Connectivity & Community: Improving information linkages in a technology park*

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Abstract

The growth of science and technology parks worldwide has been stimulated by the perception of their role as foci for regional development. Studies of these parks often show discrepancies between the media hype associated with these developments and the reality on the ground. This paper provides an overview of a study commissioned by the National Technological Park (NTP), Limerick, Ireland, in order to enhance information linkages among relevant actors on the Park, in the longer-term context of encouraging innovation through such formal and informal communication mechanisms. The study consisted of a survey and a series of follow-up face-to-face interviews with Park and University people, resulting in a set of recommendations. The paper outlines the methodology of the study and the follow-up actions initiated on the Park as a result of the report recommendations with a view to enhancing the innovatory capacity of the Park.

Keywords

science and technology parks, innovation, linkages, communication, survey

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"The raison d'être of a science/technology park is to harness the energies of the participating groups to increase the probability of innovation"

N. Mulcahy (1988)

"economic growth in a knowledge-based economy depends on industrial clusters, on knowledge networks, on mechanisms for efficient knowledge and technology transfer, a techno-infrastructure consisting of various public and private institutions and agents, a well-trained human resource base, and public policies that support and promote innovation."

H. G. Schuetze (1996)

1 INTRODUCTION

In recent years, there has been increasing interest at global, national and regional level concerning the need to encourage innovation at all levels within enterprises and throughout economies. Much of this discussion centers around technological innovation, and the potential of new technologies, such as information and communications technology, optics technology, genetic technology, etc. to stimulate innovation. Various methods for "technology transfer" have been proposed in order to facilitate this process. Discussion of such methods usually rely on a *linear model* of innovation, popular in the 60s, 70s, and early 80s, that emphasized a one-directional flow or transfer from basic research -usually conducted in universities, to applied research and then experimental development, leading to take-up of processes and techniques by firms further down the line, and thus eventually leading to new products or processes being introduced into the market.

There are a number of problems with this scenario. The very language that we use presents problems. For example, the notion of "technology transfer" raises a number of difficulties. The connotations of the term "transfer" are quite inadequate and indeed are misleading, as they ignore the nuanced ways in which ideas and innovations need to be melded, transformed, shaped, interwoven, etc. by a variety of actors, human and non-human, before any technique or technology can be put to use in another setting. Our thinking has too often assumed an innovation model embodying a set of discrete activities, starting with a single discrete source of knowledge creation. This linear model of innovation is seriously flawed. As Schuetze (1996) eloquently notes, this approach has become discredited, as it "does not reflect the complex, multidimensional nature of innovation, and nor does it reflect how innovations originate." (pg. 72). This model ignores the multiple feedback loops continuously active between all involved - scientists, engineers, designers, marketing people, and consumers. What is now being proposed is a more cyclical or spiral model where there are continual linkages among all the activities and actors involved throughout the whole innovation process. This approach lays emphasis on multidirectional linkages, networks, the evolution of expertise within networks, the centrality of knowledge and learning, and interdependency among participating actors. It recognizes that the innovation process is not just a technical process but also a social one (Schuetze, 1996). It is within this latter framework that the importance of encouraging and maintaining networks of various kinds in order to "keep things on the boil" becomes obvious. One approach to enhancing the possibilities for innovation is to locate key players within a geographic area, thus ensuring physical proximity, leading

hopefully to interactions of all kinds between key actors as a result. One very concrete instantiation of this idea is the creation of science or technology parks, where high-tech companies, startups, and academic units are co-located in an effort to achieve synergy.

Much has been written about the potential synergy of such developments, and versions of the concept, such as Technopoles, Science cities, etc. can be found in North America, Europe and Asia (Castells & Hall, 1993). There can be major variations in the nature of these science and/or technology parks and we will look at some of these differences briefly in the next section of the paper. The main focus of this paper, however, will be on a single Park - The National Technological Park, Limerick - which has been in existence since 1984 and is currently the only such park in Ireland. The purpose of this paper is to describe a small-scale intervention, funded by the Park administrators, as part of an on-going effort to better understand the needs of the Park companies, in order to improve information dissemination within the Park, with a longer-term view of enhancing the spirit of cooperation and innovation on the whole Park. The study consisted of both a user survey and a series of follow-up face-to-face interviews concerning user perceptions and needs in this area, and a set of recommendations based on analysis of the results. We indicate how these recommendations have been acted on, and the current situation on the Park. While in some ways the scope of this exercise was quite limited, and involved rather mundane activities, the study provided a useful base from which to evolve a plan of action designed to enervate the Park, based on factual on-the-ground data, rather than opinions or pre-suppositions, which have at times dominated the discussions concerning these parks. In conclusion, we locate this work within a background context of on-going attempts to promote regional innovation through a variety of activities within the Shannon Region.

