

# Institutionalizing University-Business Innovation Systems in an Innovation Economy

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## ABSTRACT

The purpose, design and operation of universities and institutions of higher learning are being transformed. The transformations are requiring universities to lead the process of innovation. Collaboration with stakeholders is accelerated through innovation ecosystems that are functional in some universities. Innovation hubs are powerhouses of innovations at the apex of science and technological advancement. Traditional university designs have their strength in pure science but limit interdisciplinary integration and innovation. Government, private sector and philanthropists are key funders of innovation projects. Universities with a central role in the national and global innovation system exhibit varying impact, a few have exceedingly succeeded in this endeavor and innovation systems are avenues to have national and regional impact. A university is a place of discovery where academics, researchers, government, students, community and companies work together in an innovation ecosystem to develop solutions and products that have an impact on our society. Institutionalizing innovation laboratories is a winning strategy for powering science-led economies.

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## I. INTRODUCTION

A science-led economy is only feasible through multiple innovations from universities and industries. Universities have developed a lot of innovations to-date, but few have been commercialized leaving a gap between research, innovation and economic development. An innovation policy applies to many sectors such as science, technology, engineering and social innovation beyond the education sector (Soete, 2007). The purpose, design and operation of universities and institutions of higher learning are undergoing a lot of transformation. The transformations are requiring the university to be a leader of business, engineering, health and social transformations possible through innovation labs that have been developed in some universities. Traditional university designs have strength in pure science and limits in interdisciplinary integration. Government, the private sector and philanthropists are key funders of the innovation process. The world is in need of innovations and universities have been a place for all these outputs. Institutionalizing innovation laboratories is a new phenomenon in many universities generally oriented toward scientific laboratories of basic science and lecture rooms for degrees in humanities. The accelerated growth of universities is attributed to outstanding research and discoveries and innovations that solve the pressing issues of humanity. Universities were structurally designed to have scientific laboratories, and these have been instrumental in many scientific discoveries. Innovation laboratories have different names according to several authors such as Collaborative Research Centres (CRC), studio, incubation centre, tech-space, innovation hub,

living labs, and science park (Thune & Gulbrandsen, 2011). A lot of university prototypes have been developed by universities for further industrialization and mass production. The existing labs are more scientific and less related to product development. The component of product development is more evident in industrial labs rather than at current universities. The ideas of innovation labs have been around for decades though the connections with universities and nomenclature have taken time to crystallize, however, their products transcend all horizons. An innovation policy should spur more innovations (Edler, 2010). The purpose of this article is to provide procedures for institutionalizing innovation systems, centres and initiate pathways for commercialization of innovations to directly contribute to science-led economies.

## II. STATE OF AFFAIRS

The current state of universities is the existence of scientific laboratories separated by disciplines in basic sciences or applied laboratories. Humanities programs have been left out of the innovation process and their studies have remained theoretical. Innovation laboratories integrate both arts and science students on a project or prototype designed to solve social or natural problems. The design and structure of physical innovation laboratories can take many forms depending on the goal of the centre.

The design of innovation centres at universities simulates that of a factory-based environment where industries conduct research and develop new products.

The establishment of production units at a minimal scale bridges the gap between university and industry increasing graduate competence and promoting product innovation at university level.

### III. THE ROLE OF INNOVATION LABS

Innovation labs are powerhouses for new ideas, products and systems contributing to the country's innovation capacity (Gulbranson & Audretsch, 2008; Fritsch & Slavtchev, 2007; Huggins & Cooke, 1997), without the centrality of these innovations, many ideas will go undeveloped reducing the opportunity for society to benefit from the endless ideas. Innovations are the drivers of economic development (Edler & Fagerberg, 2017; Hausman, 2012). The innovation agenda should focus on total sustainability tackling the global contemporary issues of health, nutrition, business, climate change, engineering, social innovations, artificial intelligence and security calling for multifaceted centres. The earlier focus was on engineering and biological sciences and less on social innovations which have left the world with unsustainable social behavior and many social problems. Lack of skills has been cited as a major driver of unemployment among youth. The high figures of unemployment can be reduced by skilling youth through incubation centers and mentorship by experienced successful entrepreneurs. Accumulation of skills within various sectors, increased funding by the Government and private sector into research and many years of business experience enables sustainable industrialization and further innovation.

