies, 2003.

The first cycle involved single institutions in each project so funding could be easily dis-aggregated. NUIG had a project funded in Cycle I for €19.55m. Other cycles involved partnerships and present some difficulties in identifying where the money was spent. Total funding to the IoTs under PRTLI has been €14M.

Projects, which are not necessarily of strategic importance to the institution, may be funded by one of the Research Councils operating under the aegis of the HEA.

The Technological Sector Research Programme (TSRP), for IoTs and funded by EI, operates three strands:

- Strand 1, Postgraduate research skills development
- Strand 2, The Enterprise Platform Programme (which only lasts 12 months)
- Strand 3, Core Research Strengths enhancement

Strand I approvals in 2000-2006 are shown in Table 60. To date the IoTs have obtained €24M from the TSRP. Since 2000,

- Strand I has supported 140 postgraduates
- Strand 2, 135 graduates
- Strand 3, 41 postgraduates and nine post-doctoral fellowships

Table 60. Strand I Postgraduate Research Skills Development, Approvals 2000-02

Institute	2000	2001	2002	Total
Athlone	3	2	3	8
Blanchardstown	2	2	2	6
Carlow	4	3	2	9
Cork	5	12	6	23
Dundalk	1	3	2	6
Dun Laoghaire	0	1	2	3
Galway/Mayo	5	2	5	12
Letterkenny	0	0	1	1
Limerick	1	5	6	12
Sligo	2	1	2	5
Tallaght	7	9	15	31
Tralee	1	5	3	9
Waterford	3	10	11	24
Grand totals	**34**	**55**	**60**	**149**
BMW Region total	11	8	13	32 (21.5%)
S&E Region total	23	47	47	117 (78.5%)

Source: HEA, 2003

There is a network of Enterprise Platform Programmes, which meets every six months.

Participation in EU Funded Programmes

The Fourth Framework Programme 1994-98 is the latest for which data is available[23]. As in earlier EU Framework programmes, the Third Level sector was a major participant. It accounted for 45% of all Irish involvement, i.e. 669 participants across 23 institutions. Other participants were the State Research Institutes (23%) and private industry (32%). The 23 institutions received on average 4.163 MECUs, accounting for 96 MECUs. This was a very important source of funds to the Third Level sector in that period (before the establishment of the PRTLI programme).

Unfortunately there is no Third Level institutional breakdown in the Forfas report, but there is a geographical breakdown of all contracts by country. At least 85% of the participants and 85% of the funding went to the S&E Region, while 12% of the participants and 13% of the funding went to the BMW Region. The balance (3%) went to undisclosed counties. Most of the BMW Regional funding went to Galway, primarily NUIG (9% of participants and 10% of funding). The BMW Region achieved significantly less than its expected share.

[23] Forfas, (2001), The 4th Framework Programme in Ireland, Dublin.

6.1.4 Third Level - Industry Interaction

Policies and Industry Liaison Staff: All of the Third Level institutions have policies in regard to co-operation with the private sector. The IoTs and NUIG have an Industrial Liaison Manager, who reports to the Head of Development. Activities include specialised training courses for staff in, usually near-by, firms to suit the needs of the firm, more general courses such as MBA and M.Sc. in Technology Management, and some short courses of general interest to industry. It has not proved possible to organise research clubs on campus on a sustained basis. However, the level of technology transfer staff is very low in both the BMW and S&E Regions. This will become a restriction on the sector's contribution to the knowledge economy, if the transfer resources do not increase in line with knowledge development (primarily from R&D).

Services to Industry: In addition to their primary Teaching and Learning role in the BMW Region, the Third Level institutions have a very important role in providing support services to the private sector. In doing so they substitute for the system of private sector Research Associations common in other countries, but virtually unknown in Ireland. Further activities provided by the Third Level sector for industry, in order of usage, are:

- Product design and R&D
- Provision of information, education and specialist training
- Feasibility studies and consultancy
- Testing and analysis
- Prototyping

Four important services – industry-related research, specialised centres for specific industries, incubator centres and spin-out companies – are elaborated in the following sections.

State Applied Research Funding: There remains little public research effort apart from the Third Level sector, Teagasc and some smaller programmes. These programmes also complement the private productive sector as well as other socio-economic and cultural activities. Public funding for Third Level industry related/applied research comes from a number of sources (Table 61). The major funding agencies are:

- Science Foundation of Ireland (SFI) – primarily Biotechnology and ICT
- Enterprise Ireland (EI) – mainly industry related research funding
- Department of Agriculture and Food (DAF)

Table 61. Applied Research Expenditure in the BMW and S&E Regions (€M)

Agency	S&E (€M)	BMW (€M)	% to S&E	% to BMW	Comments
DAF 00-02 Expenditure	14.1	0.8	94.6%	5.4%	Public good R&D, widespread benefits
SFI	148.0	7.0	95.5%	4.5%	Only NUIG.
EI IDA SFADCO ÚDARÁS	56.5	15.2	78.8%	21.2%	HE schemes ARG+IP '98-'02 ATRP+ Research Innovation fund
Total	**218.6M**	**23.0M**	**90.5%**	**9.5%**	**Total: €241.6M**

Source: The Funding Agencies, 2003.

HE schemes = Higher Education schemes; ARG = Applied Research Grant Scheme (now changed to Innovation Partnerships); IP = intellectual property; ATRP = Advanced Technology Research Projects

Third Level institutions in the BMW Region secured 8.5% of the State national funding for industry-related research. On a pro rata basis, this is considerably less than they should have received in comparison with the S&E Region.

Joint Industry-Third Level Research: Funding for collaborative RTDI between industry and the institutions is provided by EI under the Innovation Partnership scheme, formerly known as the Applied Research Grants (see Table 62).

Table 62. EI Innovation Partnership Programme, 1988-2002

Funds to S&E Region	Funds to BMW Region	Total	% to S&E Region	% to BMW
€17,078,462 250 projects	€6,792,977 95 projects	€23,871,439 345	71.5% 72.2%	28.5% 27.8%

Source: EI, 2003

The BMW Region received its fair share of this funding.

Specialised Research Centres: The IoTs all have specialised research interests and facilities. These generally relate to the local needs of industry and of society. Some are listed in Figure 50.

Figure 50. Some Institutes of Technology and St Angela's College Specialisations

Institutes & St Angela's College	*Specialisations*
Athlone	*Polymer engineering centre for biopolymer and biomolecular research* *Electronic engineering, digital signal processing, neural computing and software engineering* *Science cell, molecular toxicology, endocrine disrupters, ecotoxicology, separation and analytical technology*
Dundalk	*Software technology research* *Entrepreneurship research* *Borderlands studies* *Electoral studies* *Medical imaging and bionumerics* *Digital multimedia* *Renewable energy*
Galway/Mayo	*Product design* *ICT* *Marine biology and natural resources* *Energy* *Enterprise development* *Furniture design and manufacture technology*
Letterkenny	*Automation* *Business development support* *Marine biology*
St. Angela's	*Food science and Technology*
Sligo	*Centre for Sustainability – environmental monitoring and analysis, biosolids research* *Engineering group, automation, design training* *Healthcare group*

I.T. Sligo and St. Angela's College have each established limited companies to provide consultancy services to industry, the latter specialising in food and catering.

