ASSESSING THE OUTPUT OF FUNDING FOR HALAL-RELATED RESEARCH PROJECTS IN IIUM

BY

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A dissertation submitted in fulfilment of the requirement for the degree of Master of Halal Industry Management

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ABSTRACT

Research funding plays an important role in financing a research project. Besides covering the expenses of the research, it enables researchers to produce tangible output from their work. Research outputs not only demonstrate the productivity of the researcher but also provide valuable contributions to others in related fields. The objective of the study was to analyse the trend of research funding and output in halal-related research projects at the International Islamic University Malaysia (IIUM) and develop a framework for effective assessment of research funding trends and outputs. Content analysis method was performed to examine the funding trends and outputs from 41 projects (from the year 2012 until 2022) obtained from the Research Management Centre. Taking into consideration all the issues that arise during the process involved, self-reflection method was also used during the process to develop a framework for assessment of research funding trends and outputs. It was found that the amount of grant received was between RM10,000 to RM300,000. The Ministry of Higher Education was found to be the main funder. Most of the talents nurtured were at Master's level. A total of 77 journals were published, of which 75% were indexed in either Science (WOS), Scopus, or MyCite with one journal article indexed as Q2. Only 12.5% of the projects were reported to have commercialization output. No significant correlation was found between the total grant (RM) and i) total publications, or ii) talent produced. The developed framework would be useful for other researchers in diverse fields to adopt hence facilitate the process of collection and analysis of the data. In conclusion, the halal-related research in IIUM is progressing. The findings will not only benefit the research centre at the university, but also the other parties to open more opportunities, particularly in the area of priority of halal research and development.

خلاصة البحث

يلعب تمويل البحث دورًا محوريًّا في تمويل المشروع البحثي. فإلى جانب تغطية تكاليف البحث، يتيح التمويل للباحثين إنتاج مخرجات ملموسة من عملهم. ولا تقتصر أهمية مخرجات البحث على إبراز إنتاجية الباحث فحسب، بل تسهم أيضًا في تقديم إضافات قيمة للمعرفة في المجالات ذات الصلة. كان الهدف من الدراسة هو تحليل اتجاه تمويل البحوث ومخرجاتها في المشاريع البحثية المتعلقة بالحلال في الجامعة الإسلامية العالمية بماليزيا (IIUM) ووضع إطار للتقييم الفعال لاتجاهات ومخرجات تمويل البحوث. تم استخدام أسلوب تحليل المحتوى لفحص اتجاهات التمويل ومخرجات 41 مشروعاً (خلال الفترة من 2012 إلى 2022) تم الحصول عليها من مركز إدارة البحوث. وبالنظر إلى جميع القضايا التي تظهر أثناء العملية، تم أيضًا استخدام طريقة التأمل الذاتي لتطوير إطار لتقييم اتجاهات تمويل الأبحاث ومخرجاتها. وتبين أن مبلغ المنح المتلقاة يتراوح بين 10 آلاف إلى 300 ألف رينجيت ماليزي. وتبين أن وزارة التعليم العالي هي الممّول الرئيسي. وكانت معظم المواهب التي تمت رعايتها على مستوى درجة الماجستير. كما تم نشر ما مجموعه 77 بحثًا في مجلات، تمت فهرسة 75٪ منها إما في قاعدة بيانات Science (WOS) أو Scopus أو MyCite مع مقالة واحدة في الدورية مفهرسة في Q2. لقد تم الإبلاغ عن أن 12.5٪ فقط من المشاريع لديها مخرجات تجارية. ولم يتم العثور على ارتباط كبير بين إجمالي المنحة (RM) و1) إجمالي المنشورات، أو 2) المواهب المنتجة. سيكون الإطار المطور مفيدًا للباحثين الآخرين في مجالات متنوعة لتبنيه وبالتالي تسهيل عملية جمع البيانات وتحليلها. في الختام، فإن الأبحاث المتعلقة بالحلال في الجامعة الإسلامية العالمية كانت تتقدم. ولن تعود هذه النتائج بالنفع على مركز الأبحاث في الجامعة فحسب، بل على الأطراف الأخرى أيضًا لفتح المزيد من الفرص، لا سيما في مجال أولوية البحث والتطوير في مجال الحلال.

APPROVAL PAGE

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

Atiqah binti Azmi

Signature ..... Date .....

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This dissertation is dedicated to my parents for providing the unwavering support and guidance that has shaped me into the person I am today.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION TO THE CHAPTER

This chapter is an introduction section consisting of the background of the field related to this study. This chapter also describes the problem statement, research objectives, and research questions resulting from the identified research gap. The significance hence the importance and benefit of this study is also described.

1.2 BACKGROUND OF THE STUDY

Idea and execution are the two most important components in research projects, along with the availability of infrastructure and facilities to achieve successful execution of any research work (Neema, 2021). Thus, in fulfilling the research aims, monetary support is an absolute need to cover the travel expenses, contingency, stationeries, hiring of trained personnel, purchase of equipment, consumables, and publication expenses (Akram et al., 2022). This monetary support, commonly referred to as funding or grants is commonly divided into four categories based on the funders; research grant by the university, research grant by the ministry, research grant by industry/private sector, and research grant by the international fund (Pusat Pengurusan Penyelidikan (RMC) UTHM, 2021).

Funding is positively associated with the output of research (Kyriakos et al., 2015) and has been reported to play a role in academic engagement (Hooi and Wang, 2019). However, there were cases where funding was found to have no association with the output. For instance, it was observed that a budget cut of 19.23% in 2017 from RM7.57 billion received in 2016 for higher education public universities in Malaysia still contributed to the country's rank (at 39th) out of 50 countries for the research output and its impact, institutional excellence, and graduate employability (Abdullah, 2017). Nevertheless, such data was year-specific and could vary depending on the global scenario.

It is unequivocal that research is important to academic development all around the world, such that it becomes the backbone of modern society and economy (Papalampropoulou, 2021). Discoveries and findings from research help build new knowledge that can be applied to benefit the humankind. For instance, research in the health and medical area provides important information related to disease trends and risk factors. In addition, outcomes of treatment, patterns of care and costs can also be revealed through research in health and medical care (Nass et al., 2009).

Taking the construction industry as another example, most of the research done revealed the importance of issues in relation to the expansion of construction productivity and the development of public interest in establishing homes and buildings at both local and national level (Chan, 2019).

From the Islamic perspective, the Qur'an strongly emphasizes the importance of seeking knowledge and encourages us to read, write, do research, and acquire diverse fields of knowledge in this world. Allah s.w.t mentioned in Surah al-'Alaq, verse 1-5:

> Read (or Proclaim) In the name of thy Lord and Cherisher-Who created, Created man, out of a leechlike clot: Proclaim! And thy Lord is Most Bountiful, He Who taught (the use of) the Pen, Taught human being that Which he knew not [al-'Alaq: 1-5].

Besides, these verses also reflect mankind to think, ponder, and gain knowledge that can bring mankind closer to God and his creation. Hence, the discussion about research and knowledge in halal areas is crucial as it is not only limited to knowing what is halal to be consumed but to develop and provide halal products and services for all.

In terms of halal research, Malaysia was reported to be one of the major contributor countries between 2006 and 2019, followed by the United Kingdom and Indonesia (Haleem et al., 2020). Besides, a study by Zain et al. (2017) also stated that halal research is one of the crucial elements in the halal industry which allows for higher quality, productivity, integrity, and competitiveness in delivering halal products and services by the stakeholders.

To date, the halal industry has become one of the fastest-growing businesses in the global market. The halal industry, while traditionally being linked to food, has diversified in recent years into various halal-related areas such as finance, tourism, service and transportation (Nurrachmi, 2017), biotechnology and personal care products

(Zain et al., 2017). Despite the positive trend, it appears that the number of researchers in the halal area is still small with most articles generally focused on the growth of halal products (Nizar and Triyawan, 2020).

In addition, not all scopes of halal research are sufficiently covered. For instance, halal research in the fields of social science, humanities and arts, and business management is low in comparison to research in halal food and products (Mohamed Ismail et al., 2020). More specifically, a bibliometric study on the subject areas of halal research has shown that biochemistry, genetics, molecular biology and medicine exhibit a small frequency of published documents in the Scopus database from 1996 to 2020 compared to business management and accounting, agricultural and biological sciences, and social sciences (Hashim et al., 2022).

Halal research contributes to the expansion of knowledge and the discovery of new findings such that it can assist in fulfilling the needs and providing solutions to halal industry stakeholders (Ahmad et al., 2011). As the halal industry is growing and expanding its areas, halal-related studies and knowledge should not be overlooked to ensure the sustainability of the halal industry in the country (Aziz et al., 2015). In Malaysia, the halal industry has been reported to receive support from the academia in terms of research and development as well as nurturing human resources (Zain et al., 2017). However, other studies reported that there are imbalances between research in halal areas and the growth of the halal industry with the former not being able to catch up with the speed of growth of the industry (Mohamed Ismail et al., 2020).

The International Islamic University Malaysia (IIUM) was reported to be the third major institution that contributed to the publication in the area of halal after Universiti Putra Malaysia and Universiti Teknologi Mara (Haleem et al., 2020) These universities have established halal institutes or centres that offer academic programmes in halal areas and have contributed to academic research work leading to the expansion of the body of knowledge and the development of skills (Hashim et al., 2022). Considering the significant impact of research in the halal area, it is important to study the funding trend for halal research and its outputs.

1.3 PROBLEM STATEMENT

Research output can be influenced by factors including sufficient funding to finance overall research activities. One of the keys to measure the effectiveness or achievement of a research project is to observe the outputs. The academic landscape today has shown noticeable opportunities in funding the researchers in various fields of study. This funding is provided by the government as well as other parties such as the university and private sectors. Research is undertaken to discover new knowledge in fulfilling the needs and further development in a particular field. Science and technology (S&T) area is one of the prominent fields in research and development (R&D) where the S&T has been shown to be benefitting from the R&D activities. In a similar thread, other industrially growing sectors such as 'halal sectors' also requires extensive R&D towards providing better solutions, products and services that bring socioeconomic benefits to all. 'Halal' has frequently been interpreted as a field that only focuses on Muslims; about what can be eaten and what are being prohibited. However, 'halal' is beyond those connotations where it covers various subcategories such as fashion, travel, lifestyle, economy, cosmetics, pharmaceutical, and others. Given the halal inclusive values, the knowledge in these categories benefits not only Muslims but also all mankind. Therefore, it is crucial to properly understand and monitor the funding allocation and the output achieved in this research area to identify its trend and outputs towards strategic actions for future execution to spur its further growth. While the trend of research articles published related to halal is increasing, there is no report on the overall trend of funding and its output such that it fails to provide a concrete landscape for future research in the halal area. Thus, the findings from this study could fill in this gap of research by providing insights into areas of priority in halal research that would benefit many stakeholders in the halal industry.

1.4 RESEARCH OBJECTIVES

This study aims to achieve the objectives as follow:

1. To describe the funding trends in halal-related research projects in IIUM.
2. To determine the outputs of funding in halal-related research projects in IIUM.

3. To propose a framework to assess the output of funding for halal-related research projects in IIUM.

1.5 RESEARCH QUESTIONS

The research questions of this study are as follow:

1. What are the trends of funding in halal-related research projects in IIUM?
2. What are the outputs of funding in halal-related research projects in IIUM?
3. How to effectively assess the output of funding for halal-related research projects in IIUM?

1.6 SCOPE OF THE RESEARCH

Notwithstanding the halal research conducted all over the world including in Malaysia, this research specifically studied the output of research funding for halal-related research projects at IIUM only. The funding for the halal-related research awarded to IIUM researchers in this work could be from an internal or external funder. The study is only concerned with the trend of research grants and the outputs. The causal relationship between research grants and outputs is outside the scope of this study.

1.7 SIGNIFICANCE OF THE RESEARCH

The current halal research area is no longer limited to food and is increasingly diversified into sub-areas that were previously unexplored. To date there is no published work in the assessment of trend of funding and the outputs of halal research available in the literature. Therefore, this work can contribute immensely to the body of knowledge in halal. Despite having a narrow scope for the IIUM research population, this work can be an impetus to more research in this area thus adding valuable information to the halal knowledge base.

This work is expected to identify lacuna in the halal field that researchers can refer to in future research. Further, researchers can refer to this work to identify potential funders for their halal research based on the data provided in the study.

This study also provides valuable data for the research management centre (RMC) on funding for halal research at the university. The proposed framework can also be extended to other fields of research. Meanwhile, RMC can use the information for its strategic planning and to spur further research in the field at the university. The information can also provide insights to the funders themselves (such as JAKIM or HDC) to open more opportunities for halal researchers to aid them in producing tangible output rather than just solely focusing on paper publication. The current situation of research and funding trends revealed through this work can also contribute towards strategic research of which authorities including policymakers could weigh the priorities of a certain scope of work and future-proof the halal industry through appropriate policy making.

Finally, in line with Malaysia being the benchmark country for a successful halal industry, the country can take the opportunity to develop the halal research area further and deeper based on the trends observed. Such efforts not only have positive impacts on the local halal industry but to the whole world.

1.8 DEFINITION OF TERMS

Research : A Detailed Study of a Subject, Especially in Order to Discover (New) Information or Reach A (New) Understanding(*Cambridge Dictionary*, n.d.)

Halal Related Research : Halal Related Research is a Study Conducted in the Areas of Halal which May include Sectors as Modest Fashion, Halal Food, Halal Pharma, Muslim Friendly Travel, Media and Recreational, Islamic Finance, Halal Cosmetics

Research Funding : A Grant Obtained Through a Competitive Process to Conduct Scientific Research (Neema and Chandrashekar, 2021)

Research Output : Products Generated from Research, include the Means of Evidencing, Interpreting, and Disseminating the Findings of a Research Study (Mutz et al., 2013 as cited in European Science Foundation, 2011).

1.9 SUMMARY OF THE CHAPTER

In this chapter, the background of the study, problem statement, research objectives and research questions of this study are deeply discussed. Besides, the scope and the significance of this study are also explained and the definitions of terms also provided at the end of the chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION TO THE CHAPTER

This chapter presents previous relevant literatures. It first discussed research funding and research output before going further into halal research and past literature related to parameters that have been used in various fields of similar work.

