

# A System Driven Method to Research and Intellectual Property Generation

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**Abstract:** *Zimbabwe is currently transforming from a Resource-Based Economy to a Knowledge-Based Economy. To achieve the goal of a middle-income economy through unlocking value from research inputs, the Government of Zimbabwe reached a milestone through launching the Intellectual Property rights policy three decades after gaining economic and political freedom. The thrust is to realise value from the funded researches through collaborations. Therefore, this policy created an enabling environment to promote the University, Government, and industry engagement. How can we help poor people earn more from their knowledge-rather than from their sweat and muscle alone? It has been a difficult question for most Zimbabweans. For any developing nation to prosper, there is a need to promote and protect indigenous knowledge. Zimbabwe has improved its educational curriculum for the past three decades. However, the education system has failed to provide graduates who could produce goods and services for a developing nation. The Government had made an effort is trying to solve the anomaly by introducing more than ten state-owned universities and licensing additional two private-owned universities. This effort did not result in the formulation of any new industry, and the new academic programs and degrees did not even improve the confidence of the industry captains on the contribution the universities can do on industrial growth.*

**Keywords:** *Intellectual property, research, innovation commercialization, industrialization.*

## I. INTRODUCTION

This section evaluates different models used for collaboration between universities, industry and the Government. The strength and weaknesses of these models were evaluated with an emphasis on their applicability to a developing nation. Other concepts which will be reviewed include:

- An in-depth review of the Harare Institute of Technology's IP policy and long-term vision.
- The operationalization of the national IP policy and its relevance to the industrialization policy.
- Innovation and commercialization

## Background of Harare Institute of Technology

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To develop and validate the proposed approach, the research centred on Harare Institute of Technology (HIT) as a case study to test and validate the developed model. HIT was transformed into a university from a technical college in 2005 through the HIT Act {Chapter 25:26}. The Act mandated HIT to develop, incubate and transfer technology. The guiding principles for the learners are based on Technopreneurship. The University thrives on being the leading provider of research to commercialisation platform through the implementation of the Kanhukamwe-Sharma Model. HIT has evolved from just a degree-awarding institution to a leading industrialist center through its systematic approach to research commercialisation.

## Research and Development at Harare Institute of Technology

It is HIT's calling that made it ideal to be used as an environment for developing and validating the proposed model. The calling is based on commercialisation of technology, and thus the basis of the research. The idea is to evaluate how many technologies were channeled from the University compared to what has been the output after implementing the proposed model.

The students and staff submit their research proposals through their respective schools to the research board. To achieve the calling, the university awards staff and students research grants through the research board. After the research outputs have been realised, the Technology Centre receives the requirements for prototyping and submit the outcomes to Communications department in order to seek investors for the potentially commercialisable research outputs.

The commercialisation model presented major challenges on the ability of the University to create value on research outputs. Even though the University had created a strategic business unit, Institech (Pvt) Ltd which was responsible for marketing products from the Technology Centre, it was failing to successfully commercialize its products besides bottled water and cordials.

## Intellectual property rights in developing nations

Intellectual property is regarded as the creation of the mind, hence requires protection rights [1]. Industrial revolutions have been a result of new inventions and ideas being created as way back as the 19<sup>th</sup> century. Innovation is cultured well in an environment where Intellectual Property rights are respected. Under the Medium-Term Strategic Plan 2010-2015, the World Intellectual Property Organization aims to promote a balanced ecosystem for a reliable IP rights system [2].

## A System Driven Method to Research and Intellectual Property Generation

For a rapid economic growth, there is a need to develop policies and procedures that promotes seamless synergies between the industry and the universities. In order to achieve such a broad objective, rapid industrialization strategies have to be implemented in holistic and sustainable manner. There is a linear relationship between business start-up companies and economic growth. Although the success rate of start-up businesses is less than 20% their financial impact is of great significance [3]. For these new business ventures to be successful, the economic environment should be stable hence this stability is brought about by sound economic policies by the Government. Wealth creation can be a result of well managed IP rights. Any company built on strong IP claims produces competitive products that have global impact.

Africa has managed to establish an organization to foster IP issues for its member states through the African Regional Intellectual Property Organization (ARIPO). It is an intergovernmental organization that grants and administers Intellectual Property (IP) titles on behalf of its Member States and provides IP information to its clientele in the form of search services, publications and awareness creation [1].