EI has developed an assistance package with three support elements – feasibility, proof of concept and technology commercialisation – to assist the commercialisation of new product/process concepts and patents developed by the Third Level sector. This assistance will become very important in the future to commercially exploit IP (Intellectual Property) developed in the Third Level sector.

Incubation Centres: Business incubation centres are already in place in Dundalk (originally funded by IFI, INTERREG and IDA but now with EI funding), Letterkenny and Sligo IoTs and NUIG. Dundalk and Sligo IoTs are to expand its campus incubator centre, known as the Regional Development Centre, and is establishing an outreach centre in Drogheda. EI has agreed to provide funding for incubator centres in GMIT in Galway and Castlebar, Athlone and the IoTs in the S&E Region. St. Angela's has deferred a decision.

While the incubator centres are a resource for local entrepreneurs and new start-up companies, they also are a resource for spin-off companies based on academic R&D. This is not a generally accepted institutional objective per se, although EI seek to make it a condition of support. However, the reality is that most of the tenants are not spin-off companies. The Border incubator centres have the longest operational experience. Dundalk has had an occupancy rate of nearly 90% for a number of years now. Candidate firms are screened for their business realism and relevance to the interests and skills of the academic staff prior to taking up their tenancy, and are monitored regularly once admitted. The company survival rate three years after leaving the incubator centres is typically 75%. The rate in the US is 80%. The LYIT incubator centre has produced 30 jobs in the last two years. One company, which started six years ago, now employs 70.

Technology Transfer: The Technology Transfer Initiative (TTI) was established by the three universities of the Atlantic University Alliance (UCC, UL and NUIG) with support from EI. It was the Alliance's first project and provides technical and business support for SMEs in the West, Southwest and Midwest Regions by acting as a gateway for access to the expertise and resources of the three universities. The aim is to encourage Irish firms to become more innovative and competitive. TTI is represented on each of the three campuses by two staff, in addition to the existing industrial liaison teams. Services provided include collaborative R&D, technology brokering, specialist training activities, mentoring, innovation clubs and outreach programmes. Funding is available from EI to firms for these services. The TTI is focused on the key growth sectors of the Atlantic seaboard: ICT, Engineering, Biomedical and Healthcare and Food.

The technology network TecNet was established in 1999 by the Council of Directors of the IoTs and is jointly funded by EI. It is a commercially focused company located in Cork. TecNet's primary objective is to provide industry with high quality, comprehensive R&D, consulting services and technology transfer by utilising the skills and facilities within the IoTs. TecNet will find the most suitable solution providers for the client and then manage and control the project.

The Atlantic Corridor is a four-way transatlantic business, education and cultural alliance between the Midlands, Northern Ireland, upstate New York and Southern Ontario. Atlantic Corridor USA, Inc. is the U.S. administrative unit of the Atlantic Corridor. It is a non-profit organisation serving an area in upstate New York stretching from the Pennsylvanian to Canadian borders, and east to Syracuse. The goal of Atlantic Corridor USA, Inc. is to provide opportunities for partnerships and strategic and reciprocal alliances for SMEs in these locations. The Corridor offers opportunities across the sectors of business, education, culture and health. The mission is accomplished through:

- Business Development - business partnerships in licensing technologies, manufacturing, selling and distribution
- Educational Programs - student, faculty and CEO exchange, technology transfer, and joint collaborations of upstate New York and European colleges and universities
- Arts and Cultural Exchange - facilitated by the visits of musical, dance, theatre and other arts groups from across the Atlantic

In Southern Ireland, the partnership is represented by the Offaly Regeneration Company, based in Tullamore, and is 100% funded by the Department of Foreign Affairs. The work of the Atlantic Corridor in the Midlands will be focused on three fronts:

- To seek out and attract projects and enterprises that will assist in supporting sustainable development
- To encourage higher educational attainment
- To work with the partners to identify, develop and implement projects, which are mutually beneficial and which will strengthen the corridor

Atlantic Corridor works closely with the IDA, EI, Shannon Development and Offaly County Council to address upskilling needs for local industry. The Corridor also assists AIT and DCU in fostering links with universities in the US, especially the University of Buffalo and Syracuse University.

An educational centre, **Quest Campus**, located in Charleville Castle, Tullamore was established some years ago to bring a fresh approach to Third Level education. Quest micro University was developed in partnership with a number of Irish and U.S. universities. Based on team learning, the micro University integrates all possible learning events and systems under one umbrella and accreditation system. This initiative will encourage greater local participation at Third Level and facilitate exchange programmes between the US and Ireland.

Spin-off companies from universities are important, but the rate at which they are set up in Europe is much lower than in the US, their growth is slower and their survival rate lower. Many of these spin-offs would be High Potential Start-Ups – an essential contribution to developing more high tech/high growth companies. Increased collaboration between the IoTs and NUIG would be beneficial.

Other university activities of regional importance include the establishment of science parks and technology centres, the development of co-operation structures between industry and universities and between universities and the expansion of universities' regional socio-economic strategies. The level of spin-off companies is very low in the BMW Region.

6.1.5 Administrative Barriers to Future Developments

There are a number of challenges that need to be overcome before the Third Level sector in the BMW Region can contribute in any significant way to the knowledge economy and to regional development. These include both culture changes and administrative operating rules and regulations:

a) The university culture in NUIG is based on a combination of teaching and learning, and basic research or the pursuit of knowledge. Promotions are based primarily on teaching and research publications, with little allowance for industry or development-related research, consultancy or technology transfer for promotional considerations.

b) There is no formal mechanism in the IoTs for rewarding staff who carry out research, unlike the university system of advancement based on research performance. Nor is there a formal system of recognition in many IoTs. A step in this direction is being taken by some, whereby staff are encouraged to obtain a Ph.D. This may lead to promotion from Assistant to Principal Lecturer. Thus there is very little an IoT can do to reward those who perform research or penalise those who do not.

c) In practise, the IoTs offer much more limited support to industry than NUIG for a number of reasons. These include constraints on time, space and adequate equipment, which must be up to industry standards, and lack of interest on the part of some staff whose focus is on teaching and learning.

d) There is no critical mass in the BMW Region IoTs, as their role is based mainly on teaching and learning and they have little time for undertaking R&D, supervising post-graduates or working with industry. Nonetheless, a number of IoT staff do carry out research and collaborate with the private sector, as the research funding statistics show.

e) International trends removing differences between the roles of universities and IoTs/colleges of further education emphasise their contribution to the knowledge economy and regional development, and require that:

- Changes will be made in the structures, attitudes, funding and governing legislation
- Consensus between the Department of Education and Science and the Department of Enterprise, Trade and Employment on the optimum roles for the Third Level sector is achieved. There are already concerns about academic drift
- There will be long-term planning and government commitment to continuous funding, e.g. the recent 'pause' in PRTLI funding is sending the wrong message

f) In other countries State research institutes and private research associations usually share this role. But Ireland has no private research associations and the BMW Region has just a single State research institute, the Marine Institute in Galway, which moved to Galway in 2003. Consequently, it should play a more important regional role than heretofore.

g) The reality of the situation is that academic staff in IoTs, and to an extent in universities, do not represent a large resource of support for industrial R&D. It seems likely that the total industry related resource in the BMW Region is no more than 15-20 FTEs. Lack of time is one barrier. Others include the lack of physical resources, such as time available on equipment used for teaching, contracted teaching hours per week etc. The NUIG resource is much greater, due to the presence of the Programmes in Advanced Technologies (PATs). Its resource probably amounts to 25 FTEs.

h) The available information of the impact of the Third Level sector's work with the private sector is limited and measurement is necessary to monitor and evaluate progress.