2 SCIENCE AND TECHNOLOGY PARKS

In attempting to understand the phenomenon of science and technology parks, one may be forgiven a certain amount of bewilderment as one surveys the variety of activities found in such parks around the world, their different modes of operation and funding, and the conflicting opinions as to their economic contribution to regions and national economies. One discovers that, while there is an international association of science parks (IASP), their funding, mission, composition and priorities can be radically different. In some cases, parks are owned and developed by the local university, in other cases, a separate company, often supported by the regional development authority, owns and administers the park. Some parks have a very restrictive policy concerning the kinds of companies allowed onto the park, e.g. only those involved in research and development activities, whereas others have a more open policy, allowing light manufacturing. Typically there are restrictions as to the size and shape of buildings that can be built on the park. The strong emphasis on property development in some cases results in some of these Parks simply being real estate operations.

In an effort to clarify the nature of these parks, the following definition, used by the IASP may be helpful:

“The term Science Park is used to describe a property-based initiative which: o has formal and operational links with one or more Universities or major research centres

o is designed to encourage the formation and growth of knowledge-based industries and organizations normally resident on site
 o has a management function which is actively engaged in the transfer of technology and business skills to the tenant organizations.”

Different countries often have different policies concerning the nature and management of these Parks. For instance, in many Asian countries the parks tend to be industrial in nature and often have central government involvement. In Japan, for example, the government body MITI has been behind the development of a number of Technopoles. Interestingly, often the "transfer" that occurs in these settings is from the industrial research labs to surrounding Universities, rather than the more traditional, (and often not very accurate, as we noted above), Western model where the university is seen as the provider of concepts, ideas, and innovative applications for park companies. In the UK, many science parks are property rather than technology-oriented, and while there are linkages with universities, often this linkage is not as strong as many believe (Green, 1995).

In the US, one finds a variety of science and technology park models. In some cases, *de facto* parks emerged due to agglomerations of R&D activity, for instance along Route 128 in Boston, near the intellectual powerhouse of MIT and other 3rd level institutions in the Boston area. One very explicit park model, which was initially conceived in the late 1950's, is that of the Research Triangle Park (RTP) in North Carolina (Rooks, 1995). This Park was established as a private non-profit foundation, with a focus on regional development, as the area had been suffering from a net emigration of skilled workers. Though the Park is not owned by the 3 nearby Universities, all 3 play an important role in attracting companies to the region. In recent years many State governments have set-up parks in the hope of attracting high technology firms to their region, with over 100 parks having been set-up in the past 15 years (Economist, 1985). In France, local authorities have been proponents of science parks or Technopoles, characterized by a network of interfaces linking universities, research and industry conurbations throughout a region. Their concept reduces the importance of geographical boundaries often associated with the idea of "science parks", thus reducing the criticism that science parks can often lead to uneven economic development and exacerbate existing inequalities (Massey, Quintas, Wield, 1992). The French focus has been on urban planning, real estate development, job creation, image improvement and the attraction of outside companies rather than the linkage to Universities and Research Centres, although more recently emphasis is being placed on the importance of technology transfer (Delearde, 1995).

