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Need for developing deep-science based research translation capabilities in academic organizations throughout Japan: An conceptual perspective

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Abstract

Japan, although being a developed nation, still seems to be grappling with some of the problems related to inclusive growth, standard of living and equal employment opportunities. Improving research translation capabilities of academic organizations located throughout Japan, might be able to solve some of these problems. Translating research from lab to the market can benefit all the major stakeholders in the process – government, academia, industry and society. Academia can play a major role in this holistic process. A pro-active academia can seek out some of the major problems plaguing the society and leverage its position, resources and expertise to suggest possible solutions. Industry can look at the feasibility of commercializing solutions which are novel, effective and scalable. Major breakthroughs can happen when government decides to promote ‘state-of-the-art’ research and development in frontier areas of science, technology and innovation with a strong focus on ‘societal impact’.

With one stroke, many targets can be achieved if such capabilities can be built in the next-generation of students, researchers and teachers. Japan, with all its science and technological expertise, is in a position to pursue ‘deep-science’ based research and explore opportunities to translate such cutting edge research from lab to the market. Especially, Japanese premiere science and technology institutes can take a lead and set up ‘exemplary’ models for others to follow. However, the biggest challenge in implementing a nation-wide approach will be at the first step of this process – establishing the need for developing such capabilities. Unless, a strong need is felt by each and every academic organization, none of them will be able to mobilize their limited resources towards this direction. This paper attempts to establish the need for developing ‘deep-science’ based research translation capabilities in academic research organizations ‘throughout’ Japan so that it’ll be able to solve some of the major problems related to shrinking population, workforce shortage and economic inequality, which seems to be plaguing its society.

Key words: Academic Research Translation Capability, deep-science-based research translation

Introduction

Japan's current economic prowess, especially its 'developed' status can be attributed to its ability to leverage its world-class expertise in science and technology. The ability to pursue high-quality research in science and technology coupled with a singled-minded focus on certain key areas like automobiles, electronics and chemicals enabled Japanese industry to create products which could compete with the 'best in class' from around the world. The secret of Japanese survival, revival and eventual dominance in certain sectors, can also be attributed to the Japanese management style. The coupling of scientific expertise and lean management led to the meteoric rise of Japanese technology-based organizations and empowered them to excel in the global race. It also enabled Japanese organizations to explore as well as exploit markets outside their territory and expand in markets around the world. Japanese technology-oriented organizations placed great importance on efficient and effective use of resources to come up with high-quality products at affordable prices. This could be one of the reasons for their instant popularity around the world, apart from many others.

In this paper, we wish to understand the importance of some of these key factors which helped Japan to achieve its 'economic miracle' and the possible factors which might impact its ability to sustain it in the future. We take a slightly macro-analysis outlook to enumerate and understand the bigger picture of the existing situation in Japan so that we can estimate its future in the long run. Especially, we focus on some of the most important socio-economic-political and technological factors which might help us understand the Japanese growth story. These outlooks also allow us to holistically understand the possible bottlenecks, barriers and challenges which might play a spoiler in the on-going Japanese economic recovery efforts. It is important to study the combined effect of these seemingly unconnected factors in order to uncover the latent phenomenon and hidden interconnections driving them.

Globalization

Developed as well as developing nations, seem to be almost similar, in terms of the nature of problems faced by them in today's highly 'globalized' world. Problems such as – inclusive growth, standard of living and equal employment opportunities for everyone, are plaguing nations irrespective of their 'developed' status. However, the scope and gravity of such barriers might vary with respect to the 'developed' status. Barriers such as developing the right kind of ecosystem to nurture high-quality scientific research and development at their universities and industries are still considered 'difficult' to overcome. If these barriers continue to remain as they are, they will continue to inhibit the progress of such developing economies and the situation may worsen even further as the gap between the rich and the poor keep on widening. Developed as well as developing countries have realized this and are now taking steps to address this pressing issue. Especially, in terms of building deep-science-based research translation capabilities can be a possible way to bridge this gap. Such translation capabilities, if developed with a long-term approach, can lead to a sustainable competitive advantage for such research-driven organizations as well as their host countries.

