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Landscaping Of Intellectual Property In Indian Academic Research Institutions

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Abstract: ***Research and development in the field of science and technology is the crucial part of most Academic Research Institutions (ARI). The technology developed needs to be protected via Intellectual Property. ARI houses a special office called as Technology Transfer Office (TTO)/IPR cell for the task. The management of IP, involves many factors on the part of ARI. The present paper discusses the role of ARI and TTO responsible for IP management. The study has been designed on the basis of questionnaire prepared and circulated to the academicians. A total of 483 responses were obtained. The response obtained was analyzed by the IBM SPSS Statistics 20.0. It was found that most of the ARIs are taking crucial steps for management of IP to foster and culture the innovative environment.***

Keywords: TTO, Factors for IP management, management of IP, ARI & IP

I. INTRODUCTION

Universities/ Higher Education Institutions (HEIs)/ Academic Research Institutes (ARIs) are organizations of Higher Education, Research, Innovation and Extension. These Institutes provide employable graduates who contribute to the development of the society as a whole across various sectors. Innovation in ARIs has been on the forefront of scientific breakthrough across disciplines including science, technology and medicine thus improving quality of life. Google (invented by Sergei Brin and Larry Page of Stanford University)[1] Polio Vaccine (Jonas Salk from Univ. of Pittsburgh); high yielding varieties of crops developed by Panjab University during green revolution[2] are few notable examples. In the recent past, ARIs have come to understand the importance of Intellectual Property Rights (IPR) and its applications and long-term impact in terms of protection and financial security. Intellectual Property (IP) refers to the property or assets created by the application of human mind such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce. Different types of IPs include Patents, Trademarks, Copyrights, Designs, Geographical Indications, Semiconductor Integrated Circuit Layout Design and Plant Varieties. This protection enables inventors/ARIs to earn recognition or financial benefit from what they invent or create[3]

The role of ARIs has changed from traditional teaching and producing job seekers to job creators. The National Education Policy (NEP) released in the year 2020 guides the education system in the nurturance of creativity and critical thinking in learners to harbour innovation. It prioritizes that ARIs form the basis for knowledge creation and innovation thereby contributing to a growing national economy. NEP encourages to focus on research and innovation by setting up start-up incubation centres, technology development centres, centres in frontier areas of research, greater industry-academic

linkages, and interdisciplinary research including humanities and social sciences[4].

Various schemes of Government of India like Make in India[5], Start-up India[6] Stand-up India[7] National Initiative for Developing & Harnessing Innovations (NIDHI)[8] and Atal Innovation Mission[9] are helping ARIs increasing and nurturing the culture of innovations and entrepreneurship within their campus. Further examples include schemes by Ministry of Micro, Small and Medium Entreprises (MSME) like Prime Minister Employment Generation Programme[10], Technology and Quality Upgradation Support to MSMEs[11] and many more.

Through this innovation, Small and Medium Enterprises (SMEs) in the form of Start-ups, Spin-offs and Spin-ins have sprung up within several ARI campuses across India. This has attracted Industry to also collaborate via consultancy, contract research among other activities to boost their technical know-how and expertise in the areas they lack as well as acquisitions of these SMEs at ARIs. For example, government undertakings like National Research Development Cooperation (NRDC), BCIL (Biotech, Consortium of India Ltd.) as well as promotion of Non-Governmental Organizations (NGOs), Technology Business Incubators (TBIs) or science parks. This has established linkages of ARIs with the private as well as public sectors including Public Private Partnership Modes (PPPs) to benefit from innovations generated and intellectual capital.

As can be seen, IPR plays an important role in ARIs, without which the above-mentioned initiatives and activities can not possible. Consequentially, in order to manage IP filing, prosecution, maintenance and its usage, several ARIs have developed their own individual policies known as IPR Policies as per their socio-economic, political and cultural context to protect their innovations generated through R&D. Most of the ARIs have Technology Transfer office (TTO/ IPR cell for effective management of IP. In our previous paper we have briefly demonstrated this importance citing similarities and differences between various ARIs across the world[12]. Therefore, this study aims to understand the current practices at ARIs with respect to IP management, identify the key factors facilitating IP development as well as the bottlenecks for IP creation at ARIs within India. This will help to further advance the best practices for IP policy at ARIs in India.

II. MATERIALS & METHODS

In order to elucidate the current practices of IP at ARIs in India, we adopted a qualitative content analysis and quantitave approach for the above mentioned objectives. Following steps were used in our methods:

✓ Literature Search

- Search Tools: Government of India Official Websites (Indian Patent Office, Department of Science & Technology, Department of Biotechnology, Cell for IPR Promotion and Management (CIPAM), University Grant Commission), WIPO, Google, Elsevier, Scopus, Google Scholar, Web of Science and PubMed
- Keywords: IPR in academia/university/college, Benefits of IP/patents for ARI/faculty/students, rewards for scientist for protecting IP, role of technology transfer offices (TTO), staff of TTOs, economics of patents, cost analysis for patents, uses of IP protected, generation of innovation & it's management, IPR cell/TTO in ARI, IPR and TTO, innovation protection & it's governance, papers or patents, negatives of IP, open science Vs patents, patents for basic research Vs applied research for generation of IP.

