A Model for Nurturing Research in Technological Institutions

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ABSTRACT

A strategic framework for nurturing research in Technological Institutions (TIs) is proposed. In contrast to several existing models used for mapping individual research profile, the authors focus on a five-stage model for use at the organisational level. The model is first described highlighting the characteristics of the five stages a TI might go through in developing and managing research. The authors then discuss matching strategies for nurturing research at various stages.

KEYWORDS

Research framework, Technological Institutions, Strategies for nurturing research.

1.   INTRODUCTION

Nowadays the core business of Technological Institutions (TI) is not confined just to imparting skills (training) but is firmly rooted in imparting knowledge (education) as evidenced by the growth of degree programmes these Institutions offer. As a result of this shift, research is becoming an important facet of academic activity in TIs. Seminars are conducted to facilitate individuals assess their current research capabilities and to guide them for improving their research skills. To supplement this, however, the TIs need to put in place suitable enabling processes - at the organisational level - for improving both the quantity and quality of research activities.

In order to comprehend what sort of enabling processes are required and when, the authors propose a five-stage model for use in nurturing research in TIs. It is a strategic framework for possible use by a TI to plan research growth in a formal way. Some of the suggested strategies are based on research initiatives observed in an organisation over the past six years. The strategies for nurturing research, no doubt, have to match with the characteristics of the stage at which research growth is and the environment in which the TI is operating. In the following section, the five-stage model is described together with the characteristics of the five stages. The strategies are grouped under the respective stage in such a way that they match the group's characteristics.

2.   STRATEGIC FRAMEWORK

The concept of universities being the central place for research has paid high dividends over the years and nowadays research is considered a core activity in Universities. However Technological Institutions (TI) are yet to establish themselves in research. Thus, nurturing research is essential in TIs as they make the transition into higher levels of knowledge-based education. Development of research in a TI can take place in several stages starting from initiation to entrepreneurial. These stages have resemblance to the stages that organisations went through in exploiting Information Technology some two decades ago. Nolan used a six-stage model (Nolan, 1979) for mapping the growth of Information Systems in an organisation. Even though this model is not applicable for the current situation, it offered a basis then for selecting appropriate strategies for managing IT activities. Picking the cue from this approach, a model for managing TI's research growth is presented. The identified stages are Initiation, contagion, control, integration and entrepreneurial. In the following, the characteristics of these five stages along with matching strategies to nurture research are presented.

2.1   Initiation

This is the stage where research is considered as an optional addendum in a TI. Usually, there is a central body (Research Committee) to co-ordinate research with somewhat limited funding. In many cases the funding is on a need only basis. The committee could be large with representation from all faculty and departments. The funding and ethical approval processes could be elaborate. So much so, that only the staff with initiative and tenacity will benefit from this scheme. However, in this stage, there can be islands of excellence in some areas with total paucity of research in several others. The functioning is totally procedure based and the focus may be on arbitration rather than nurturing research.

However, in order to increase enthusiasm, the TI could put in policies to encourage continued education and bring in specialists to make presentations on the benefits of research and process of starting research. TI could recognise the research efforts through publicity (inclusion in annual report) and other incentives (educational fees and travel funds for researchers).

2.2   Contagion

When research becomes part of academic requirement, many would try to explore their skills at research - some through collaboration and others would invest in formal approaches to learn research skills first. Some may be motivated by the success of their colleagues. However, when the novice fail to compete against the veterans, they might resent the central body approach (as it favours only the established). When this disgruntled group grows in size, it gets its voice heard, forcing the TI to come up with alternatives to the central body for dealing with research. There is also the pressure for research demanded by the environment (in particular, the regulatory authorities and competitors).

One strategy is to persuade faculties to consider research as a critical requirement. To the individual, research moves from the supportive category of accountability to suddenly the important or even to the critical category. The faculties at this stage could come up with their own research committees and research co-ordinators to support the research initiative. These research co-ordinators will provide a variety of services tailored to the individuals' requirements. More funding needs to be allocated to faculties for promoting research. Initially, the total funds actually used need not exceed the earlier central funding budget since some business units could take longer to organise themselves to the new stage that the TI has moved into. However, in course of time, more and more faculties will come up with innovative schemes to get into the research limelight.