Despite the occasional voices raised in criticism of the science park concept, and the, at times, overly optimistic rhetoric concerning their benefits, there is little doubt but that they are still seen as important engines for regional innovation and prosperity. A recent report by the US-based Association of University Related Research Parks (AURRP, 1995) summarized the ways in which growth companies could be facilitated by being involved in a research park under a set of concerns: Real Estate, Capital, Value Added, Access to networks and alliances, Credibility and image, Risk assumption, and Incubation. We will return to some of these topics in our concluding discussion on the potential benefits of being located on these parks, but here we wish to comment on the topics of "value added" and "access to networks and alliances", as this is the context within which the case study that we conducted is relevant. The AURRP report notes how the technology park manager can assist companies in making links to relevant potential partners or related expertise on the Park, and to research faculty in the University, and also encourage them to tap into the various local, regional and national assistance

schemes for growth businesses, all of which can be very time-consuming for companies to discover on their own. The report notes that the major difference between real-estate and research parks is the potential availability of technical and management support through the affiliated academic institution. The kinds of resources that may be available are wide-ranging, including access to undergraduate and graduate students for part-time help, access to a pool of graduates for full-time employment, access to research equipment and facilities, to University sports, social and cultural activities, to libraries, to faculty for consulting, opportunities for joint industry-university research project funding, to educational opportunities for staff from the Park companies, etc. The hope is that since many of the Park tenants will be technology-based growth companies, a sense of community and common interest would also develop between Park companies, thus enabling them to help each other in various ways. The role of the Park manager then becomes important in assisting this process of open dialogue between Park companies, and between companies and the University.

3 BACKGROUND TO THE NTP STUDY

It was within the framework discussed above that the current study was initiated. One of us had recently been appointed Chief Executive in the NTP, and was keen to promote initiatives to enhance linkages and a sense of community on the Park. The other had recently arrived at the University to head a new research unit, and was also keen to develop links with Park companies. After several joint discussions, it was agreed that a fact-finding study to assess the attitudes and perceptions of Park companies concerning their existing and preferred linkages to other companies and to the University, and to the Park management more generally, would be a useful starting point for discussion of possible future initiatives in the area. In order not to prejudice the findings, and to ensure that the study would assess the current situation "warts and all", it was decided that the investigation should be conducted by a research unit independent of the Park management, and that contributions to the study would be anonymous. (This latter point did not turn out to be an issue in the surveys, as most people were quite willing to put their views "on the record".)

The emphasis in the study was to pursue a "bottom-up" approach, focusing on the real needs and concerns of Park companies in the areas of communication and information sharing, rather than pursuing a "top-down" public relations initiative focusing on the installation of the latest communications infrastructures. As we shall see, one clear outcome of the study was the interest in developing a stronger sense of community on the Park, which could be encouraged through developing social and sporting facilities. While such findings might appear somewhat mundane and banal, in the context of models of innovation and technology transfer scenarios, within the cyclical model of innovation that we have espoused, all such networking activities are of importance in developing liaisons between different parties in the process.

It has always been a stated objective at the Park to build up communication linkages between the different organizations at all levels, both formal and informal. At the formal level, there exists a Park Board that meets every month and discusses overall policy re. Park developments. This consists of representatives from Shannon Development, the University, the Industrial Development Authority (IDA), Government Departments, and industry. There is also an Innovation Board, consisting of members from the Park administration,

and the University, that meets roughly every two weeks and discusses general issues of interest concerning innovation. Another Committee - the Park Property Committee chaired by the property manager of Shannon Development, meets every quarter and is concerned with the physical environment and services on the Park. This was the only group that originally had Park companies directly involved. Finally there is been an Information Systems & Services Committee (ISSC) which has concerned itself with technical support and infrastructural requirements on the Park. This latter group produced a report in June 1990 on Telecommunications Interconnectivity on the Park, then was less active for a period, but has more recently been very active in drawing up strategies for IT development in the Park and the Shannon Region.

At a more informal level, a number of steps were taken by NTP around the time of the commissioning of this study (1993) to help the communication process and improve the flow of information about Park companies and services across different Park groups. The use of computer technology to support the development of these internal Park communications had been limited. There was a well developed campus local area network (LAN) and Shannon Development/NTP Ltd./Innovation Centre personnel could communicate via email service. However, there was at that time no computer-based communication system for the non-campus companies. While the stated objective of the NTP is "to provide a high quality business environment in a campus setting with particular emphasis on creating a synergy between Park organizations, between business units and the University and between individuals on the Plassey site" there was a perception among people both within organizations in the Park, NTP administrators, and UL Research Groups, that linkages could be improved. After a number of informal discussions in the Spring of 1993 between the two authors, it was agreed that the NTP Administration would commission a study, entitled "Connectivity & Community: An initial study of user needs, requirements, and responses to existing and projected services, in the area of information sharing and communications within the National Technological Park and between the Park and the University of Limerick" from the University of Limerick CSCW Centre, with a view to shaping its plans for the future. The next Section provides some detail on the NTP

