Need for strong university-industry partnerships: a case study in Sri Lanka

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Abstract. University-Industry Partnerships (UIPs) in the field of DRR have produced several innovative tools, services, and advancements in industrial applications globally. However, from the Sri Lankan perspective, the level of UIPs appear to be significantly lower compared to the global context. In Sri Lanka, a country that has suffered a lot from natural disasters such as landslides and floods especially over the past few years, DRR activities are undertaken by the governmental and private sector organizations and volunteers, mostly as separate entities. This could lead to inefficiencies, overlapping of efforts, and also to the reinvention of the wheel. The Universities as Higher Education Institutions have a key role to play in bringing the aforementioned stakeholders together not only to strengthen the work they do by effective partnerships but also to come up with innovative solutions through research and development. The purpose of this paper is to explore how effective UIPs can be created in Sri Lanka to achieve the above by exploring; 1) current status of UIPs in Sri Lanka; 2) barriers to creating UIPs; 3) needs and opportunities for creating UIPs; 4) identifying best practices in creating strong and sustainable UIPs. The purpose will be fulfilled with the use of a literature review and by gathering stakeholder opinions. The research findings revealed that there is a need to develop a policy that addresses the aspects of knowledge diffusion, production, engagement, increasing the exposure of the academia for the industry and capacity building in universities. This is in order to tackle key barriers to creating UIPs. There is also a need for strong and effective leadership initiatives from universities to ensure sustainability of UIPs in Sri Lanka.

1 Introduction

Sri Lanka is a tropical island in the Indian Ocean was identified as one of the ten most affected countries from climate risks during 2016 [1]. Historical records also show that government and external expenditure on Disaster Risk Reduction (DRR) in Sri Lanka has an increasing trend [2]. Colombo floods and the Aranayake landslide which occurred in May 2016 [3], and floods which affected Galle and Matara districts in 2017 [4] clearly show that the country is gradually becoming disaster prone due to climate change issues. Also, the dramatic increase in the number of affected people through these disasters [5], [6] is a fact that cannot be ignored. In order to reduce the disaster risk and to increase the community resilience, Research and Development (R&D) activities should be undertaken. To carry out R&D activities, technology and innovation links between universities and industry are of critical importance. The close partnership between universities and industry related to DRR is essential to reduce the community vulnerability as well. Here, a partnership can be defined as a contractual relationship between the university and the industries, having specified and joint rights and responsibilities. Each party bears an equal share of the reward as well as the risk. The main purpose of the University-Industry Partnerships (UIPs) will be to bring the best of both universities and industries by mixing the theory with practice. In addition, university-industry collaborations can be seen as a subcategory of partnerships, when several stakeholders pool their common interests, possessions, and skills to serve to the community's benefit.

This eventually aims to fulfill the national targets with respect to Sendai framework, which can be enlisted as:

a) halving the annual average disaster mortality.
b) halving the number of affected people.
c) 50% reduction of direct disaster economic loss in relation to gross domestic product (GDP)
d) 75% reduction of disruption of education for children during a disaster by discouraging   use of school building as safe centers by 2030

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e) having over 80% of district offices and local authorities adopted disaster risk reduction strategies and plans by 2025.

f) enhancing international cooperation by 50% compared to 2005-2015 period.

g) having total population at risk covered by multi-hazard early warning systems by 2030.

The said UIPs include three intensity levels, i.e. low, medium and high. Low intensity herein refers to the transfer of intellectual property, medium intensity implies mobility of participants and the high intensity includes research partnerships and shared infrastructure [7]. The industry comprises of government and semi-government institutions including technical agencies, private sector profit-based companies, and non-governmental non-profit organizations. Furthermore, most of the countries in the European Union identify UIPs as a dimension of Entrepreneurial activities which drive the economic growth and development [8].