2.2 OVERVIEW OF RESEARCH AREA

2.2.1 Halal Research

Halal is not a new area, but the recent trend showed an ever-increasing demand from the market as exhibited in a report by Dinar Standard (2023), Muslim spending on halal products increased from US$1.62 trillion in 2012 to US$2.29 trillion in 2022. Besides, it is forecasted to achieve US$3.1 trillion in 2027, a growth of 4.8% CAGR over the 5 years period. Research and development activities are one of the important aspects of the effort to meet this growing demand. As with many different fields of study, research is being pursued in higher education that leads to innovation, discoveries, and knowledge advancement.

In the current scenario of advanced scientific knowledge and information technology, halal knowledge must also be updated to support the technology in food, pharmaceuticals, cosmetics, and other sectors (Zain et al., 2017). Halal is of particular importance because it extends beyond the understanding of what is permissible to consume and what is not permissible to take. For instance, discovering what is halal to be eaten also requires some research and studies to identify the sources of food and how the food is processed. Hence, the study of halal at a higher and deeper level is important so that it can produce specific knowledge to fulfil the needs of life as guided by the Maqasid al-Shari'ah.

Malaysia remains a major player in the halal industry and a leader in halal-related academia (Mohamed Ismail et al., 2020). Zain et al. (2017), reported that the halal industry is consistently receiving support from academia through the

establishment of academic programmes and research. These constitute the halal studies that can be understood as scientific knowledge with a multidisciplinary programme in which it is studied based on the concept or and framework of halal (Zain et al., 2017).

Following the Ninth Malaysia Plan 2006-2010 in which halal economy became a key strategy in the country's economic development, several Malaysian academic institutions established research centres that cover a wide range of halal topics, from food to pharmaceuticals and vaccines, logistics, consumerism, and others (World Bank Team, 2022). For instance, Universiti Putra Malaysia (UPM) established the Halal Products Research Institute (HPRI) in 2006 which was initially named as Halal Food Institute in 2005 before the university implemented the policy changes. The International Islamic University Malaysia also became one of the main contributors to the continued growth of the halal industry through the establishment of the Institute for Halal Research and Training (INHART) in 2011. Table 2.1 showed the list of the research centres at Malaysian universities and the services provided.

Table 2.1 List of the Research Centers at Malaysian Universities and the Services Provided

Source: (World Bank Team, 2022)

Research center/ Center of Excellence	**Laboratory Testing**	**Training and Consultancy**	**Product Commercialization**
Halal Research Centre (UMHRC), University of Malaya	No	Yes	Yes
International Institute for Halal Research and Training (INHART), International Islamic University Malaysia	Yes	Yes	Yes

Institute Of Fatwa and Halal (IFFAH), Universiti Sains Islam Malaysia (USIM)	Yes	Yes	Yes
Halal Products Research Institute, Universiti Putra Malaysia	Yes	Yes	Unknown
Unipeq, University Kebangsaan Malaysia	Yes	Yes	No
Asian Halal Institute, University Utara Malaysia	Unknown	Yes	Unknown

Despite the positive development of the research centres focusing on halal in the country, it is reported that data on commercialised research and registered patents related to halal is still limited which in turn would have possible effects on relevant research and development (R&D). The Halal Development Corporation (HDC) has identified that there are inadequate product creation and innovation by Malaysia's halal economic players which has become a catalyst for HDC to promote research and knowledge generation by introducing the Halal Knowledge Centre at end of the year 2021 (World Bank Group, 2022).

Studies have also shown that the number of researchers working in the halal field is still small. It has been reported that the development of halal studies, specifically in the Theory of Planned Behavior between the increased from the year 2006 to 2019 (Nizar and Triyawan, 2020). However, different trends could be found in other scopes of halal research. In a study by Hashim et al. (2022), subject areas of published documents in halal research exhibit various scopes. Based on Table 2.2, the top three subject areas that have been studied in the scope of halal research, are business, management and accounting, agricultural and biological sciences, and social sciences; representing around 46% of the total subject area that was analysed in the Scopus database from 1996 to 2020. In addition, the Global Islamic Economy Report shows that halal food (65%) has the highest number of articles published in halal research

followed by the general sector (9.5%) and travel sector (8.4%) between 1996 to 2020. (Dinar Standard, 2020). Sectors such as modest fashion, halal media and recreation, halal curriculum, halal science, and intellectual discourse between halal practice and Islamic faith appeared to be as untapped areas in halal research (Hashim et al., 2022).

Table 2.2 Subject Area of Published Documents in Halal Research
Source: (Hashim et al., 2022)

Subject Area	**Frequency**	**% (N=1770)**
Business, Management and Accounting	341	19.2
Agricultural and Biological Sciences	271	15.3
Social Sciences	205	11.5
Engineering	159	9.0
Computer Science	122	6.9
Economics, Econometrics and Finance	101	5.7
Art and Humanities	89	5.0
Environmental Science	58	3.3
Medicine	55	3.1
Biochemistry, Genetics and Molecular Biology	53	3.0
Others	316	17.8
Total	1770	100

Mohamed Ismail et al. (2020) reported that most of the research published was conducted on halal product studies and had parameters such as consumer perspectives, consumer behaviour, and challenges. The author observed that the main scope of halal study undertaken by researchers since 2005, has been related to the field of social

sciences, humanities, business, and management. The author also concluded that the most focus field in halal research based on Scopus articles was on halal food that covers issues in slaughtering, meat, animal, gelatine, and detection method. This finding to some extent suggests the researchers in Malaysia are in trend with the halal industry and the market growth related to the halal ecosystem.

2.2.2 Research Funding

Funding is one of the main and crucial elements of a research project. Even though not every research requires funding, funds or grants assist and support the researcher's expenses. Research funding provides opportunities, career advancement for a researcher, mobility, and trajectory, and it is instrumental in supporting researcher's scientific inquiry (Julia Melkers et al., 2022).

In Malaysia, the government is the main contributor in providing strong funding to Higher Education Institutions (Rahman Ahmad and Farley, 2013). The government provided 70 - 90% of the funds for research and innovation activities (Amran et al., 2014).

Other than government funds, grants are also available from private business entities, foreign-based organisations and corporations, and internal funds of the university (Amran et al., 2014). Prof Datuk Dr. Mohammad Shatar Sabran, Chief Executive Officer of the Malaysia Qualification Agency (MQA) highlighted that more quality research can be produced through grants which can further improve the image of higher education in the country at the national and international level. As a result, it can attract more international students to pursue their education in the country (Petah Wazzan Iskandar, 2022).

Many research grants are available for researchers in Malaysia from both local and international funders. These research grants have various requirements and expected outputs depending on the eligibility, field, and duration of the study. Below is a list of examples of grants for research funding (Table 2.3).

Table 2.3 List of Examples of Grants for Research Funding

No.	Grant Type	Funder	Requirement/Remark
1	Fundamental Research Grant Scheme (FRGS)	Ministry of Higher Education (MOHE)	• For basic/fundamental research • Maximum of 3 years of the study period • No upper limit on grants • Only for full-time academic staff (permanent/contract) - Staff on study leave are not eligible to apply • Field of study: Pure science, applied science, technology and engineering, -medical science, social science & humanities, art & literature, natural science &, natural heritage
2	Long-Term Research Grant Scheme (LRGS)	Ministry of Higher Education (MOHE)	• Requires longitudinal studies of more than 3 years • Only for full-time academic staff (permanent/contract) - Staff on study leave are not eligible to apply • Priority for the project under FRGS • Field of study – global warming, infectious disease, tropical medicine, the safety of energy and water, food diversity, Information and Communication Technology, Manufacturing Technology
3	Trans-Disciplinary Research Grant Scheme (TRGS)	Ministry of Higher Education (MOHE)	• Application must involve at least three (3) institutions. • The program must be multi-disciplinary, involving science & technology corpus and

			• social science & humanity. • Only Malaysian citizens can lead the TRGS program. • Programme Leader is a permanent academic staff (Professor or Associate Professor) and should lead one of the projects in the program. • Minimum two (2) Project Leaders (academic staff) must be a Malaysian citizen. • Total application ceiling for the whole program is RM1,500,000.00. The first-year allocation shall not exceed 50% of the approved amount. • Duration of research is not more than three (3) years.
4	Prototype Research Grant Scheme (PRGS)	Ministry of Higher Education (MOHE)	• Open to academic staff of IPT (Public and Private Institution) • Academic staff (Permanent/contract) must have a co-researcher who is a Malaysian • citizen (permanent academic staff). • Expatriate (permanent/ contract) academic staff are required to have, a Malaysia coresearcher who is a permanent academic staff of the institution. • The amount requested does not exceed the ceiling which has been set at RM500,000.00 with duration maximum research for up to two (2) years only. • The requested grants must involve earning one of the following: Proof of concept, evaluation, up-scaling, pre-clinical testing, field testing • The research results that Prototype grant holders need to achieve are at least one (1) prototype, one (1) intellectual property and commercialisation results.

5	MOSTI Funds	Malaysian Ministry of Science, Technology, and Innovation	• Project application shall encompass the 10-10 Malaysia Science, Technology, Innovation & Economy (MySTIE) Framework by the Academy of Sciences Malaysia (ASM). • Open to companies and businesses registered with the Companies Commission of Malaysia whereas businesses in Sabah and Sarawak are required to be registered with the local authorities • Applicants from public and private Institutes of Higher Learning, Polytechnics, Community Colleges, GRIs and STI agencies are encouraged to collaborate with start-up companies or SMEs (documentary proof shall consist of at least a Letter of Acceptance (LoA) or its equivalent). • The project must be executed in Malaysia. • The project leader who is a Malaysian citizen may appoint project members from international organisations or expatriates who are working in the same institution. • The project team shall comprise members who are qualified and competent in the technical aspects. Each team member shall prepare a curriculum vitae that is clear on his/her research areas, experience and successes.
6	Science and Technology Research Grant	Malaysia Toray Science Foundation	• Each year, 10 to 15 grants of up to RM 60,000 each are awarded to Malaysian researchers below 40 years of age pursuing basic research in science and technology (limited to the fields of natural sciences including the environment but excluding clinical medicine and mathematics). • For energetic and creative young Malaysian researchers.

			• Aged below 40. • Engaged in a basic fundamental scientific research field at a research facility in Malaysia. • Residing in Malaysia. • Individual or Group effort. • Excludes clinical medicine and mathematics.
7	MOH Research Grant	Ministry of Health	• The PI must be a MOH personnel • The research funding period shall not exceed three (3) years • PI is allowed to apply and submit only two (2) research submissions at a time • Investigators who are on study leave are not allowed to be PI. However, he/she can be a Sub-I • Funding scope: travel and transportation, utilities, Rental, food and beverages, raw materials, minor repair and modifications, services, contract personnel and equipment and accessories; related to research activities. • Priority in research evaluation: research that can support and improve an existing policy, methodology, and solution model according to the needs of the MOH; or research covering health issues for the purpose of increasing the value of life in the country and globally; or research must identify and obtain the support of MOH stakeholders; or research that has the potential to contribute to the national strategic plan.

8	Digital Society Research Grant	Malaysian Communications and Multimedia Commission (MCMC)	• The maximum duration of a project is six (6) months including submission of project report • The grant is open to full-time academic faculty in schools of communications, social sciences, humanities or related fields of private and public institutions of higher learning (IHLs) • Lead applicant must hold a doctoral degree • The applicant is responsible for research and financial matters. • The grant amount shall depend on the type and scope of the research project and subject to the guidelines herein may be of a sum of up to Ringgit Malaysia ten thousand (RM10,000) • Focus area: Digital Services, e-Commerce and e-Identity, Technology (Internet of Things, Analytics and Artificial Intelligence); and Trust, Privacy and Security Management.
9	MRC Industry Linkage Fund	Malaysian Rubber Council	• The focus of the programme will be on projects that have the potential to improve the competitiveness of Malaysian rubber products in the global market. Priority areas and products for research are as follows; latex based products, dry rubber products, automation and process improvement, application of rubber in infrastructure and construction, solid waste reclamation/management, wastewater treatment, green and sustainable technology, energy saving, advanced manufacturing

			• Application is open to all researchers who are employed on a permanent or contractual basis with the following organisations: - Public and private institutions of higher learning in Malaysia - Malaysian research institutions and - Registered industries in Malaysia • Application is open to all researchers who are employed on a permanent or contractual basis with the following organisations: - Public and private institutions of higher learning in Malaysia - Malaysian research institutions and - Registered industries in Malaysia
10	CREST R&D Grant	Collaborative Research in Engineering, Science and Technology (CREST)	• Research project involves at least one company pairing with at least one university. • At least one of the universities involved must be located in Malaysia. • Companies involved must not be owned by the university. In the case where the company is a spinoff from the university, the university must not hold equity in the company. • Universities involved must not be owned by the company. In the case where the university is owned by the company, the company and the subsidiaries of the companies are not eligible to be the partner of the university. • Either project lead or principal investigator must be Malaysian citizen. In the event the project lead and principal investigator is the same person, he / she must be Malaysia citizen.

			• Full-time postgraduate student researchers and full-time post-doctorate researchers whose tuition fees and allowance are paid by CREST R&D Grant must be Malaysian citizen. • Students involved in the research project shall not be the project leader. • Approved funded research duration corresponds to research scope. Maximum approved duration is not more than 3 years. • Industry contribution must be at least 50% of the total research project budget.

2.2.3 Research Output

Research output can be referred to as products or outcomes gained from the research projects. Published articles in indexed databases are the most frequent indicator used to measure research productivity (Valdivieso et al., 2022).

Apart from the number of articles published, citations are also considered research output. Citation is referred as a text and used by the researchers to critique or acknowledge previous research work (Khatoon et al., 2024). Uddin and Singh (2014) mentioned that citation with a higher count for a research paper is a weigh of its expansion contribution as well as its impact in a particular research area. Besides, it also indicates its impact and quality when it is cited by other researchers.

The field of research also influences the scope of the publication. The field with a larger market will dominate the publications system, for instance, the field of history of science has less publications due to its small market segment (Young NS et al., 2008). This suggests that not all fields in research development are well-explored. The field of studies with a larger demand for exploration and finding solutions to certain specific problems often dominates the research area.