6.1.6 Case Study: Athlone Institute of Technology (AIT)

Athlone Institute of Technology's (AIT) mission is to contribute to the technological, scientific, commercial, economic, industrial, social and cultural development of the State, with particular reference to the Midland Region, through the provision of a balanced education to the highest international standard founded in accessibility, mobility, collaborative links, and research excellence.

Teaching and Learning

Established in 1970, the main campus building currently houses the Schools of Business, Engineering, Humanities and Hospitality Studies and Science; the Library; the Information Technology Centre; the main student canteen and facilities and the Institute's administration offices. The Institute currently offers an extensive range of undergraduate and postgraduate programmes to over 4,000 students. There are some 300 Academic Staff members and about 200 Administrative and other Staff.

The Department of Adult and Continuing Education provides the opportunity to pursue a lifelong education process and fulfils the need to constantly update knowledge, skills and attitudes. Currently, there are approximately 1,200 students studying on a part-time basis.

Research

Since 1974, research has been one of the functions of AIT. It is funded in a number of ways:

- Direct funding by companies. This usually applies to the short-term (six-month) undergraduate projects. Typical cost to the company would be <€2000
- Joint funding by companies and state bodies (Enterprise Ireland, IDA). Companies usually provide 25% - 50% of the costs which fall within a range of €50,000 to €500,000
- Direct funding by State or EU bodies, or as part of collaborative programmes with other institutions and/or industry. These programmes are multi-project, and the costs involved are in excess of €1 million.

The advent of the third type of programme above has led to AIT setting up CBBR, The Centre for Biopolymer and Bio-Active Research. This is a collaborative research body arising from common interests in the Polymer and Toxicology/Biochemistry Departments, and undertakes all research work related to the Biomedical and Pharmaceutical industries.

AIT staff has worked with a wide range of clients over the years, including Howmedica International Ltd, Wellman International Ltd., L. M. Ericsson Ltd., 3-Technologies Ltd., Dublin District Milk Board, Elan Corporation plc., Athlone Laboratories Ltd., Midland Health Board, Arran Chemicals Ltd, Boston Scientific Ltd., Athlone Extrusions Ltd. and Mednova Ltd.

As part of the final-year degree programme all students undertake a short-term research project.

Table 63. AIT Research Project Funded by Faculty, 2000–2003

Total Research Grants Awarded.		2000	2001	2002	2003
	Faculty	€1,334,910	€480,510	€407,142	€994,554
No. of projects funded	Science	11	7	5	5
	Engineering	12	4	2	5
	Business	-	-		2
	Humanities	-	-		1
	Totals	23	11	7	13
No. of Postgraduates funded		**19**	**9**	**6**	**7**
No. of Post doctoral posts funded		**4**	**1**	**1**	**2**

Industry-Related Activities

The External Services Unit: At AIT, this provides administrative services involved in the funding of research and coordinates many of the other external services of the Institute. ESU provides a service to Industry and Business through the provision of Tailor-made Training Programmes, Business and Technology Consultancy, Analytical Testing Services, Technology Networking, Conference and Exhibition Facilities and Information on State Grants and EU Programmes. The Unit also facilitates the negotiation of technology transfer agreements, research contracts and agreements between potential Collaboration Partners.

Entrepreneurship Programmes: AIT is collaborating with the other Third Level institutions in the BMW Region under the auspices of Líonra, which will result in the provision of 11-month part-time courses on running a business. The courses will involve lectures, workshops and mentoring, and are expected to commence in 2004.

Competitive Business Intelligence , (CBI): Established in 1997, CBI is a self-financing unit within AIT providing training, information and consulting services directly to business. It has built up a clientele in excess of 100 organisations, including banks and other financial concerns, local and national industries, state and semi-state bodies and other commercial businesses.

The Midlands Business Innovation Centre: The key objective of the proposed Midlands Business Innovation Centre is to generate and develop "High Potential Start-Ups" in knowledge-intensive sectors. Enterprise Ireland has committed €2.54 million to support the design and construction of the state-of-the-art Innovation Centre.

Table 64 summarises AIT's industry-related activities between 2000 and 2003.

Table 64. Summary of Industry related Activities, 2000-2003

Description	Number
Nos. of Industry commissioned/joint research projects	15
Nos. of applied industry research projects	17
Nos. of consultancy assignments	N/A
Nos. of companies in the incubator building	12
% of professional staff involved in industry related research and consultancy	13
Nos. of spin-out companies from AIT	-

Overall Conclusion

One of the issues explored in the AIT case study was how much staff time was spent addressing the multiple objectives of an IoT. Table 65 shows the first estimate and a suggestion as to what it should be in the longer term.

Table 65. Percentage Effort by AIT's Objectives

	Now % Effort	What should it be?
Education (incl. Administration)	88	70
Research (basic & strategic)	6	15
Economic & social development (incl. applied research)	6	15
Total	**100%**	**100%**

6.1.7 Conclusions

The main conclusions are:

1) If the Third Level sector is to make a more direct contribution to the development of the private sector and to regional development, more research, and research of a more applied nature, will be required. Indeed, if Ireland is to progress as a knowledge-based society - the only way of competing internationally - there is no choice in the matter.

2) Academic research workers in every institution will need some research training in management protocols and ethics. Institutions will all need formal and consistent IPR policies. Staff must learn to regard IPR as a marketable commodity.

3) The reality of the situation is that academic staff in IoTs and to an extent in universities do not represent a large resource of support for industrial R&D. It seems likely that the available resource in the BMW Region is no more than 15-20 FTEs in the IoTs and 25 FTEs in NUIG. The academic staff represents a **reserve**, which could become a **resource** in the future.

The following figure shows the main areas for improvement.

Figure 51. Current Performance in the Third Level sector's Main Development Activities

Main Activities	Activities - Measures	Evaluation
Teaching and Learning	▪ Undergraduate and graduate ▪ Life Long Learning – adult	Adequate, but the entry cohort needs to be increased Needs considerable strengthening
Research	▪ Basic research ▪ Post-Graduate training ▪ Participation in competitive national research programmes ▪ Participation in EU research programmes	Needs considerable strengthening Needs considerable strengthening Needs strengthening Needs strengthening
Industry & Regional Development	▪ EI Applied research programmes ▪ Industrial liaison function ▪ Technology transfer expertise ▪ Incubator Centres ▪ Specialised centres for specific industries ▪ Contract research for development and industry ▪ Industry training ▪ Consultancy and information ▪ Spin-out companies	Needs strengthening Adequate Needs strengthening Should be in all IoTs Better promoted & developed Needs strengthening Needs strengthening Needs strengthening Promote more

The available resource to support industrial R&D needs to be increased. This will require changes in attitude, culture and the regulations governing staff in the IoTs. It will require the co-operation of Third Level staff, the Department of Education and Science and the Department of Enterprise, Trade and Employment. It will require change programmes in NUIG and all IoTs in the BMW Region.