There are many UIPs in the global context, which has led to many successful results. Those partnerships have not only addressed the issues in industries but also have helped in the R&D activities in universities. One example could be taken as the partnership between Centre for Disaster Management and Public Safety of the University of Melbourne and Volunteer Fire Brigades Victoria (VFBV) for the project Surge Capacity Analysis and Visualisation Tool for the Fire Incident Report System (FIRS), which has developed spatially enabled decision support tool to visualise volunteer firefighting capacity across Victoria [9]. Another example would be the partnership between University of Southampton, UK, EPSRC and BAE systems for the project ALADDIN (Autonomous Learning Agents for Decentralised Data and Information Networks) which aims to develop methods for modelling, designing and building decentralised systems that can bring together information from a variety of sources in order to take informed actions [10]. This is especially supposed to operate in dynamic environments such as in a disaster. Therefore, it is apparent that the UIPs lead to valuable outcomes that would not have been possible to achieve individually.

The purpose of this paper is to explore the ways and means of creating effective UIPs in the context of Sri Lanka by exploring research questions on; 1) current status of UIPs; 2) barriers in creating UIPs; 3) needs and opportunities for creating UIPs; 4) identifying best practices in creating strong and sustainable UIPs. The main sections of the paper will be based on the above. Beforehand, the method adopted to identify the relevant findings are discussed as well.

2 Methodology

In order to assess the current state of the UIPs in Sri Lanka, a literature survey was carried out initially based on existing University-Industry Partnership literature and related regulations and policies. The purpose of the literature survey was to identify the current context of UIPs in Sri Lanka. This literature survey includes studies carried out as part of a major EU funded ERASMUS+ project [11] considering three selected universities in Sri Lanka, namely the University of Moratuwa, University of Colombo & University of Ruhuna to assess the current condition of research facilities, staff, and programmes related to DRR sector. The three universities were partners in the aforementioned EU funded project, thus, only they were taken into consideration in gathering information.

Next, expert stakeholder roundtable discussions were held during a Symposium on 'Creating University-Industry Partnerships' held on the 12th of March 2018 with the Ministry of Primary Industries. The symposium brought together more than 60 academics, policymakers, industry professionals and financial institutions involved in UIPs. The event consisted of several inaugural speeches from distinguishing invitees, thematic presentations of related to university-industry links and a final roundtable discussion to fulfill all four research questions mentioned in the introduction section.

The final discussion was carried out with fourteen officials from the Disaster Management Centre, where the role of universities in DRR sector was discussed. The findings of the data collection process led to identifying the existing gaps, barriers, and challenges which helped to provide recommendations to build effective and sustainable UICs in Sri Lanka.

3 Results and discussion

Following subsections will present a synthesis of all findings emerged from the literature review, interviews, questionnaire and roundtable discussions as per the themes of the research questions.

3.1 Current level of UIPs in disaster risk reduction

The historical records show that Sri Lankan universities have had a low level of R&D activities as the primary duty of the faculties was identified as teaching [12].

When looking at different types of UIPs, consultation projects appear to be one of the most common types of UIP in Sri Lanka. For an example, the Disaster Management Centre (DMC) in Sri Lanka, the main technical body involved in DRR activities, has involved in consultative projects such as preparation of coastal hazard profiles and tsunami inundation maps and development of drought hazard profiles with some Government Universities, e.g. University of Peradeniya [13].

Then looking at the other governmental authorities affiliated to Ministry of Disaster Management, National Building Research Organization (NBRO) has done a significant amount of consultation for the projects with national importance with University of Moratuwa [14]. Another significant project which has been taken place from 2014 is the Climate Resilience Improvement Project (CRIP) by Irrigation Department in partnership with Mahaweli Authority, DMC and many other non-governmental organizations and governmental organizations including University of Moratuwa [15].

The private sector organizations have made their contribution ineffective UIPs. Development of the application DEWN (Disaster Early Warning Network - Sri Lanka's first mass alert early warning system) can be seen as a success story of a strong UIP established between Dialog Axiata, Dialog-University of Moratuwa (UoM) Mobile Communications Research Laboratory and 'Microimage' [16]. The same laboratory developed automated rainfall monitoring systems [17] in partnership with Meteorological Department and a system to detect and locate elephant breaches in elephant guard fences which is called eleAlert [18] has been developed in partnership with Sri Lanka Wildlife Conservation Society.

With the above cases considered, it is visible that there are some UIPs which have produced successful outcomes, but it was agreed by the stakeholders that there are many barriers and challenges in creating UIPs according to their experiences.

