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The Impact of Commercialization to the Research Institutions

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ABSTRACT

The increasing number of commercialization of research and innovation has given a significant impact to the universities and other research institutions. This paper is to examine the impact of commercialization of research and innovation to the research institutions. The study was derived from the 119 research articles that were published from 2008 to 2019 from various sources such as Google Scholar, Scopus and Web of Science. The five impacts of societal benefits; economic growth; industry partnerships; reputation and entrepreneurship, are among the impacts found the most in the previous studies. These findings have proven that commercialization is not only beneficial to the research and innovation it selves but it also has a major positive impact to the region's economy and human life.

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1. Introduction

In recent years, the emphasis of the research commercialization has increased significantly. The studies have found that there is pressure to commercialize from the government, industries and institutional which are associated with science exposure, research surroundings, conflicts in research policy, as well as loss of public trust in the research enterprise [1-5]. It has been urged and promoted at the highest level of policymaking. The area that clearly shows the emphasis from the government are funding and program support.

As for Malaysia, the emphasis for commercialization can be seen from the Malaysia Budget Speech by the Treasury Ministry from year 2012 to 2019 in the research and innovation advancement [6-13]. The government also has enthusiastically announced 2012 as the year of National Innovation Movement. As proposed by the former Prime Minister in the budget speech back in 2012, research institutions should re-strategize and commercialize their research and development (R&D) findings [6]. In other note, innovation has to be internalized as a way of life and to be practice by all. This has

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proved that the government of Malaysia is realizing the aspiration to bring the nation to a higher level.

The former US leader, President Obama has endorsed to drive economic growth in his State of the Union Addresses [14-16] from the technology research. He has remarked that in the twenty-first century, businesses will rely on American science and technology, research and development [14]. To cite from another source is the speech by the Prime Minister Stephen Harper of Canada. He has stated that the major aim of the scientific research is to “power” commerce [17]. The approach by these leaders shows that the important of the commercialization to the nation is crucial. With this aspiration, commercialization is now become the central and mission of the research institutions [1, 2, 18] not only in Malaysia but worldwide.

2. Methodology

The research was conducted based on the previous studies for the research and commercialization topic. The study was derived based on the twelve years’ data through the title and abstract reviewed of 119 articles from various sources from 2008 to 2019. The articles were then screen out for possible inclusion in the study and finally, there were 79 articles reviewed. Finally, the articles included in this study was 66. The flow chart of this study is shown in Figure 1.

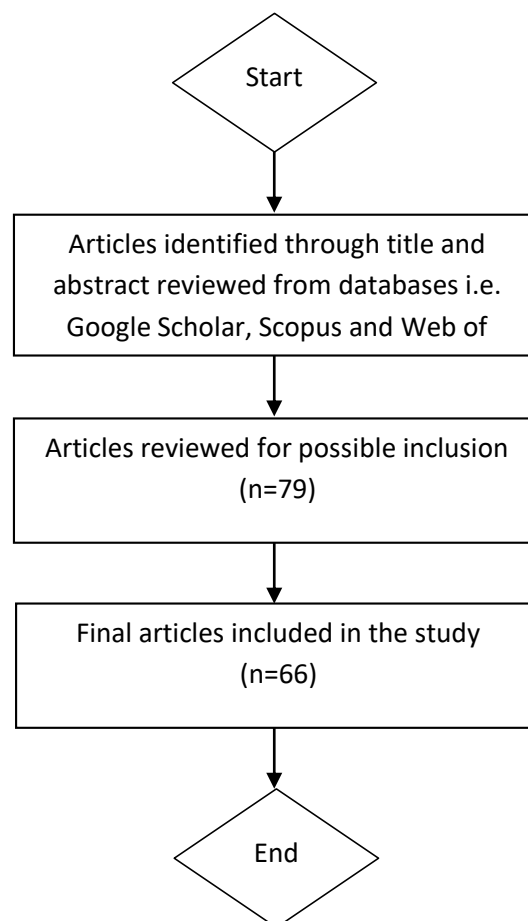


Fig. 1. Research flow chart

3. Results

3.1 Findings

This section shows the results obtained from the study. The findings are discussed in the next section. There were five commercialization impacts found in the previous studies; societal benefits, economic growth, industry partnerships, reputation and entrepreneurship.