### IV. INSTITUTIONALIZING INNOVATION PROCESSES

#### A. Innovation Systems

Developing innovative University systems that innovate for economic development requires a transformation of existing systems. Universities have a long history of protocol guided by disciplines, education philosophy, research orientation, government policies and regulations. Social capital and knowledge exchange are key to functional collaborations (Mäkimattila, 2015). A complete understanding of innovation systems is limited (Lyytinen & Rose, 2003). The institutions of higher learning are transiting towards openness in science and innovation where student competencies are associated with the learning environment (Keinänen & Kairisto-Mertanen, 2019).

#### B. Policy Integration

Integrating University policies, master plans and budgets should feature the centrality of space and investments in innovation laboratories to institutionalize innovations. Innovation labs are not a replacement for traditional science laboratories where most basic and fundamental research is conducted to feed the innovation laboratories. Mohnen and Röller (2005) argue that multiple policies are necessary to develop an efficient innovation system. Flanagan and Uyarra (2016) present a direction for avoiding the dangers in innovation policy studies.

#### C. Triple Helix Model

The triple helix model of university-industry-government is familiar (Etzkowitz & Leydesdorff, 2000). Science-led growth is accelerated through science-based initiatives and institutions working in unison with industry. Industries have the capacity and resources to fund incubation centres and train students in a business and industrial environment in which the University has only simulation labs and studios.

#### D. Innovation Centres

The name depends on the context, namely tech centres, innovation centres, incubations, and innovations labs though serving a similar purpose. The objective of an innovation hub is to develop new innovations, actualize ideas and concepts into prototypes and mimic laboratory production for scaling at industrial levels. However, resource competition arises with the development of incubation centres and may influence the growth of related research initiatives and output in other universities (Kolympiris & Klein, 2017). Capacity building is necessary as most scientists are more experienced in the current systems than in industrial systems. Stakeholder involvement in innovation and the development of prototypes is minimal.

#### E. Funding

University budgets will change to include funding for innovation lab at government-funded institutions. Funding scientific research from university tuition is unrealistic and unfeasible goal, it should be government and company investments that profit from the innovations. Funding from companies is more common in health, engineering and technology. However, Universities have to re-orient their training systems and budgets towards business modes to attract company investments (Henrekson & Rosenberg, 2001). Government science and Education policies and ministries have a tremendous influence on the establishment of innovation laboratories especially in Government owned institutions. These are complex investments that develop over time with more innovations. Trajectories are in policies promoting science and its role in development. The private sector is a key partner in the formation and sustainability of these centers providing research funds, equipment, and infrastructure. Commercializing innovation promotes the sustainability of innovation systems. Litan *et al.* (2007) discuss several approaches to commercialization.

#### F. The Student

Students are at the center of innovation systems that need to accept and study in an innovative culture. Young innovators are the most inspired and most motivated stakeholder in the innovation system. Autonomy and previous innovation behavior are among the predictors of innovation (Martín *et al.*, 2017). Zhu and Engels (2014) show that the organizational culture of an institution of learning has an influence on student innovation output. Leadership development is key to managing innovation in the future and there exist different methods to develop student leadership abilities (Hero & Lindfors, 2019; Vohra *et al.*, 2015).

#### H. Innovators, Intellectual Property, and Benefits

Intellectual property right needs to be streamlined in innovation policies as benefits to innovators is a motivator for

high innovation. Reducing the privileges of innovators results in low research output (Hvide & Jones, 2018). Industrial collaborations speed up the processing of commercialization of prototypes that yield financial returns. However, the role of the university and its benefits to innovators needs to be clearly guided through innovation policies.