3.2 Barriers and challenges in creating effective UIPs

As discussed by the participants during the symposium, there are many barriers and challenges that have to be overcome in the process of creating effective UIPs. The first and the most important point raised by the practitioners and the academia is the gap between the outcome and the impact. The unavailability of the disaster-related research problems for the academia, which should be prepared by the DMC was highlighted. Furthermore, it was raised that the readiness to accept more risk in investing in R&D works should be taken by the DMC, rather than moving for consultative work.

Another aspect considered was the absorptive capacity of the industry to apply the outcomes of the research for their own applications [19]. For instance, many advanced types of research have been carried out in universities (E.g.: Development of damage functions for flood risk assessment in the city of Colombo (Sri Lanka)[20]), referring to global literature and practices, but it could be seen that the local authorities have made a very little or no use of the produced knowledge from them. There are articles published by the authors in partnership with the relevant agencies, which evolves the knowledge on the advanced subject matter, but the knowledge in those publications are not put in to practice up to date (E.g.: How to Make your House Safe from Natural Disasters [21]). Therefore, participants stated that the absorptive capacity of the industry should be enhanced.

In addition, lack of networking and networking models in use [22] was seen as a major barrier in creating UIPs. As aforementioned, there is no existing mechanism to link the universities to industries, other than the personal contacts held by both parties. On the other hand, both parties should realize that a relationship between the university and the industry should not be engineered other than the financial aspects. Higher the informality of the relationship, higher will be the benefits and understanding among each other [23].

Therefore, expanding the boundaries in the relationship with industry should be considered in enhancing UIPs.

Sri Lanka could be taken as a country with one of the lowest rate of employment of Ph.D. graduates in the industry. This could be due to the academic orientation of the PhDs rather than focusing on the problems in the industry [24]. Due to the fact that most resource persons have foreign degrees for PhDs and MScs, the applicability of the knowledge could be limited within the local context. It was discussed that, in DRR sector, a little or no graduates with BScs are made from local universities. A very little number of MSc and Ph.D. graduates are produced from all local universities, even from them, the number of M.Sc. graduates supersede the number of PhDs [25]. The available courses in DRR were enlisted as M.Sc. in Disaster Analysis, Management and Mitigation by the University of Colombo, M.Sc. in Disaster Management by the University of Peradeniya, two postgraduate diploma courses from the same institutions and the Diploma in Disaster Management by the University of Kelaniya. In addition, there is a course module offered in Disaster Management under the M.Sc. in Project Management by the University of Moratuwa.

Furthermore, at times, the academics do not realize the importance of industry related research [26][27]. These negative attitudes should be changed in order to create strong UIPs.

Another fact raised was the mistrust between the industries and academics. The industry might have second thoughts about the technical capacities of the universities and expertise on supervisors. This might have caused because of past experiences of UIPs and attempts at forming UIPs. Participants agreed that expected outcomes from an effective UIPs are adequate timely delivery, the focus of the end goals, production of tangible outcomes, good quality and acceptable quantity of the produced outcomes and holding the liability of results [26]. Lack of the above-mentioned deeds combined with discontinuities in the university system (E.g.: Worker union actions: strikes) have caused the failure of forming and continuing UIPs effectively. As an example, failure of business incubators of the University of Ruhuna was brought into notice by the symposium participants. Because of this, some authorities even have problems with convincing their employers and employees about the significance of the UIPs as well [22]. Therefore, it was agreed that the academia should have to put a lot of effort into gaining trust and forming healthy relationships by being exemplary.

Another aspect which was considered is the research culture. The industry was oriented to establish short-term relationships with the universities which are having a consultative basis, over the past years. But the universities tend to establish longer relationships, as a UIP could mean a sponsorship for a candidate in M.Sc. or Ph. D.[28]. In this case, it would be good to have a duration of commitment which is compatible with both parties.