Failure by a government to enforce IP rights could lead to the collapse of a thriving industry. Companies and individuals put effort on the establishment of a product and its market value could be eroded due to lack of IP rights thereby affecting economic growth [4]. A very good example is the collapse of the Nollywood film industry in Nigeria due to movie piracy. Also, a visit to the “Gulf” in Harare, Intellectual Property laws stand no match against counterfeiting. Besides being the hub of imported fake goods have affected the Nigerian economy as the local manufacturers are failing to compete with the low cost goods [5]-[6]. The implementation of IP policy increases investor confidence and the enforcing of the policy further increases bilateral relationships between nations.

New [8] argued that there is a need for a collective action to eradicate piracy and reduce IP infringements in all sectors of the economy. To achieve that, both local and foreign policies should address the issues of IP rights infringement. According to Daniels [9], nine productive years of stakeholder consultations were used to establish an acceptable IP policy in South Africa. This has been commended as the most important step towards the improved access to South African domestic medicines and pharmaceuticals. Such a milestone will propel the country in a new horizon.

Developing nations such as Zimbabwe have been lagging on enforcing IP rights. Zimbabwe had its first IP policy in 2017 after three decades of independence. South Africa has been the leading African country on IP issues, this is evidenced by the review of their IP policy in May 2018 to match world best practices. The lack of IP policy has been highly influenced by lack of self-drive for industrialization and high dependence on foreign investors as the country seeks for direct foreign investments. According to Khan and Arshad [9], less developed countries often have a cost in manufacturing particularly due to low wages. However, with modern trends in manufacturing companies have begun to establish IP policies to safeguard employee and company creations.

The bold decisions made by both Zimbabwe and South Africa to review their IP policies will not have an impact if not appropriately implemented on their domestic laws [6]. As free trade takes centre stage, regional competition increases in Sub-Sahara hence the need for continuous improvement on regulatory frameworks for IP rights protection. In Zimbabwe,

the IP policy resides in the office of the President and is managed through the Research Council of Zimbabwe. While our counterparts in South Africa have the IP Policy viewed as an industrial policy. IP rights laws and regulations brings confidence to investors. It is a well-known business concept that a country without proper IP policies is too risky for innovative ideas. As a result, foreign investors shun such an environment. Hence this is a common environment to most developing nations.

According to Siegel and Wright [1], and Thomas [10], in drafting a national IP policy, it is important to take into consideration World Trade Organization (WTO) frameworks and regional trade agreements in order to avoid defeating the purposes of an established free trade area in most regions in the world. Creation on the policy alone will not yield positive results unless African governments put in place legislations that enforces issues of infringement.

### Motivation

Most available models of engagement such as the Triple Helix model have been widely implemented as the framework of engagement between universities [11], industry and Government. However, the model has grey areas that always inhibit individual growth among the three partners. In these models each partner seeks to understand what is beneficial for both or all parties. Such perspectives have resulted in most partnerships between industry and universities failing to produce any tangible results [12]. The universities have been overwhelmed with the need to produce patents and copyrights while the industry is making efforts on improving their profit margins. If the universities do not see any potential in journal publications, patent generation or copyrights they do not put much effort on the partnership while the industry ignores any partnership that does not translate into increased profit margins.

### Unique Contribution

The unique contribution of this research will be:

- The development of a dynamic model for research and policy formulation.
- The establishment of a systematic and holistic reliable model for IP generation, commercialisation of research outputs and industrialization in a developing country.
- Extending the literature on how best proper innovation and research outputs could be commercialized to address societal needs.

### Main research question

Which factors are fundamental for the development of a holistic framework for the engagement of university-industry-government for commercialisation of research outputs and optimisation of industry and commerce in a developing nation?