4 THE NATIONAL TECHNOLOGICAL PARK, LIMERICK

The National Technological Park, Limerick was formally inaugurated in 1984 and comprises a 650 acre site on the banks of the River Shannon. With the University of Limerick* at its core, the mission of The National Technological Park is to create the appropriate physical, administrative and technological environment conducive to the growth of technology based enterprise. The Park also supports the provision of appropriate support services on the site. There are over 90 separate organizations, currently (1996) employing approximately 2,700 people. The Park is run by the National Technological Park Plassey Ltd., a Park management company which operates as a wholly owned subsidiary of Shannon Development - the local regional development agency. The Park is also home to

* For further information on the University of Limerick, visit ULiX, the University of Limerick WWW information exchange, at <http://www.ul.ie>

Shannon Development's Innovation Centre. The Innovation Centre is a core entity within the National Technological Park in stimulating/incubating/growing new Irish technology companies. Its business is technology-based entrepreneurship. Its flagship Entrepreneur's Programme is directed towards the development of strong venture teams with a balanced blend of business skills. There is also an Investments Section on the Park that manages Shannon Development's portfolio of Investments in Industry and Tourism and provides new equity to qualifying businesses in the industrial and tourism sectors on a commercial basis. The funds for investment are provided through the EU Industry Operational Programme - Equity Measure. A central objective behind the whole development is to provide a high quality business environment in a campus setting with particular emphasis on creating a synergy between Park organizations, between business units and the University and between individuals on the Plassey site.

The organizations at Plassey are not a homogeneous group and can be categorized into the following groups:- subsidiaries of overseas multinationals (e.g. AST Computers, Cabletron, Vistakon (Johnson & Johnson)); indigenous high technology companies - there are 20-30 such companies, with electronics and software being the dominant sector. Companies within the Innovation Centre are still in the development phase while companies in Plassey Enterprise Centre have stand-alone facilities; research & development units - either autonomous units, semi-autonomous, or operating units within the University; educational & training units; and service organizations - e.g. Hotel, The University Club, banks, bookshop, the Business Technical Information Service (BTIS) etc.

5 THE CONNECTIVITY & COMMUNITY STUDY

The study was conducted over a 6 month period. A small advisory group with representatives from the NTP administration, Park companies, and the University, provided an occasional forum for discussion on the conduct of the study. The starting point for the study was an empirical assessment of the perceptions of Park companies concerning a host of issues related to information needs, availability of services, opportunities for future exploitation, development of a Park community, etc. This part of the study was conducted in two sequential phases: an initial large-scale postal survey* and subsequent personal interviews.

5.1 The Survey

The initial phase of the study consisted of the development and distribution of a questionnaire to a large number of Park companies (selected by the NTP). The survey queried the respondents' familiarity with some of the existing Park information dissemination mechanisms and their perceived utility, their links to the University, both current and desired, their sense of "membership" in the Park, their relation to other Park companies and related issues. Reactions to a variety of proposed mechanisms for interaction were also ascertained. 42 surveys were distributed, and 26 returned, a response rate of 62%, which is quite reasonable for surveys of this form. The survey was designed to be open-ended and there were

* Due to space limitations the survey form is not included here, but it is available from the first author for those interested.

plenty of opportunities for respondents to add comments. It is important to bear in mind that the responses reflect the attitudes of those who completed the surveys (at management level), and are therefore not necessarily representative of the company workforce as a whole.

5.2 Follow-up Interviews

Once the results of the survey had been ascertained, the second, more probing part of the study was undertaken. This consisted of a set of face-to-face, hour-long, interviews of senior figures in a number of Park companies (12) and of senior figures within the University research and administration (6). With respect to the Park companies, there was a chance to review their responses to the questionnaire, and clarify any ambiguous questions or responses, and follow-up on strong responses, positive or negative. These interviews also allowed the research team to develop a much more personal and grounded view of how the particular companies saw the world, their market, and the Park and University, that helped significantly in the interpretation of user concerns and responses overall. With respect to the UL people, a shortened version of the questionnaire (appropriately modified) served as the interview guide during the interview. Here the focus was on the perceptions of the researchers about the Park, and especially of how the University might be able to develop closer ties to specific companies on the Park.