6.2 Physical Infrastructure

6.2.1 Introduction

Traditional elements of physical infrastructure include transport, energy and communications. These elements are an integral part of socio-economic development and are considered in detail in the National Spatial Strategy (NSS), which is concerned with integrated planning. Traditionally, they were provided by local authorities or public agencies. However, there are now growing trends towards their provision by the private sector, public-private partnerships (PPP), or communities. These trends provide the BMW Region and its communities with opportunities and challenges to decide their own future and become more independent of central government.

To these traditional elements should be added Environmental Services and Social Amenities. The former are important to all sectors of the community and the latter in attracting and retaining people, especially those with young families, to sparsely populated areas.

There is a gap between the BMW and S&E Regions in terms of the quality of some elements of physical infrastructure. Steps are being taken to narrow this gap, but the BMW Region is likely to remain less densely populated and less industrialised for some time, such that strict economic considerations may militate against full equalisation. It may then be a question of priorities, taking account of real needs as well as resources. Despite the number of operators and funding mechanisms in the BMW Region, the NSS and the need for an integrated approach to regional development may make choices easier than before. Investment by the private sector, alone or as a PPP, in electricity generation, for example, in no way conflicts with the need for improved rail transport.

It is important to distinguish between the quality of life and the standard of living. Living in a sparsely populated area of natural beauty has aesthetic and economic attractions. Even on low class roads, commuting may be much faster than in congested cities. The catchment for a potential employer may also be large and there is mobility of labour. Because commuting distances are greater, road quality is important.

There will always be potential conflicts between infrastructural development and other interests such as the environment, and these will call for integrated and balanced development. Integrated planning of inter-modal transport for the BMW Region is also desirable.

It should be noted that the BMW Region is far from uniform. The North East area from Dublin to Dundalk is very well served with all categories of infrastructure and the greater Galway area is served fairly well. However, the rest of the BMW Region is poorly served with any category of infrastructure. In the following sections the present status is summarised and recommendations made for the future.

6.2.2 Transport

Rail

The rail network serves commuters, long distance travellers and tourists, as well as freight. Usage of the rail network is about half the European average for passengers and less for freight. The economic justification for each is different in terms of demographic, national and regional needs. The rail network should be part of an integrated intermodal network, reducing traffic on the roads.

Passenger rail lines in the BMW Region extend from Dublin to Portlaoise; Portarlington, Tullamore, Athlone, Ballinasloe and Galway; Roscommon, Castlerea, Ballyhaunis, Claremorris, Castlebar, Westport, Foxford and Ballina; Mullingar, Edgeworthstown, Longford, Dromod, Carrick on Shannon, Boyle, Ballymote, Collooney and Sligo; Drogheda and Dundalk and thence to Newry and Belfast. At first sight the rail network in the BMW Region is not very different to that in the S&E Region in terms of the line numbers. However, the quality of the service is inferior in that there is more single track of inferior quality and inferior signalling systems, leading to slower and unpredictable travel. There are fewer trains; they lack adequate catering facilities and are badly timed. None of the new rolling stock, described in the NDP, seems to be destined for use in the BMW Region.

Iarnród Eireann is investing in the rail system, but much more so in the S&E Region. There are no plans to open new lines in the BMW Region, despite local support for the Western Rail

Corridor (a line from Sligo to Galway). An existing connection between Galway and Limerick via Athenry could be upgraded at relatively little expense, linking further via Cork and Waterford to Rosslare. However, as Rosslare is a Ro-Ro port, a rail connection to the BMW Region is not a great advantage. Existing track could also be used to provide commuter services into Galway, between Athlone and Mullingar and between Athlone and Tullamore. Mullingar and Tullamore have never been connected, and any new track would cost upwards of €0.75m per mile.

There is a case for staged development of the BMW Region's rail system.

Extending the network would be expensive and hard to justify in strict business terms. It would however be feasible to improve the quality of service on existing lines by incremental investment in the permanent way, stations, signalling and rolling stock. Some improvements have been made to the Dublin-Sligo line. Improved timetabling to suit customers' needs and to ensure reliability and punctuality should be the end result. Encouraging intermodal transport of goods should also be an objective. Any move that increases rail usage will reduce road congestion and to some extent emissions to air. This applies even more to freight transport.

Consideration should be given to re-opening old lines for tourism. Several appropriate and scenically attractive lines, such as Galway-Clifden, Buncrana-Derry and Strabane-Donegal, exist. The last two may attract INTERREG funding. However, capital costs may be prohibitive. Existing goods-only lines such as Drogheda-Navan-Nobber could be opened to passengers.

Rail transport is supplemented by bus services, public and private. These have grown in significance in the last decade and competition has been good for the customer. There is now a wide spread bus network, running cross-country as well as radically.

Roads

The desirable standard of roads relates to traffic volume and the size of vehicles using them. Whilst there may be more kilometres of higher standard road in the S&E Region, traffic volumes, especially in the Greater Dublin Area are higher and congestion worse. The net effects on journey time may be the same. Providing motorway standard roads from Dublin all the way to Galway, Westport, Sligo and Letterkenny may be neither necessary nor the best use of resources for the BMW Region. There is also a need for better intercity roads other than those radiating from Dublin, and better cross-border roads such as Sligo-Enniskillen. North–South roads linking the BMW Region and the S&E Region should also be improved, for example Galway-Sligo within the BMW Region, and Galway-Limerick and Athlone-Cavan.

A major problem with secondary roads is the poor surface quality, leading to reduced speeds and excessive wear on vehicles. This poor quality is often the result of inadequate maintenance, botched reinstatement following work on buried services and poor workmanship in the first case.

Bottlenecks caused by narrow roads, bridges and towns lead to delays and worse, unpredictability of journey time with consequent economic costs, especially for hauliers. Re-alignment and bypasses can remove these bottlenecks.

Incremental improvement to surface quality and the removal of bottlenecks may give a far greater return in areas of relatively low traffic density than investment in motorway-standard roads. It is not always realised that there are standards intermediate between secondary roads and motorways, such as dual carriageways, which are wholly acceptable. Trunk roads in Sweden, a sparsely populated and large country, commonly consist of three lanes, the centre lane alternating in direction every kilometre. This allows faster traffic to safely overtake slower traffic every kilometre. The same system is successfully used in France, which has a higher traffic density.

Shipping

Merchant shipping and tourism pose separate issues for the region. As far as merchant shipping is concerned, the BMW Region has harbours in Galway, Westport, Sligo, Letterkenny, Drogheda, Dundalk, Greenore and effectively in Warrenpoint. While none of these compares in volume or the maximum size of vessel to Cork or Dublin, there is little if any demand in the BMW Region for large ships such as the bulk carriers bringing coal to Moneypoint or petroleum to other ESB stations and Whitegate. Container traffic passes through Galway, Drogheda, Dundalk, Greenore and Warrenpoint, but traffic with the Northwest must pass through Dublin. There is a strong case for improving intermodal transport for this traffic via the railway to Sligo.