### Research Scope and Limitations

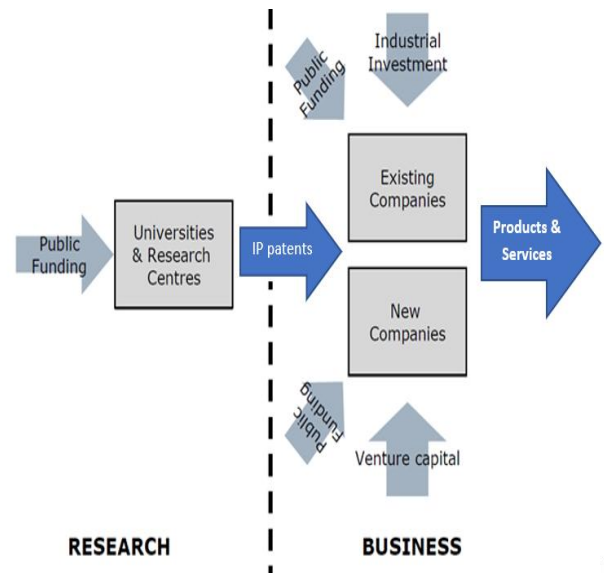
The research seeks to address the applicability of a well thought systematic model for the collaboration between industry and universities with the aid of government support to foster commercialisation of research outputs resulting in rapid industrialization.

Therefore, the scope of the research is a survey on existing partnerships between industry and universities was carried out in Zimbabwe. An analysis of success and failures of the partnerships will be presented. These findings will assist on developing the proposed model.

An in-depth evaluation of the Triple Helix Model currently being implemented in Zimbabwe state universities was carried out. Weaknesses and strengths of the model will be presented. During this stage of the research workshops and conferences surrounding the model were done and papers were presented on different forums. The proposed framework was tested as from 6 January 2018 to 31 January 2018 and officially operationalised on 2 February 2018 through the establishment of the Technology Transfer, Licensing and Commercialisation Centre at Harare Institute of Technology. A directorate within the Researcher's direct supervision. The results and achievements of Harare Institute of Technology through the TTLCC are presented as results of the proposed framework. A review on how the framework is aligned to the available national policies for higher education and industrialization such as the Zimbabwe Vision 2030 and the Industrialization policy was presented. Furthermore, recommendations were derived on how the framework can be nationalized and adopted by other developing nations for rapid industrialization.

## II. INNOVATION AND COMMERCIALISATION OF IP IN ZIMBABWE

Technology adoption and use has increased rapidly since the beginning of the 21<sup>st</sup> century as organizations begin to search for tools to enhance their operations and survive in the technology era [13]. Having defined IP as the *creation of the mind* [14], one could attribute stagnant economic growth in Zimbabwe to lack of meaningful innovations, among other reasons. Although not all industries are based on generated IP, foreign direct investment attraction is highly affected by how IP rights are handled in any country [15]. There have been notable innovations in the fintech sectors of the economy. Large cooperates have been battling small institutions who have managed to develop financial innovations for cost reductions hence achieving huge returns with minimum resource thereby increasing competition to established entities [16]. Fig 1 illustrates general funding flow in a commercialisation ecosystem. Due to the struggling nature of the Zimbabwean economy fintech innovations had been welcomed by the society. This has resulted in the increase use of mobile money and new payment platforms. Much focus of these innovations has been on welfare issues, particularly on its impact on financial inclusion. These new trends have created huge profits for telecommunication companies such as Econet (*Ecocash*), Netone (*OneMoney*) and Telecel (*Telecash*). All these initiatives are from very big tech giants in Zimbabwe.



**Fig 1: General commercialisation model indicating funding flows and key actors**

The industry is more comfortable with collaborations with universities in anticipation of a generated IP [17]. In Zimbabwe most universities have lukewarm approach regards the generation of commercialisable IP. Industrialization of patented technology moves from the entrepreneurial mind-set (can it be sold) to an industrial perspective (can it be reliably, safely, mass-produced whilst achieving economies of scale). Yet achieving reliable mass production is one of the biggest challenges facing technology-based products in Zimbabwe. It is one of the most common problems of new technology adoption, yet also the most intractable [18].

According to Pagani *et al.*, [16] although commercialisation models are utilized for innovation management, there is no sufficient evidence to highlight the benefits of the models to small companies. Majority of the industries in Zimbabwe are regarded as the informal sector. Thus, making it practically impossible to foster research and development. However, most of these small and medium enterprises (SME) companies are formulated around innovative idea. SMEs are predominantly popular in Zimbabwe, hence the need to craft regulations that protects their products. Although the national IP policy is now in place, vast majority of these SME companies shun being regularized hence increasing their vulnerability from large cooperates. The Government should increase the awareness on IP rights related issues.