✓ Inclusion Criteria

- IP Policies of International and National ARIs
- Innovations generated/utilized in ARIs
- Research papers and reports relevant to IP policy/IP management
- Reports and Guidelines pertaining to Innovation generation and IP uploaded on the websites of Government of India.

✓ Exclusion Criteria

- Research papers focussing on importance of open science, commercialization of patents, patent thefts, patent trolls, uses of non-patented IP
- Policies unrelated to IP in academia
- Policies of academia related to Research & development/incubation

In summary, apart from policy documents, a broad selection of peer-reviewed research articles and scholarly papers were reviewed to supplement the policy analysis. Supporting research papers/review articles/conference proceedings discussing impact of IP in ARI on the innovation ecosystems were identified through database searches. These secondary sources provide insights into the practical aspects of the policies, the factors favouring the translation research into IP and the roadblocks faced by the inventors/ARIs for IP creation/development and management. This multi-source approach ensures a comprehensive understanding of how IP is managed by the ARIs for their and societal benefits.

In addition to the above, IP policies of the top 10 national and top 10 international ARIs were selected for analysis. The ranking criteria were searched using the following sources:

- QS World Ranking
- Berlin Principles on Ranking of Higher Education Institutions given by International Ranking Expert Group founded by UNESCO European Centre for Higher Education
- World University Ranking given by Times Higher Education (THE)
- Academic Ranking of World Universities (ARWU) given by Shanghai Ranking consultancy
- Webometrics Ranking System published by Cybermetrics Lab, a research group of the Spanish National Research Council located in Madrid

Out of the above, we selected THE as the gold standard as no other ranking system has included Patents or IP as an

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indicator in their respective ranking systems. THE introduced in the year 2023 IP/Patents within performance indicator known as 'Industry (4%)'. This indicator includes Industry income (research income an ARI earns from industry adjusted for PPP scaled against the number of academic staff it employs) and patents (number of patents from any source that cite research conducted by the university) as mentioned in figure 1 below along with it's weightage of 2% each.

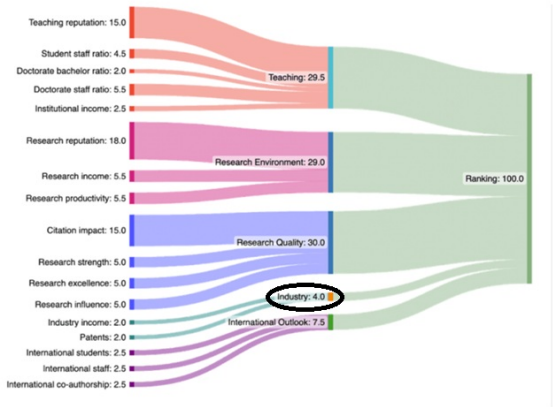

Figure 1: Performance Indicators used by World University Ranking System given by THE[13]

The 'THE' overall rankings of top 10 ARIs are given in Table 1 below, which takes into account five parameters.

Rank	Name	Overall	Teaching	Research Environment	Research Quality	Industry	International Outlook
1	University of Oxford, United Kingdom	98.5	96.8	100.0	98.8	99.6	97.3
2	Massachusetts Institute of Technology, United States	98.1	99.2	96.0	99.7	100.0	93.8
3.	Harvard University, United States	97.7	97.3	99.9	99.3	85.7	90.1
4	Princeton University, United States	97.5	98.3	98.0	98.9	96.9	87.4
5	University of Cambridge, United Kingdom	97.4	95.9	99.9	97.6	88.4	97.1
6	Stanford University, United States	97.2	97.5	97.3	99.6	100.0	85.1
7	California Institute of Technology, United States	96.3	95.2	97.5	97.3	100.0	89.7
8	University of California, Berkeley, United States	94.5	87.2	98.9	99	99.5	86.4
9	Imperial College of London, United Kingdom	94.4	89.3	94.9	98.5	90.8	98.3
10	Yale University, United States	94.1	93.7	95.0	97.8	86.5	82.3

Table 1: Representation based on "Overall" Rank[14]

As can be seen from Table 1 above, not all ARIs as per 'Overall' rank, scored highest on the 'Industry' parameter. THE offers the option to select ranking based on a single parameter to see how ARIs rank changes accordingly. Since the scope of the present study is to analyze the policies followed by top ARIs i.e. ARIs scoring high on 'IP/patents' parameter, the ARIs that scoring highest on 'Industry parameter' were selected. Therefore, the revised THE top 10 ARIs, selected on the basis of 'Industry' are listed in Table 2 below.