Canals, lakes and rivers have long fallen into disuse for commercial traffic and there is little case for their revival as such. However, they play an important role in the tourist industry, and this should continue to be reinforced and integrated with other aspects of tourism, such as niche markets. The coast does not provide as many safe anchorages for pleasure vessels as does the coast of the S&E Region, so investment in that area would also benefit tourism.

Air

Irish people require air services for business, pleasure and social purposes, such as island services and general emergencies. Improved air access would stimulate tourism. Air transport is a vital part of transport logistics.

Air access in the BMW and S&E Regions is not as different as sometimes supposed. The S&E Region is served by Cork, Shannon and Dublin, which last also serves an arc of the Midlands and Northeast from Dundalk to Moate. There are regional airports in Waterford and Tralee. While Galway, Sligo and Carrickfin can only handle commuter traffic (ATR 42 and Fokker 50), Knock handles Boeing 737, 757, 767 and equivalent aircraft, and logistics companies operate there. There is a small private airstrip in Enniskillen, which could be upgraded.

6.2.3 Energy

Electricity

In recent years the ESB has been divided into separate generating and transmission companies, the latter being Eirgrid. Providers other than ESB may use the national grid for transmission and sale to commercial and other customers and to the ESB. This de-regulation has opened the way for private investors, mostly operating wind farms to date. Wind power is now a commercially viable mature technology, and in fact the cheapest way to generate electricity.

Development and expansion of industry in the BMW Region, or anywhere else, makes three demands of electricity supplies:

- Adequate capacity
- Stable voltage and frequency
- Reliable supply, especially for high-tech companies who cannot afford a blackout

The last condition demands either in-house standby generators or two independent connections to the high-voltage transmission system. This is not commonly available in the BMW Region.

The provision of improved electricity supplies to more remote areas of the BMW Region is hampered by a lack of generating capacity in Ireland as a whole, and by the weakness of the grid in many places. The ESB is planning to increase its installed capacity using gas-fired combined cycle plants. Significant expenditure is also in progress under the ESIOP to strengthen the grid such that existing generators will be able to increase supply. Just as importantly, it will be possible for new generators of any type or ownership to be constructed in remote areas for local and national sales. The use of landfill gas for electricity production, as is proposed by Wexford County Council, is an example.

It will therefore be possible to supply more remote areas from small local generators, such as wind turbines. Large wind farms will need access to a strong grid connection. This may also lessen the environmental impact of new large fossil-fuelled stations and main transmission lines, both already opposed by some public opinion.

There are no significant reserves of hydropower, which would be environmentally acceptable, but there are other proven technologies suitable for small-scale local electricity generation in addition to wind power. These include:

- Combined heat and power (CHP) plants using fossil fuels
- Anaerobic digestion of municipal refuse producing landfill gas for electricity
- Anaerobic digestion of municipal sewage or animal slurry

The last technology will not only produce electricity or heat, but will also alleviate environmental pollution. At the moment, municipal sewage is being used this way in Carrick-on-Shannon, Clonmel, Dundalk, Drogheda and Greystones. The Local Authorities have installed these plants, but local communities or public-private partnerships could construct similar ones.

Gas

Bord Gáis Eireann (BGE) has a sole right to buy and sell natural gas in Ireland. At the moment, about 30% of our gas supply comes from the Kinsale field, which has a limited life. The balance of the supply now comes from North Sea gas fields through the inter-connector to the UK. In the near future, gas from the Corrib field will be brought ashore in Belmullet.

The existing network runs from Cork to Dublin with branches to Limerick and Waterford and from Dublin to Dundalk with a branch to Virginia. An extension is planned from Bray to Arklow and from Athy to Portlaoise and Portarlington. A major pipeline is planned from Belmullet to Galway, passing close to Newport, Westport and Headford. From Galway, the line will continue to Dublin passing close to Athlone. Another spur from Galway will link to the existing line near Limerick.

BGE proposes to install a pipeline from just south of Drogheda to Belfast and Derry by 2025, and is building a second inter-connector to the UK. Otherwise, no new transmission lines are planned.

There are no plans to provide natural gas to the other parts of the BMW Region.

Natural gas is a clean fuel as compared to oil or coal, and as such will always command a higher price. This is offset by increased combustion efficiency and reduced maintenance costs. However, there are few applications for which natural gas is the only technically possible fuel. While natural gas would be advantageous for some industries, the BMW Region is not at a significant disadvantage as long as fuel oil and LPG are available. There is no reason to believe natural gas would be sold at a reduced price in the BMW Region, were it to be provided.

However, natural gas causes less pollution and specifically emits much less carbon dioxide than oil or coal. If and when carbon taxes are introduced into Ireland, companies lacking a provision of natural gas may be at a severe disadvantage as compared to those who have access. This may be the main justification for extending gas lines into the BMW Region.

6.2.4 Telecommunications

A priority for the BMW Region is the provision of improved, affordable, broadband systems. A limitation is the lack of appropriate transmission lines. However, on January 31st 2003 the southern loop of the ESB Fibre Optic Broadband network was switched on, linking Dublin to Limerick, Cork and Waterford on the ESB high voltage network. The network was finished in 2003, providing broadband access from Buncrana to Cork in a "figure of eight". The network consists of 24 pairs of fibres, each capable of carrying 2.5GB/second, and is ten times more reliable than equivalent underground networks. ESB will operate as "a carrier's carrier", providing a number of access packages for telecommunications companies and other businesses requiring broadband access. For the first time, this will provide a uniform bandwidth across the country.

On February 10th 2002, a new national broadband scheme, known as the Metropolitan Area Networks, was inaugurated. Connected to the broadband backbone countrywide, it will provide affordable, always-on Internet access to 19 towns when completed at the end of 2004. 11 of the towns are in the BMW Region: Galway, Athlone, Mullingar, Carrick on Shannon, Manorhamilton, Gweedore, Roscommon, Portlaoise, Letterkenny, Tullamore and Ballina. Under the most recent, 7,500km announcement, a MAN will circle 17km around Athlone, 18km around Mullingar, 19km around Portlaoise, 13km around Tullamore and 10km around Roscommon. Similar networks are being put in place in Galway-Oranmore (a €9m broadband system) and around Letterkenny, including a connection to Derry as part of the North West Cross Border Digital Economy Project. However, the "last mile" may not be installed without sufficient economic demand.

In May 2003, the BMW Regional Assembly announced a new Wireless Internet Service for four locations: Ballyhaunis, Co. Mayo, Strokestown and Ballinlough, Co. Roscommon and Virginia Co. Cavan. In addition, funding has been provided by the Minister for Community, Rural and Gaeltacht Affairs for three projects at Dungloe, Co. Donegal; Killala, Co. Mayo; Enniscrone, Co.

Sligo; Lanesborough, Co. Longford and Ballyleague, Co. Roscommon. This service will complement the Government's national broadband scheme, as yet unavailable in rural locations, and will provide much faster download speeds than are currently available.