### Harare Institute Intellectual Property Policy

The Harare Institute of Technology through its Act has the most vital mandate of creation of knowledge and enabling its transfer and application to industry and commerce for the development of the economy. Harare Institute of Technology is an institution involved in technology incubation, transfer and commercialisation which is achieved through research and development activities of its various established units and outputs of new technologies, processes and services. Its motto being 'Success through Innovation' is an indicator of the importance it places on creation of inventions, innovations and other intellectual property outputs



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This Intellectual Property Policy is therefore critical for the Harare Institute of Technology as it creates a research-to-business platform. It creates an enabling environment for staff and students to generate IP and commercialize their research finding. The Research Board plays an oversight role as prescribed in the policy.

### Objectives of HIT IP Policy

- To promote technology incubation and commercialisation.
- To safeguard the creation of the mind and general research outputs of the institute.
- To create an enabling environment for research commercialisation and revenue sharing.
- To create a knowledge society through technology transfer.
- To facilitate research collaboration with external partners and investors.

### Application of HIT IP Rights

The policy applies to all schools, teaching departments, commercial and technology units to include all school staff, students, non-university entities / outside organizations visitors, and anyone participating in research programs of Harare Institute of Technology (HIT). The University is recognized as the leading commercialisation hub. As such, there has been a notable increase on partnerships and collaborations with other companies and universities. As a result, the policy seeks to protect the IP generated by staff and students during these collaborative engagements. The HIT IP policy is well aligned to the national IP policy and is made reference to in all agreements signed by the University.

### Technology Transfer as a tool for national development

In its simplest definition, technology transfer is the sharing of knowledge and experiences. Technology transfer, if well managed have the potential to improve economic growth of any nation [19]. Multinational companies took center stage on the initial industrialization of China. However, the Chinese Government was quick to use the Karl Max concept on human capital development to empower its Technologists and Engineers to learn from the foreign Expatriates who constituted the bulk of the employees from these multinational firms. As the decades went by, Chinese technologists began to establish their own companies based on the knowledge they had gained as employees. According to Lee [20], multinational expatriates are rich in knowledge and technical know-how. There is a need to create policies that promote knowledge transfer to the local working class. Therefore, there must be policies and procedures that also protects the interest of the foreign investor.

The Government of Zimbabwe introduced a similar concept known as the "Look East Policy, (LEP)" in 2003 as they try to attract investors from India and China to industrialise [21]. The policy was unsuccessful in technology transfer as Chinese and Indian firms only managed to set-up companies of less interest to Zimbabweans. The majority of the established entities were in the areas of brick making, mining and warehousing. The Chinese brought in archaic

technologies in mining and processing industries leading to poor transformations. Technology transfer requires strong basis of the foreign policy of any nation if it has to attract the necessary multinational companies that can influence economic development.

The Technology Transfer method has several components that include *research*, *strategy* and *negotiation* which need to be addressed. If the LEP is to be useful as a tool for Technology Transfer, it has to be treated as a foreign policy developed by Zimbabwe within the Ministry of Foreign Affairs. Bilateral relations are built on the basis of good foreign policy, as a result, a good foreign policy attracts investment leading to rapid economic growth [22]. The LEP is identified as the only tool ever developed by Zimbabwe to foster Technology Transfer. Fig 2 illustrates the basic elements of technology transfer. However, there was no *strategy* that was in place as an implementation plan, which is a fundamental requirement for Technology Transfer.