Revised Ranking as per Industry	Name	Industry	Overall Rank
1	California Institute of Technology	100.0	7
2	Universitätsmedizin Berlin - Charité	100.0	93
3	City University of Hong Kong	100.0	78
4	Delft University of Technology	100.0	56
5	Duke University	100.0	27
6	Ecole Polytechnique Fédérale de Lausanne, Switzerland	100.0	32
7	Eindhoven University of Technology, Netherlands	100.0	185
8	John Hopkins University	100.0	16
9	Karlsruhe Institute of Technology, Germany	100.0	166
10	Korea Advanced Institute of Science and Technology (KAIST), South Korea	100.0	82

Table 2: International ARIs selected as per 'Industry' parameter of THE[15]

When the ARIs of India (selected via 'region') were tabulated using THE ranking, the overall rankings were above 200 and 9 out of these 10 scored low on the 'Industry' parameter (compared with table 1 and table 2), as can be seen in table 3 below.

S. No	Name	Industry	Rank
1	Indian Institute of Science	97.3	201-250
2	Anna University	65.8	401-500
3	Institute of Chemical Technology, Mumbai	63.0	801-1000
4	International Institute of Information Technology, Hyderabad	57.5	601-800
5	KIIT University, Bhubaneswar	55.9	601-800
6	National Institute of Technology, Rourkela	55.2	801-1000
7	University of Delhi	53.2	801-1000
8	Indian Institute of Technology, Guwahati	52.7	801-1000
9	Manipal Academy of Higher Education	50.1	801-1000
10	Jadavpur University, Kolkata	48.1	1001-1200

Table 3: Ranking of Indian ARIs based on 'Industry' score in THE Ranking[16]

The IPR laws of the ARIs are governed by socio-economic, political and cultural context of the region they occupy, and the guidelines are region specific; therefore, selection of ARIs from India using the THE ranking seemed incompatible within the scope of this study. The top 10 International ARIs were selected as a reference for understanding best practices done elsewhere to see aspects which may be included in the Indian context, given the fact of globalization.

Hence, we used the official gold standard of the Government of India, which is the National Institutional Ranking Framework (NIRF) given by Ministry of Human Resource Development. The overall ranking as per NIRF is given in Table 4 below.

Rank	Name of ARI	IPR Score (15)	Number of patents		Rank as per "Innovation"	Overall Score
1.	Indian Institute of Technology Madras	14	Patents Published	Patents Granted		86.42
2.	Indian Institute of Science, Bengaluru	11	247	192	2	83.28
3	Indian Institute of Technology Bombay	13	165	62	4	81.37
4	Indian Institute of Technology Delhi	13	228	140	1	80.31
5	Indian Institute of Technology Kanpur	10	108	88	9	77.56
6	Indian Institute of Technology Kharagpur	10	52	104	5	74.77
7	All India Institute of Medical Sciences Delhi	2.25	41	25	9	74.27
8	Indian Institute of Technology Roorkee	7	-------	------	---------	71.52
9	Indian Institute of Technology Guwahati	5	74	30	6	69.04
10	Jawaharlal Nehru University	0.75	------	-----	-------	68.53
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Table 4: Indian Ranking 2024 in NIRF: 'Overall'[17]

However, we observed that in the overall ranking of these top 10 ARIs, the IPR Score, no. of patents and innovation were not in any particular order as can be seen, drawing a parallel to the international ARIs in table 1. NIRF gives the option to select ranking based on a particular parameter somewhat similar to the THE ranking. As per the initiatives by ranking systems prevalent outside India and importance of IP and it's commercialization, NIRF has also introduced ranking of ARIs based on innovation. This includes financial support for innovation, innovation achievements, research and innovation output which includes patents published (15 marks) & granted (25 Marks), Pre-Incubation and Incubation (PII), Adoption Level of Innovation and Entrepreneurship)[18]. Therefore, we selected the parameter 'innovation' instead of the overall ranking in NIRF as in latter the majority were limited in their scope of IP as well as income generated from industry. This is in line with Table 2 of international ARIs ranking by the THE as the parameter selected (industry) in table 2 includes income generated from industry (via PPP) and patents. Therefore, the new ranking as per our innovation parameter can be seen below in Table 5.

Rank as per "Innovation"	Name of ARI	IPR Score (15)	Number of patents		Overall Rank
			Patents Published	Patents Granted	
1	Indian Institute of Technology, Bombay	13	228	140	3
2	Indian Institute of Technology Madras	14	247	192	1
3	Indian Institute of Technology Hyderabad	12	28	12	5
4	Indian Institute of Science, Bengaluru	11	165	62	2
5	Indian Institute of Technology Kanpur	10	52	104	5
6	Indian Institute of Technology Roorkee	7	74	30	8
9	Indian Institute of Technology Delhi	13	108	88	4
8	Indian Institute of Technology Mandi	2.50	17	11	72
9	Indian Institute of Technology Kharagpur	10	41	25	6
10	Anna University	9	70	37	20

Table 5: National ARIs selected via NIRF based on 'Innovation' parameter[19]

From these selected 20 ARIs, we investigated through their websites including WIPO for their IP policy, policy on research & development, Technology transfer policies as well as literature for the practices and approaches followed. The reason for this approach is several documents have combined policies with IP.