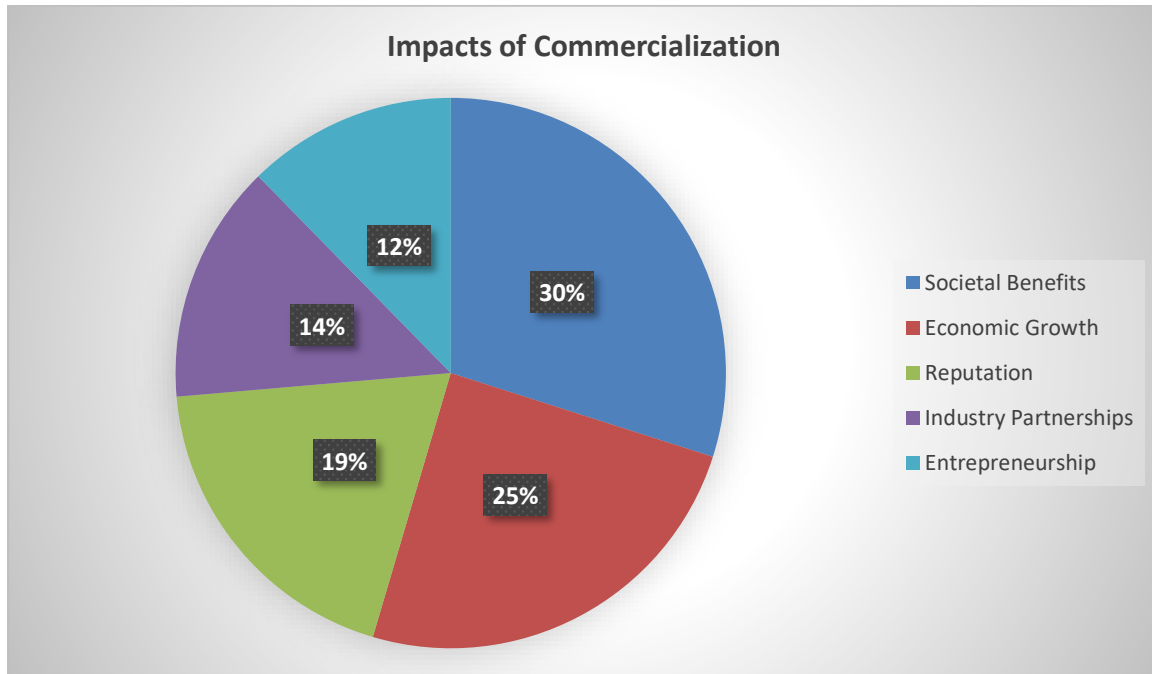


Fig. 2. The impacts of commercialization

3.2 Discussion on the commercialization impacts

This section is discussing on the research findings. Table 1 shows the commercialization impact and the authors in the previous study from 2008-2019. Based on the results, it shows that the societal benefits, economic growth, reputation, industry partnerships and entrepreneurship are the commercialization impact found the most from the studies.

Table 1

Commercialization impacts and the author of the paper

Impact	Authors
Societal benefits	[19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36]
Economic growth	[37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53]
Industry partnerships	[54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64]
Reputation	[65] [66] [67] [68] [69] [70] [71] [72] [73] [74] [75]
Entrepreneurship	[76] [77] [78] [79] [80] [81] [82] [80] [83]

3.2.1 Societal Benefits

Societal benefits are the key driver for the commercialization of new inventions at most research institutions. In recent years, universities, government, industries and society are turning to university or other research institution to solve their significant societal problems such as cures for disease, beauty, food and energy consumption. Researchers from these institutions always find solutions for problems facing by human life. Most of the innovation area that provides societal benefits are medical, beauty and health, agriculture, farming, food, process and many more [19, 23, 24, 30, 32]. The commercialization by the research institutions mostly affects many socio-economic groups like women, children, farmers, engineers and others under different sector. In farming for example, the number of smallholder farmers worldwide is approximately 500 million people and 2 billion are depending on them for livelihood [24]. Due to the rising of population, urbanization, new technology, climate change and many other factors, there is a need to transform the current agriculture sector. The researchers is helping by moving the current production practises to higher market-oriented level to cater the food demand [21].

Another example is on the biotechnology and medical research. Academic scientists focus on making discoveries to provide life and health benefit to the humanity. Research institutions become a place to find solution for such diseases and improvement in health care and public health. In addition to these importance, the research by the academic scientists can provide important information about disease trends and risks factors, outcomes of treatment, public health interventions, functional abilities, patterns of care and health care costs and use [22]. One of it is the development of the stem cell innovation. Government and many funding agencies believe that commercialization is necessary to realize the biomedical research as per target and deliver the benefits of stem cell to human life [27]. As reported by Media Planet Canada, a hockey legend Gordie Howe had recovered from a stroke by doing the stem cell therapy [28]. Due to the stem cell research is still an on-going discovering, the Ontario government has established Ontario Institute for Regenerative Medicine (OIRIM) in order to translate the stem cell research findings into curative therapies. This has shown that the importance of the commercialization biomedical research to the human life.

3.2.2 Economic Growth

Bringing the innovations to the market through commercialization also provides economic growth as its capability to generate income and creates job opportunity locally and internationally. As for Malaysia towards achieving a developed nation by 2020, the need to promote innovation and commercialization activities in all sectors is very crucial. In March 2016, the Malaysia Finance Ministry (MOF) as well as the Ministry of Science, Technology and Innovation (MOSTI) have introduced the Malaysia Commercialization Year (MCY) initiative under the National Blue Ocean Strategy (NBOS) [40]. In this event, the speech by the former MOSTI minister, Datuk Seri Panglima Madius Tangau has said, there were 71 products and services technology-based R&D products have been commercialized and started generating revenue for about RM80 million.