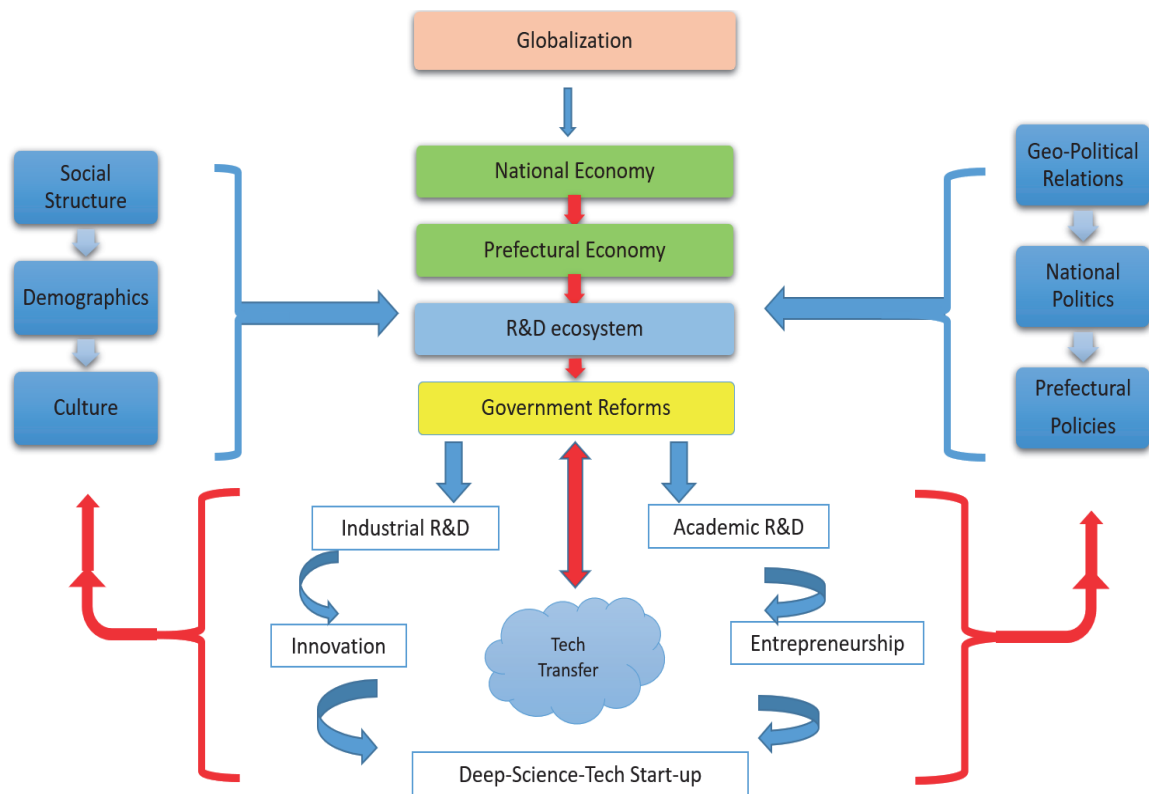


Figure 1: Socio-Economic-Political factors affecting an innovation ecosystem

However, building such research translation capabilities can be significantly affected by the socio-economic-political dynamics in a particular country. Historically, Japan has always been a nation which has been able to capitalize on its scientific and technological expertise to fuel its economic growth and prosperity. The ability to leverage scientific expertise to gain economic benefits is a very rare ability to possess and certainly, difficult to nurture at national, prefectural and even organizational level. Hence, even in developed economies it is clearly evident that only certain key areas or ‘hotspots’ have been able to excel in this respect. A closer observation behind the success of these critical areas will reveal that they have a very well-functioning ecosystem to convert their research from lab to the market and back to the lab. So the money that is invested to fund the research projects helps in creating new products and services which can be easily absorbed in the market. Such market success is the key for smooth and efficient operation of this research-driven ecosystem. This demands market-oriented research, development and innovation to be undertaken by the researchers in order to reap commercial benefits and success.