While it is difficult to give a précis of the results of the interview process, we mention a few salient points from the interviews. In terms of current perceptions, there was a general view, both in the Park and the University, that the basic concept of the Park - that of the synergy between the University and Park companies - could be made to work much more effectively. At the same time, a number of other companies on the Park are relatively content with their current situation. This seeming discrepancy in views can partly be explained by noting the segregated nature of the Park, in terms of the kinds of companies that exist on the Park, and their very different needs, due to a variety of factors, e.g., size, core business activity, market location, R&D activity, linkage to overseas host, etc. We were able to perform separate analyses for the different kinds of firms on the Park, although, again, the differences in perceptions and concerns were not as appreciable as we had surmised. What came out clearly is that, taking the Park as a whole, there was no currently perceived need for significantly greater interaction between Park companies than is currently provided via the Park administration information dissemination activities. However, there certainly were possibilities for improving connections between specific companies on the Park, those with related core business activities, and between companies and the University.

5.3 The Study Recommendations

Based on the material amassed from the initial survey, together with the 2 sets of interviews, the next part of the study consisted of a set of recommendations for action to improve the situation. A key element in the majority of the proposed changes is that they should be relatively easy to implement. In the study we noted that many of the companies on the Park were content with their situation, although they had suggestions for improvements when directly queried concerning particular issues. For example, the Park as it existed in 1993 did not have, for the majority of companies residing on it, any clear identity, and the Park companies did not see themselves as members of any clear Park community. Our recommendations were broken into several sections, that address different facets

of the issues. A central concern is the role of the Park administration and how it can encourage and promote a Park identity and assist in the dissemination of general information and news, as well as collate and catalyze action in a number of areas. At another level, the role of the University on the Park was questioned, in the light of some of the comments we received.

In what follows we have taken a few examples of the recommendations made, and subsequent NTP action in the light of these recommendations. It is a truism that many surveys and reports such as this one are commissioned, produced, duly acknowledged, and then consigned to the shelf to collect dust. One of the most interesting aspects of this particular intervention has been the strong commitment on the part of the Park, after further consultation with interested parties, to implement many of the recommendations in the report (Bannon & Young, 1994)..

6 EXAMPLES OF RECOMMENDATIONS AND ACTIONS

6.1 Relations between the University and the Park

Recommendations: While it was not our brief to directly tackle strategic issues concerning the relations between the two entities, there is undoubtedly a need to clarify this relationship and possibly to re-invent it as time passes, due to the explosive changes in size and orientation of both parties. Failure to at least mention this issue would reflect badly on a number of lower level operational suggestions, as these must be premised on a certain view of what the relationship between the Park and the University is. Note that this study did not explicitly investigate either the Park Board or the Innovation Board, where Park administrators and the University play an important role. Thus the following recommendations are put forward for interested parties to discuss:

- o The relationship between the Park concept and the University needs to be clarified. Currently, the University is seen by some parties as the “core” of the whole Park concept, by others as standing quite outside, though adjacent to, the Park, and by others as one element in the Park. This should not be seen as requiring fundamental changes, rather as ensuring some common, agreed platform for the benefit of publicity and external visibility.
- o The resulting clarification of this role (above) should be reflected in a range of literature from both parties including :publicity material about the Park and Region; general information from the Park and the University; business addresses for the different parties
- o In this regard, the concept of encouraging the notion of a Park “community” embracing both the University and the Park companies could be enhanced with the idea of a Park membership or ID card, which could be used for a variety of purposes. (If the card concept is to have any meaning, its use must provide “members” with access to some facilities - e.g. slight reduction in the charges for some services at both University and Park locations, preferential seating at University Concert Hall events, or whatever).
- o Greater consistency is called for between the information dissemination activities of the University Newsletter and the Park Bulletin. They should complement and support each other to the relevant parties. The nature of this co-operation should be discussed by the affected parties, taking into account their audiences etc.