Previous studies have explored various factors that possibly affect the output of research such as gender, age, academic qualification, recognition, the size of academic departments, leadership in research groups, and others. For example, these factors can be evaluated in the individual characteristic category as well as environmental characteristics (Valdivieso et al., 2022). It is understood here that research output does not depend on one sole factor but takes into consideration of the situations and conditions of the research.

2.3 REVIEW OF EMPIRICAL PAST LITERATURE

Studies on research output in general is very limited. Table 2.4 shows several studies conducted in relation to funding and its research output. During the course of this work, no study was found to be reporting on the funding trend and outputs of halal research.

Table 2.4 Studies Related to Funding Trend and Research Output

No.	Research Focus	Country	Element of Funding Trend Studied	Type of Research Output Studied	References
1	All field*	Western Europe	Year, funder, funding amount	Publication	Hussinger and Carvalho (2022)
2	All field*	South America	Not applicable	Publication	Valdivieso et al. (2022)
3	Health	Pakistan	Year, funder, funding amount	Publication	Saqib and Rafique (2021)
4	Biomedical	Australia	Year, Funder	Publication, commercial contracts, Invention disclosures, patent applications, Intellectual property	Webster et al. (2021)
5	Not applicable	China & European Union	Year, Funder	Publication	Wang et al. (2020)
6	Science, Technology, Engineering	Singapore	Funder	Patent licensing, consultancy, advisory,	Hooi and Wang (2019)

	and Mathematics			academic spin-off	
7	Health	Malaysia	Year, Funder	Publication	Fun et al. (2019)
8	All field*	Malaysia	Year, Field, funding amount	Publication, citation	Henry et al. (2018)
9	Agricultural Science	Greece	Year, Funder, funding amount	Publication, citation, patent	Kyriakos et al. (2015)
10	All field*	Italy	Year, Funder, field	Not Applicable	Muscio et al. (2014)
11	Pure science and engineering	Korea	Not applicable	Publication, patent	Kim (2014)
12	Health	United States	Year, Funder	Publication, citation	Jacob and Lefgren (2011)
13	All field*	New Zealand	Year, Funder	Publication	Smart (2009)

Note: All Field: Most of the studies observed the overall picture without specifying fields, the study intended to explore the areas of study funded by a certain funder

Generally, previous research on funding trends focused on the year and the funders. Meanwhile, most research focused on publication as the research output with very few include other outputs such as patents and citations. Most of the studies observed the overall picture without specifying fields, where the work itself intended to explore the areas of study funded by a certain funder. However, there are some studies

in specific fields with health area being the most studied. No similar study was found to have been conducted for halal areas.

Most past studies have highlighted that research output such as publication numbers and citations can be influenced by research funding. In general, the results appear to have mixed relationships between the type of research funding and the quantity and quality of research output. However, a study found that all the funding is positively associated with the research output though the relationships are not always statistically significant (Kyriakos et al., 2015).

A study conducted by Jacob and Lefgren (2011) focuses on the causal effect of receiving a U.S. National Institutes of Health (NIH) grant on the research output in terms of publications and citations. Data on NIH funding was taken from previous grant applications between 1980 and 2000. Findings showed that the NIH used one-third of $31.2 billion in total funding per year for the purpose of research and training. Funding decisions are made within institutes and review groups from various institutes. Generally, over 90 percent of applicants have at least one publication in the first period of five years after the application takes place.

Another study by Hooi and Wang (2020) examines the relationship between the sources of research funding and academic engagement in Singapore. Data for the study were obtained from a survey conducted at two universities in Singapore; The National University of Singapore and Nanyang Technological University. These two universities were chosen because both have a long history with established STEM departments.

Based on the study, the author observed that industry funding demonstrates a positive relationship with academic engagement compared to government funding. Industry funds may contribute to creating connections and supporting relationships between industry and scientists. Hooi and Wang (2019) also added that academic scientists may be more often requested to collaborate with firms through consultancy services, board memberships, and expert opinions.

Another research conducted in Pakistan by Saqib and Rafique (2021) assessed health research funding and its output over five years. Data for this study was collected from three major Pakistani funding agencies; Pakistan Health Research Council, Pakistan Science Foundation, and the Higher Education Commission. For the research

output, data were taken based on the number of publications in both local and international journals in the Pakmedinet and PubMed. In this study, international funding showed an inconsistent pattern while local funding portrayed a significant increase. This study points out that health research output was directly associated with adequate resources.

In a study conducted by Henry et al. (2018), there seems to be a relationship between funding and research impact at Universiti Teknologi Mara (UiTM), Malaysia. The study focused on the publications published by UiTM from 2007 to 2016. The data extracted from the Web of Science (WoS) Core Collection as the database serves as the reference source for Malaysia's Research Star selection by the Ministry of Higher Education (MOHE). The result showed that 32.53% of the publications published by the university were funded from 2007 to 2016. The researcher also found that a high number of publications came from funded research compared to unfunded research. This indicates that financial aid is key for fostering a quality research and produce significant publications whereas it ultimately boosts the institution's research productivity.

Besides, Henry et al. (2018) also found that the high number was also exhibited by the number of citations from the funded research whereas the highest citation was in the field of Clinical Medicine, Chemistry and Mathematics in most science and technology fields. These findings indicate that financial support in research activities is crucial to encourage the researcher to cultivate the culture of doing research. Such impactful research output will not be possible without support from the funding; thus, researchers should attempt to seek funding from relevant sources, either from the government, private or international sources.

Valdivieso et al. (2022) discover that resources allocated to research activities are important in enhancing the productivity levels of the researchers. The author also suggests that universities should give financial support to promote a culture of excellence in research, especially for doctoral programmes in addition to non-monetary research awards. Other than that, the author also stressed the importance of allocation of internal funds to cultivate research activities and support in acquiring external funding for research projects. Figure 2.1 demonstrate that there are several factors influencing the research output of university professors. Besides age, academic rank,

work habits, recognition and leadership in research groups, resource allocation is highlighted as having a direct effect on research output.

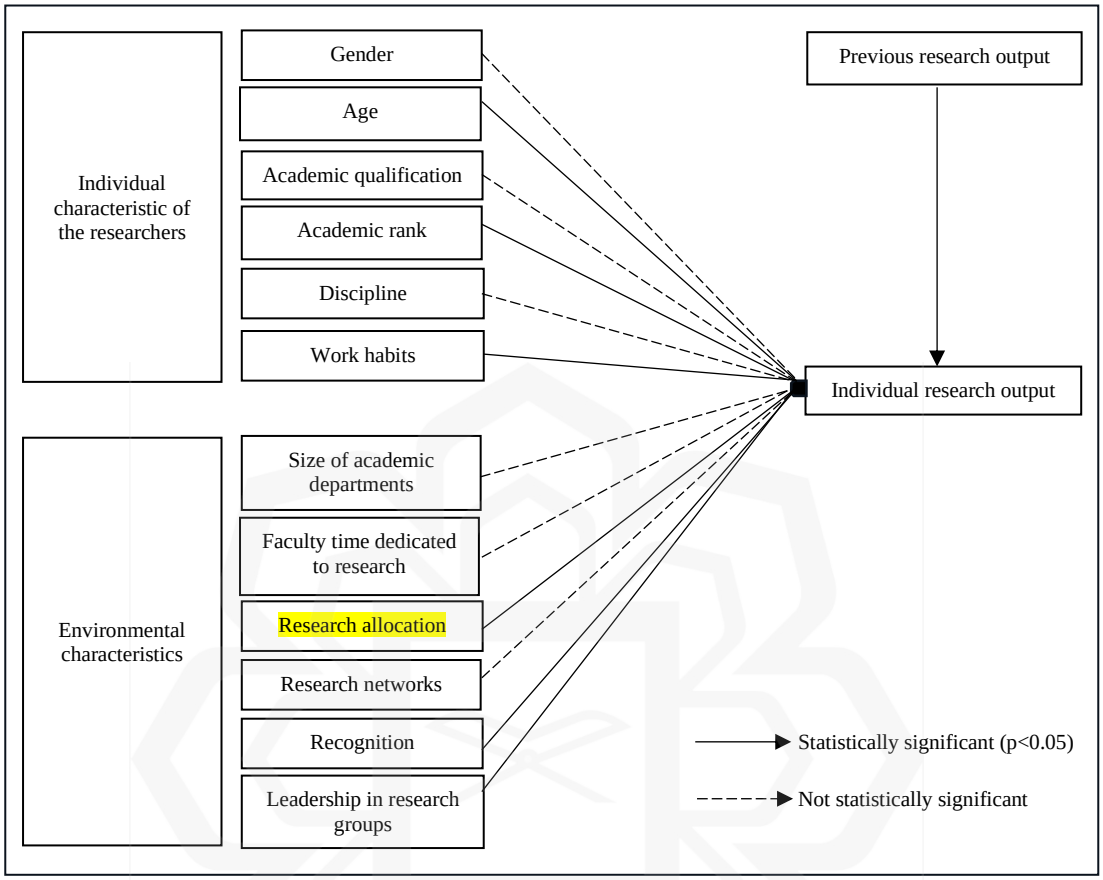


Figure 2.1 Factors that Influence the Individual Research Output

Source: (Valdivieso et al., 2022).

To this end, based on the previous literature, there is still a lack of studies specifically focusing on halal-related research area. As halal industry is growing tremendously, research and development activities should also be in line with such growth. More projects should be studied and focused on this field to benefit various stakeholders.

2.4 CONCEPTUAL FRAMEWORK

Existing works have demonstrated some limitations particularly on the research output studied. While there are some literatures discussing on funding and research output, there is no specific study done in the halal-related area. Considering the current development of the halal industry which has high demands in the market and the importance of halal research and development as well as its exploration, this study is timely to describe the funding trends and outputs of halal-related research projects. Although the work is undertaken specifically for halal-related research in IIUM, the findings are useful to develop a framework to effectively assess the output of the halal-related research, which is the third objective of this study. Based on the past literature, the funding trends were accessed based on the year, funder and field, amount approved, and kulliyyah (faculty) (Table 2.5). The outputs of funding were studied based on talent, publication, intellectual property, product, prototype/commercialization, collaboration, award, policy paper and conference.

Table 2.5 Conceptual Framework

Funding Details	**Output/Achievement**
• Year • Funder • Field/area/scope • Amount approved • Kulliyyah (faculty)	• Talent (Graduate Research Assistant (GRA), Research Assistant (RA) • Publication (number, citation, quality index), • Intellectual property (copyright, patent, trademark, utility invention, trade secret) • Product, prototype/commercialization • Collaboration (local, international) • Award (local, international) • Policy paper • Conference (local, international)

2.5 SUMMARY OF THE CHAPTER

This chapter discusses the overview of the research and consists of a discussion about halal research, research funding, and research output. Next, the review of the past literature is also provided to highlight the gap in the past studies which related to research funding and halal-related projects. At the end of this chapter, the conceptual framework was discussed portraying the framework chosen to guide this study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION TO THE CHAPTER

Every research requires the researchers to design and plan their study to help identify and define the focus so that the objective of the study can be achieved. The specific techniques chosen will assist the researcher in keeping track of the research outline and data analysis. This chapter laid out the overall design of the research with description of research approach used, population, sampling of the study, research instrument, and data collection procedures. Figure 3.1 demonstrates the flowchart of the study.

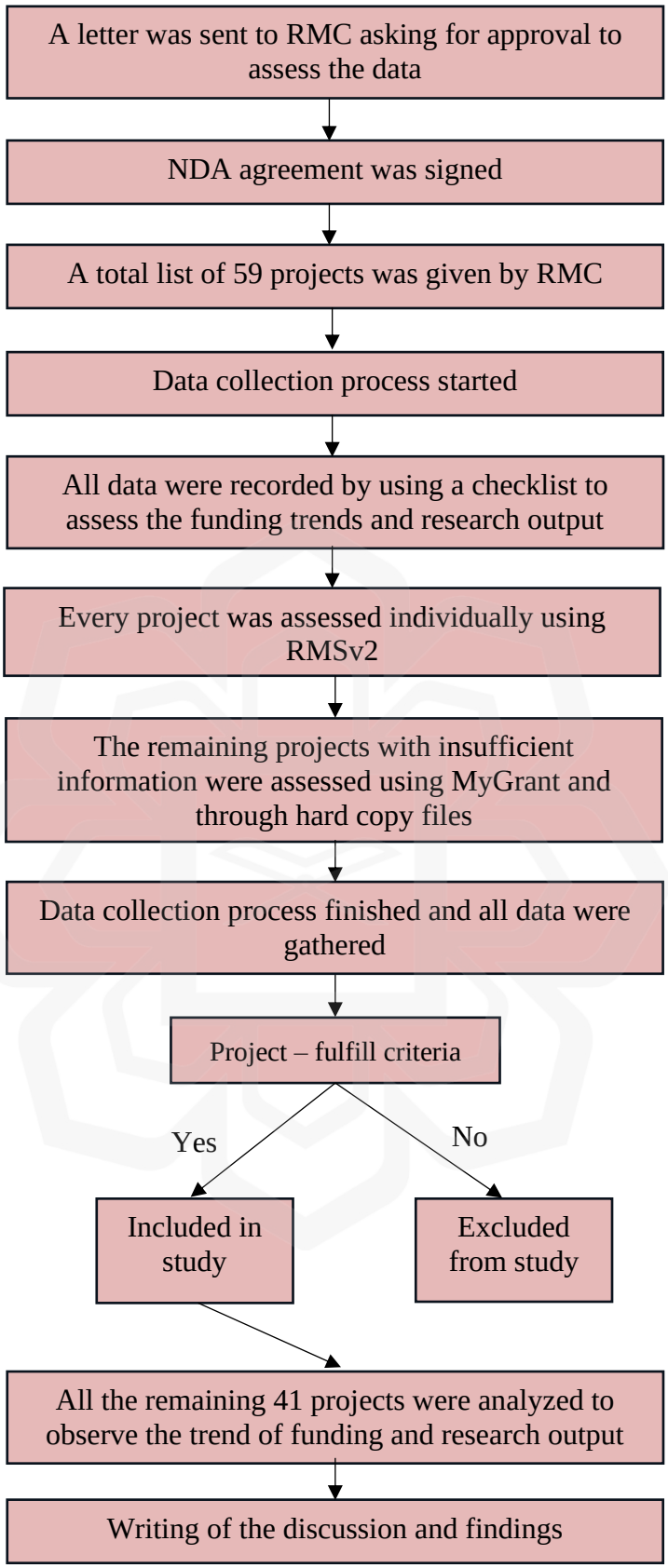


Figure 3.1 Flowchart of the Study

3.2 RESEARCH DESIGN

This research focus on using qualitative methods to obtain the data for the study. The types of data that were collected consist of secondary data and, final report of the research project. This study took a qualitative document analysis approach given as it collected data which can be categorized as records in the form of documents that consist of information related to the needs of this study.