These infrastructural projects will improve telecommunications in the BMW Region and increase industrial opportunities.

Examples of inadequate communications and their costs to companies in the BMW Region:

Company & Location	Producing	Advantages & Disadvantages
Iontas (16 employees), Moville, Inishowen Penninsula, Co. Donegal	Performance management software for Lucent, Conduit & Esat BT	Easy to secure and retain staff Uses dial up ISDN at €6000 pa as against DSL at €1080 (18%)
2PM, Athlone, Co. Westmeath Subsidiary offices in Plymouth & London	Messaging applications company	The business started in Ballinasloe, had to move to Athlone due to inadequate communications infrastructure Moved 6 jobs to Plymouth due to lower cost of internet access in the UK

Notes: DSL = digital subscriber line

6.2.5 Environmental Services

Potable water

There are adequate supplies in most parts of Ireland for human consumption. However, industrial demands can impose severe burdens on the public supply. Water required by the process industries or for cooling may be obtained from wells or rivers, but supplies of potable water are not everywhere available in quantity. This can restrict industrial development.

Waste water

Regulations governing the discharge of waste water or any other form of waste are the same in the BMW Region as elsewhere in Ireland or Europe. The BMW Region is not at any disadvantage.

Wastes arising

The same applies to domestic, municipal and industrial waste, toxic or not. However, the provisions and charges for waste disposal vary considerably from county to county and may be a disincentive for industry to establish in a particular county.

6.2.6 Social Amenities

Schools

The provision of Third Level education is discussed elsewhere in this report. In many ways, the availability and quality of Second Level education is more important. This may be a problem in sparsely populated areas and will favour towns and cities for younger families. Children may have to be bussed to school. This is one area where the BMW Region may be at a disadvantage due to its low population density. Nonetheless, Leaving Certificate completion rates are higher in the BMW Region than in the Greater Dublin Area. The implications for industrial growth are clear.

Hospitals

Healthcare is a concern for all, again especially so for young families. Adequate provision of hospitals and outpatient clinics is needed close at hand. Failure to do so will make living in a poorly served area less attractive whatever the employment opportunities and housing costs.

Sporting and cultural activities

Sporting and cultural activities are essential for all ages in order to maintain a healthy society. These include youth organisations of all forms as well as sporting facilities for all ages and opportunities for intellectual stimulation. People can provide and run some of these organisations themselves, but there is a minimum size to sustain, for example, a significant theatre. Co-operation on an area basis may be needed. Such provisions also attract tourism and can enhance natural attractions. There are many examples of success stories in sporting and cultural activities in the BMW Region.

6.3 Culture

The CIRCA innovation model emphasises the importance of the prevailing culture within the region on the level of innovation. Culture involves at least three components: what people think, what they do, and the material products they produce. Thus, mental processes, beliefs, knowledge, and values are all parts of culture.

So how does culture in the BMW Region affect the level of innovation in the region?

Typically, anthropologists research cultures by “doing” (participating) and “analyzing” (observation). The audit used a series of Focus Group meetings, interviews, desk research, data collection and analysis to explore the impact of culture, attitudes and behaviour on entrepreneurship and innovation in the BMW Region. The report discusses these impacts at four levels: the entrepreneur, firm, sector and region.

Some definitions of Culture

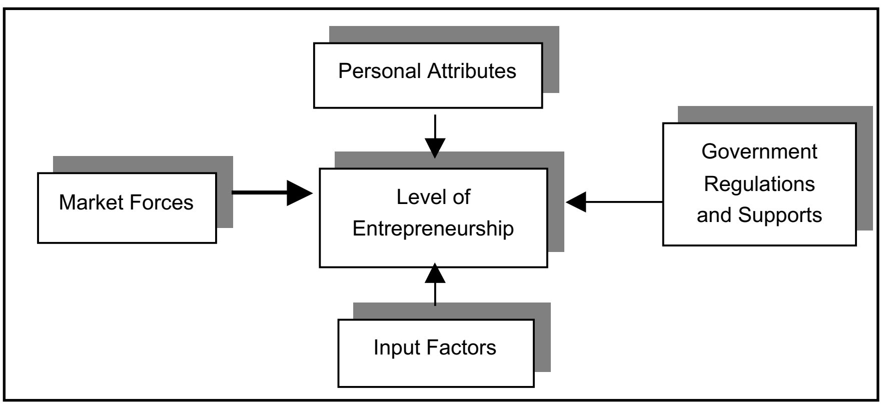
"The total way of life of a people"
"The social legacy the individual acquires from his group"
"A way of thinking, feeling, and believing"
“A theory on the part of the anthropologist about the way in which a group of people in fact behave”
"Learned behaviour"
“A mechanism for the normative regulation of behaviour”
"A set of techniques for adjusting both to the external environment and to other men"
"A behavioural map, sieve, or matrix”

6.3.1 At the Level of the Entrepreneur

The level of entrepreneurship is critical, as many international studies show it to have a direct impact on the level of innovation. The data in Chapter 3 confirms that entrepreneurship (measured as new company start-ups) is lower in the BMW than the S&E Region. What are reasons for this?

Many factors influence the level of entrepreneurship[24]. Key factors influencing the level of innovation are market forces, government regulations and supports, input factors (primarily labour, finance and information) and the personal attributes of the entrepreneur (see next figure).

Figure 52. Main Factors influencing the Level of Innovation in the BMW Region



[24] Faltin, Gunter, (2001), Creating a Culture of Entrepreneurship, Journal of International Business and Economy, Volume 2 Number 1, San Francisco State University, USA.

Government Regulations and Supports

There are few differences between the BMW and S&E Regions in terms of government regulations and supports, excepting local authority activities, typically in the areas of planning, rates, waste disposal licenses and factory waste removal. Currently these costs are reasonably similar throughout Ireland, but there may be greater divergence in the future.

People throughout the BMW Region were invited to focus group meetings in Athlone, Carrick-on-Shannon and Galway. The meetings covered:
A cross section of business people representing manufacturing firms in four separate groups –

- Micro firms and SMEs
- High-tech firms
- Large Irish companies and MNEs
- Service firms
- Community groups
- Third Level education sector
- State development agencies in the BMW Region

The focus groups looked at innovation in its broadest sense, including: what does innovation mean? Is the BMW Region innovative? What people, organisations and sectors are innovative? How does innovation work in the participant's organisations? Who leads it? What barriers and stimulators do they face?

Market Forces

Market forces differ between the two regions. The S&E Regional consumer market is larger, more urban and concentrated. Its population is wealthier. Its business market has many larger companies, a higher proportion of high-tech companies and most of Ireland's international financial service companies. The markets for many companies in the BMW Region are mainly in the S&E Region. Consequently, establishing and growing a business in the BMW Region is more difficult.

Input Factors

Many input factors (cost of labour, insurance, property etc) are less expensive in the BMW Region and grants are higher. This should influence the location of some companies, but it does not seem to. The Focus Group participants (see note in the box) believe that these advantages were little known outside the region.