Availability of data was considered as another aspect. Some authorities hold data which are available for only

on request and for a price. Sometimes reaching these data even for a company working in the same range would be much difficult (E.g.: Government organizations). The perspective of the people gathered was that there should be a mechanism to exchange this information. At the same time, another related problem was the exchange of knowledge. Problems have been arisen in past years for not acknowledging the data providers with research publications and not sharing the results of publications with the concerned stakeholders. Even these problems have led to damage the UIPs in great terms.

The symposium participants also stressed the barriers related to financing. When Sri Lankan country profile is considered, the percentage allocation from the GDP for the research and innovation sector has been on decline (0.3% in 1966, 0.18% in 1996, 0.17% in 2006 and 0.1% in 2013) [29]. This is very low when compared with some of the regional countries; Malaysia 1.3% (2015), Singapore 2.2% (2014), India 0.63% (2015) and developed countries such as Japan 3.28% (2015), USA 2.79% (2015) [30].

When considered about the industries which are willing to fund for DRR sector, a handful of organizations can be seen. The funding may have benefited some private organizations and universities, but in general, such UIPs are still not significant in contrast to the government funding. It would be a good trend if more private investors are attracted by universities with respect to DRR related studies. Furthermore, funding will be available depending on the industries recognition and understanding of the value of UIPs and research work, therefore the attitude upon academia should be enhanced as well.

At the same time, the symposium participants stressed that the universities should be able to come up with feasible rates in UIPs [26]. Sometimes the researchers are asking for unreasonable rates and at most of the time due to rules and regulations, a high amount of fund is allocated for the university itself on behalf of the facilities and resources, which doesn't seem to benefit the researcher directly. The transparency of some of these regulations is in question, which is seen as a barrier in the path of creating UIPs [23], [28]. One example is that for any consultation done through the university, 46% of the total value of the work should be deposited to the university on behalf of 'University Overhead' by regulation, which is very less transparent for both the academia and the industry.

When considered about intellectual property related conflicts, it was the common agreement that the government funding agencies such as NSF will allow the public disclosure of knowledge, as in some instances, the private funding agencies could be reluctant of public disclosure of the findings of research and consultancy. It would be a better practice for the companies to adapt to academic disclosure practices in exchange for valuable knowledge [31]. More complications could arrive in the case of patenting and licensing; therefore, the rules and regulations and memorandums of understandings should be able to address the plausible complications.

Finally, another minor detail came into the concern of the participants was the engagement of the officers in the R&D divisions of the industry, to other non-R&D work such as management related and quality control and quality assurance work. This will make those officials become less focussed and committed to R&D work, and that will make them depend more on the researchers from the university side [23]. The common understanding was that the industry representative should be sound on the subject matter he or she is dealing with the university, but under the said circumstances, that officer could lag behind.

Therefore, with all the barriers and challenges, the participants suggested that the discussion should be focussed on the needs of requirements to be considered in creating and maintaining successful UIPs.

3.3 Needs and requirements

The discussions in the meetings yielded that the most important requirement would be the need of research topics, research problems, and ideas. This was seen as a requirement which should be addressed by the industry, as the industry knows the problems they are encountering better. If the requirement is made on the industry side, the academia will be able to align their research to answer the problems, hence produce results which could be used by the industry.

Another important fact that risen was that the industry needs to be confident of the capabilities of the universities. It was raised that academia could be slow in producing results as the resource persons are busy with teaching, administrative work, and other consultative work and with the hierarchical processes. Nevertheless, according to a study done in Australia, it should be noted that the universities could be holding the best and up to date knowledge on the subject, and multi-disciplinary approaches will be much enhanced with working with universities [24]. Therefore, the confidence of the industries towards universities has to be enhanced.

Another point considered in the discussion was the availability of subject expertise and a mechanism to identify the subject expert. With the points discussed under the current level of UIPs in DRR, it can be observed that the industries are keen to approach the universities and universities are also keen on assisting problems and working together.