High quality market-oriented research or in other words - ‘applied research’, cannot be done without a strong foundation in basic science and technology. This is where, the role of a proactive academia comes into the play, as it empowers the research community with the freedom to pursue ‘curiosity-driven’ basic research and ‘need-driven’ applied research. Hence, at an organizational level, a healthy balance between the two needs to be established in order to build long-term innovation, research translation and entrepreneurship capabilities in organizations. Some nations have been able to empower their academia and the research community to build a highly conducive environment to pursue either of the options or both, as per the situation. However, not every academic organization has been able to do so due to several reasons. In this paper, we attempt to highlight some of the macro factors which tend to play a significant role in influencing this ‘research translation capability’ in academic organizations.

Research translation capability, refers to the ability of an organization to successfully translate its research from lab to the market in several formats in order to generate leverage out of it. Translation of research can be perceived as (1) intellectual property (2) proof of concept (3) prototype (4) products, services, platforms (5) consulting, training and development programs (6) collaborative projects (7) venture creation (8) spin-offs (9) license. In this paper, we focus on some of the macro aspects such as social, political and economic factors which may significantly impact this research translation capability at a national, prefectural and organizational level. It is important to focus on the various mechanisms through which academic research-driven organizations may achieve the necessary leverage to improve their competitiveness in the global innovation and entrepreneurship landscape. This paper may have practical implications for shaping the science, technology and innovation policies at national level. The paper also contributes to improving the theoretical knowledge and understanding about the best practices which can be followed by the governments, industry and academia which are interested in building such research translation capability in their nations.

Research Translation Capability

There can be several mechanisms through which research can be translated from lab to the market. Especially academic research can (as well as should) be endeavored to be translated from the lab to the market for the benefit of larger sections of the society. Especially, for government funded research laboratories located in the academia or research institutes, they carry a moral obligation to give something back to the society which pays for their funding. The following figure clearly explains the different mechanisms through which cutting edge research conducted inside the labs can be brought outside the lab for the benefit of the society as well as the research organization. These are also the mechanisms through which the research organizations can evaluate their own performance in terms of value added to the society and creating societal impact from their research. These measures are qualitative as well as quantitative, hence they can also be used to generate revenue by the organization which is conducting research and generating outputs.

A close observation of these research translation mechanisms can suggest that they follow the technology readiness levels framework developed by NASA to evaluate the readiness of their own space programs. However, their applicability was found to be useful by other organizations as well, for evaluating their research programs and outputs. Our framework draws upon this TRL framework to come up with a potentially advanced and comprehensive framework for assessing research translation capability of organizations. It was predominantly developed for assessing the research translation performance of academic research organizations but can easily be modified for assessing industrial research organizations as well.

Establishing the need

The Japanese R&D ecosystem is clearly oriented towards the development of society from the actions of the other stake-holders in the triple-helix model – government, industry and academia, as shown in the figure 5. The Japanese central government seems to lay a strong emphasis on the societal impact especially while funding science and technology based research projects. Such top-down approach has created a strong awareness in the minds of the researchers regarding the societal impact of their projects. This seems to be a good practice that every nation can follow, especially while funding their academic research programs. However, not every research project or organization may be able to deliver on these parameters. Especially, long-term fundamental research projects may not have a strong case in terms of their output to the society however, deserving projects should be allowed to be pursued for the sake scientific advancement and knowledge generation. This understanding can only be developed when all the major stakeholders in the process agree to collectively share the risks associated with pursuing such research projects. The ability to

conceptualize, plan and execute such kind of risky projects, which may or may not have a clear outcome or benefit to the stake holders depends on the nation’s socio, economic and political factors.