The stimulation of the economic growth is based on the establishment of the spinoff company and licensing of product and technology by the universities and other institutions. Through spinoffs the research institutions are enable to attract investment from joint venture companies. One of the institution that is successfully developing spinoff is University of Manchester with over 50 spinoff companies in the multiple areas such as transmission of electricity, stem cell research, business location analysis and skin-health products. As of to date, the university has successfully attracted

over £360M from the venture funders [37]. With regards to the fast growing of the innovation economic, the strong commitments and market oriented are required.

Another research institution that is successfully contribute to the economic growth to the country is the University of Massachusetts. Massachusetts is a focus place of the entrepreneurial activity from the high-growth technology to small businesses as well as the student-run enterprises. In 2018, Massachusetts has been rated number one in its State Technology and Science Index by the Milken Institute based on state's science and technology capabilities and innovation commercialization that contribute to high-skills job creation and broad economic growth. As reported in the Inc. magazine, 25 out of 5000 lists of start-up companies are from Massachusetts including Promoboxx, Skyword, Forward Financing, Allego, Invoice Cloud and Tripleseat. Massachusetts is ranked second in U.S. News and World's Report's 10 Best States for Business with a score of 3.1% for venture capital funding and patent creation rate of 1,005.02 per million people [41]. This has shown that instead of research institutions, commercialization also contributes to the economic growth as well as job opportunities to the people in the country.

3.2.3 Industry Partnerships

The importance of university and industry partnerships are very significant in fostering the economic development of a nation. Partnerships with industry enable the universities and students have more resources to undertake research [54] by improving corporate partnership. The collaborative research between university and industrial scientists is basically on the marketable projects. Additionally, industry partnerships provide universities as well as the students additional funding for research and this be able to expand the research areas [58]. Enriching experiences between researchers and students is a key importance to build sustainable relationships with industry partners by nurturing trust [59]. One example of university with long-standing relationship with a company is Dalhousie University. Based on the respond by one of the researcher in Dalhousie University on the long-standing partnership is due to the exposure to the real problems as well as developing the real solutions. This is not only beneficial to the research institutions but also to the companies for a better result. Those companies realize that by partnering with external especially with the research institutions will allow them to access different pools of knowledge as well as save the R&D costs [56]. These companies also require talent from the research institutions and become a good opportunity to student to be exposed to the industry [54, 62]. The studies have shown that industry partnerships provide a significant impact to the research institutions as it builds a strong relationship for knowledge transfer process.

3.2.4 Reputation

Commercialization of university research is proven increasing the reputation of research institutions [70-72]. It can improve the reputation or competitiveness of the institutions so that it can attract more students and client to choose the institutions for studies or business purposes [67]. The reputation of the university as reported by [65] is relative to the researcher because an effective researcher is more likely to commercialize and improve university reputation.

The top 10 university technology transfer and commercialization index in 2017 is shown in Table 2.

Table 2
University rank in technology transfer and commercialization

Rank	Institution	Indexed Score
1	University of Utah	100
2	Colombia University	97.83
3	University of Florida	97.66
4	Birgham Young University	97.58
5	Stanford University	95.6
6	University of Pennsylvania	95.39
7	University of Washington	95.11
8	Massachusetts Institute of Technology	95.33
9	California Institute of Technology	94.11
10	Carnegie Mellon University	93.54

According to Milken Institutes 2017 ranking, University of Utah is the top research university for Best Universities for Technology Transfer, above Colombia University, University of Florida and Birgham Young University [66]. The ranking was based on the University Technology Transfer and Commercialization index with four key indicators of technology transfer success for four-year average (2012-2015); patents issue, licenses granted, licensing income and formation of start-ups. Based on this success, the Technology Transfer Office (TTO) plays an important role in enhancing the reputation of the university. The engagement of the academic researchers with TTO from the commercialization activities can improve university's ranking, reputation, networking as well as research income [68]. Therefore, it is proven that the commercialization gives a good impact to the research institutions in enhancing the reputation of the institutions.

3.2.5 Entrepreneurship

Entrepreneurship is more than a skill. It requires passion and vision. Entrepreneur has the ability to see the potential opportunities as it could be and persuade others to realize it. Entrepreneurs are leaders, problem solver, a person who find opportunities and build a sustainable future for our future generation through innovation [79]. In recent years, the strategies to transform the universities to entrepreneurial institution have been proposed progressively [80, 83]. Universities are very close to the industries, society and government thus be able to foster entrepreneurship through university spin-off formation. Nowadays, the role of the universities has changed due to the rapid knowledge based economy and society [76]. At the universities, students are exposed with the research-driven excellence and evidence-based education by the university. The university perspective of the entrepreneurship is a key element for starting a new venture by students. This can be seen by the increasing of the spin-offs from the university research from the last forty years [80, 81]. The impact of the commercialization through entrepreneurship provide a significant change to the research institutions as it is not only beneficial to the institutions only but to the researchers as well as the students nationally and internationally.

4. Conclusions

The impact of commercialization to the research institutions is presented in this paper. These findings prove that commercialization is not only beneficial to the research and innovation it selves but it also has a major positive impact to the region's economy and human life.

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