Document analysis is a systematic procedure for researchers in reviewing or evaluating printed and electronic (computer-based and internet-transmitted) document material. It involves the process of interpreting the data and gaining an understanding of the information they provide (Indeed, 2022). The systematic evaluation of the documents is used as a part of study and it may appear in diverse forms such as advertisements, agendas, attendance registers, minutes of meetings, manuals, background papers, books, and brochures, diaries and journals, program proposals, application forms, organisational or institutional reports, survey data, and various public records (Bowen, 2009). Document analysis will help a researcher describe and identify patterns in the data. Besides, it also helps in retrieving useful information and assists in answering the research question of a particular study. This approach is suitable as this study aims to assess the trends and output of funding towards research output in IIUM.

This study also adopts a self-reflection research method to propose a framework for assessing the outputs of halal-related research projects funded at the International Islamic University Malaysia (IIUM). Self-reflection, as a qualitative research approach, enables the researcher to gain knowledge through moments of self-discovery and insights, enhancing the shared understanding of the research process (Franks, 2015). Unlike traditional methods that require systematic analysis or in-depth interpretation, self-reflection focuses on the authentic observation of personal behaviours and experiences within the research process (Zajonc, 2009). This method is often used in ethnographic studies (Ryan, 2021). Self-reflection is a well-known method in qualitative research, especially from constructivist, feminist, interpretivist, and poststructuralist perspectives (Denzin, 1994; Lather, 1991; Mac Naughton et al., 2001). However, it offers benefits beyond being a suitable research method that aligns with specific research paradigms. According to Ortlipp (2008), critical self-reflection can actively influence the research process itself, allowing adjustments to the research

design, chosen methods, and overall approach. Data collection involved an iterative self-reflection process, which provided a comprehensive understanding of issues encountered during data collection. Reflection also highlighted opportunities for improving the management and assessment of halal research funding. The reflective process, carried out over 13 months (during data collection and analysis), also involved regular discussion sessions with the supervisors. This method requires the researcher to engage their mind in activities, report self-observations, and then produce written texts (Franks, 2015). By engaging in this contemplative process, the researcher generated valuable insights that informed the development of the proposed framework.

3.3 RESEARCH POPULATION

The research population of this study was the final reports of research projects that were obtained from the Research Management Centre (RMC) of the university (IIUM). This population was chosen considering the accessibility of information needed as well as to achieve the objectives of the research. The final reports of research projects are only focused on the projects which have been registered with RMC hence available in the RMC. All relevant records in the scope were included from the earliest database until the most recent active research in the university. In addition, this study does not restrict the population to any specific principal investigator or co-researcher in IIUM only but it includes all the projects available in the RMC database within the stipulated period.

3.4 SAMPLING PROCEDURE AND SAMPLE SIZE

There are many ways or techniques that can be used for a researcher to adopt the sample from the population. In this study, documents were purposefully sampled, with the aim of undertaking a rich and in-depth interpretation, rather than a systematic attempt to sample documents representative of all final reports available in IIUM.

The samples in this study were focused on the halal-related project awarded to researchers by any funders at IIUM. The data needed can only be assessed after obtaining the information from Research Management Centre in IIUM. The halal related projects in this context refer to projects that have the '*halal'* in the title, keywords, and executive summary or abstract. The data was collected from the earliest

database to the research projects completed in 2021. The scope of samples was broad and it may include diverse sectors of halal such as halal food, halal pharmaceutical, halal business, halal tourism, halal logistics, halal biotechnology, halal personal care products, halal service and transportation. However, the Islamic finance-related project, was excluded in the focus of this study.

3.5 RESEARCH INSTRUMENT

The instrument of study is explained as a tool used for collecting data or the technique utilised for collecting the required data from the respondents (Salwani, Rabiul Islam, Harun, 2019). As mentioned previously, this study utilized secondary data to obtain the information needed to answer the research objectives. The secondary data was collected by assessing the documents from the research centre in the university focusing on the halal-related project awarded to researchers by any funders in IIUM. Guided by the conceptual framework (section 2.4), a checklist (Appendix I) was developed to assist the assessment of the funding trends as well as the output of the research. A checklist is a useful tool for document analysis because it helps researchers to systematically analyse the content of a document. Items in the checklist were identified from various literature. The checklist includes items such as the year, the grantor, and the field of research to evaluate for trends. The output includes items such as talent, publication (number, citation, quality index), intellectual property, product, prototype/commercialization, collaboration, award, and policy paper.

3.6 DATA COLLECTION PLAN

The process of collecting the data for this research involves secondary data collection. Secondary data, which involves the data of halal-related research project funding at IIUM was collected from the Research Management Centre, IIUM. A letter with an attached research proposal was sent to the research centre requesting permission to assess the data regarding the research that has been funded by any agencies. The data were collected from the RMSv2, MyGrant, and through hardcopy files of the projects to access the final report and other related attachments.

3.7 DATA ANALYSIS PROCEDURE

All the data from secondary sources were gathered, which consisted of information on research projects funded by the university. Document analysis involves several steps: skimming (superficial examination), reading (thorough examination), and interpretation. The method of analysis was based on content analysis (Bowen, 2009). Content analysis allows the quantification of qualitative information by sorting and comparing various pieces of information in order to summarize it into useful information. It involves systematically and objectively counting and analysing the occurrence and use of certain words, themes, or concepts in a body of text (Columbia Mailman School of Public Health, 2022). This allows generation of descriptive data (frequency count) to describe the trends of the funding of research projects and the output of funding in halal-related research projects at IIUM. Data from document analysis was collated in an Excel sheet to be analysed. During the data analysis process, the collected information was categorised into funding trends and output categories. The funding trends data, including approved amount, field, funder name, and type of funder, was provided by RMC, which helped to understand the funding patterns. However, for the output information, it requires a meticulous effort to sort and search for relevant information based on the data gathered during the initial phase. For the publication output, the publication type was recorded and thoroughly checked whether it was indexed or non-indexed. The indexed publications were limited to those listed in Web of Science, Scopus, and MyCite, and only included publications from the year 2022 for Scopus and 2021 for WOS. This information helped to gain a comprehensive understanding of the project's output. Finally, the Spearman correlation was used to determine the correlation between the funding trends and the output. This was done using SPSS v27. Table 3.1 shows the summary of the instruments and the method used to analyse the data based on the research question.

Table 3.1 Summary of Research Questions, Instruments and Method of Analysis

	Research Question	**Instrument**	**Method of Analysis**
1	What are the trends of the funding in halal-related research projects in IIUM	Checklist/Form	• Content analysis • Descriptive Analysis
2	What is the output of funding in halal-related research projects in IIUM	Checklist/Form	• Content analysis • Descriptive Analysis
3	How to effectively assess the output of funding for halal-related research projects in IIUM?	Not applicable	• Self-Reflection

3.8 SUMMARY OF THE CHAPTER

This chapter provides the overall view of the research methodology of this study. The workflow together with the research design of this study were properly explained at the beginning of this chapter. Besides, the population, sampling, and research instruments were also discussed in this chapter. In the last section of this chapter, the data collection plan and data analysis procedure were also explained.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION TO THE CHAPTER

This chapter discusses the results of funding trends and research project outputs from analysing all 59 recorded projects obtained from IIUM Research Management Centre (IIUM-RMC). After screening based on a set of selection criteria, 41 research projects were included in the analysis of the study. The chapter also presented the proposed framework developed in this study that can be used by interested parties to effectively assess the trend and output of research fundings.

4.2 FUNDING TRENDS

4.2.1 Year

Following data analysis, it was observed that the 41 research projects span over a period of ten years, from 2012 to 2022 (Figure 4.1). There was a fluctuating trend of projects over the years, with 2015 having the highest number of grants, having a total of 12 projects granted. The year 2013 and 2019 also have a considerably high number of projects (9 and 8 projects respectively) in comparison to other years of study. The high number of projects granted in these years might be attributed to the growing demand for research activity on specific topics of halal.

According to the list of the projects provided by the IIUM Research Management Centre (RMC) there were no grants provided for any research related to halal in 2014 and 2017. There were eight projects in 2019 but this number substantially dropped to only one project in 2020. This trend could be affected by the outbreak of Covid-19 towards the end of 2019 and early 2020, which resulted in restrictions on movement, and preventing many educational activities, including physical classes, research activities, and field projects. Despite these challenges, research in halal industry remains as an important effort to ensure that the products and services offered in the industry are compliant with the halal standards.

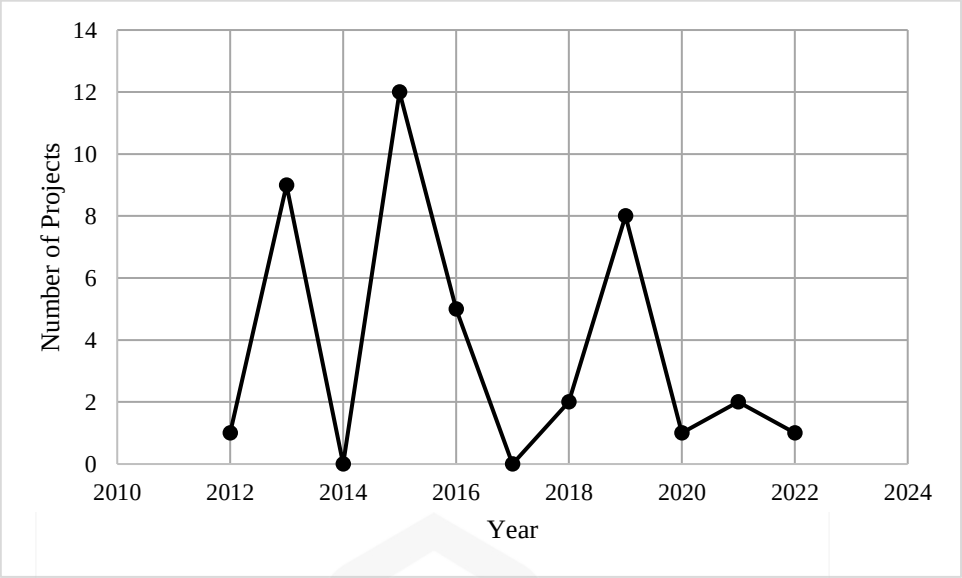


Figure 4.1 Halal-Related Research Projects Conducted by Researchers and Registered in the IIUM Research Management Centre

4.2.2 Funders

Based on Figure 4.2, the Ministry of Higher Education was the primary funder for the research grants (26 projects out of total 41 projects). These projects include the Fundamental Research Grant Scheme (FRGS), Malaysian Higher Education Grant (MOHE), Prototype Development Research Grant Scheme (PRGS), Trans-disciplinary Research Grant Scheme (TRGS), Exploratory Research Grant Scheme (ERGS), and MyRA Incentive Grant Scheme. The university sponsored 14 projects, all of which were under the Research Initiative Grant Scheme (RIGS). Only one project was sponsored by a private (local) funder. These findings indicate that the government is the major source of funding for research activities.

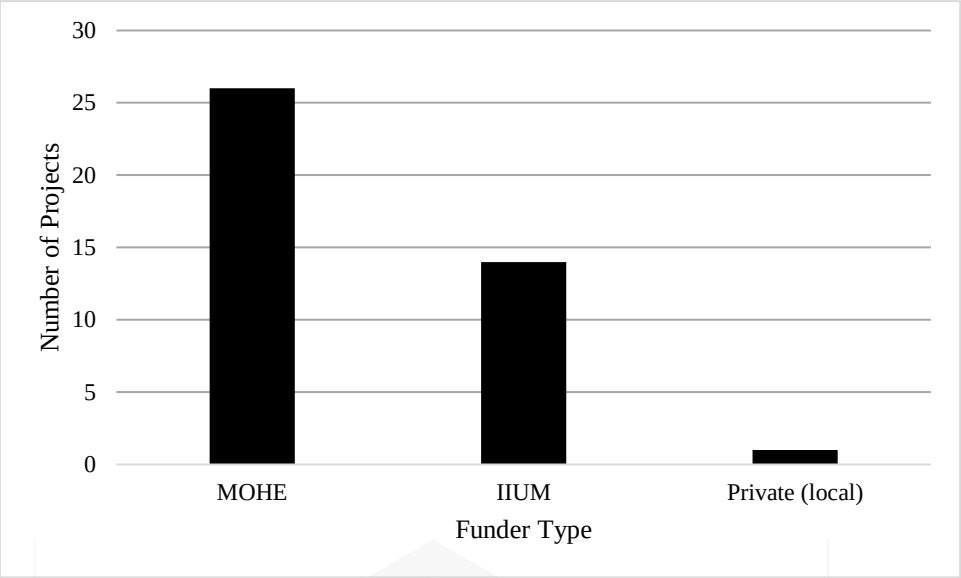


Figure 4.2 Categories of Funder of the Halal-Related Research Projects

Note:

- MOHE: Ministry of Higher Education
- IIUM: International Islamic University Malaysia

On the other hand, based on Figure 4.3, the university also provided some funding for the projects. They granted a lower amount of money through initiatives like the Research Initiative Grant Scheme (RIGS). It can be concluded that both the Ministry of Higher Education and the university played an important role in funding these research projects. The funding provided was essential to ensure that each project had the necessary resources to succeed.