After studying the literature and policies of the documents selected as well as these ARIs with respect to the practices followed/ recommended for IP management, key domains critical for IP policy were identified. Based on this, we developed a robust questionnaire, to ascertain the practices followed by the ARIs. This was accorded by our colleagues and crossed checked for any inconsistencies and then sent across Pan-India to ARIs listed by the Association of Indian Universities (AIU) and the University Grants Commission (UGC) GoI. This of course included the top 10 list in table 5. Furthermore, the questionnaire was sent to the top 10 International ARIs listed in table 2 as a point of reference.

The questionnaire was sent to ARIs selected by the authors on the basis of

- ✓ Acquittance
- ✓ ARIs selected via NIRF (those present in the ranking system given by THE and NIRF)
- ✓ ARIs selected via Central/State/Deemed to be universities via the website of UGC

The sampling technique for the selection of the academicians at the ARI was done using Stratified Random Sampling i.e. the academicians pursuing research in the field of science and technology (as most of the IPs evolve from these ARIs, as also can be seen from table 2 and table 4).

For Pan-India, total of 3400 e-mails and 600 hard copies were sent among the academicians of different ARI's (Central & State Universities – Government Universities, Private Universities and Research Institutes running academic programs owned and managed by the Government of India). The response obtained from the questionnaire was analyzed by the IBM SPSS Statistics 20. The data was entered into the software via appropriate coding, and analysis was performed.

Total Sent 4000

Out of which how many aboard and how many within India – abroad 400

India -3600

Outside India sent only to the top 10 ARIs in table 1 and 2

Within India, the sent questionnaire distribution

Uttar Pradesh	1146
Madhya Pradesh	210
Delhi	873
Gujarat	240
Maharashtra	135
West Bengal	165
Rajasthan	285
Punjab	135
Karnataka	111
Tamil Nadu	165
Telangana	135
Total	3600

Table 6: Distribution of Questionnaire

III. RESULTS

Based on the details given in the methodology section of this paper and the policies analyzed for national and international ARIs, 6 key domains were identified. These domains play a pivotal role in the management of IP in an ARI. The domains can be identified as in below table 7.

Domain	Specifications	Reasons for Selecting
1	Demographic Information (related to age, gender, area of research, years of experience, place of work-related details)	Socio-economic, Political and Cultural environment of ARI and the state where they are located determines IP filing
2	IPR awareness	Perception of the academician towards IP, determining the attitude of the academician towards IP management
3	IPR CELL/TTO (a part of the ARI for management of IPR)	specialized office present in an ARI to manage and commercialize IP generated
4	Institutional Factors	Orientation and mandates of ARI for IP filing
5	Ownership of IP Generated in Labs	Who will carry out management of IP along with the conditions in collaborative/sponsored/or any other research,
6	Commercialization of IP Generated	Utilization of IP for benefit of society, inventors and ARI

Table 7: Key Domains identified for IP Management (not in the order of priority)

We collected information from 483 academic inventors (working in different ARIs of India, through a survey. These academic inventors are working in different fields of science and technology in ARIs. The questionnaire was circulated among the academicians to study the practices being followed particularly, role of ARI and importance of TTO in IP management. We conducted a descriptive statistics test on SPSS to analyse the frequency of the responses obtained and cross tab analysis to summarize the relationship between the two categorical variables.

Out of various domains listed under Table 7, the present paper discusses role of ARI and TTO in influencing IP management.

IV. FACTORS INFLUENCING MANAGEMENT OF IP

Our respondents are mostly male (54%), falling within the age group of 36-45, completed their doctorate degrees (60.9%) and have an experience of more than 5 years. We find in our samples nearly all the disciplines, particularly having more of patent filing activities, such as engineering, biotechnology, textile technology (Table 8).

Gender		%
	Male	54
	Female	46
Age		
	29-35	36
	36-45	46
	46-55	39
	56-65	34
	=> 65	6
Qualification		
	Post doctorate	4.3
	Doctorate	60.9
	Postgraduate	29.8
	Graduate	5
Years of Experience		
	0-10	36.0
	11-20	35.4
	21-30	19.9
	31-40	8.1
	More than 41	0.6
Area of Research of academicians		
	Engineering	21.7
	Basic Sciences	19.3
	Biotechnology	33.5
	Pharmaceutical Sciences	3.1
	Textile	16.8
	Agriculture & Related areas	3.1
	Policy Studies	2.5

Table 8: Demographic Details

Since the questionnaire was widely circulated, the number of responses obtained from both Government and Private ARIs were almost same (Table 9). As the authors place of study is located in Uttar Pradesh (UP) and due to acquaintance, majority of the responses have been obtained from UP.

