



## Research Collaboration Network Among the Local Academics: A Review

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**Abstract.** This paper is a conceptual paper on research collaboration network among the local academics. The academicians collaborate and network among themselves for several reasons. The literature review indicated that the reasons were to access to expertise in the area of interest, to access to instruments, and cross-fertilization across disciplines are among the factors for individual research collaboration. A research is proposed in order to identify the factors that contribute to the collaboration of local researchers since there is no study has been done in the context of the study. Social analysis network will be used as a guide to the proposed study to determine the level of relationship between authors.

**Keywords.** Research; Collaboration; Research network; Academics; Faculty collaboration

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### 1. Introduction

Malaysian research universities (MRUs) have been established in 2006 based on the view that universities function not just to produce graduates for the workforce but also generate intellectual capital, new knowledge, and innovative technology [1]. The Ninth Malaysia Plan (2010-2016) states that greater collaboration in research will be undertaken between the public institution of higher education and the local industry. This statement shows that the government really emphasize on research collaboration between universities and industries.

As research production is one of the roles of research universities, there are increasing numbers of research papers published in MRUs. This is consistent with [2] view that universities are academic institutions which are committed to the creation and dissemination of knowledge, in various disciplines and fields.

## 2. Research Collaboration and Output

### Research Collaboration

The Merriam-Webster dictionary defines collaboration as to work jointly with others or together especially in an intellectual endeavor. Thus, research collaboration could be defined as the working together of researchers to achieve the common goal of producing new scientific knowledge [3]. Ref. [4] defines faculty collaboration as a cooperative endeavor that involves common goals, coordinated effort, and outcomes or products for which the collaborators share responsibility and credit. They also stated that collaboration has also been indicated to result in an increase in productivity, sustain motivation, stimulate creativity and risk taking, maximizes limited resources and enhances the quality of research and teaching.

Collaboration has always been part of academic life but the context of an increasingly globalized research environment has encouraged academic institutions to strengthen their external and international dimension. Ref. [5] agrees that both of them are considered essential to remain competitive and to drive economic growth. For several decades, academic around the world have been collaborating to support the development of their research domain. The majority of scientific and technological policies try to encourage the creation of strong inter-related research groups in order to improve the efficiency of research outcomes and subsequently research finding allocation.

Ref. [6] concludes that an important result of scientific collaborations is the creation of new scientific knowledge, including new research questions, new research proposals, new theories and new publications. [7]; ref. [8] agreed that collaboration reduces knowledge isolation and increases the potential to access economic resources and expertise. Ref. [9] highlights that co-operations between different scientific disciplines, different organizational units, and external actors seem to be a common and increasing phenomenon of academic reality.

Ref. [10] states that research productivity and collaborations are essential aspects of advancing academic. Publishing is a critical mechanism in higher education to allow faculty members to share new information in all disciplinary fields. Due to its importance, scholarly work is often heavily considered for promotion, tenure, compensation, and other merit decisions. Ref. [11] opined research collaboration as multiple talents converge to produce a research output. According to [3], coauthored research papers are a common unit of analysis to gauge research collaboration. Co-authorship is a formal way to analyze collaboration in scientific fields and academics in general, seek collaboration while conducting and publishing research [7]. Ref. [8] concludes that collaboration reduces knowledge isolation and increases the potential to access economic resources and expertise

According to [12], research collaborations between universities and industry are considered to be one important channel of potential localized knowledge spillovers. These collaborations

favor both intended and unintended flows of knowledge and facilitate learning processes between partners from different organizations. Ref. [13] highlights that co-authorship is the most formal type of scientific collaboration to analyze. Refs. [7, 13] have identified some possible reasons for the increase in co-authorship in research. The reasons are the maximization of economic resource, greater access to financial resources and equipment and intra-scientific factors which allow greater access to expertise, increase productivity and reduce the isolation of knowledge. The study of researchers' collaborative networks gives an understanding of some of the characteristics of social groups in scientific fields. This analysis allows the examination of collaborative relationships and the analysis of publication in a sociological perspective. Ref. [14] highlighted that to enhance the accessibility and visibility of local academic journals in Asian developing countries, it can be achieved by understanding the characteristics of the disciplines of each country through collaboration.