Looking at an industry perspective, there is a limited number of links with universities which are not widespread. Most of the organizations tend to contact the same expert from the university since they have gained trust or has a good work history with them. But sometimes this expert may get busy with other projects and there can be several other experts who are yet to emerge. Hence if there is a good mediator who knows very well about the expertise of the universities, he can coordinate properly with the industry to get everyone involved in the projects without any confusions. Furthermore, Science and Technology Management Information System (STMIS) is a computerized information system which creates a working network

among academic institutes, R&D, and industry which is developed by the National Science Foundation (NSF) of Sri Lanka [32]. (NSF is responsible for the promotion of R&D by funding and monitoring projects in natural resources, energy and science, and technology in Sri Lanka.) STMIS enables the professionals from the industry to get registered in the database which will give them access to identify the required expert for their projects.

When analyzing the Sri Lanka Disaster Management Act, it advises the Disaster Management Centre (DMC) to promote research and development programmes partnering with higher education institutes [33]. Furthermore, the National Disaster Management Policy supports the multi-stakeholder approach by identifying the need for education training and professional development which are two main concerns of a UIP [34]. When looking at the global standards, Sendai framework highlights the requirement for a close partnership of academia and public and private organizations to integrate disaster risk to their management practices [35].

One final requirement would be the transparency in the policies and agreements. Many literatures have shown that many questions arise with regards to the ownership of the intellectual property (IP) and with the transfer of knowledge [31], [36] and complications rise along with the rules and regulations [28]. The discussions strongly highlighted the delays and miscommunications took place due to the inefficient policies and regulations, which could be summarized as the discrepancies due to bureaucratic issues.

Furthermore, it was emphasized that the auditors should be more aware and educated with the auditing processes within the universities, as the funding cycles are present within the universities. It was considered that the policies and regulations should be more transparent to the industry as well as to the academia.

With the discussed facts on needs and requirements, next, it was considered the enablers and opportunities to be considered in creating effective UIPs, which were identified during the symposium and focus group meetings.

3.4 Enablers and opportunities in creating effective UIPs

Enablers and Opportunities can be defined as the key factors that allow the universities to get along with the industry, to work together for advanced and better results. There are several enablers identified at the symposium which could be discussed as follows.

With regard to the DRR practices, the current enablers were seen as the undergraduate research projects which carry a component of DRR. And, in postgraduate studies, diploma programmes, M. Sc. Programs and Ph. D. programmes offered by the local universities can include a component or can be based on DRR. Other than that, attending workshops from DMC or any other stakeholder government or non-government

organization were identified as enablers which are in practice, in the discussions.

Sri Lanka Disaster Risk Management Plan (2018-2030) which will be the roadmap for DRR in Sri Lanka (which is still in a draft stage) has identified the need of disaster-related research and technological innovations from universities, lack of integration of research findings in to DRR [37] which was seen as a good opportunity for both industry and universities to collaborate in practice. Most of the work carried out by the DMC was consultative, rather than research oriented at the time. Furthermore, it has identified that the investments for the research activities should be made available.

Another enabler recognized was the social and geographical proximity of the universities and the relevant organizations [23]. DMC raised the point that the geographical proximity could be used in many effective ways in the DRR process in Sri Lanka as if the universities are given the responsibilities of the DRR related studies for a specific region, based on their geographical locations. For instance, under this concept, landslide risk assessment in upcountry areas can be assigned to the University of Peradeniya which is located in the upcountry, while the risk assessment of coastal floods in down country can be carried by the University of Ruhuna which is situated in the coastal belt. In this way, the proximity of academia and industries could be utilized.

Another strong suggestion was to have the Technology Transfer Offices (TTOs) which are currently unavailable in the local universities. These TTOs are located inside the university and they are supposed to act between the industry and the university in case of a consultancy or in case of a research development. These TTOs will have the duties of undergoing through the policies and regulatory procedures for the industries to reach the universities and to find financial support for the university researches. From the TTOs, the burden on universities to find financing will be lessened, therefore, the researchers can focus more on the subject matter. On the other hand, the industry will feel more encouraged to reach the universities for subject matter expertise, as the rigorous procedures are handled by a third party for the industry [36]. Even the TTOs can play a role in the cases related to IP and patenting [38].