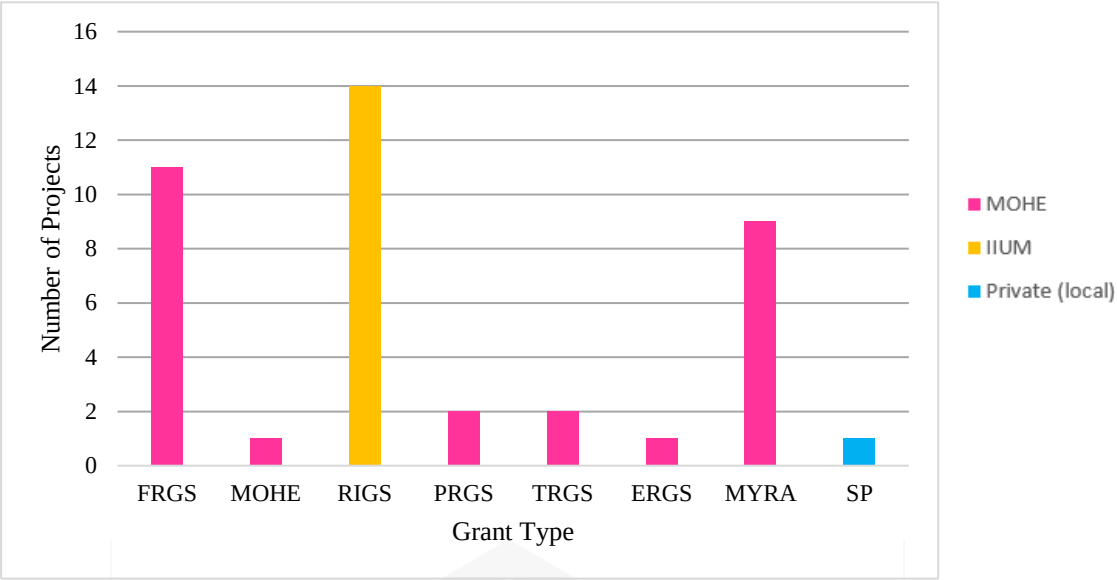


Figure 4.3 Type of Grant of the Halal-Related Research Projects Categorised based on the Specific Types of Grants

4.2.3 Amount Approved

The total amount of grants approved for all 41 research projects reached the amount of RM3,408,280. Based on Figure 4.4, the research projects received a minimum of RM10,000 in funding. None of these projects were approved for an amount exceeding RM300,000. Research projects in the science and technology field were observed to acquire a higher amount of funding. The highest amount of funding approved for these projects came from the Ministry of Higher Education under the grant MyRA Incentive Grant Scheme (RM280,000), and the Trans-disciplinary Research Grant Scheme (TRGS) (RM252,030).

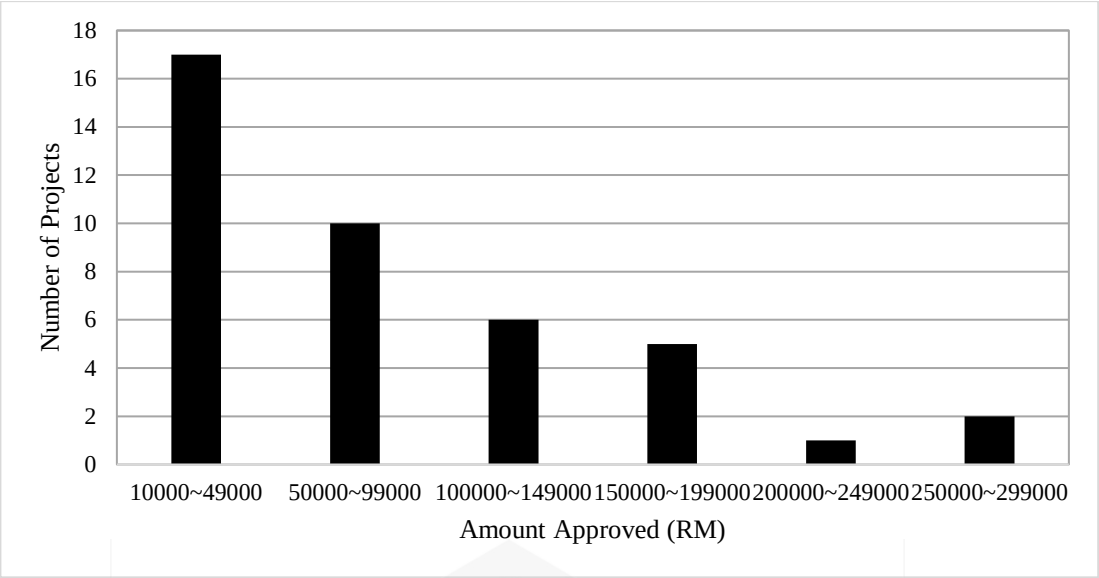


Figure 4.4 Total Grants (RM) Approved for the Halal-Related Research Projects

4.2.4 Faculty (Kulliyyah)

Looking deeper into the 41 halal-related research projects registered at the Research Management Centre (RMC), it was observed that the projects were conducted by researchers from various faculties (Kulliyyahs) and institute, namely the International Institute for Halal Research and Training (INHART), Kulliyyah of Pharmacy (KOP), Kulliyyah of Engineering (KOE), Kulliyyah of Economics and Management Sciences (KENMS), Kulliyyah of Allied Health Sciences (KAHS), Kulliyyah of Science (KOS), Abdulhamid Abu Sulayman Kulliyyah Of Islamic Revealed Knowledge And Human (AHAS KIRKHS), Kulliyyah of Dentistry (KOD), and Kulliyyah of Architecture and Environmental Design (KAED). Based on Figure 4.5, INHART was observed to be the most active Kulliyyah, contributing 12 research projects, followed by KOP and KOE. KAED and KOD had the least number of halal-related research projects, suggesting that they may be focusing on different areas of study.

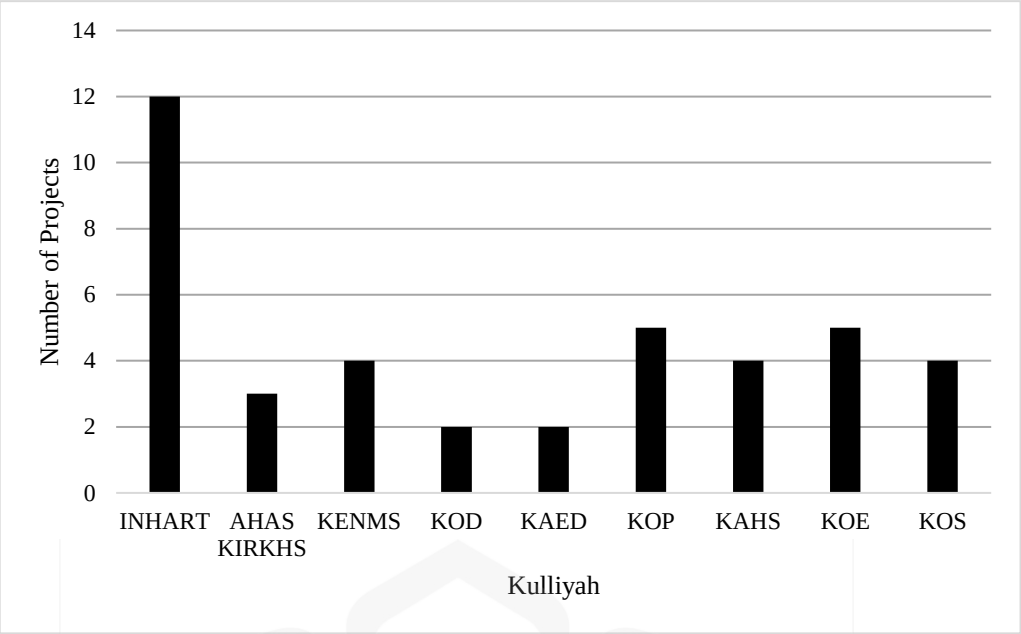


Figure 4.5 Halal-Related Research Projects Based on Kulliyyah/Institute at IIUM

Notably, since the inception of INHART in 2011, the Institute fulfilled its role in spearheading halal-related activities, particularly in halal research. The research projects from INHART primarily focused on topics such as collagen and gelatin, halal authentication and portable halal devices.

On the other hand, the Kulliyyah of Pharmacy received more funding for research related to halal pharmaceuticals and formulation. This research included the formulation of halal cosmetic products and study on the evolution of halal medication.

4.2.5 Field of Study

Based on projects reported in Figure 4.6, most of the research granted are from the science and technology (S&T) field which covers 78% of the total projects. The non-S&T projects (22%) were observed to come from three major kulliyahs; Abdulhamid AbuSulayman Kulliyyah of Islamic Revealed Knowledge and Human Sciences (AHAS), Kulliyyah of Economics and Management Sciences (KENMS) and Kulliyyah of Architecture and Environmental Design (KAED).

It was observed that there were discrepancies in the categorisation of S&T and non-S&T projects with their respective project titles. This could be due to the fact that the categorisation has been done by RMC based on the Kulliyah name. The generalization of the field based on the kulliyah is not an accurate process as any Kulliyah can produce diverse topics in research including S&T and non-S&T. Hence, to avoid these discrepancies, it is advisable to consider a refining process of the categorization of S&T and non-S&T projects based on their project titles. The process may involve deep reviews on researches' objectives, scope, and findings to ensure the accurate categorization are done under the appropriate classification.

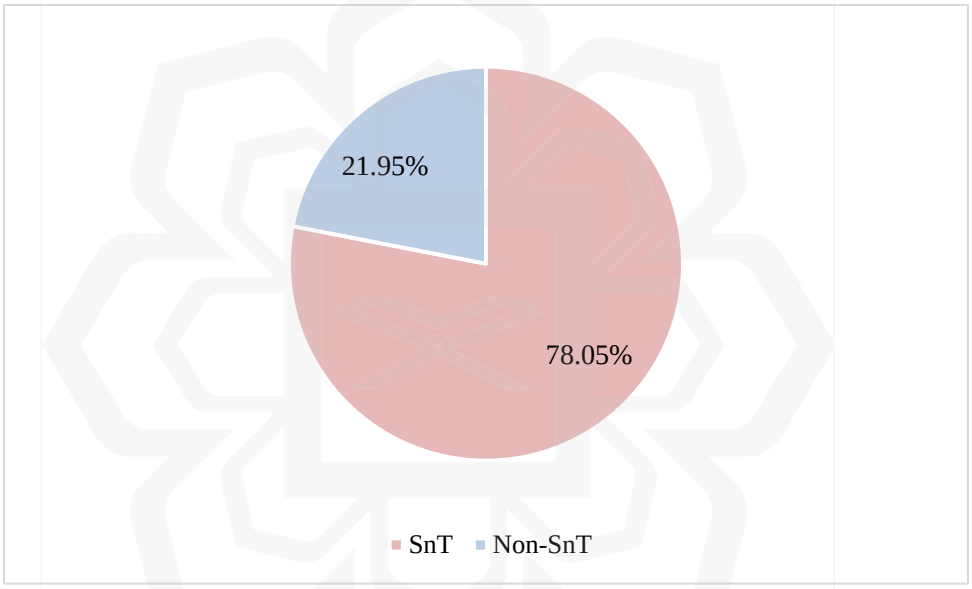


Figure 4.6 The Halal-Related Research Projects Categorised into Science and Technology (S&T) and Non-science and Technology (Non-S&T) Field

Besides, the classification of the projects also was done based on the Global Islamic Economy Report (GIER) sectors. Based on the 41 projects recorded, it is observed that the number of Halal Food is the highest sector among all sectors listed. Halal Pharma also dominates the sector of the projects with five projects observed to fit this category. Based on Table 4.1 there was no project under the Muslim Friendly Travel category. There are several areas of studies which did not clearly fit into any of the categories on halal sectors based on the Global Islamic Economic Report (GIER). These

studies were categorised into ‘others’. This includes the studies related to agriculture, health, technology, engineering, and microbiology.

Hence, it is observed that Halal Food still dominates the sectors in the research and development area indicating the demands and its importance. However, it is undeniable that other sectors also play a crucial role in the halal field as these sectors as they contribute significantly to the public in term of knowledge as well as services. Hence, the least sectors mentioned earlier need to be focused on in the future to open more space for research and development to benefit a wider audience globally.

Table 4.1 Number of Research Projects Based on Categorization by the Global Islamic Economy Report (GIER)

No.	**Sector**	**Number of Projects**
1	Modest Fashion	1
2	Halal Food	15
3	Halal Pharma	5
4	Muslim Friendly Travel	0
5	Media and Recreational	1
6	Islamic Finance	1
7	Halal Cosmetics	2
8	Others	16

While research is commonly being categorized into S&T versus non-S&T as in the case of this work, it is interesting to note that the halal-related studies may likely be conducted using multidisciplinary approach. This refers to study of a research topic from multiple disciplines at the same time as it incorporates perspectives from different disciplines that enrich the understanding of any topic. While this approach goes beyond disciplinary boundaries, its goal remains within the framework of disciplinary research (Nicolescu, 2014).

For instance, in relation to halal-related research, the work may have both the elements of pure sciences and social science with a reference to religious studies (shari'ah) as well. The concept of the halal area is deeply rooted from the Quran. Even for researchers focusing on the S&T field, it is highly advantageous for them to incorporate shari'ah perspective in their work. In addition, when writing a paper, it is not merely about conveying information, but it also serves as a platform to cultivate awareness about halal practices from an Islamic standpoint. It is crucial to acknowledge that the halal field is important, and its significance extends beyond worldly affairs and holds relevance for the afterlife as well.

To conclude, it is better to develop a more refined category of research that can be used to better identify and understand the field of work of halal-related research that has been done.

4.3 OUTPUT

4.3.1 Talent

After analysing the data collected from the 41 projects, it was observed that there was a notable difference in the trend of output data across the various categories of projects. In total, the projects produced 59 talents, and it was discovered that Master's students accounted for the highest number of talents with 14 identified (Figure 4.7). This was followed closely by Ph.D. students with 15 identified talents. The remaining talents, totalling 30, were categorized as "others," which included undergraduate students and research officers. While it is easy to assume that the amount of grant is positively related to the number of talents nurtured. However, this is not necessarily the case in all projects especially when the categories of talents are not clearly defined. For instance, one project that was approved for an amount below RM50,000 reported to produce seven undergraduate students as talents. To this end, it is important for the funder as well as the monitoring agency to be clear of the definition of talent.

