Introduction to basic research

Basic research' is a term that is widely used but with little apparent consensus on what it actually means. The term basic research usually refers to study and research on pure science that is meant to increase our scientific knowledge base. This type of research is often purely theoretical with the intent of increasing our understanding of certain phenomena or behaviour but does not seek to solve or treat these problems.

Most scientists believe that a basic, fundamental understanding of all branches of science is needed in order for progress to take place. In other words, basic research lays down the foundation for the applied science that follows (ELSI Research) Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. In comparison, Applied research is original investigation undertaken in order to acquire new knowledge.

It is, however, directed primarily towards a specific practical aim or objective (OECD, 2003). It is because of the lack of a particular definition or structure that it is widely regarded to be only academic and some researchers are critical of basic research at times. " Dealing with deficiencies in business R&D by making basic research more ' relevant' is like pushing a piece of string" (Pavitt 1991: 117). Importance – Several scientists in the UK commented that the political climate for basic research is better than it was in the 1970s and 1980s.

One reason given for the increased importance of basic research is the emergence of certain new technologies (such as biotechnology) which require very basic research but then quickly produce marketable products - now a ‘ fundamental’ breakthrough can simultaneously be a commercial breakthrough (Elzinga 1985). Benefits - The benefits of basic research are examined by Ben R. Martin and Puay Tang in their SPRU (Science and technology policy research) article of 2007. They have been re-examined and illustrated by me. . Increasing stock of useful knowledge – Usually two types of research based knowledge is created – codified and tacit. Codified knowledge is in written form and the more visible of the two whereas tacit knowledge is related to skills and work experience. Firms generally need a threshold level of internal research effort in order to develop the tacit knowledge and provide the ‘ absorptive capacity’ needed to identify and assimilate potentially exploitable scientific knowledge elsewhere (Cohen and Levinthal, 1989).

It may be decades before a commercial application may be set up but it is evidently important to have all knowledge possible to assist in any future endeavour. 2. Supply of skilled graduates and learners – New graduates in their post graduate studies in university who enter into the industry either for summer internships or part time work bring with them fresh levels of enthusiasm, new skills to perform research, to develop ideas and have a know - how of using latest instruments and techniques taught by their professors who also perform research at universities.

Video link - http://www. youtube. com/watch? v= NHjrMtECVo0 3. Creation of new scientific instrumentation and methodologies – Researchers continually develop new equipment, laboratory techniques and analytical methods to tackle specific research problems. Hence, the development of new research instrumentation or scientific methodologies is often a key output from basic research (Rosenberg, 1992). In all of the top research based industries, these are of utmost importance. It's a two way flow process to make processes simpler and tackle problems that require consistent research.

In all of history of science, many examples of scientific instrumentation or research methodologies have brought benefits to the industry, for example, electron diffraction, the scanning electron microscope, ion implantation, synchrotron radiation sources, phase-shifted lithography and superconducting magnets (OTA, 1995) One example would be of the ' Clearvue' ™ Technology developed by Dmist in their camera that can take continuous shooting showing good visibility even under harsh conditions of extreme Fog and Rain as demonstrated in the picture below. . Development of networks and stimulating social interaction – Open science with time has become part of an international network of researchers, scientists and research bodies who are all basically trying to address similar issues reading similar material and attending the same conferences. This network can be reliably contacted without delay in order to attain information, guidance or advice. This can help plug the gap between industrial researchers and academic researchers stimulating fresh ideas and benefits.

Some analysts argue that the density of these network interactions is itself a good indicator of the vibrancy of a regional or national innovation system (Cooke and Morgan, 1993). 5. Enhancement of problem solving capacity - Many firms in technological fields face complex technical issues and problems. Researchers also contribute to the economy by helping industry recognise, face and address problems. Tijssen (2002) has produced evidence that 20% of private sector innovations are based to some extent on public sector research.

In the biomedical industry, Toole (1999) has shown that a 1% increase in the stock of public basic research ultimately leads to a 2 % – 2. 4 % increase in the number of commercially available new compounds, and that firms appropriate a return on public science investment of between 12% and 41%. All problem solving capabilities are an important form of economic benefit from basic research. 6. Creation of new firms – Any successful scientific research can spur the growth of most firms.

If publicly funded and supported by the government, graduates and researchers can transfer their knowledge, exploit new ideas and skills from a purely academic level to a commercial environment. A location in a science park, often next to a university, can be very advantageous for new small firms (Storey and Tether, 1998). There is plenty of evidence in the work of Zucker and Derby (2002) that leading university researchers and academic stars have created bio-technology start-ups and that their funding is mostly publicly funded. 7.

Provision of social knowledge – No matter what profession one is in, it isn’t a perfect world. There are always social implications concerning the environment, health care, government policies, technical barriers and lots more. Nuclear energy is an example of one such case which is always under the scanner. The general public can be a big deciding factor between acceptance and decline of new technologies. There are codes of conduct and national systems of innovation with which every researcher has to comply and be answerable to the authorities.

Then there are costs of patents which cannot be met without Government support and public funding but the benefit is that if everything goes down the road smoothly, public funding is in itself a huge benefit to the researcher as long as the researchers be transparent about their systems. The end result would lead to better social understanding of surroundings and working conditions, ever improving scientific platforms and health care systems, higher standard of living and every youth will be employed.