### I. Education Systems

Though innovations are critical in developing innovators and contributing to industrial and economic development, education systems in many countries especially in developing economies are too theoretical with little innovation and practical training. The role of education in several institutions needs to be redefined. Current curricula have laboratory practicals and internships. Innovative curricula have a wider scope beyond a few exposures to practical systems. It is student centered, with the student being the innovator. There are several challenges with assessment procedures in an innovation setting, fewer assessment tools exist for this system (Keinänen *et al.*, 2018). Technology usage aids the communication of ideas (Daiz, 2009). Assessments are paper-based drawing learners to memorize for excellence in theories instead of project assessments and prototypes. Innovation culture is developed in early education settings. The focus should be on prototypes that are most relevant to industries and businesses for testing, development and mass production.

## V. DISCUSSION

Universities fully institutionalized lecture theatres and scientific laboratories with less investment in studios, innovation labs and centres. Extensively formal education centers were found to have less performance by Thune and Gulbrandsen (2011). Studios have been popular in some engineering, arts and design faculties. Viable innovation laboratories have to be created in collaboration with all stakeholders with a major influence from industry to provide models for student experimentation as the university develops ideas and prototypes for industrial development and mass production after subsequent testing. The designs of these labs are tailor-made per discipline and have the potential to evolve as science and technology contribute to overall innovation. It is essential to have the designs and protocols to allow for multidisciplinary innovation. Innovation labs are powerhouses for new ideas, products, and systems, without the centrality of these innovations many ideas will go undeveloped reducing the opportunity for society to benefit from the endless ideas. The innovation agenda should focus on total sustainability tackling the global contemporary issues of health, nutrition, business, climate change, engineering, social innovations, artificial intelligence and security calling for multifaceted laboratories (Fagerberg, 2017). Earlier focuses were more on engineering and biological sciences and less on social innovations which have left the world with unsustainable social issues. The challenge will exist to raise funding for science privately owned institutions that have to entirely rely on companies, however, such partnerships are feasible if universities contribute commercially profitable innovations as an incentive for company investment into these institutions (Cao *et al.*, 2009).

A clear understanding of the roles and goals of all members of the innovation ecosystem need to be well stipulated. Sometimes there are challenges of ethics in publications, patenting, data management, mining and management of projects co-sponsored by corporations, these issues need rigorous regulation and guidelines to uplift the moral and safety standards for humanity and profitability of investments. However, it should be noted that future innovation systems will be in the hands the of private sector (Oughton *et al.*, 2002; Kuhlmann, 2001). A clear understanding of the drivers of innovation is essential in the development and implementation of functional innovation policy (Boon & Edler, 2018). Policy in advanced innovative states is less applicable in emerging economies, a redesign of systems is essential to develop sustainable innovation policies (Tödtling & Trippl, 2005). As we focus on universities as the center of innovation it is noteworthy to remember that universities operate under a lot of social, political and economic pressures that need clear analysis (Smith, 2007). Institutionalizing innovation systems is a complex and progressive endeavor due to diverse business environments (Jiménez & Zheng, 2021), the interests of stakeholders in the innovation process and products. Government is a key stakeholder in science initiatives guiding scientific systems through science policy and providing funding for infrastructure development and funds for consumables in some instances the end-user being the wider society. Corporations in tech sector have huge budgets for R & D to increase their competitive advantage in the markets where they thrive, part of the funds are provided to universities in collaborations for discoveries the motivations are profit, development, new products and sustainability. Researchers and other innovators need royalty from innovations. Universities need coherent policies and guidelines for all stakeholders to benefit from an innovation system. Intellectual property is high on the agenda of policy in research as all efforts converge towards a product or output several are worth patenting. It is imperative that institutions develop functional policies on intellectual rights. Current information shows that most innovators have limited knowledge of filing for intellectual property rights and patenting procedures an area that needs further discussion. Universities are rapidly migrating into a new era of online and distance learning, innovating on the virtual system may favor more development in computing and engineering design than other laboratory-based disciplines.

## VI. CONCLUSION

Innovation centres are the future hubs of science and technology. Though technically and scientifically pragmatic, policies for their implementation and integration in universities need further development and refinement. Cities that have innovation hubs have a lot to contribute to the process of scientific and economic development.

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