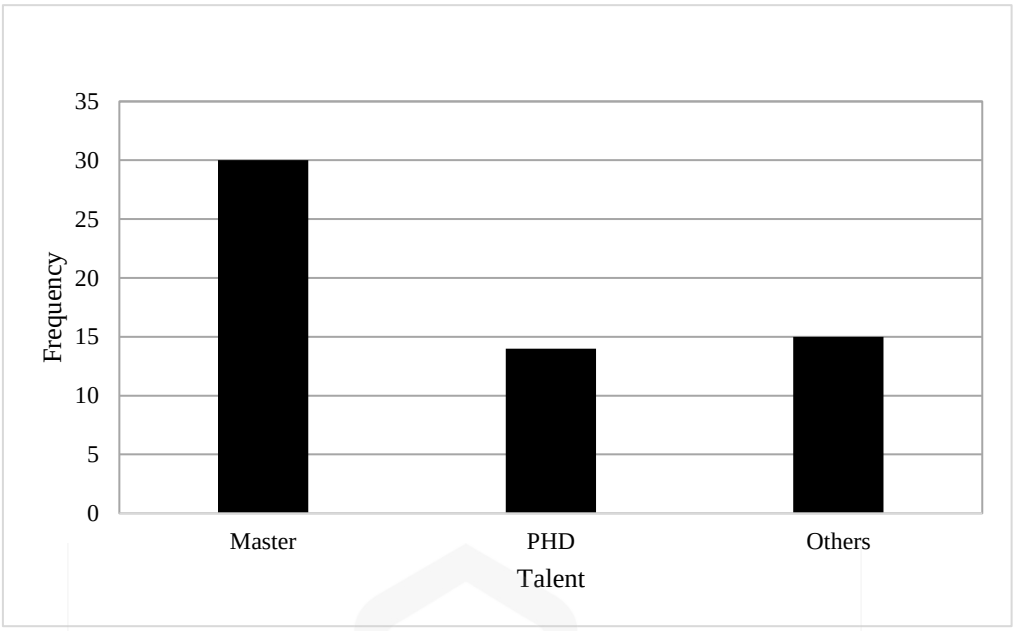


Figure 4.7 Talents Nurtured and Produced by the Halal-Related Research Projects

4.3.2 Product and Prototype

In product, prototype, and commercialization output, based on the data analysed, only 4 out of 41 projects have successfully translated their findings into products which only represent 12.5% of total projects. Skin cream and plant-based burger patties were among the examples of the product reported in the projects. This small percentage obtained from the analysis of products produced by the researcher could be indicating several scenarios. One, the scopes of the other projects may not involve development of products. It could also mean that the funding may not be sufficient to include product development. This finding portrays that there is an urgent need to increase funding and other resources to support the development and commercialization of halal products and services that have the potential to have a significant impact on society.

4.3.3 Intellectual Property

Only 26 % of the projects managed to produce intellectual property. Out of these 11 identified projects, four patents were still in the application process. One of the intellectual properties is categorized as a utility innovation, while the other six are in

either the trademark or copyright category. This low number of intellectual properties produced may be due to various reasons. One of the possible reasons is that producing intellectual property is not a mandatory output required by most of the funders such as FRGS and TRGS. This means that some research projects may not have a specific priority or allocation of resources specifically for intellectual property due to the fact that most of the funders focused on the production of the talent and publications output. Additionally, for a researcher to register for intellectual property, this process may cost a large amount of money, hence, it is advantageous for the funded research to finance its cost. Besides, it also may be time-consuming, which may discourage some researchers from pursuing it. However, this output holds valuable assets for researchers as it not only protects their work but also can provide recognition and financial benefits.

4.3.4 Conferences

Next, in the field of research, conferences play a vital role in sharing knowledge, ideas and insights among researchers. In this study based on the 41 projects, 59 conferences were reported, both locally and internationally, as a platform for researchers to present their papers and participate in conferences (Figure 4.8). The conferences were divided into two types, local and international. Interestingly, the frequency of conferences was not significantly different based on the amount of grants approved for research projects. This implies that even those research projects that received the least amount of funds still had the opportunity to participate in local and international conferences. In addition, some projects did not require much financial assistance to travel and participate in conferences outside the country specifically for the virtual conferences, which became more common during the Covid-19 pandemic outbreak in 2020 and 2021. This allowed researchers to participate in conferences from their own homes with comfort, without the need for traveling and other associated expenses. Most of the international-level conferences were held in Malaysia (24 conferences), specifically in Kuala Lumpur (7 conferences) and Putrajaya (4 conferences).

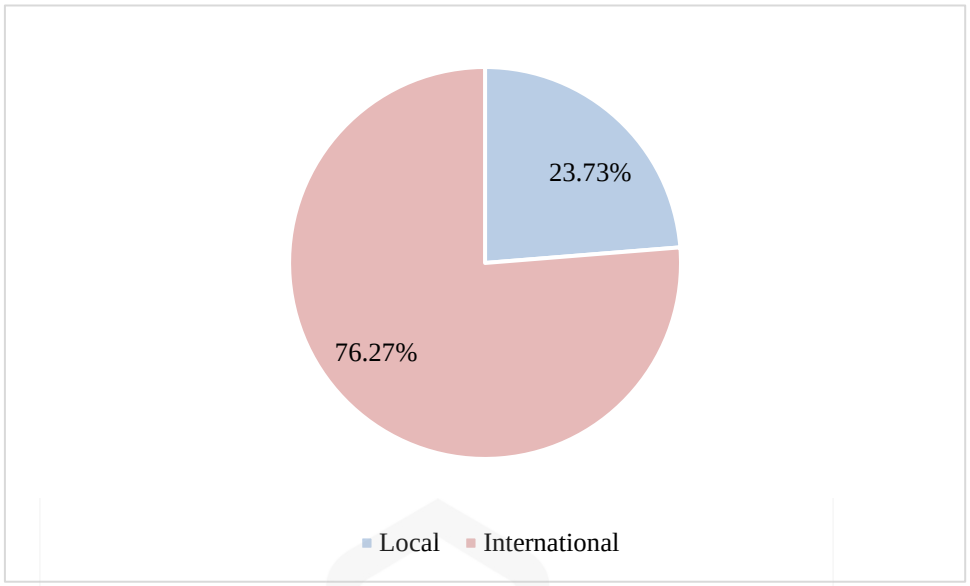


Figure 4.8 Local and International Conferences Participated by the Researchers of the Halal-Related Research Projects

The choice of the type of conference (face-to-face, virtual, or hybrid mode) lies on the interest and preference of the researcher. The virtual conference is said to have more significant effectiveness than the face-to-face mode as reported in a study by Hofstädter-Thalmann et al. (2022) as it attracts more participants from all over the world geographically. Moreover, this mode of conference is said to give more benefit to the economy and environment. Economically, the fees are less expensive for this mode, and it is said to be environmentally friendly as it will save cost for travel. A study by Palacios et al. (2022) described that virtual conferences give opportunities to the attendees to make the conference materials available for a period of time which they will able to revisit or watch whenever they miss the live sessions. However, the virtual format of a conference may not suit different learning styles, although the same disadvantages exist in the face-to-face format. In addition, the face-to-face format has been described to have the advantages of effective networking beyond the academic setting where physical conferencing commonly involves social events such as luncheon, dinner or even excursions.

4.3.5 Collaborations

Next, based on the data analysed, it was found that twelve local universities and one international university engaged in collaboration in some of the projects. Based on Figure 4.9, the majority of collaborations were observed to be between local universities in Malaysia, including Universiti Kebangsaan Malaysia (UKM), Universiti Sains Islam Malaysia (USIM), Universiti Malaysia Pahang (UMP), and Universiti Malaya (UM). In addition, collaborations with external agencies such as the Forest Research Institute Malaysia (FRIM), Malaysian Agricultural Research and Development Institute (MARDI), and Veterinary Research Institute (VRI) were also reported.

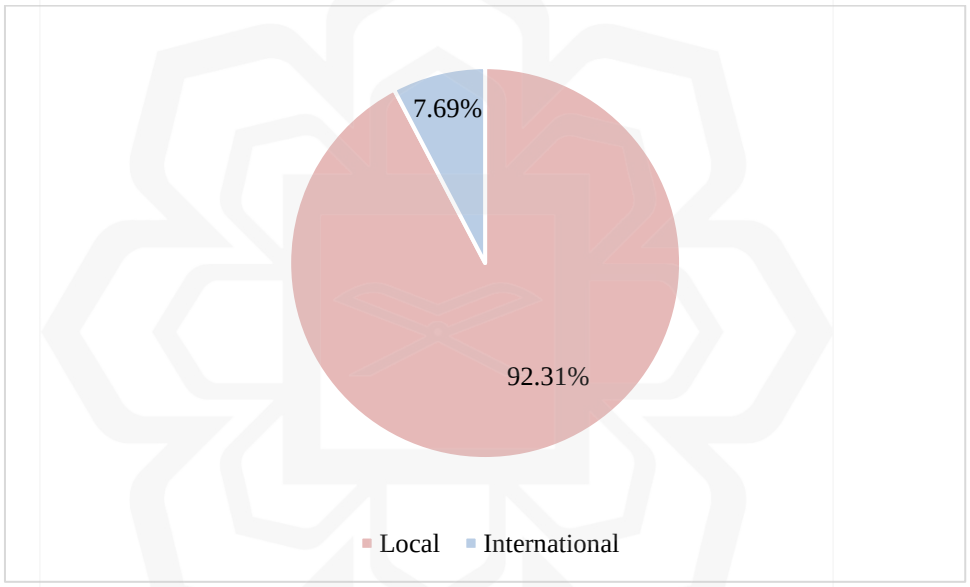


Figure 4.9 Type of Collaboration Reported in the Halal-Related Research Projects

While some researchers did not require collaboration with external agencies or universities, several research projects necessitated the expertise of external experts. It was also observed that researchers sometimes needed to avail facilities and resources from other places and agencies to complete their projects depending on their needs. In short, it is one of added elements and advantages for the research that establish collaborations in their studies. The findings achieved with cooperation and partnerships can facilitate the flows to attain the research objectives. Hence, it is important to encourage the researchers to open the opportunity for collaborations between them and

other parties or agencies to enhance the quality of the study especially research output. By doing so, researchers can support the experts from external sources and utilize the resources to improve their research projects' quality and impact. Besides, Delgadillo (2016) also mentioned that collaboration in research has been more successful when the research is funded, as it allows for a well-defined study plan with designated responsibilities.

4.3.6 Awards

In the evaluation of 41 projects (Figure 4.10), seven projects were observed to receive awards for their exceptional work. This means that only 17% of the projects were recognized for their outstanding work.

Based on the seven projects recorded, only 57% of the projects received awards at the international level which portrays that they managed to produce achievements and were qualified to achieve recognition on a global scale. These projects have proven that they not only had the potential to make a significant impact locally but also on an international level. On the other hand, the remaining 42% of the seven projects were awarded locally, which remains as a remarkable achievement for their works. Besides, it also indicates that their work was also recognized in the local level in the community.

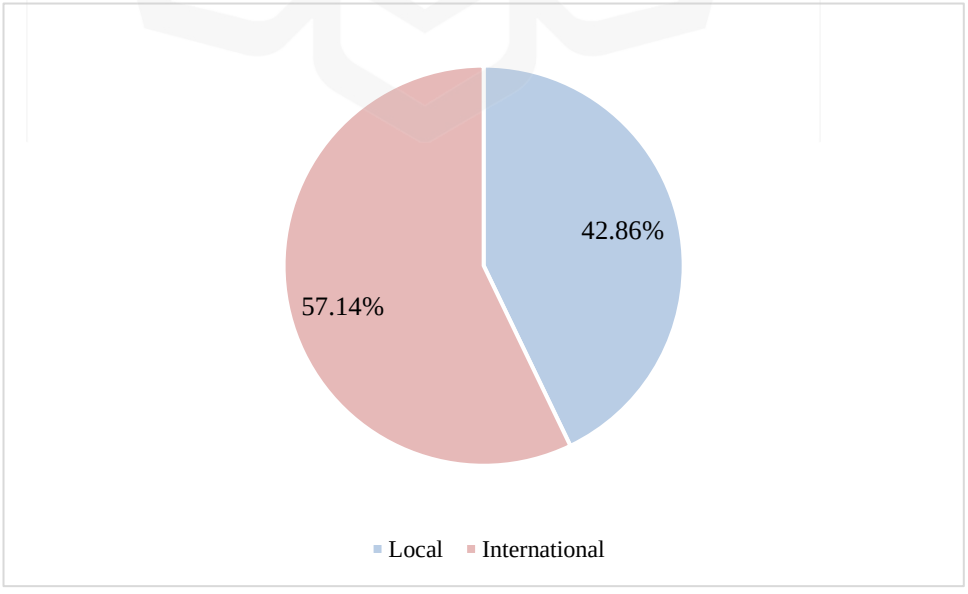


Figure 4.10 Level of Awards Received by the Halal-Related Research Projects

It has been noticed that the recipients of the awards were more likely to have produced intellectual property, particularly in the S&T field. This means that the projects that were given the awards were not just innovative but also had the potential to contribute to advancements in science, technology, and innovation.

4.3.7 Policy Paper

There are no policy papers to have been produced by the 41 projects analysed. This could be due to several reasons such as the lack of urgency or relevance of the research topics to the creation of new policies. Furthermore, policy making is a complex, ongoing process that spans long periods and involves multiple interests and participants. Besides, it may differ over time (Serban, 2015). Hence, the creation of new policies is a time-consuming process that requires careful consideration and input from various stakeholders. Miles (2012) stated that the policy processes have their cycles and stages based on Knill and Tosun (2008). The process begins with agenda setting, followed by policy formulation, policy adoption, and implementation, and ends with an evaluation process. Given the challenges involved in creating a new policy, it is not surprising that no output exists in the policy paper category of this study.

4.3.8 Publications

4.3.8.1 Types of Publication

Publications are the most dominant category in the research output, indicating a high level of productivity among research projects. The publication output was categorised into three forms; journal papers, proceedings, and books. It was observed that journal papers stand out as the most published type, followed by proceedings and books (Figure 4.11). This indicates that researchers are more inclined towards sharing their findings in journal papers, which are considered a more effective medium for disseminating scholarly research output. Moreover, publishing a journal paper is a requirement set by most funders of the grants which must be achieved by the researchers.