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Type of ARI		Percentage
	Government University	43.5
	Private University	42.2
	Research Institute	10.6
	Company	3.7
State in which city is located		
	Uttar Pradesh	46.0
	Madhya Pradesh	0.6
	Delhi	24.2
	Gujarat	2.5
	Maharashtra	3.7
	West Bengal	3.1
	Rajasthan	9.3
	Punjab	3.7
	Karnataka	3.1
	Tamil Nadu	.6
	Telangana	3.1

Table 9: Categories and States of ARI

ROLE OF ARI IN INFLUENCING IP MANAGEMENT

The management of the ARI plays a pivotal role in creating and nurturing the ecosystem of encouraging researchers for IP protection. R& D activities require huge investment for creating conducive atmosphere, such as recruitment of academicians, development of lab and other infrastructural facilities like office space, library, classrooms, refreshment areas, recruiting support staff for labs, supporting students, training facilities for staff, providing access to different knowledge facilities like access to software's, journals etc., and remuneration to faculties providing training to students. Apart from this, ARIs have to create opportunities of knowledge sharing between them and the world like seminars, conferences and many other opportunities. Nowadays, ARIs provide academic freedom to the academicians which does not constrain them to work in a particular area, thereby allowing them to spread their wings.

As IP management is an complicated procedure, it is essential that it is one of the main objectives of the ARI. Out of all the responses obtained, 336 ARIs are focussing on it. However, entire process starting from drafting till maintenance requires adequate amount of funds. The owner of the IP has to pay fees as prescribed within the IP acts and professional fees if the filing is done by an external agent. Apart from the fees, certain other formalities like fees under biodiversity act (if it involves biological material), etc. needs to be paid. Therefore, these expenses are to be included within the budget of ARI finalized usually at the beginning of calendar/financial/academic year as applicable (Fig 4).

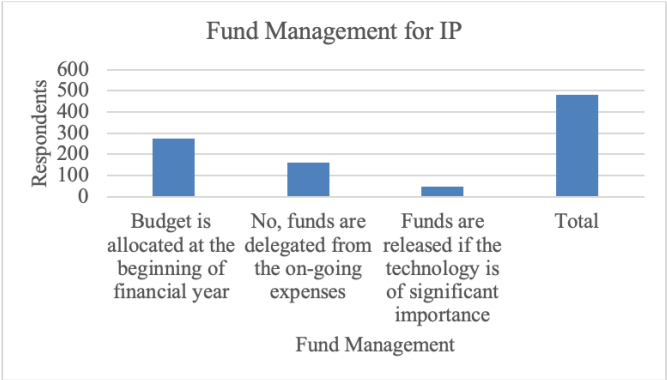

Figure 4: Funds for Management of IP

As IP requires heavy investment and the technology developed should be made available to the society, ARIs tries to either transfer that to industries or encourage students to have their own start-ups. This also fetches return on investment in the form of revenues and royalties for ARI as well as academicians. Therefore, 345 ARIs (Fig 5) do have a goal of converting IP into business, rest may be filing for accreditation and ranking systems.

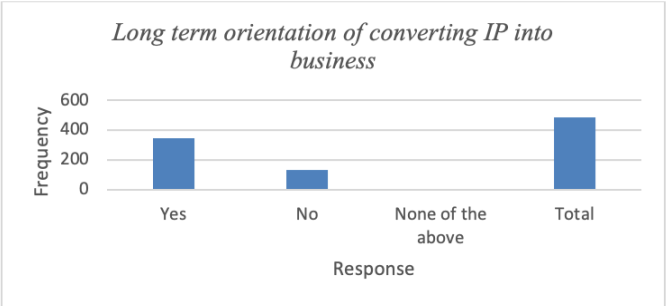

Figure 5: Orientation of ARI

In order to encourage academicians to develop more innovative products and process as well as encourage newly joined employees, every ARI needs to reward the academicians for creating IP. Therefore, different ARIs have developed various encouragement methods like providing financial benefits, inclusion in career advancement along with rewards and recognition.

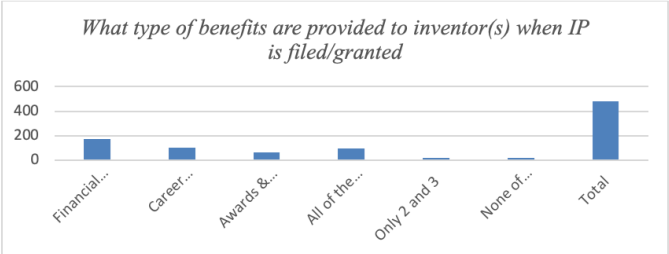

Figure 6: Benefits to academicians

Financial benefits like honorariums/cash prizes (177), inclusion of IP in their promotion and career advancement (102), special awards and recognition in academic events organized (66) or combinations are provided by ARIs. A small percentage of the ARIs (21) provide all the three types of rewards to their academicians (Fig 6).

Apart from the benefits accrued to the academicians, ARIs also benefit from IP. When the entire cost of R&D activities along with the IP filing is borne by the ARIs, the owners (applicants) are ARI themselves (Table 10).