Ref. [15] concludes that many reasons have been reported for individual research collaboration and these include access to expertise, access to instruments, cross-fertilization across disciplines, improving access to funds, obtaining prestige or visibility, learning tacit knowledge about a technique, pooling knowledge for tackling large and complex problems, enhancing productivity, educating a student, increasing specialization of science and fun and pleasure [3, 16–18]. These reasons partly point to personal motives [15]. Individuals may be intrinsically motivated to collaborate, simply because they enjoy social interactions, or because they are encouraged by a challenging research question which they cannot tackle all by themselves.

## **Research Output**

The evaluation of researchers, which should be based on their output and productivity, is not only needed for faculty recruitment but also for governmental funding allocation and achieving high reputation within the research community. The reputation of research organization indirectly affects the society's welfare since a high reputation attracts foreign investments and highly qualified students from around the world. Thus there is a need for measuring the output of universities and the output of researchers. With respect to governmental funding, i.e., a research group, it is important to choose the appropriate scholars with the aim of maximizing the research output, cost savings and resource utilization.

Research output is important in every research university as it is an indicator for research activities. Universities and research centers use publication and citation counts to monitor the performance of their researchers and give promotions. Ref. [19] agrees that research output is increasingly evaluated and monitored at different levels and for different purposes. Researchers submit research proposals to funding entity which uses peer review committees to decide which proposals ought to be supported. Ref. [20] highlights that in the evaluation process, evidence of past publications has an important effect on the expected level of grant funding. Ref. [19] also supported the decision made by companies when they also use publications as a way of detecting expertise within universities. In practice, research has shown that the interaction among the scientists is one of the factors that affect the production of scientific knowledge [21].

### 3. Social Network Analysis (SNA)

A promising solution for attaining more meaningful information about faculty research performance involves the use of Social Network Analysis (SNA) and it offers a useful methodology for evaluating individuals, collaborations, and research networks. SNA is currently used in a variety of professional and academic fields to examine relationships and their effects on change, productivity, and information sharing.

According to [22] public and academic interest in social networks grew rapidly over the past generation and SNA is a tool for evaluating research collaborations [10]. The two indispensable elements of any social network are actors and relations and their combination jointly constitutes a social network. SNA is characterized by a distinct methodology that encompasses techniques for collecting data, statistical analysis and visual presentation. SNA also offers a useful methodology for evaluating productivity and collaborations within research networks [10]. Ref. [23] highlights that SNA is rooted in psychology, anthropology, sociology, and mathematics. The modern use of SNA originated in the fields of medical research and epidemiology to explain the spreading of the AIDS virus [24] and is currently used in a variety of professional and academic fields to examine relationships and their effects on change, productivity, and information sharing [10].

Ref. [25] mentions that the application of SNA to a co-authorship networks scenario has become increasingly common during the last decade. [26] states, in general, the benefit of analyzing social networks is that it can help people to understand how to share professional knowledge in an efficient way and to evaluate the performance of individuals groups, or the entire social network. For instance, with respect to performance evaluation, the social network of a researcher within a research community can be considered an indication of his collaboration activity.

### 4. Research and Collaboration in Malaysian Context

#### Malaysian Research University (MRU)

Five public universities in Malaysia hold research university status. They are, University of Science Malaysia (USM), University of Malaya (UM), Universiti Putra Malaysia (UPM), National University of Malaysia (UKM) and University of Technology Malaysia (UTM) [26]. The roles of these research universities are to promote economic growth and social well-being, produce research and train researchers, and link the local academic community to the global academic system of science and scholarship. Research universities usually function as repositories of historical and cultural information and artifacts and share expertise with the broader society. The academic community serves as social and cultural critics as well as participates in international science and scholarship.

One of the Ministry of Higher Education plan was to cultivate research culture by funding selected higher institution center of excellence (HiCoEs) [26]. The Accelerated Program for Excellence (Apex) and Research Universities Malaysia has a low patent output. Malaysian ISI Web of Knowledge (formerly Web of Science) output was low with 10, 538 papers out of 13,278,111 of the world papers. Since 1986, there was an increase in research activities in

Malaysia [26]. Malaysian publication trend showed a very strong upward trend since 2007 and the growth is expected to be exponential during this decade. However, the research output especially the publications started to rise quickly after the announcement of the four Research University, namely USM, UM, UPM and UKM in 2008, a few years after the big boost in R & D funding by the government.