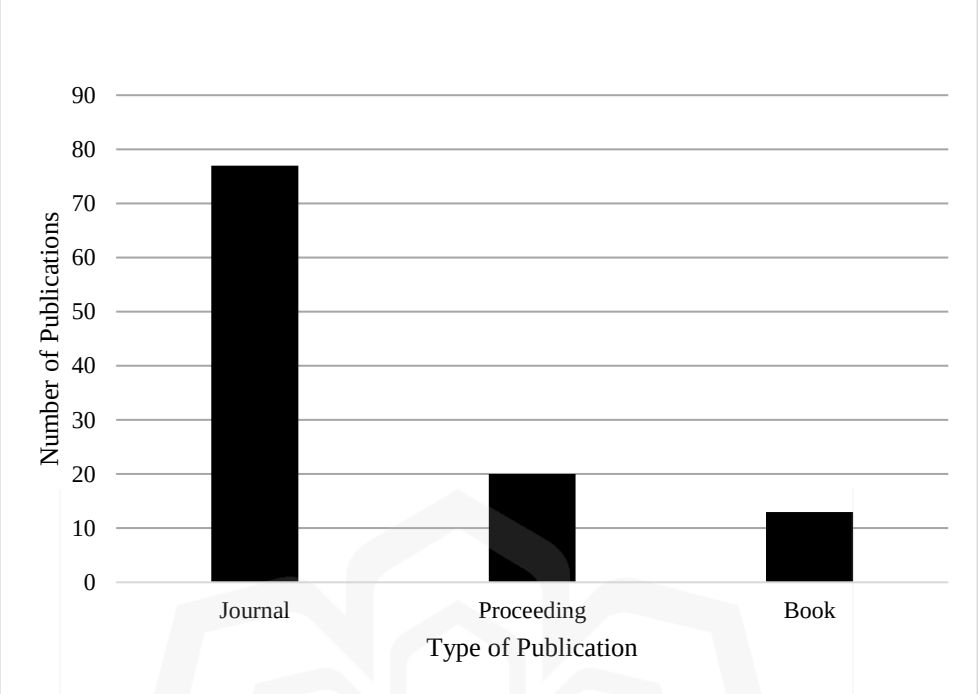


Figure 4.11 Type of Publication Produced by the Halal-Related Research Projects

4.3.8.2 Indexed and Non-Indexed Journal

55% of these publications are indexed in reputable databases such as Webs of Science (WOS), Scopus, or MyCite for the all three types of publications. Based on Figure 4.12, 75% of the journals listed are indexed in WOS, Scopus and MyCite. Specifically, Scopus emerges as the most popular database for publishing research output, with 51 publications, followed by MyCite and WOS with 30 and 33 publications respectively (Figure 4.13). The higher number of indexed publications in Scopus as compared to WOS and MyCite is probably due to Scopus's vast and more diverse range of content, with a user-friendly interface. Besides, this site offers free author and source information which includes metrics, hence making it more accessible to the public (Pranckutė, 2021). From this analysis, it indicates that the researchers are making exceptional efforts to publish their works in such a high-quality database.

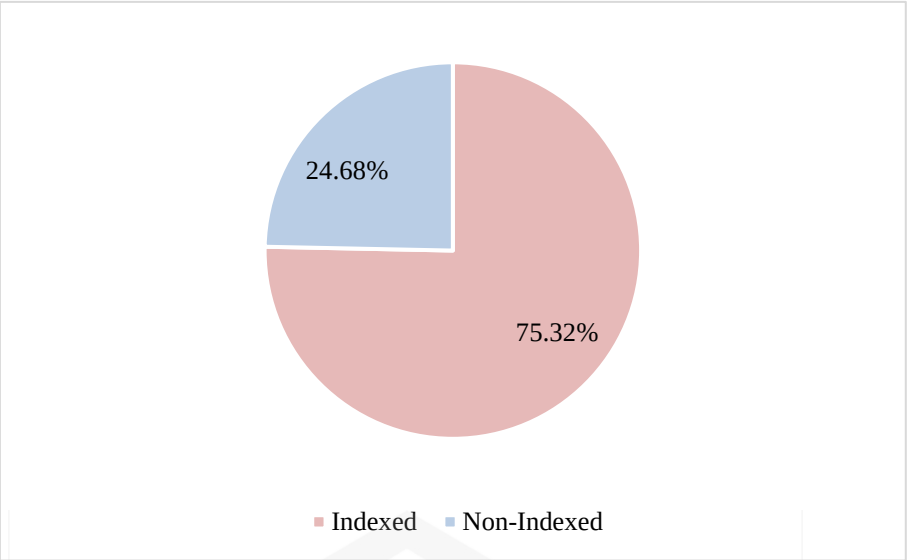


Figure 4.12 Indexed and Non-Indexed Journal Produced by the Halal-Related Research Projects

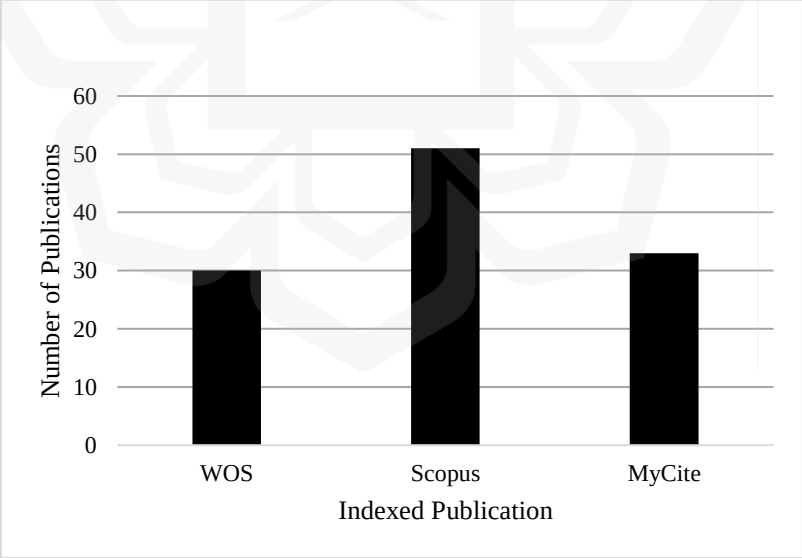


Figure 4.13 The Number of the Indexed Publications Produced by the Halal-Related Research Projects

Note: WOS: Web of Science

4.3.8.3 Quartiles of Journal

Meanwhile, the publication indexed in WOS revealed that out of all the publications listed, only one has made it to the Q2 category, while 17 publications are from Q4 (Table 4.1). The publications in Q4 have higher numbers among all publications indexed in WOS. Additionally, some publications are listed under ESCI, which stands for Emerging Sources Citation Index, while others belong to the 'Not Applicable' category, which means they are not assigned to any quartile. None of the publications are listed in Q1 or Q3.

Achieving a publication in the Q1 quartile is not an easy process as it involves a series of evaluations and also examinations for the publication's quality which be done by experts in the field. Based on Table 4.2, this study has revealed that the majority of publications only managed to achieve a ranking in Q4. It demonstrates the high level of difficulty in achieving a ranking in the Q1. In the process to prepare for the publication of a paper, there are several crucial steps involved. Beside maintaining a high standard throughout the article, it is also crucial in ensuring quality in the title, abstract, methodology, discussion, and other relevant sections.

Table 4.2 Publication Produced by the Halal-Related Projects Listed by Quartile

Q4	17
Q3	0
Q2	1
Q1	0
ESCI	6
NA	6

Note:

ECSI: Emerging Sources Citation Index

NA: Not Applicable

It is important to note that some researchers had to resort to publish in non-indexed publications due to cost where the indexed journal often imposed a high publication fee. In addition, there is also a limitation of indexed journals that are suitable or accept halal-related research articles rendering the researcher to publish in the non-indexed journals.

4.3.8.4 Citation in Scopus Database

In terms of citations in the Scopus database, not all publications have been cited in the database records. The number of citations can differ widely based on several factors. It may be due the nature of subject matter, the quality of the research, how well it has been promoted, and also the period of publication after it was published. One of the publications showed the highest number among all publications although it was only published in 2019. This research project was in the science and technology field which study on halal nanoemulsion production and it was funded by the Ministry of Higher Education. This research project has demonstrated a huge achievement as it managed to produce six publications in total. Besides, two of these publications recorded a significantly higher number of citations in Scopus - 112 citations and 21 citations, respectively.

4.3.9 Correlation

Spearman correlation was used to analyse the collected data to see if there was any correlation between i) the total grant (RM) and the total publications, and ii) the total grant (RM) and the talent produced. As shown in Table 4.3, no significant correlation was found between the total grant (RM) and the total publications of the project, indicating that the amount of money received by the projects does not necessarily affect the publication output produced by the researchers. There was also no significant correlation between total grant (RM) and talent produced (Table 4.4).

Table 4.3 Spearman Correlation for Total Grant (RM) and Total Publications

			Total Grant (RM)	Total Publications
Spearman's rho	Total Grant (RM)	Correlation Coefficient	1.000	-.061
		Sig. (2-tailed)	.	.705
		N	41	41
	Total Publications	Correlation Coefficient	-.061	1.000
		Sig. (2-tailed)	.705	.
		N	41	41

Table 4.4 Spearman Correlation for Total Grant (RM) and Talent

			Total Grant (RM)	Talent (GRA and RA)
Spearman's rho	Total Grant (RM)	Correlation Coefficient	1.000	.340*
		Sig. (2-tailed)	.	.030
		N	41	41
	Talent (GRA and RA)	Correlation Coefficient	.340*	1.000
		Sig. (2-tailed)	.030	.
		N	41	41

Initially, it was expected that the amount of money received by the projects might affect the output produced by the researchers in their projects. However, following data analysis, it was found that some projects that received a smaller amount of money managed to produce a larger number of publications compared to others that received a higher amount of total grant (RM). This demonstrates that the correlation between the total grant (RM) and the output produced by the researchers for their projects is not always linear, and it may be caused by other contributing factors that may play a role in determining the output produced.

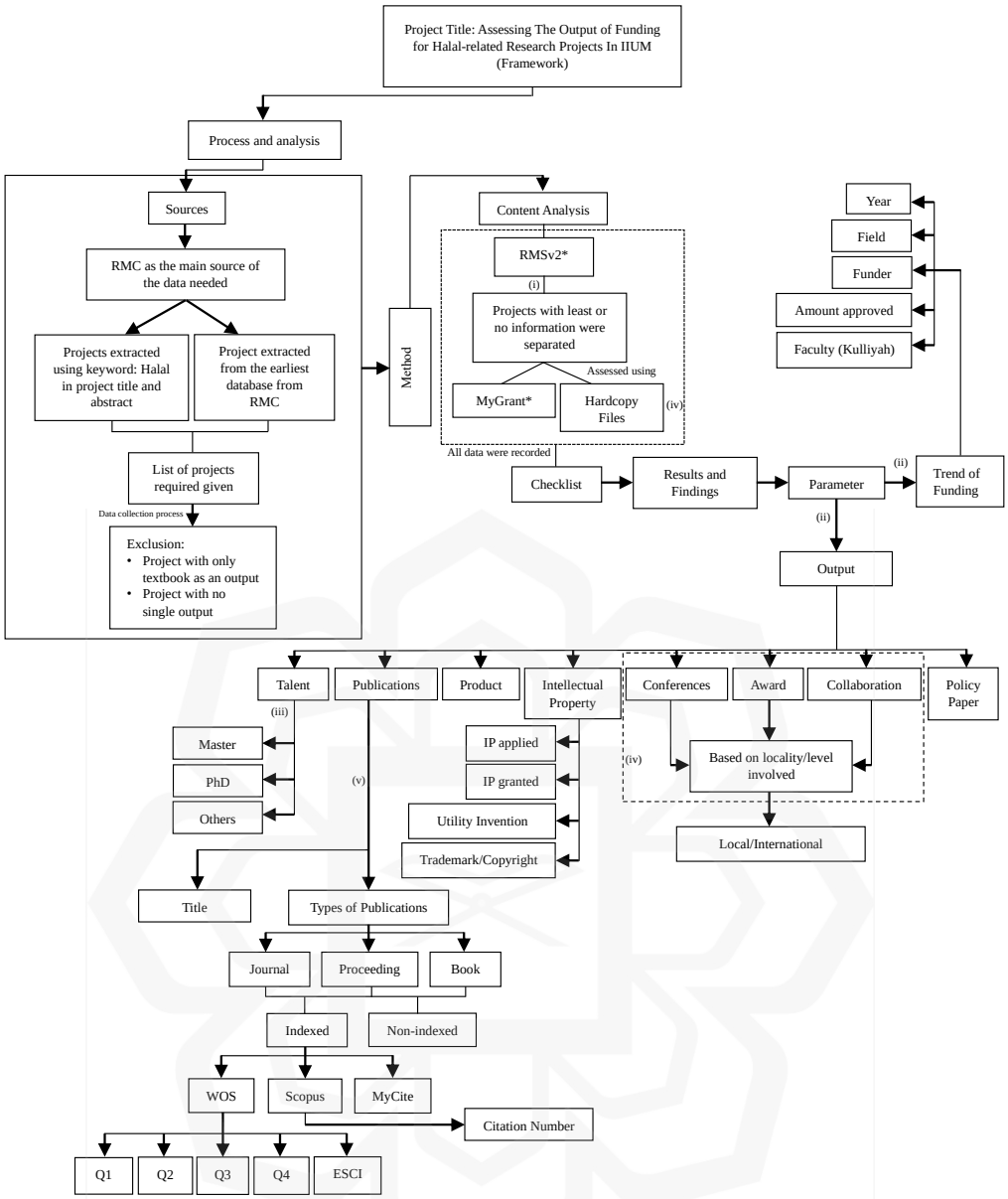
One of the reasons is related to productivity of an individual researcher where the level or productivity may differ from one another. Some researchers may have slow progress in handling their current study, while some may complete their projects within the given timeframe. Hence, the output that is produced from the projects is not solely reliant on the total grant (RM), but it might also be influenced by the individual's productivity which may be affected by age and time management in actively producing the best output for their study. This is in agreement with a study done by Fursov et al. (2016) in Russia which found that older academics demonstrate a higher level of publication activity as they are more productive and publish one or two articles more than their younger academicians. In addition, a study done by Vuong et al. (2017) among Vietnamese researchers also observed that the older age of researchers is correlated with more scientific output whereas those with 15 to 25 years of experience have managed to publish the largest numbers of papers. Besides the age factor, the time allocated for research activity also influences the level of productivity in publications as professors who spend more time teaching or engaging in management activity demonstrate lower research results (Valdivieso et al., 2022).