In addition to the improvements related to the rules and regulations, it was agreed in discussions that a proper code of ethics should be introduced for the UIPs. This will create a more work-friendly background for working, and the space for discussions will be large, as the understanding among each party will be higher than what is in practice now. Especially when it comes to the human interrelations, 'boundary spanners' can enhance the level of interaction between each party. These boundary spanners pose the qualities of having open mindsets, active listening and active participation in conversions, strong ability to extract information, strong communication skills and emotional maturity, empathy, and integrity while interacting with stakeholder companies [39]. People with these qualities can act as mediators between the university and the industry.

Since there were concerns about data and result sharing, having a common platform to share the results among all the other stakeholder agencies was seen as a good enabler. In relation to this, open data policies can be implemented. Some acts such as the right to information act of Sri Lanka emphasize the access to information [40], more specific policies should be implemented on open data sharing, at least for governmental institutes. One such initiative is the 'Desinventar' online database which consists of all the details available about disaster situations happened from 1974 up to date[41]. More initiatives like Desinventar will enable the UIPs in great contexts.

Another point agreed in the discussion which was raised by the academia was improving the R&D culture in universities. This could be done by having research allowances, salary hikes based on h-index for research publications and citations. (Universities in Sri Lanka are having low world rankings, mainly because of the lack of publications [42].). The stipend paid for a researcher with Ph.D. qualification is about USD 560 (LKR 90,000) in Sri Lanka, therefore increasing this amount could be seen as an enabler, as money can be a good motivator.

Finally, the discussions made it clear that the availability of funding will work through its way to strong and successive UIPs, and it will make the researchers feel more secure about their study and it will keep them more focused and in line with the subject matter. Identification of this requirement and stating the measures to address them in the roadmap for the years 2018-2030 for DRR is a considerable improvement. It will be better if the other stakeholder authorities do the same in the near future, such that the creation of UIP platforms could be broadened.

With all of the above enablers being discussed, the discussions continued in recommending the best practices and sample cases for the betterment of UIPs.

3.5 Best practices and recommendations

There were many best practices and recommendations were stated in discussions, one of the most outstanding practices was having an external body which can undertake projects from the industry which is affiliated to the university. A living example was given as UNI Consultancy services (UNIC) which is operated within the premises of the University of Moratuwa. UNIC is a limited liability company which is registered under the company act of act no. 07 of 2007, which makes it enable the company to bid for the projects in the industry which is a privilege that the university does not have. And the objective of UNIC is to facilitate the industry with the expertise that can be gained from the academic staff in the university through the R&D culture [43].

UNIC limits its membership only to the academic staff in the university, and it is handled by a board of management consisting of university academic members, but the vice-chancellor of the university is not permitted to be a member in UNIC, to avoid any ambiguities in the operations of UNIC and university. UNIC is audited by an auditing firm, and as it uses the name of the university, 15% of any payment made to an academic member in UNIC is paid to the university. Through UNIC, it has been easier for the industry to approach the university and consult for its services, without going through the rigorous and time-consuming procedures within the university. And as a consulting firm, UNIC was able to produce quick and accurate results with the project within the given timeframe. If establishments similar to the UNIC can be formed and the disaster-related research could be consulted through that establishment, a big amount of time and money could be saved rather than going along with typical university procedures.

Given that, another recommendation is the provision of a good framework or a policy that addresses the aspects of knowledge diffusion, knowledge production, knowledge relationship and knowledge engagement [44]. These frameworks will enable for both universities and industries to work in understanding about each other. Furthermore, these frameworks can include meetings among industry and university which discuss about the industry need and the research problems, state of art references made by the university, concept solutions brought forward by the university which is open for discussion for the industry, separate evaluations by the industry and the university where both parties can interact and have interventions about the solutions and finally a validation which is issued by the university [23]. Then both parties can put a combined effort in publishing the findings and in applying the findings into practice.

A different setup of recommendation was the provision of state of the art knowledge incubators. With correct handling and optimization, incubators are capable of producing good results [23]. The Rubber Product and Process Development Incubator in the University of Moratuwa in partnership with Samsons International PLC were explained as a success story. However, it should be noted that the incubators which are not managed and focussed properly have damaged the UIPs in great quantities. A demonstration in the discussions was the case with business incubators in the University of Ruhuna.