The Japanese R&D Ecosystem is slowly changing its nature from following a closed ‘innovation’ system to a much more ‘open’ innovation system which is willing to collaborate with different entities in its ecosystem. The Japanese R&D ecosystem is seeking new ideas, approaches and experts who are willing to work on inter-disciplinary projects which are centered around a particular scientific theme, with clear objectives and deliverables oriented towards creating a greater societal impact (Jofre, 2008). Also, Japanese R&D ecosystem is slowly and steadily opening up to foreign researchers and experts in order to exchange expertise and more importantly, align itself to the ‘global’ standards. It also opening up to new mechanisms of translating academic research such as academic venture creation and funding in order to boost the start-up creation and scaling up. Japan sees the ‘value’ in promoting scientific innovation and entrepreneurship among its academic research community and the government seems to be coming up with proper support structures and mechanisms.

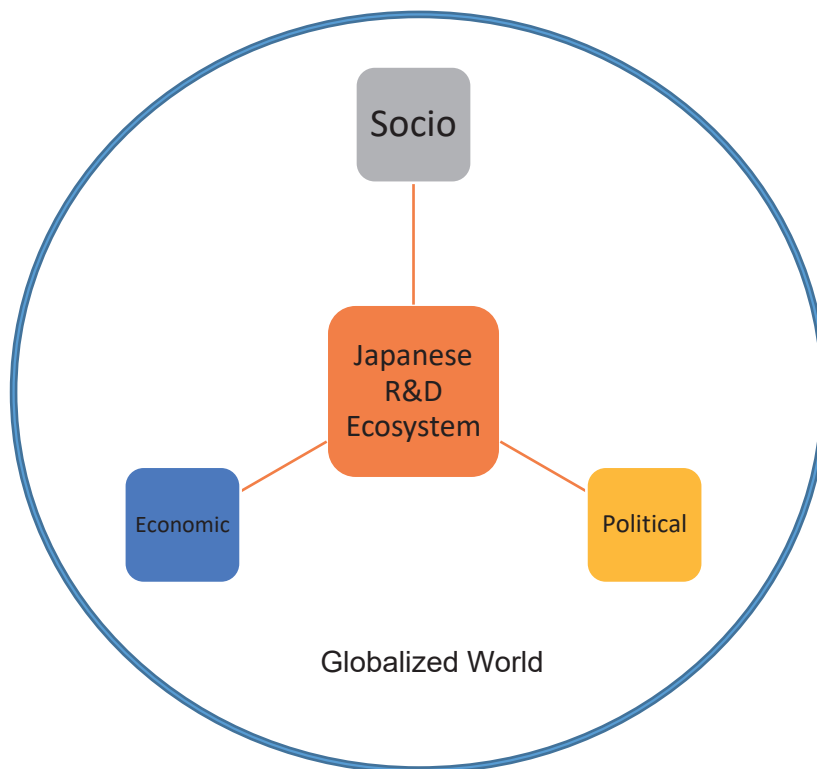


Figure 2: Japanese R&D Ecosystem in a Globalized World

In the coming future, it would be interesting to see the extent to which the Japanese R&D ecosystem will be able to align itself to the globalized ecosystem. It would also be interesting to understand which aspects will remain unchanged and which ones will change due to the exposure to the global dynamics. It would be interesting to see if Japan is able to fuel its future growth based on the ‘ecosystem’ based approach. Will Japan be able to overcome of the barriers like hierarchical systems, excessive formalization and risk-averse nature (which may be inherent in their social structure) in order to achieve its targets for social benefit and welfare ? Will it be able to harness its S&T expertise to solve some of most toughest societal problems like aging population, reducing work-force, dual pay system, glass-ceiling and unequal opportunities for

employment ? Will Japan be able to train its young generation to think creatively and especially – out of the box - to overcome their problems ? Will it be able to create mechanisms through which Japanese youth can interact with the global youth community and be at par with their peers from around the world ? Will Japan be able to overcome its traditional operating models and make way for the new ones which might be more relevant while operating on a global platform ? Will Japan be able to create enough jobs for everyone inside and even outside its territory ? Will it be able to solve its productivity paradox where large number of employees spend countless hours at the workplace yet their productivity levels are lower than most of the OECD nations ? Will it be able to create equal opportunities for people belonging to all genders, religion, region and color ?

By 2020 – the Tokyo Olympics year, will a new Japan be ready to take on all these challenges ? Interesting times ahead for Japan. Good Luck, Japan !

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