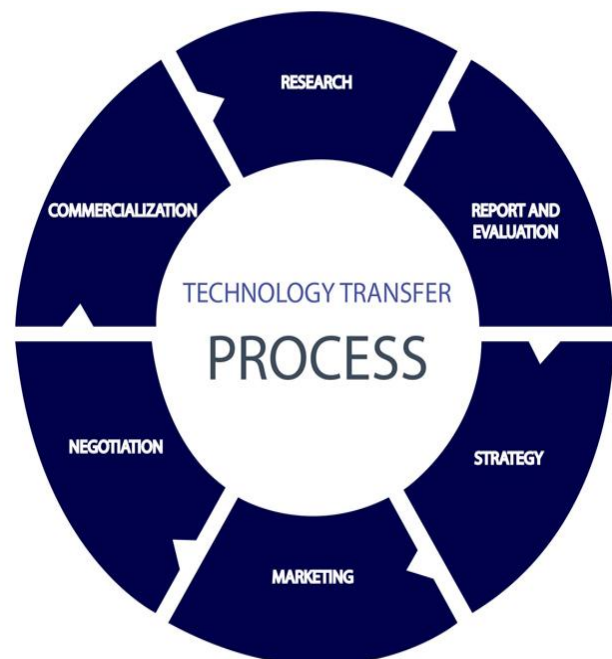


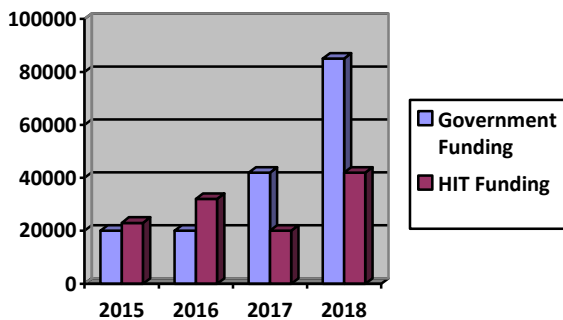
Fig 2: Elements of Technology Transfer

During Technology Transfer negotiations by companies from different countries, what should take center stage is employee training. Company training policies should shift from basic training to technology transfer, a company can engage an expert on contract basis so that new employees can learn [23]. As a result, productivity and efficiency of an organization improves. It is because of this *cost* associated with Technology Transfer that has made our bid for industrialization unsuccessful. As long as the China-Zimbabwe and or India-Zimbabwe relationships are considered as the microcosm of their African policies, Technology Transfer will remain a total failure between Zimbabwe and these Asian giants. The Researcher strongly disagrees with Chun [24] on the fact that the relationship is mutually beneficial. Currently, Asian investors are only after tenders and cheap land deals without any knowledge transfer.

### III. RESULTS

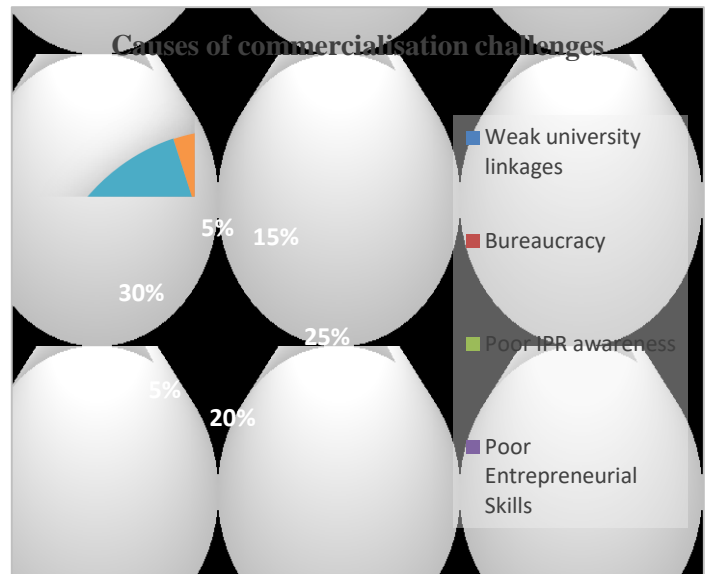
There is a relationship between patents granted and economic growth. Furthermore, Asian countries have more successful granted patents than American countries. Although China has more filings than any other Asian country, Japan has the most granted patents signifying the quality of innovations and efficient internal control measures being implemented by Japan. There is overwhelming literature regarding the structure of relationships between the industry, Government and the universities. Many at times, the relations are bilateral rather than tripartite; that is, it is either university-government relationship or industry-government relationship. In most cases, the Government is merely creating an enabling environment for manufacturing or research without having clear participation.

Although universities do struggle to fund researches in developing nations, efforts are always made that notable research outputs are realized. At times the government intervenes by providing additional funds as illustrated in Fig 3. The Harare Institute of Technology (HIT) had been funding its researches by providing funding through the research board thereby motivating the researchers. However, as from 2017 the government realized that HIT has been providing quality research outputs added more funds.