When research is conducted solely in your labs, owner of all kinds of IP generated is	
Owner	**Frequency**
ARI	207
Individual Scientist	105
Both of the above	141
Case-to-case basis	30
Total	483

Table 10: Applicant of ARI

Since majority of ARIs have long term orientation of making business out of IP protected (Fig 5), the protected IP is commercialized to the industries and via start-ups, generate revenue and distribute this in the form of royalties. Further, the revenue can be used for further research and development activities to increase the technology readiness level of the invention. It can also be used for infrastructural development or both or both (Fig 7).

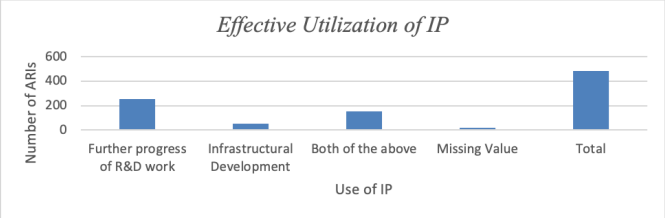

Figure 7: Utilization of IP

ROLE OF TTO IN IP MANAGEMENT

Organizational structure of an ARI is constituted by general administration, finance office, human resources, research & development, extension activities, staff and student welfare, library, legal services and any other department depending on the type of ARI. However, in order to manage IP, and commercialization of IP generated, ARIs generally establish a separate office called as Technology Transfer Office (TTO). These offices deal with the IP management and are specialized in their duties as they serve as a bridge between industry and academia. Majority of our respondents have a TTO in their ARIs.

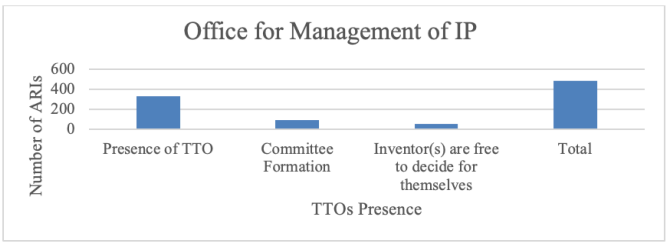

Figure 8: Presence of TTO

DUTIES & RESPONSIBILITIES OF TTO

The staff of the TTO is constitutes by the experts of various domains for IP management and business developments. The committees constitute may comprise of academicians from different disciplines and head of the ARI of research & development. There exist a third category where Inventors are free to decide for themselves, if they wish to file IP or not. Staff of TTO has to provide guidance between to the academicians before filing of IP so as to draft the document as per the needs of the Patent office. After filing, the TTO is responsible for keeping the academicians well informed (Fig 9) about various stages of prosecution and technology transfer.

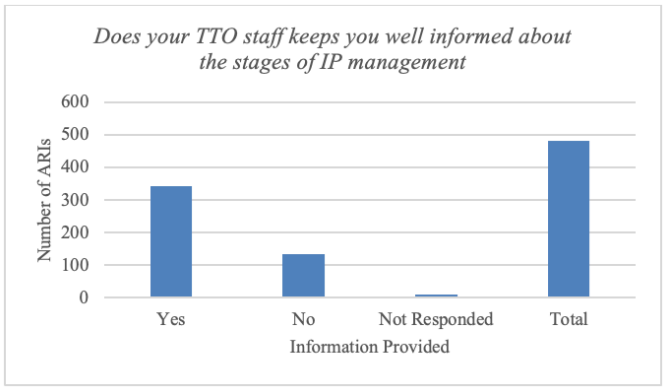

Figure 9: Role of TTO

As seen from above that IP is filed to be utilized effectively for the benefits of it's various stakeholders. However, in the rapidly growing technological world it is essential that steps for commercialization are taken as soon as IP is filed (Fig 10).

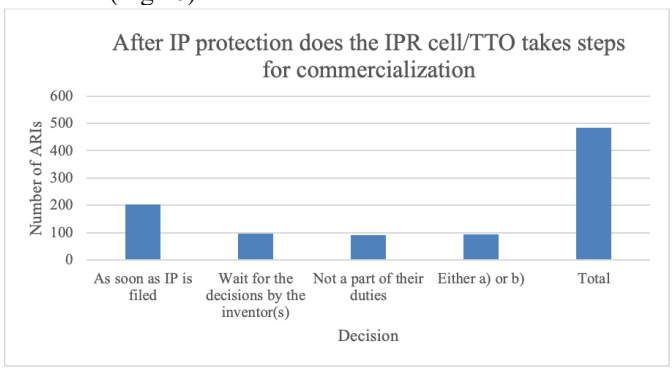

Figure 10: Commercialization of IP

However, in ARIs listed in Table 5, the TTOs may decide not to file the IP and the rights are transferred to the inventors for IP filing or publication as decided (Fig 12).