Personal Attributes

From entrepreneurial traits studies and the work of researchers and behaviouralists such as Hisrich, McClelland, Begley and Boyd, emerges a set of essential attributes which define strong entrepreneurial orientation, i.e., an entrepreneur is an individual who:

- Achievement motivated
- A moderate risk-taker possessing a high tolerance for uncertainty
- Creative
- Energetic
- Willing to take personal responsibility for success or failure

In addition, dissatisfaction with one's previous employers and a favourable upbringing are important factors. According to extensive research by McCelland and other behavioural psychologists[25] in the 1960-1980s, the most favourable upbringing is to be raised in a matriarchal household.

[25] David C. McClelland, Achievement Motivation. For over twenty years he and his associates at Harvard University studied this urge to achieve. McClelland was convinced that the need for achievement can be taught to people. In fact, he developed training programs for business people that where designed to increase their achievement motivation.

Attitudes at the Focus Groups identified risk aversion as a particularly significant issue, particularly in smaller communities where fear of failure was a high level concern.

A broad range of determinants explains the level of entrepreneurship, including economic and social factors[26]. Moreover, it is generally accepted that policy measures can influence the level of entrepreneurship[27].

Developing an Innovative Culture

- Select innovative employees
- Train them for creativity and innovation
- Develop a learning culture
- Empower employees
- Set up idea capture schemes
- Develop managers to support the innovation of others
- Make creativity a requirement of the job
- Improve employee participation in decision-making
- Have appropriate reward systems for innovation
- Allow risk-taking as an acceptable mode of practice
- Encourage investment in research and development

6.3.2 At the Company or Firm Level

Innovation had a very wide range of meanings to Focus Group participants. There was some level of commonality among the manufacturing firms and the development agencies, less between the service companies, but little between the community groups. One can reasonably conclude that there is even less agreement on "what is innovation" amongst the general public.

There was wide agreement that the BMW Region was less innovative than the S&E Region. In discussion the reasons for this were largely believed to be structural, including:

- Poor manufacturing and service company base, generally small and medium sized firms with low-capitalisation and a low level of exports
- Poor linkages with the Third Level sector
- Low levels of business research, technology transfer and new product development
- Low skills base
- Poor physical, energy and communications infrastructure
- No clear cross-agency strategy and limited control over their regional investment
- Limited relevant data collection to underpin the strategy and monitor progress

Some of these weaknesses are within the control of the firms themselves and opportunities exist to make other choices. Not enough companies are making these choices, however. The development agencies argued that suitable programmes and adequate funds were available but were not being drawn down. The firms rated lack of finance as their major obstacle, followed by a shortage of skilled staff and managers. Undoubtedly reasons for the low level of innovation are more complex and include a mix of other factors, which emerged in discussions and individual interviews. They include the underlying attitudes of many business people ("I'm all right at the moment"); a lack of high-quality practical development of owner-manager skills; a lack of 'real' appreciation as to the necessity of innovation; procrastination; unwillingness to take risk and inadequate appreciation of the changing competitive environment. Based on these discussions, interviews and the survey data, one could conclude that many of the SMEs in the BMW Region are not innovative, i.e. the culture is, at best, weak to negative with regards to innovation.

[26] OECD, 1998, Fostering Entrepreneurship, the OECD jobs strategy, OECD, Paris.

[27] Verheul I., Wennekers S., Audretsch D. and Thurik R. (2001) An eclectic theory of entrepreneurship: policies, institutions and culture, Centre for Advanced Small Business Economics, Erasmus University Rotterdam, The Netherlands.

The results of a Swedish study suggest that values and beliefs do have an effect on regional new firm formation rates[28]. The State could influence this situation by promoting strongly the need for innovation, its rewards and the supports it provides.

What would an innovative organisational culture look like? It would be one in which employees were motivated and confident enough to continually try new things out. To this end, they would be equipped with the right types of knowledge, skills and abilities to generate and implement new ideas effectively. However, innovation will only flourish if the work environment is supportive of these efforts. This means employees must be given opportunities to explore, investigate and experiment, and management should provide support through active encouragement of such behaviours. At a broader level, the organisation itself should have structures and processes in place that allow for smooth transitions from the appearance of new ideas to their implementation. Such a culture can be developed[29].

6.3.3 At the Sectoral Level

In addition, the Focus Groups discussed innovators in the region and innovation in the different sectors. Many prominent innovators were identified, but the participants were less positive about sectoral innovation. They believed that, on average:

- The private sector, although it has a low level of innovation, was the best performing sector in the region in terms of innovation
- The Third Level sector was a low performing sector with great potential, if its objectives and programmes can be altered. Even its student output was better geared for MNE employment than new enterprise development or SME employment. In extensive interviews the consultants found that the current culture and attitude was focused on teaching and learning (including life long learning), and basic research. There was little commitment or interest in assisting industry generally. Only a small percentage of Third Level staff actually worked with industry.
- The Public Sector was the least innovative sector in the region, with the development agencies getting a variable low score and the local authorities a negative score. The local authorities were believed to be too focused on their infrastructural responsibilities, as evidenced by their county plans, sometimes to the detriment of local development

The participants also commented that:

- There were many support agencies, each with their own objectives and clientele
- They offered a wide range of services and had good insight into the problems of the BMW Region, but there was no co-ordination and too little effective implementation
- There are too many agencies and this can cause confusion to potential entrepreneurs
- Most agencies were very bureaucratic, formal and more committed to “not making mistakes” than providing client service
- Many of the state development agencies are risk-adverse and large projects that are high-risk are likely to encounter difficulties in securing support

[28] Davidsson P. and Wiklund J., Cultural Values and Regional Variations in New Firm Formation Jönköping International Business School (JIBS), Sweden

[29] Birdi, Kamal and Wall, Toby, (2003), Developing an Innovation Culture: Implications from Research, Institute of Work Psychology/ ESRC Centre for Organisation and Innovation, University of Sheffield

- Too many decisions on behalf of business are being taken by public servants and they have no real business experience.

On the other hand the agencies argued that there was a shortage of suitable projects and poor uptake of available grants (this was verified by the grants analysis). In too many instances there is a wide gap in perception between the agencies and the companies and this is exacerbated by the need for most proposals to go to Dublin for approval. Perception gaps between all the sectors discussed here indicate a culture with too few crossover points, too few opportunities for working together and minimum understanding of others' positions.

In relation to the S&E Region, the presence of a higher proportion of larger companies, and six of Ireland's universities, which are closer to industry than the IoTs, give the region a more positive attitude towards Third Level-industry co-operation.

6.3.4 At the BMW Regional Level

As already noted, most proposals go to Dublin for approval. This reinforces the belief that the S&E Region is more important than the BMW, and frequently gives rise to the idea that companies in the S&E Region are favoured.