NTP Action: This issue has been looked at several times by the NTP Board and a modified Mission Statement agreed : "The National Technological Park, as a development partnership between Shannon Development, the University of Limerick and other interests, aims to provide an integrated environment for knowledge based enterprise that will contribute to sustainable economic growth at regional and national level." Also the NTP commissioned a study from the Marketing Centre for Small Business on the potential benefits of a Park ID Card. After reviewing the results of this study, it was decided not to proceed with this idea at the moment.

6.2 NTP Information Exchange Mechanisms

Recommendation: Overall, there is strong support for the recent activities of the Marketing Director and others at NTP to provide an improved news & information service to the Park residents. Due to the fragmented electronic space on the Park, electronic mail distribution does not reach the majority of Park residents, so the use of fax should continue, together with on-line distribution for those able to receive them.

- o The Park Bulletin should be sent to companies marked clearly as "For Public Notice Board", as often faxes do not get distributed if they simply go to individuals in companies.

- o The idea of having short profiles of companies on the Park in the Park Newsletter should be encouraged.

- o The existing Park Directory is not well known or used. A re-vamped Directory should take note of the following : It should include UL Research Centres offering some commercial services; It should note the size of the companies, and centres listed; It should list a contact person (not necessarily the Director) for each entry; It should provide a brief synopsis of the company; A version of the Directory should be easy to carry and use; It should be produced in a form allowing for frequent updating; It should also be available in electronic form

- o The use of Minitel services is very minimal at present. No great interest was shown in the service on the Park. Further effort in this area should not be undertaken without clear strategic policies concerning provision of Minitel equipment, support, and further development of services, both locally and nationally.

- o A mechanism should be put in place to assist new companies in setting up on the Park, a form of "Newcomer Service" to include : explicit hand holding of new companies by the NTP; introductions and visits to neighbouring companies; information on Park facilities; contact information for emergencies; Park Directory; a package of Helpful Hints for Newcomers (developed by the NTP through de-briefing of recently established tenants)

- o A concise Park map should be produced and copies held at the reception area of all Park companies and the University. This should be updated regularly.

- o The NTP should ensure the provision of a minimal social calendar for companies: e.g. Christmas Reception, New Year Social Bulletin, Newcomer Welcome (to include research people from UL), Easter Reception, etc. Several groups noted how such sessions helped to provide a setting for informal networking.

- o The NTP should once again consider ways and means of providing an electronic network infrastructure for the Park. At the very least some form of

access to a host system via modem should be considered. It is recommended that a Task Force be set-up to investigate the technical and economic issues involved, comprising Park company representatives, the UL Information Technology Dept., NTP and Shannon Development.

- o In the meantime, it is important to ensure that Park tenants are provided with information on the variety of ways in which they can get “on-line” and link into the Internet world-wide computer network, via CompuServe and other systems or intermediaries. A variety of commercial services that provide this service this are now available, and the NTP administration should ensure that tenants are kept up to date on such options.

- o There should be a special focus on providing some form of electronic connection to incubator companies, as start-ups and others could benefit greatly from being on-line.

NTP Action: Park Bulletin now issued 5/6 times yearly to everybody at UL and on Park; Bulletin includes profiles of Park companies and UL Departments/Centres. Park Directory revamped to take account of a no of suggestions, e.g.- Directory available in CD-ROM format. Newcomer Service introduced.; extensive range of sports/social activities introduced e.g. Park Golf Society, Park Fitness for Life Programme etc. Electronic Access: In co-operation with IEunet, Dublin, Shannon Development installed an Internet node at Innovation Centre to provide local access. Commerce Ireland developed as a means for companies to have company data on Web. Telematics Sub-Committee of Innovation Board has developed a detailed plan for a fibre-optic network between main Park sites, and this should be implemented in 1997.

6.3 Additional issues for incubator companies in Innovation Centre

Recommendation: The study noted that a number of the companies in the Innovation Centre felt somewhat isolated from the rest of the Park community. The following recommendations touch on a number of initiatives that might help with this issue: Encourage specific activities targeted to start-up companies; Encourage local companies to champion Innovation Centre start-ups; Develop a Student Resource Centre at Enterprise House for information for students relating to innovation, entrepreneurship, company creation procedures; Develop co-operation with the university on the Entrepreneurship programme; The Park Orientation for beginning students in UL, should include an Innovation Centre tour.