At this stage, the controls are deliberately eliminated to allow for growth, which results in lack of uniformity or standards to the approaches used. The various faculties may formulate their approaches largely based on consensus rather than on effectiveness. Staff members are encouraged to attend conferences as part of induction into research. This could result in, on the average, poorer return on investment, as the focus will be on the low-end research activities (conference presentations and posters). There is also increased awareness for research ethics. A separate research ethics committee could be put in place to draw guidelines and simplify procedures for ethical approvals.

The policies that faculties follow should enable staff to test their real interests and aptitude for research. The success of this stage (level of proliferation) will depend upon the level of unconditional encouragement given by the management.

2.3 Control

Having seen the proliferation of low-end research initiatives, the TI would like to put in measures for getting the value for money spent on research. One strategy is to pull up the central body that was in hibernation to look at means of putting in suitable controls and draft standards to help create accountability and set direction. The TI should ensure that the controls put in are supportive and the approach used is consultative. Certainly instituting the old procedures would be detrimental. The composition of the new central committee will be small and their activities focus on standards and policies to promote research. The main objective is to improve research quality without jeopardising the enthusiasm generated in the previous stage.

Those who have developed real interest for research will adjust to the new situation and move on to the higher strata in research (journal publications). In terms of fund utilisation, those lacking aptitude for research will slowly give way to those who have taken up research by will rather than by force. However, some will continue their low-end research. On the whole, there will be improvements in the quality of research. This may be the appropriate time to bring in a research co-ordinator at the organisation level to set policy guidelines to measure research outcomes, to set norms for research funding allocation, and to organise resources (tools and external consultants) to improve the quality of research. There will be greater communication between the central body and the researchers in the faculty. Electronic media based meetings might be the norm as the research community will be large to find common time-slots for meetings. In order to improve quality of research and to find appropriate outlets for presenting the results of research, the TIs could work with professional bodies in instituting new journals whose publication interests match the philosophies of the TI. However caution should be exercised in ensuring the journal has a strong editorial board for monitoring quality.

2.4 Integration

Although the quality of research would have improved in the control stage, the type of research carried out are mostly isolated leaving behind islands of research initiatives within each faculty. However, at the integration stage considerable internal alliances will take place and research theme centres evolve. The opportunity for attracting external research funding increases. Large-scale research projects - spanning a few years and a team of people from within - emerge. The environmental factors affecting research in a TI are the directives for funding research by government. An analysis of these helps in planning the scope of research growth and identifying strategies for setting up apparatus for securing funds and establishing the required accountabilities.

2.4.1 Current Public Research Funding

The current situation indicates (MoRST, 2001) that the New Zealand govt in 2000/2001 is investing $473 million in research, a 10% increase over last year. This increase is intended to encourage new researchers to help meet its four research goals - Innovation ($84 million), Environmental ($84 million), Social ($42 million) and Economic ($263 million). It is also a signal encourage partnerships between researchers. A deeper analysis indicates that the largest area targeted, under the economic goal, is Research for Industry ($171 million). The funding agencies such as NERF, SIAC, FRST, PGSF etc allocate according to cost and the proposed benefits of the research.

2.4.2 Strategies for Integrative IT research

Funding for IT research can be increased by integrating IT research with research undertaken in other areas, thus tapping into the grants for specific areas. For example, under the goal of environmental research, there is a growing need for IT support in modelling and mapping soils, in order to develop technologies for intensive production (crops, dairy etc) with minimal environmental impact. Under the social goal, IT can integrate with social research, Maori Education, and Health. Maori education might be enhanced using the interactive multimedia technology to produce a product targeted to a particular ethnic group. In health, IT can help in the automation of specimen sampling and collection of data, and better warehousing and analysis of data,

leading to health care improvements. Bringing the farming industry into the IT world is a rich source of projects, such as the automation of milk testing and the on-line availability of test results, leading to a decrease in time between a cow contracting mastitis and being treated, with the consequent savings in costs.