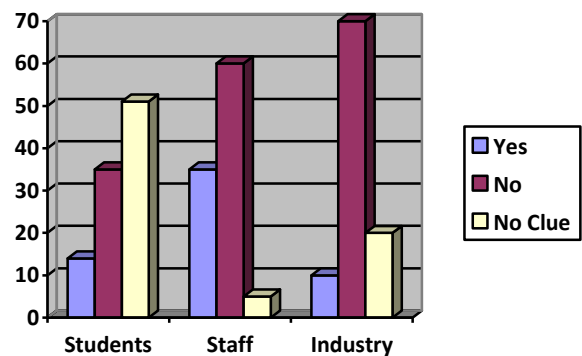
**Fig 3: Government and university funding**

System driven research is based on the synergies established between government, academia and industries. Findings have revealed reasons that causes challenges for commercialisation as illustrated in Fig 4. One of the major causes of lack of commercialisation is the ignorance among researchers with regards to intellectual property rights, as a result, there is great difference between patent filed and journal papers published.



**Fig 4: Challenges for commercialisation of research outputs.**

Intellectual property rights have a commercial value attached, however, the majority of the researchers have no clue what intellectual property rights are and how to unlock value from them. As a result, the curriculum for the students should include issues with respect to intellectual property rights. The students are the future researchers as illustrated on the figure 5. Therefore, there is a need to systematically craft research thematic areas and empower them with knowledge on intellectual property rights.



**Fig 5: Intellectual property awareness.**

As illustrated in Fig 5, nearly 70% of industrialist in Zimbabwe have no IP policies within their organization with close to 20% having no clue what IP rights are all about. Such knowledge gaps pose a real threat for national development and economic growth of a nation as available goods and services in Zimbabwe have no IP protection.

For a system driven research to produce tangible intellectual property rights, there are several centers of excellence that are expected to be in place for a technologically biased institution. Well defined roles among the committees and centers of excellence also promotes quality research besides funding and infrastructure at a university.

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Fig 6 illustrates the responses from student, staff and industrialist with regards to research, “Does the use of directed research promotes generation of research outputs such as journal publications, conference papers and patents? The results are from a sample of 65 lecturers, 800 students and 45 industrialists.

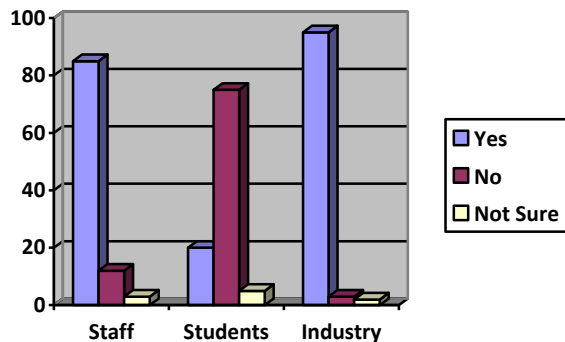


Fig 6: Directed research

The large population of the students believed that directed research destroyed disruptive innovations. As a result, there was a large number of 80% of the students did not support the suggestion. However, lecturers who constituted the staff sample of the population were in support of directed research as they believe it is good for resource management and can easily achieve the research objectives of the university. In support, over 90% of the industrialist participated in the survey believed that targeted research is easier to fund and can assist on solving the existing problems within the industry. As a result, it will be easy to fund the researches within the university from the industry fund.

Table 1 indicates the number of Patents filed per country. China shows its dominance over all other countries including India and America. As at 31 December 2018, America only managed to file less 0.011% of what China has filed. This shows a great commitment to national development by the Asian country. Sadly, Zimbabwe has filed less than ten patents for the period under review. While India has filed forty-nine international patents. However, Zimbabwe and India have large number of local patents filed within their respective countries. Their national research policies and national IP policies promote more local filing than international. Another cause of the low numbers is due to the funding need for international filing, some Indian and Zimbabwean companies are comfortable with only local or regional protection since they are not involved in exports.

### IV. DISCUSSION

The developed nations channel large sums of funding towards university research to improve their economies. The investment and exploitation of IP rights improves economic growth. According to Bok, some of the world's most developed countries such as India, Japan, Korea, China, and America have invested in cutting edge researches through the establishment of centers of excellence and university research funding.

It is only after the Cultural Revolution that China began to embrace issues of patenting. However, its first patent law was passed in the early 1980s leading to the first copy right law

being operational in 1990. Ever since Xiaoping's rule, the ideology of “getting rich is glorious” resulted in the exploitation of IP and mostly those expired IP rights from the Western world. Furthermore, the Chinese authorities created an enabling environment for technology transfer. As a result, China unleashed a generation of serial entrepreneurs with acquisitive talent that led to the rapid growth in Chinese economy to date. The way the Chinese IP law was developed is such that it protects the foreign companies from local infringement as the increasingly high lawsuits could have a detrimental effect on the Chinese foreign policy. Although there have been diplomatic tensions between China and USA resulting to trade wars concerning IP rights there haven't been a high-level lawsuit concerning a Chinese company.