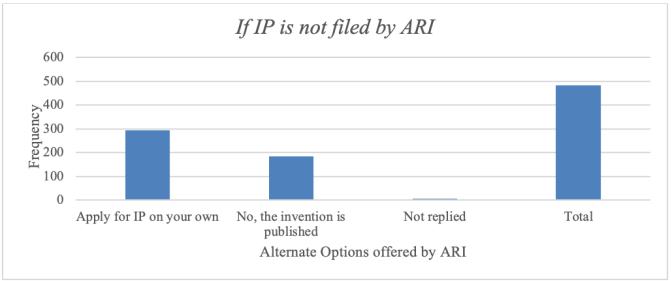

Figure 12: Alternative options

V. DISCUSSION

Due to advent of multidisciplinary studies and increasing global needs, fields of applied sciences like Engineering, biotechnology, pharmaceutical sciences, etc. are patent intensive fields generating inventions and innovations. Therefore, ARIs having these fields focus more on IP as compared to others (Figure 13). Although pharma sector should have more IPs due to high nature of cost and degree of research involved, but the results obtained may be due to less

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number of responses obtained from academicians working in this field.

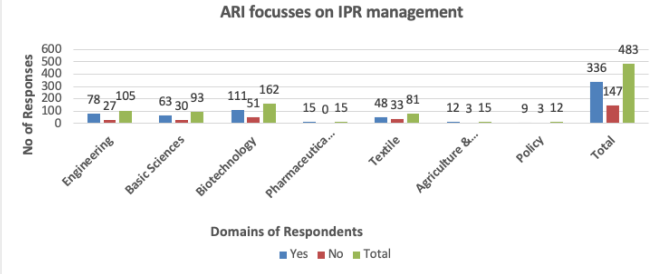

Figure 13: Importance of IP in different disciplines

IP is turning to be an important aspect both for the ARIs owned and managed by government of India and private sector (Table 10). This is due to the fact that central and state owned ARIs wish to elevate their ranking in various ranking system. Private enterprises are more focused on IP management due to various accreditations/attracting students/name and fame worldwide. Apart from usage of IP in accreditation and for professional development of the academicians, there is a surge in the growth of start-up culture in the ARIs due to advent of the concept of incubation and entrepreneurship by various schemes launched and promoted by Government of India.

Does your ARI focusses on IPR management as their primary						
	Government University	**Private University**	**Research Institute**	**Company**	**Total**	**%**
Yes	141	147	30	18	336	69.6
No	69	57	21	0	147	30.4
Total	210	204	51	18	483	

Table 10: Cross Tab Analysis to see types of ARI focussing on IP management

Maximum ARIs including the ARIs listed in Table 3 and 5 have provision for providing funds for IP filing. However, many ARIs do allocate budget at the beginning of the financial year. However, policies do not mention the same as this is a mandate of finance department of ARI and not the TTO. As per the data received, private ARIs (129 out of 483) are focussing more on IP management, funds are delegated at the beginning of the year for smooth management (Fig 14). However, there may be cases, that funds are released only when technology is important as they might be filing IP only when it can be commercialized. Majority of ARIs listed in Table 3 do manage funds for IP filing from the revenue generated after commercialization

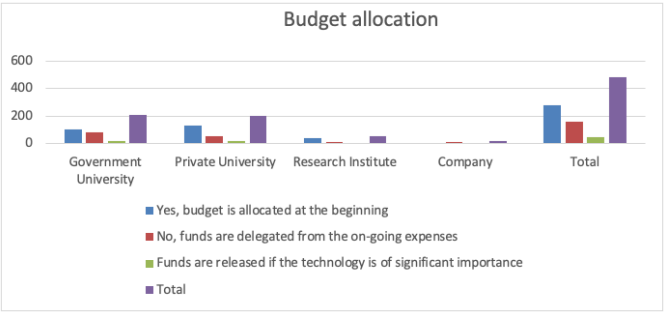

Figure 14: Budget allocation for IP filing

Many ARIs like IISc Bangalore, Anna University provides funding for filing in India only (Ref: Policies of these ARIs)[20].

In order to encourage the inventors, many ARIs owned and managed by private entities are offering benefits to academicians (Table 11). Although a very small percentage of ARIs (4.3%) believed that they are hired to invent but these additional perks are beneficial for the academicians apart from their regular salary. Scientists primarily motivated by immediate earnings are more willing than those primarily motivated by puzzle solving (who have a strong "taste of science") to orient their research towards patentable activities[21].

What type of benefits are provided to inventor(s) when IP is filed/granted: -							
Name of Office							
	Financial benefits (1)	**Career Advancement (2)**	**Awards & Recognition (3)**	**(1) + (2) + (3)**	**(2) + (3)**	**Inventors are hired to invent**	**Total**
Government University	63	54	33	42	9	9	210
Private University	84	39	27	30	12	12	204
Research Institute	24	6	6	15	0	0	51
Company	6	3	0	9	0	0	18
Total	177	102	66	96	21	21	483

Table 11: Benefits accrued to academicians

Establishment of a TTO requires further investments and if the ARI specializes in basic research or does not have IP management as primary objective, they may have a committee formed at 6 months or yearly basis to determine the filing of IP. Majority of the ARIs, both controlled by government and private sector have TTOs (Fig 14).