NTP Action: Shannon Development (Innovation Centre), Forbairt and UL now actively promote a Campus Enterprise programme within UL, linking into the University Technology Enterprise and Development Unit (TEDU) . The Innovation Centre is developing a series of seminars, networking etc. for its own tenant companies. Also, the computing and communications infrastructure at the Centre is being upgraded.

6.4 Training & Education

Recommendations: As regards Student involvement, the following suggestions are made: Ensure freshman students are introduced to the Park on arrival at UL - as part of their orientation; Set-up an "Innovation Shop" in the Innovation Centre as a resource centre for students (As outlined by the Manager of the Innovation Centre); Give recognition to companies who have co-op students and report on the experience of both parties (in Newsletter, Bulletin etc.); Have company talks in UL for students (at Orientation); Keen interest was shown by some companies in allowing employees to take courses, or degrees at the University on a part-time basis. The University should seek to provide some packages suitable for Park companies (e.g. day release type schemes) in this regard; Many companies have specific needs for training and education that could be provided for by a sympathetic faculty at UL (similar to what the UCD Business School developed recently for Greencore) Given the expected growth in the provision of tailor-made educational courses for selected markets, the University should be encouraged to provide such courses or modules. The Park administration could assist in ascertaining the need for such courses; There is scope for more specialist kinds of fora for companies on the Park, targeting different groups (e.g.. management, women in management, executives) on specific topics of interest (e.g.. employment conditions). These could be organized by different groups; Reinforce linkages between the Park and University at several levels; Encourage Adjunct Faculty positions for qualified people working on Park; Have Guest Talks by NTP people in UL - at both research and educational level - and vice versa; The creation of Special Interest Groups (SIGs) on particular topics were of interest to many companies and research centres. Such a forum could be an ideal way of developing informal linkages within the Park, as well as with parts of the University, and so we recommend that some pilot SIGs be started as soon as possible. SIGs should be organized to suit time constraints of companies.

NTP Action: Information on the Park is now included at Student Orientation. UL has now set up a Coordinator / focus office for Lifelong Learning/Training activities. A Multimedia Special Interest Group was formed, facilitated by the UL CSCW Centre, with support from NTP. It met on several occasions, and while there was some interest shown, and attendance by companies, it did not reach critical mass, and so did not sustain itself after the initial period. Further discussion on this issue is required.

7 CONCLUDING DISCUSSION

It is difficult in a short paper to do justice to a case study, but we hope to have shown how a relatively small-scale empirical study can provide significant input to organizational strategies. The perceived benefits for many companies of a well-managed, greenfield site, with ample parking, lack of congestion, and of a "prestigious" address, which was found by the survey, should not be minimized. While the sense of community apparent on the Park did not seem so marked, there was interest in developing this, and the Park management have acted to promote this on a number of levels, from sports, social and cultural activities, to technical interest groups on the Park. These efforts are continuing, and while we do not have objective measures as to their success, certainly there is an increased vibrancy evident among the Park community. This study has shown how important it is to

gather user input and gauge reactions to proposed developments before expending time and effort in implementing new programmes. As a result of this sensitivity to user concerns, the change implementation process has been met with support from the companies rather than indifference or even hostility.

There still remain open questions as to how to measure as well as further stimulate innovation on the Park. Certainly, the range of support services currently available for fledgling companies is impressive. From advice and support for student and faculty business ideas, through to funding for feasibility studies, and the provision of investment advice and direct subsidies and grants for start-ups, together with a range of practical support for incubator units in the Innovation Centre, and further advice available on expansion and re-location, the NTP has shown itself responsive to users' perceived needs. There is still a need to monitor the networks that are developing on the Park, and to create new affordances for cooperation between different groups, in order to stimulate innovation. This study has acted as a catalyst for recognizing and supporting some of the formal and informal linkages that are necessary for a vibrant innovating community. It is - paradoxically, in this electronic age - the sense of place and location provided by a physical science park that can play an important role in focusing industrial and research activities, and thus provide a nexus for various forms of engagement and interaction among practitioners, university researchers and students, out of which innovations arise.

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9 BIOGRAPHY

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