There has been less infringement rights cases between China, India and EU because the EU design law was passed nearly the same time with the Chinese copyright law and consultations between the states were extensively done. Furthermore, the EU law when assessing infringement defined infringement as the measure to the extent at which the new product or service affect the expression of the existing product. In 2018, the Chinese president, Xi Jinping emphasized on the commitment by China during the Import Expo on protecting the IP of foreign investors through the implementation of strict IP rights regulation. This indicates the commitment by the Chinese Government to promote IP rights for national development. Thus, a clear indication on the contribution of proper IP rights management for economic growth.

India has been the Asian Giant with regards to research policy formulation and alignment to national laws. Such an initiative resulted in economic boom in 2016 after the implementation of the 2015 Indian Research Policy. However, the local industry still struggles to partner with private and state universities across India due to unfavorable policies and procedures that inhibit collaborations. Although extensive consultations were carried out during the development of policies and procedures for the Indian IP rights, many researchers still have reservations on the ability of the research policy to unlock value from research outputs.

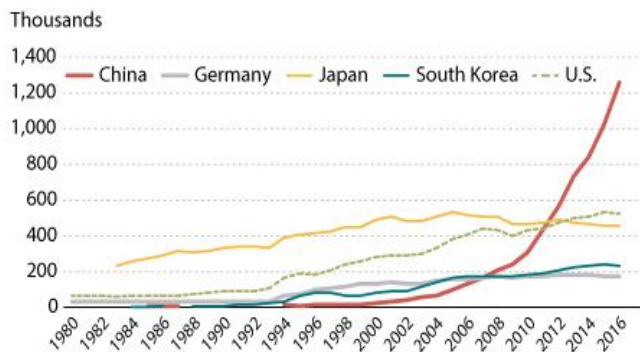


**Table 1: International patent filing by country (Source WIPO).**

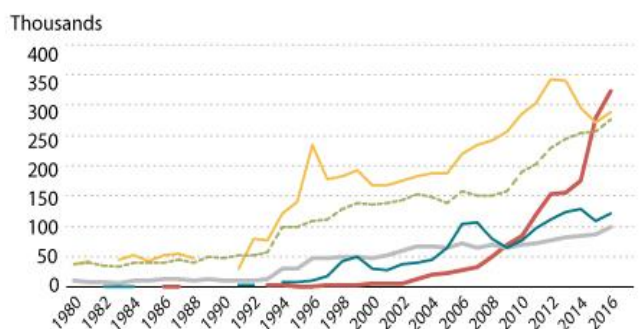
	<i>Origin</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>
1	China	679,539	825,711	1,027,997	1,115,267	835,170
2	India	3,674	3,385	2,665	1,588	30036
3	Japan	235,314	228,741	229,034	127,452	11,310
4	United States of America	163,022	162,809	158,501	96,081	9,259
5	Zimbabwe	1	3	1	1	1

Fig. 7 illustrates the relationship between patents filed and those that were granted from 1980 to 2016 by WIPO. There was a notable surge between 2008 and 2014 for the number of Patents filed by China while those by Japan and America increase gradually. However, if we consider graph B, it is indicative that Japan produced the highest number of granted patents even though they filed the lowest number.