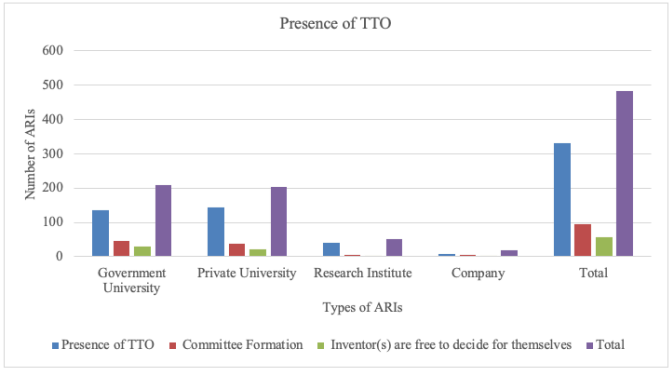

Figure 14: TTO Importance

TTO provides full guidance to the management of IP as depicted in Fig 15 to bring forth the novelty, technical step and fulfill other legal requirements.

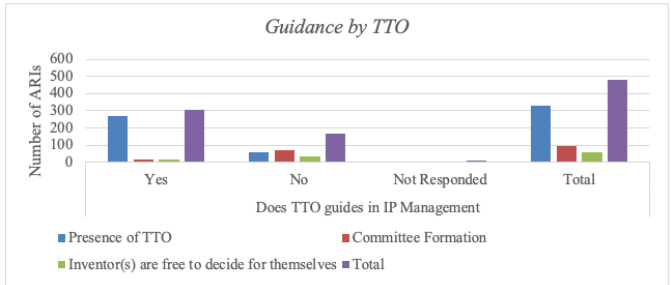

Figure 15: Role of TTOs

Apart from IP management, TTOs are also responsible for converting IP into business. Therefore, one of the mandate of majority of TTOs is to accomplish the task (Fig 16).

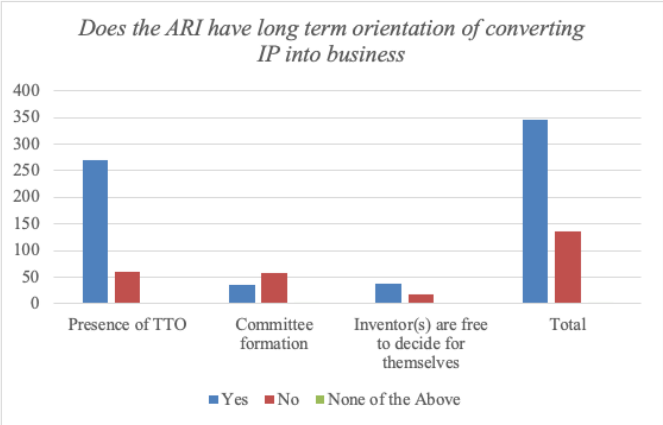

Figure 16: Business Orientation of TTO

Some TTOs may decide not to file IP in case it does not have commercial potential as is the case of many international ARIs listed in Table 3. In this case, the inventors have to return to the ARI, out-of-pocket expenses of the TTO. In case, the TTO does not release the invention, inventors are required to publish to add the technology developed to the pool of literature. However, many ARIs release the invention to allow the inventors themselves to file the IP application and they allow them to file the IP application and return out-of-pocket expenses of the TTO, if commercialized. In order to smoothen the commercialization process, meet the demands of the industries and gain a competitive advantage over the existing competitors, they start the process as soon as IP is filed (Fig 17).

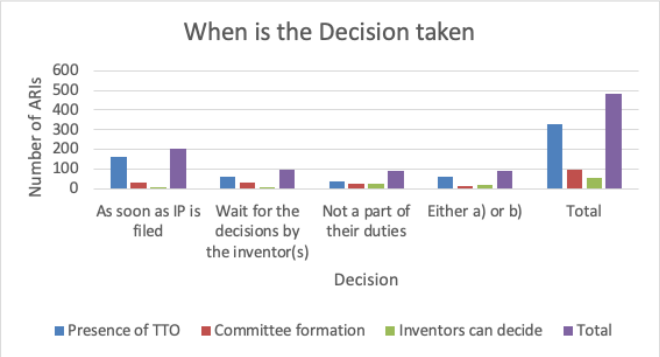

Figure 17: Commercialization of IP

VI. CONCLUSION

- ✓ It is of utmost requirement that ARI research gets out of ivory tower and close to the kingdom of the industry. Most of the ARIs have started focussing on IP protection
- ✓ Innovations are although proportional to the amount of resources available within the ARI, however, same needs to be judiciously managed. ARI and TTO should jointly
- ✓ In order to promote IP, ARIs provide a budget for IP filing
- ✓ Even if there exist a TTO, it may not be necessary that IP is filing where main focus is on commercialization rather than accreditations and affiliations. It is the duty of TTO to guide the academicians accordingly.
- ✓ The commercialization of the IP generates should start as soon as the IP is filed so as to enter the market and gain a competitive advantage.

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