Increasing the awareness and the exposure of the academia for the industry was recommended too. This includes sending the undergraduates to the establishments related to DRR to have the in-plant training programmes, accommodating the MSc and Ph.D. candidates in those establishments to work together and the academics to spend their sabbatical leaves in those establishments (local or overseas) [22]. This way, the relationships with the industry can be strengthened and these are the best methods of identifying the industry requirements for research gaps. Within the process with the high-quality work of the university representatives, trust and the confidence of the industry towards the university will be built automatically. And the networking aspects of building UIPs will be addressed as well.

On the other hand, it was agreed that it is very important to build the capacity within the organizations to apply the theoretical knowledge in practice, therefore

the industry is encouraged to recruit the people with necessary qualification and the expertise, in order to build the capacity within the organization.

The results of the discussions can be summarized as shown in table 1.

Table 1. Identified problems and suggested solutions in the discussions

	Identified problems	Suggested solutions
1	The unavailability of the disaster-related research problems for the academia	The industry should produce and maintain a set of challenges they encounter, which needs a research component in finding a solution, having TTOs.
2	The inadequate absorptive capacity of the industry	Provide employment opportunities to qualified academics (MSc, Ph.D. holders in respective expertise) in the industry with competitive salary schemes.
3	Lack of networking	Employment of a mediator between the industry and universities, having a database of resource persons, having TTOs.
4	Mistrust between the industries and academics.	Carrying out small-scale pilot projects with industry-academic partners, before moving into full-scale projects. The industry needs to be confident of the capabilities of the universities, Universities adopting many beneficial and efficient methodologies in partnering.
5	Non-availability of a well-established research culture	Government and DMC should initiate research centers in selected universities. Enhance the employment of students doing higher studies in industry-related research.
6	Non-availability of data	Maintaining free accessible databases (at least for government agencies) and make the fee structure available in the websites, digitizing the data and make the process smooth. Introduce policies to improve the flexibility of accessing data.
7	Challenges of getting the funding	Making funding sources and deadlines available to the academics, making the funding mechanism smooth. Adhering to various models of partnerships, universities presenting more feasible
		economics in partnerships.
8	High charges in UIPs	Academics getting along to work with industry, revision of policies that incur expensive and less-transparent overheads
9	Conflicts with IP rights and ownership	Making the policies and agreements transparent, both industries and universities working on an understanding of each other's ambitions.
10	Engagement of the officers in the R&D divisions of the industry	Having dedicated officers for industrial divisions of R&D, with boundary-expanding qualities.

4 Conclusions

This study is composed based on results from a symposium which had over forty participants from fifteen different institutes including academic institutes and from a meeting held with DMC of Sri Lanka to uncover the possibilities of UIPs, where there were fourteen participants. The study could be extended to gather the opinions from other establishments who are interested in studies in DRR such as NBRO, Irrigation Department, Mahaweli Authority, Meteorological Department, Geological Mines and Survey Bureau, Survey Department etc. which could be identified as the future work.

In conclusion, the discussions stated that the UIPs in DRR segment in Sri Lanka is not a common and popular phenomenon for most universities and for most industries, on the contrary of the urging need of both universities and industry getting together. Therefore, it was a common agreement that the UIPs should be enhanced in order to make use of the theoretical knowledge which might not be driven from the industrial needs to a certain extent, and for the betterment of the industries.

In order to implement an effective university-industry landscape, well-defined policies and regulations are needed [6]. It should be noted that the necessary actions are being taken to modify the policies that are being hurdles to the current UIPs by the administration of the universities. Nevertheless, it should be noted that the new paths and frameworks of UIPs should be discovered and put in to practice rather than getting used to undergo the typical procedures to engage in with universities.

In general, the discussion led in gathering the ideas of different stakeholders in the sequence of needs and requirements in creating UIPs, barriers to create them, enablers and opportunities to create UIPs and finally the recommendations and cases of best practices in creating them. As a principle, it was agreed by all of the participants that the leadership of creating UIPs should be taken very seriously. There are many responsible parties that can take the responsibility of leadership, and they could do the reaching out task either for the university or for the industry. Other than that, both the

industry and the universities were quite confident that they pose the ability to carry along UIPs, for mutual benefits.

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