The BMW Region has a range of culture and values that vary from the very modern and young city of Galway to the declining, poor agricultural/social welfare-dependent areas, and all the variations in-between, including:

- The rapidly expanding surrounding areas of Dublin (Drogheda, Mullingar and Portlaoise)
- The traditional industrial areas of Louth (growing) and Donegal (in decline)
- The newly industrialising areas such as Athlone and Sligo
- The more traditional areas dependent on a combination of traditional industry, tourism and agriculture such as Cavan, Roscommon and Leitrim
- The midland counties of Offaly and Laois which were dependent on jobs in the ESB and turf extraction with both ESB and turf extraction industries currently in decline
- Other areas where tourism and fishing or farming are the primary source of employment

In many of these areas there is a tradition of migration, primarily to Dublin, but also to the midlands in the UK, Chicago and the East Coast of the U.S. In recent years this has been reversed, with more emigrants returning than departing and more people staying at home than heretofore. But migration for education and jobs remains the norm for some counties, or parts of these counties.

There are many geographical areas, some as small as a DED or a few DEDs, that have their own special mix of culture, values, attitudes and behaviour. This results in many variations throughout the region. ***Thus, the BMW Region has a major challenge facing it – to develop a common ethos and brand for the region that assists its development.*** Everyone does not need to accept this ethos, but it does have to command enough respect to allow common ideas to be politically and operationally pursued.

So what are the strengths and resources available (public and private - individual, institutional, and community) to bring about the necessary change in the BMW Region?

The following are the core resources in the region.

State Bodies and Local Authorities

Currently, every State agency (tourism, development agencies, and local authorities) has its own geographical territory and organizational objectives and agendas. Their programmes are co-ordinated through the National Development Plan rather than through the BMW Regional Assembly.

Private, Professional and Community Bodies

Community initiatives, such as the Council for the West, LEADER groups and private community groups actively pursue their own goals, which are sometimes in conflict with the larger picture. Even the private industry groups are organized on a smaller geographical basis, such as

- IBEC is divided into the West, North West and Midlands
- Chambers of Commerce which generally cover one urban area such as Galway, Sligo, Castlebar or Dundalk
- Professional bodies with different geographical structures (accountants, marketing people, engineers etc.)

Competition for markets, prestige or funding can result in inter-regional rivalry, e.g. the eleven arts groups in Galway city, which are known for their innovativeness and quality, are very competitive with each other. Such rivalry can be difficult to overcome.

Thus there are considerable differences in geographical structures, organisational objectives (local, county, sub-regional, regional, and national) and individual commitments to the development of the BMW Region. This picture is further complicated by the periodic change in official planning structures, which in recent times has left too little time for new organizational partnerships and new social cohesion to evolve.

Figure 53. The Evolution of the Planning Regions in Ireland, 1940-1999

Ireland 1940	8 emergency regions
Ireland 1970's	9 planning regions, including the Midland Region, with County Donegal as a separate region
Ireland 1980's	7 European Community funding regions, no Midland Region, Dublin separate
	from eastern region, border counties grouped
Ireland 1994	8 NUTS III EU funding regions, with the Midland Region and Dublin separate from Eastern Region and the border counties grouped as a region
Ireland 1999	2 NUTS II Regions – the BMW Region and S&E Region with 8 NUTS III Regions still in place

This whole system operates under a very centralised planning system with a bias towards the Dublin region where the majority of the key officials and other important players live and work. For the first time, the BMW Region is a large enough entity (over one million population) to politically secure its requirements from the national resources. By this, the consultants mean a disproportionately large share of the national resources to assist it in catching up with the S&E Region, i.e. 35-40% for a number of years. Given that the S&E Region is considerably ahead of the EU average, this would seem to be a reasonable approach.

Most Focus Groups participants believed that the region had many advantages but that these were inadequately appreciated or known outside the region.

6.4 Conclusions

Third Level Sector

1) The Third Level sector is facing a period of major change. The main drivers are an increasing demand for lifelong learning, a decline in the numbers of post-Leaving Certificate students, the trend towards a knowledge-based economy and an increasing demand to support regional economic development. NUIG and IoTs are beginning to plan for this more complex, multi-task future. This new direction requires new strategies and change programmes in Third Level institutions.

2) The available resource to support industrial R&D needs to be increased. This will require changes in attitude, culture and the regulations governing staff in the IoTs:

- More applied and contract research for industry is essential
- Third Level staff and postgraduate students require more research and IP management training to enhance their research skills
- Finally, most services and activities under teaching and training, research and industry and regional development need strengthening

3) The BMW Region is proportionately better supplied with IoTs than university places, as compared to the S&E Region. But, with only 14.7% of the national total, it needs more university places. These are important because they have a significant impact on post-graduate places. Expansion in the latter has not occurred evenly. This contributes to the 'knowledge drain' of undergraduates and postgraduates to the Greater Dublin Area.

4) Virtually all of the research funding is competitive and the quality of the proposal and the people are key elements in the assessment. The more applied expertise of the IoTs is not relevant in the assessments for PRTLI and SFI. Between 2000 and 2002, the total allocated to the third level sector was €880.9m. The BMW Region received €103.4m or 11.7%. A special scheme is essential to build IoT capability.

5) There is a reasonable spread of expertise in the Third Level sector in the BMW. But there are restrictions in the IoTs that limit the time available for research and other non-teaching tasks, such as working with industry. These restrictions should be reviewed.

6) There has been an increase in graduate output over the 1990s and the trend to work in Ireland rather than emigrate. The distribution of employment of primary and post graduate degree holders shows the lower ability of the Border and Midland Regions to absorb graduates, which is one measure of the level of innovation in a region. The Western Region fares relatively well in comparison with the Midland and Border Regions.

Infrastructure

1) The BMW Region is deficient in many aspects of infrastructural provision as compared to the S&E Region and the Greater Dublin Area. These add costs to doing business in the BMW Region and act as disincentives to new companies to locate there.

2) Given the importance of roads in the BMW Region in comparison to the rail system, increased investment is urgently required. Roads are not all required to be of motorway standard, but should have improved surface quality and have bottlenecks removed. The Region already suffers a disadvantage in having to use East Coast ports for exporting, and predictable journey and arrival times are important components for efficiency.

3) The lack of 'Dublin' cost telecoms is affecting the competitiveness of the Region and costing jobs and new business, but some developments are underway. The BMW Region will shortly be reasonably well served with broadband backbone systems and a number of local wireless pilots are being undertaken. However, the provision of "last mile" services is not guaranteed. Absence of "last mile" services will place local industry at a disadvantage.

4) Rail infrastructures and services in the BMW Region are inferior to those in the S&E Region. Rail services on existing lines need to be improved to give a better and more reliable service for passengers and freight.

5) Electricity supplies to the greater part of the BMW Region are inadequate, but improving. Opportunities will exist for small-scale local generation of electricity by local authorities, communities and PPPs. Future supplies of natural gas to the BMW Region are likely to be limited. This will not generally place consumers in the Region at a disadvantage unless Carbon taxes are introduced.

Culture

1) The culture of entrepreneurship and innovation in the BMW Region is neutral at best, and probably a little negative in many of the more rural areas. A more positive culture is desirable.

2) Although culture is slow to change, entrepreneurial activity may create its own feedback cycle, slowly moving society to a more entrepreneurial and innovative culture.

3) The government can exert influence on entrepreneurship and innovation in different ways: directly through specific measures (support for new start-ups, R&D etc.) and indirectly through generic measures (e.g. education, regulation to create more competition etc.).