**A. Patent Applications, 1980-2016**



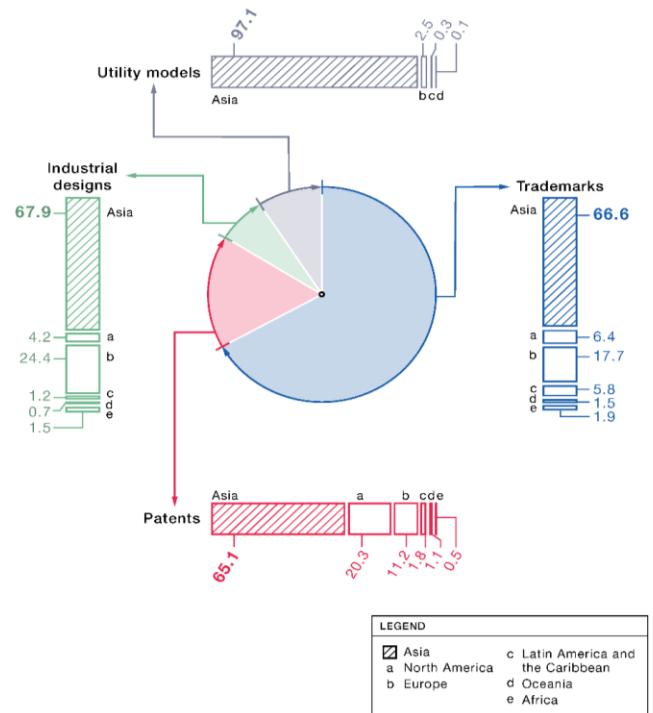
**B. Patent Grants, 1980-2016**



**Fig. 7: The patenting trends (Source: WIPO Statistical database, September 2018).**

In terms of Indian relations with other countries, the Government signed a Patent Prosecution Highway (PPH) with Japan in 2018 as a commitment to safeguarding local and foreign entities. The primary concern at the moment is the use of a single pre-grant controller as opposed to the much-anticipated bench of controllers when it comes to pre-grant of patent rights in India. The Indian Patent Office (IPO) has been working tirelessly to introduce technologies to expedite patent granting. This included among other methods,

video conferencing on presentations, electronic filing on submission and use of artificial intelligence to determine infringements. India has been dominating the software development industry since 2012. Protection of valuable technology innovations that come with software development must be a priority. Asia has managed to maintain its grip on the patent filing as illustrated in Fig. 8.



**Fig 8: Regional contributions (Source: WIPO Statistical database, September 2018).**

Flexible research policies by the Indian Government has resulted in the formulation of private research centers that managed to drive the economy. The strategic partnerships between universities and industry captains in India has resulted in rapid economic growth as from 2016. Some of the biggest beneficiaries of University-Industry collaborations are Tata Industry and Microsoft India.

Tata managed to patent its technologies and those from partner universities such as IIT Madras that resulted in the boom in the motor industry resulting in improved car models that generated a substantial amount of foreign currency as the exports increases.

Although large cooperates seem to be comfortable with the IP rights issues in Indian, SMEs were more worried about the lack of proper disclosure by large cooperates during submission of Form 27 to the IPO. Since March 2017, Form 27 has been subject of debate to the extent that the Delhi High Court even received a petition with regards to “confidentiality” issues being cited by large cooperates and international companies on submission that gave them the waiver not to detail the working statement by the patentees. The court only directed IPO to look into the issue. The stakeholders’ comments published in the same year by IPO also echoed the same sentiments.

Unless the issue of “working statements” have been resolved there will be a significant drop on filed patents from India and that may lead to a stalled economic growth. The primary concern of the Indian Government is that, an amendment on Form 27 to allow full disclosure may result in some international companies pulling out their products from India as they may fall victim to unresolved infringement issues within the Indian Courts. The Europeans and the Americans already perceive the Asian industry as a risk with regards to IP rights infringement; hence, the amendment of Form 27 may further deepen their concern. Although these IP rights issues have been a cause of concern, the Indian Government has managed to create a very good ecosystem that enable collaboration between universities and industry with the government funding majority of the projects. The successes are shown through the improved Indian GDP and infrastructure development.

America has a knowledge-based economy which has been developed since the beginning of the 19<sup>th</sup> Century. The American Government take IP rights infringement seriously and any breach of its creation by any nation may result in serious consequences. Due to its strong global economic influence, their foreign policy and safeguard the interest of their multinational companies in any country. The strength of the American system is based on the ability of the Government to fund research. Table 1.0 below shows the amounts invested on American universities for research from 1990 to 2009.

### V. CONCLUSION

A systematic approach for research and generating intellectual property was presented. Requirements for a system driven research were identified as human capital, infrastructure and funding. Furthermore, industrial and government relationships with the academia improves the quality of the research inputs. Intellectual property is generated through innovative research outs, hence, the need for proper funding. Lack of knowledge on intellectual property rights among industrialist in developing nations may result in collapse of currently established entities as the global market turns into free-trade areas. The long term benefits of system driven research include creating of an enabling environment that promote grassroots innovations.

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