2.4.3 Strategies to Support Integration

Projects such as these show the possibilities of inter-disciplinary collaboration and integration of research. This would mean that members from diffident faculties within a TI prepare integrated research proposals, operate under a research theme centre and carry out joint research aimed at solving a problem within the scope of the funding agency. To nurture research under this stage, the TI could institute a steering committee with the research co-ordinator (of the TI) as its secretary to manage these contracts. The steering committee ensures growth of research in the organisation as a whole rather than just catering for individual excellence. It provides guidelines for managing patents and additional compensation for researchers. The TI could co-opt established researchers in Universities into the steering committee for guidance. Initially, there could be joint projects with the Universities, where the TIs focus on the application aspects while the Universities focus on the conceptual issues.

2.5   ENTREPRENEURIAL

A few of the research initiatives using government funding may belong to the category of research for industry. Such researches pave way for additional research and development initiatives leading to new product development. Thus consolidating on the success in attracting external funding, the main players could be encouraged to form smaller business ventures focusing purely on research with development. The source for external funding is not limited to government only. The appropriate industries could be approached with enticing product development proposals.

2.5.1 Strategies for Entrepreneurial Research in IT

The TIs can supplement the industries with their expertise in standards and training and access to greater knowledge base. For instance, the TIs can offer expertise in the development of standards and methods that are not available for new paradigms. They can develop training, delivery mechanisms and documentation required for new products. Using their broad-based experience and integrative skills, they can help in the development of commercially viable products. It has been proven that Venture Capitol for further product development is more readily available for companies that have standards and methods, areas in which TIs have expertise.

The main strategy for the TI is to create forums for interaction between staff members and industry leaders. The staff members must be encouraged to actively participate in professional societies like NZCS and other related special interest group forums. Some of the selected final-year student projects in IT could be displayed for review by industries. Further, more group projects with greater scope should be encouraged. Considering current technology trends, there is scope for applying IT for a lot of small-scale organisations who cannot afford expensive e-solutions. This would mean having internal sponsors with sufficient domain knowledge (these can be found in other faculties within the TI) and developing generic products that are customisable for different businesses.

2.5.2 Strategies for Supporting Entrepreneurial Research

A possible strategy at this stage is to create an Incubator Centre as a separate unit operating like yet another faculty but with a different set of objectives aimed at nurturing innovation. This centre provides the facilities (both infrastructure, administrative and legal support) for these smaller entrepreneurial ventures and helps hatch into new businesses providing employment. The Incubator assists in matters relating to patents and the legal issues in establishing a new business. This lets the research team focus on the product development. Getting to the entrepreneurial stage largely requires applied research rather than fundamental research. Hence in this stage, bright students could get involved in product development related research projects. These students can be part of the new business developed through the incubator. They can be expected to maintain closer ties with their TI as alumni and may even create such opportunities for other students in later years.

3. CONCLUSION

A five-stage framework for the growth of research in TI is described. This model gets the basic structure from an old model used in managing the growth of IT and the stage characteristics based on observation of research nurturing in TIs in recent years. This model seems to fit their observations of research initiatives put in place in an organisation over the past six years culminating in the formation of a centre for innovation. The model also reflects the processes the organisation used in trying to develop a research culture. The purpose of this framework is mainly to come up with suitable matching strategies for nurturing research in a TI at different stages. The authors caution that this model is not recommended for evaluating organisations' research capabilities, as it does not provide sufficient support tools (such as metrics) and processes for evaluation.

Irrespective of the stage in research, TIs should include an optional research project course in their programmes. This increases the opportunities for promoting research.

The authors consider the contagion stage a valuable phase to go through to promote research even though there are no guaranteed returns. More attention is paid to the control and integration stages in view of their relevance to TIs. Leadership plays a significant role in improving the quality of research. Quantity should never be the main metric at the control stage. It would take considerable effort to reach and maintain research at the integration stage.

If a TI finds it hard to move into the integration stage due to the fact that there are well-established universities competing for the same resources, it should examine the possibility of moving into the entrepreneurial stage using its applied research and product development skills.

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