The increasing number of publications is in line with the function of the establishment of research universities which is to generate intellect capital, new knowledge, and innovative technology. To achieve these goals, The Ninth Malaysian Plan (2006-2010) states that greater collaboration in research will be undertaken by public institutions of higher education and the local industry [1].

Ministry of Higher Education stresses the importance of research collaboration between institutions of higher learning, research institutes, and the industry, local or offshore since Malaysia has a low patent and research output. Ref. [26] highlights that Malaysian government has made a remarkable progress in enculturating academic research in universities.

### **Proposed Study**

The researchers propose a study on research collaboration network among local academics. This study will identify local academics, particularly UiTM researcher's pattern of publication, the level of collaboration and other related factors such as funding, distance, and networking. The motivation to study such area is to understand the research collaboration within our own unique parent institution, i.e. UiTM. UiTM is a mega university in terms of campus sites and population size. As of 2014, UiTM has one main campus, located in the city of Shah Alam, with 12 state campuses, 6 satellite campuses in the state of Selangor itself, 11 state satellite campuses and 21 affiliated colleges [27]. In terms of population, UiTM is a place of 17,770 workforces, home to about 175,200 students, and offers not less than 500 academic programs in a conducive and lively environment.

At the moment, no evidence of research is done to determine the way academicians and scholars publish and collaborate with other academicians and scholars, within or outside UiTM, and to identify the reasons for such networking activities. There is also no adequate study to understand the distinction between networking and collaborating and their joint impact on productivity. It is important to know and choose the most appropriate researchers in order to maximize research outputs, cost savings, and resource utilization. Thus, there is a need to understand the research collaboration network activities among the academics, and to measure the output of UiTM as an organization and the individual output of UiTM's researchers. Ref. [25] supports this idea that in order to improve the benefit from research (and research funding) well-performing researchers have to be identified. Through quantifying the researchers' and scholars' publication activities, the most reputable and suitable scholars in particular disciplines can be identified.

UiTM develops an online institutional repository, known as Publication Repository Information System Management (PRISMa) [27]. Data from the PRISMa database will be used as a data source which consists of publications of all UiTM academics. PRISMa is a comprehensive database management system of UiTM which is designed to provide up-to-date



information on the publication. The PRISMa database will be retrieved, analyzed and processed. This study will use SNA as a method to identify the collaboration of UiTM academicians. SNA is chosen in order to generate better results and more accurate view of researchers' networks. The results will allow the researchers and policy makers to enhance predictions of future publishing potential.

Methodically, co-authorship networks based on these publications will be assembled, visualized and analyzed with social network analysis software packages. Network visualization and analysis will generate new information, allowing better design and strategic planning of the UiTM funding. After identifying the most top 20 authors in UiTM through social network analysis (first step), the next step will be to interview the top authors in order to know the factors contributing to their success in publications and also collaboration aspects.

This study will cover 5 years of publication registered in PRISMa which the publication date begins from 2010 till 2015. The interview session will be held at least with the top 20 UiTM researchers only. Other researchers from different parent institutions will not be included. The result of SNA on PRISMa will be a list of authors' names that actively collaborate at national or international levels. It is hoped that the results provide valuable information to university managers and policy makers on the current status of UiTM's researchers.

## Conclusions

In short, this paper is a conceptual paper describing an overview of research universities and potential research universities in Malaysia and there search collaboration activities among the academicians-cum-researchers. Numerous literature highlights the importance of research collaboration and network of the academicians, without which the benefit of a research could not be improved. Therefore, a study on research collaboration network among local academicians is proposed in order to understand the factors contributing to the pattern and level of collaborations and networking, publication activities, as well as funding activities. By coming to understand the factors that promote such activities, a clear and an accurate view of networking activities would allow for enhanced predictions of future publishing potential.

## Competing Interests

The authors declare that they have no competing interests.

## Authors' Contributions

All the authors contributed significantly in writing this article. The authors read and approved the final manuscript.

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