The time when the research is conducted is also a crucial factor to consider. This factor became even more prominent during the Covid-19 pandemic. Some of the researchers might have faced constraints in achieving the target output during this time. Limitations of communications and interactions between researchers in a team including the research assistant, and participation in conferences may have affected the output of research regardless the quantum of funding.

4.4 FRAMEWORK TO ASSESS RESEARCH FUNDING TRENDS AND OUTPUT

The primary objective of this study was to analyse and evaluate the funding trends and outputs of halal-related research projects in IIUM. The research work was guided by a conceptual framework shown in Chapter 2 (Figure 2.5). During the data collection and document analysis, various challenges were faced that necessitated certain solutions, strategies and recommendations. Using the self-reflection approach (as described in section 3.2), these elements were put together into a proposed framework as shown in Figure 4.14. This framework (and the procedures described) can be useful for future research particularly in assessing the trends and output in a certain research field.

To describe the challenges hence the strategies and recommendations, the following section reiterates the work undertaken during data collection and analysis, infused with self-reflection. With a scope and objective in mind, the research work commenced with a deep study of the past literature to provide a better understanding of the area of study and the current issues in order to identify the gap of study. A rough plan on the flow of study was then developed to assist the journey of this study.



*RMSv2: a research management system used by Research Management Centre, IIUM to record the information of research projects
*MyGrant: a research administration software of education grants offered by MoHE
(i) : it is required to have a backup of sources here when the information cannot be retrieved from only one source
(ii) : the information may be in the same format hence the need for it to be individually checked and categorized based on the latest progress achieved
(iii) : some information may show discrepancies when checked across different available sources
(iv) : it is necessary to check manually on details of the subcategories where it is observed based on the level of achievement
(v) : some of the documents are unrelated to the projects, and need to be manually checked and verified

Figure 4.14 Framework for Assessment of Research Funding Trends and Outputs

Note: (refer to Appendix II for a clearer visual)

Research Management Centre (RMC), IIUM was selected as the main source of data and information on the halal-related research projects that have been funded in IIUM. After granting permission to access of data, the centre provided the list of the

projects from the earliest database in their records in RMSv2 database. All the final reports were extracted using the keyword 'halal' from the project title, resulting in a list of 59 projects. The final report of a research may vary in its format based on the guidelines of a particular institution. This format was chosen as it was supposedly the most complete version containing the information related to the project. For example, as mentioned in IIUM Research website (IIUM Research Management Centre, 2023), the final report or progress report for MyGrant submission must include research activities, finance, awards, publications, intellectual property, products, talent, and assets. However, (as will be described further) in practice, the completeness of information recorded in the final report may be inconsistent depending on the grant and researchers.

The next step was the process of data collection from the list given consisting of all 59 projects using the RMSv2 database. A checklist (Appendix A) was used to record the information on funding trends and outputs to capture and properly organize the data that have been collected. However, the data collection process was challenging due to inconsistent data that could be retrieved from the source used. Not all required information was readily available in the RMSv2 system, as some of the projects did not appear to have complete reports or do not have the information needed as stated in Figure 4.14 (i). The researcher then turned to MyGrant database and hardcopy files (of MyGrant report format). This phase of work was time-consuming as it required to manually assessing each file and papers attached to the projects. To address this issue, it is important for the monitoring centre to ensure a complete final report is being submitted by the researchers. A complete final report could be made a mandatory requirement for projects to be verified as completed and closed.

After the completion of the data collection phase, screening of the data commenced with two exclusion criteria. Firstly, the projects funded by an international organization were excluded, as they specifically produced textbooks. Secondly, any projects that had no output in the given record were also excluded. Consequently, the total number of projects left for analysis was 41. Projects that displayed no information may have some underlying reasons. It is possible that the researchers failed to report the final data to RMC. Secondly, the data may exist in hardcopy but have not been entered into the system. This inconsistency in data sources leads to discrepancies and

impacts the data collection and analysis process. Therefore, a systematic report template and process must be in place to guide the researchers to properly prepare the final report. The monitoring centre must then meticulously verify to ensure all required details are included in the system.

In the analysis of funding trends, the data was collected and classified into several categories in order to interpret the overall trends. These categories include the year, funder, field, amount approved (RM), and faculty (Kulliyyah). Each of these categories are important to observe the overall trend of funding of the research projects. To answer the objective of this study, the output of the projects was further divided into eight subcategories, each offering various observations and insights from the analysis. These subcategories include talent, publication, product, intellectual property, conference, award, collaboration, and policy paper. It was a meticulous process as the classification was divided into eight subcategories. Furthermore, the information needs to be accessed manually to obtain the data. The researcher might mix up between data of projects hence this process requires proper and careful data extraction from the sources. It is therefore important to gather the information project by project basis to avoid mixing the collected data.

Generally, the data on the funding trends and research output did not appear to be in the same format across the data sources as stated in Figure 4.14 (ii), hence, it is crucial to check every single information individually based on projects and categorize them into subcategories if necessary. Upon collection of the data related to the output of the research projects, the talent subcategory was further classified into several types to observe the frequency of the talents produced from the research project, and to further discover the possible correlation. The talents have been thoughtfully classified into three categories; master degree student, PhD student, and others, which includes research officers and undergraduate students. However, there were some challenges faced during the collection of this subcategory. As in Figure 4.14 (iii), it appears that some of the information on the talent produced in a few projects was contradictory to each other when cross-checked in the sources available (RMSv2, MyGrant database or MyGrant hardcopy files). For example, the data on the talent recorded in RMSv2 was two master's students, while upon checking in MyGrant, it stated otherwise. Hence, the inconsistency of the data itself affected the process of data collection in determining the

correct information to choose and record. To solve this issue, it is important to ensure that all the project's report information received is regularly updated from time to time through all sources to ensure accurate and consistent data recording. The monitoring centre could also decide on one single final system that would be used for monitoring.

Next, the intellectual property subcategory offers a comprehensive understanding of the trend of the output based on the research projects. The data has been properly classified based on the status and type of intellectual property, including application status, grant status, utility invention, and trademark or copyright. This classification helps in gaining a deep understanding of the nature of intellectual property that is being funded and its status in terms of approval and grant status. The number of projects managed to have intellectual property as an output was relatively small but there was still a concern regarding the record of the output. Some of the research only provided the application form as the evident for intellectual property records. As it is a lengthy process to be awarded with intellectual property rights, the monitoring centre could follow through the process until commercialization.

Meanwhile, the process of categorizing conferences, awards, and collaborations involved a simple sorting process based on the locality and level of the party involved - whether local or international. However, the details of the information provided of these subcategories must be scrutinized properly to classify the output only in the correct category as in Figure 4.14 (iv). In this section, the outputs recorded were lesser than the journal publications. Based on the information, the issue of these sections is in determining the classification of local and international. For example, in the conference, some were held locally in the country, but the name of the conference stated the word 'international', hence, it was initially confusing to classify it. To solve this matter, any conference that states the word 'international' in the conference title was considered an international category despite the venue. In this instance, the monitoring centre may want to define or provide a more comprehensive glossary to aid the measurement of these items.

In the publication section, the process began with the process of recording the title of each publication which was later classified into three categories; journal papers, proceedings, or book chapters. Each publication was then checked one by one to determine whether it belongs in the indexed or non-indexed category through the

website of the journal and the list in Web of Science, Scopus, and MyCite website. The indexed category includes publications indexed in Web of Science (WOS), Scopus, and MyCite. For every publication indexed in WOS, its quartile (Q1, Q2, Q3, Q4, or Emerging Sources Citation Index (ESCI) category) was checked. For publications indexed in Scopus, the number of citations recorded in the database. However, referring to Figure 4.14 (v), some of the journal articles (supposedly the output of the particular research) attached in the project's files in both hardcopy and softcopy were found to be unrelated to the project. This could be due to researchers' varied understanding of documents required. These discrepancies can be observed from the title of the journal articles, and it can be determined by examining the grant number in the acknowledgment section in some of the articles. To this end, it is advisable to only include related information and documents in the project file to avoid the aggregation of unrelated outputs of a project. Hence, the record will appear to be more organized with easier browsing for better understanding of the information. The monitoring centre could exercise a stricter evaluation upon accepting the complete report to ensure that all the information (in this case the publication) is related to the project. The centre can provide a proper training to researchers to improve the compliance such as in the submission of accurate documents. Besides, at this stage, a 'verifier' with relevant academic and research background should also receive proper training to assist the process. It would be more difficult to track the researchers to verify the information once the final report has been formally accepted by the monitoring centre.

Finally, the results and the findings of the study were collated and written. All the research objectives must be clear and answered at this phase. The sample of this study was relatively small; however, the objectives were able to be achieved. A bigger sample size could increase the reliability of the analysis. Hence, future study can widen the scope of the study to anticipate receiving more samples.

To this end, it is important to highlight that the final reports collected by the monitoring centre (in this instance, the RMC) are critical documents to enable the assessment of research trends, outputs and to a greater extent the impact of the funds towards the R&D and innovation in a particular field. The proposed framework (Figure 4.14) with more streamlined procedures can be used for future monitoring and assessment of research trends and outputs. Given that the final reports are crucial for

the assessment exercise, the monitoring centre could take proactive actions in ensuring that researchers submit a satisfactory report upon completion of a project. The monitoring centre may also include the assessment of research trends and outputs (and more deliberate work on research impacts as well as relationships between funding and impacts) in their continuous quality improvement that would also aid in decision-making research priority areas for the university.

A summary of proposed actions that could be taken by the monitoring centre are depicted below:

Table 4.5 Summary of Proposed Actions

No.	Criteria	Problem	Suggestion
1	Final report	Not all required information available in the system	A complete final report could be made a mandatory submission for projects to be verified as completed and closed
2	Projects with no records	Some projects displayed no information	A structured report template and process must be in place to guide the researchers in preparing the final report properly
3	Talents and other output	Inconsistency of the data across the sources	- All the project's report information received is regularly updated from time to time through all sources to guarantee the accuracy and consistency of data recording. - The monitoring centre could also choose on one single final system that would be used for monitoring
4	Intellectual Property	Some of the projects only provided the application form	The monitoring centre could follow through the process until the commercialization of intellectual property

			rights to better capture the return of investment
5	Conference, awards, and collaborations	Classifying local and international categories	The monitoring centre may want to define or provide a more comprehensive glossary to aid the measurement of the level of achievement
6	Publications	Unrelated documents found in some project files	- Only include related information and documents directly related to the project to avoid the aggregation of unrelated outputs of a project - The monitoring centre should thoroughly evaluate the report to ensure all information is related to projects. A "verifier" with a relevant academic and research background could assist the process

4.5 SUMMARY OF THE CHAPTER

This chapter presents a comprehensive analysis of data concerning funding trends and outputs of halal-related research in IIUM. A framework to assess the trends and outputs of research funding was also explained in this chapter.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Research and development bring benefits to humanity. This process enables individuals to observe and broaden their understanding in any discipline of knowledge. Research commonly requires financial aid in to cover the expenses for equipment, facilities, materials and human resources; among others. This then allows a smooth progress of a particular study toward achieving the objectives.

This present study has revealed the trend and output of funding of halal-related research projects in IIUM. In terms of trend, several key items were analysed including year, funder, field, the amount approved (RM), and faculty (kulliyah). For the output, the items analysed include talents, publications, products, intellectual property, conferences, awards, collaborations, and policy papers.

The number of halal-related projects (41 projects) in IIUM fluctuated during the year 2012-2022 with the amount of grants received between RM10,000 to RM300,000. The government remains as the main funder of the research projects such that the trend and output of research funded should be communicated back to the authority to assist in strategic development of the sectors. Meanwhile, the S&T field was found to dominate the halal-related projects compared to non-S&T with halal food being the most prominent sector. Other sectors such as such as Modest fashion, Media and recreational, Muslim Friendly Travel, and Islamic Finance were found to be less researched. As the halal industry grows into various sectors, it is important that funders and researchers shift their focus into the upcoming sectors too.

This study has also shown that publications appear to be the main output. It is almost a mandatory requirement of any research grant to publish either in journals or books as this is the most effective way to disseminate the new findings and knowledge found in the studies. A total of 110 publications were recorded across the 41 projects analysed. In addition, developing research talents are important for the sustainability of research and development efforts in any field such that talents are important outputs in

research projects. A total number of 14 PhD and 30 Master's graduates were produced by the 41 projects analysed.

On the other hand, it can be observed that there was no significant correlation between the funding approved and the outputs namely the publications, and talents. It can be concluded that the amount of money awarded to finance the research does not affect the output of that particular study. However, the result of the correlation may differ if the sample of the study is larger.

Overall, it can be concluded that halal-related research in IIUM is progressing. Considerable outputs were observed. Nevertheless, as the halal industry continues to grow, a strong R&D should be in place to support and provide effective solutions, products and services required. This calls for an evidence-based (as exemplified through the findings of this present work) strategic action plan.

The process of collecting and analysing the information on related data of trend and output of funding for this study was very intricate. Guided by self-reflection method, a framework for the assessment of research funding trends and output has been developed, taking into consideration all the issues arise during the process involved. This framework is envisaged to be useful for other researchers in diverse field to adopt hence facilitate the process of collection and analysis of the data in their respective studies.

5.2 RECOMMENDATIONS FOR FUTURE WORK

This study has some limitations of which it only covers halal-related research projects collected based on the specific keyword 'halal' appearing in the title, hence narrowing the sample obtained. Halal areas encompass a broad scope. Some of the titles may not actually contain the 'word' halal itself but the study could well be in the scope of halal. For instance, a study discussing on halal aspects such as the topic related to the concept of al-Jallalah may not have the word 'halal' in the title. Hence, further research is suggested to expand beyond using the specific keyword in a research project title and open the discussion on the wider topics in Islamic studies.

Next, researchers can also further study beyond the trend and output; and look into the factors that influence the individual research output. This exploration may provide deeper insights into the underlying issues and challenges, leading towards development of strategies and appropriate actions.

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APPENDIX I: CHECKLIST OF DATA

Title :

Principle Investigator :

Year :

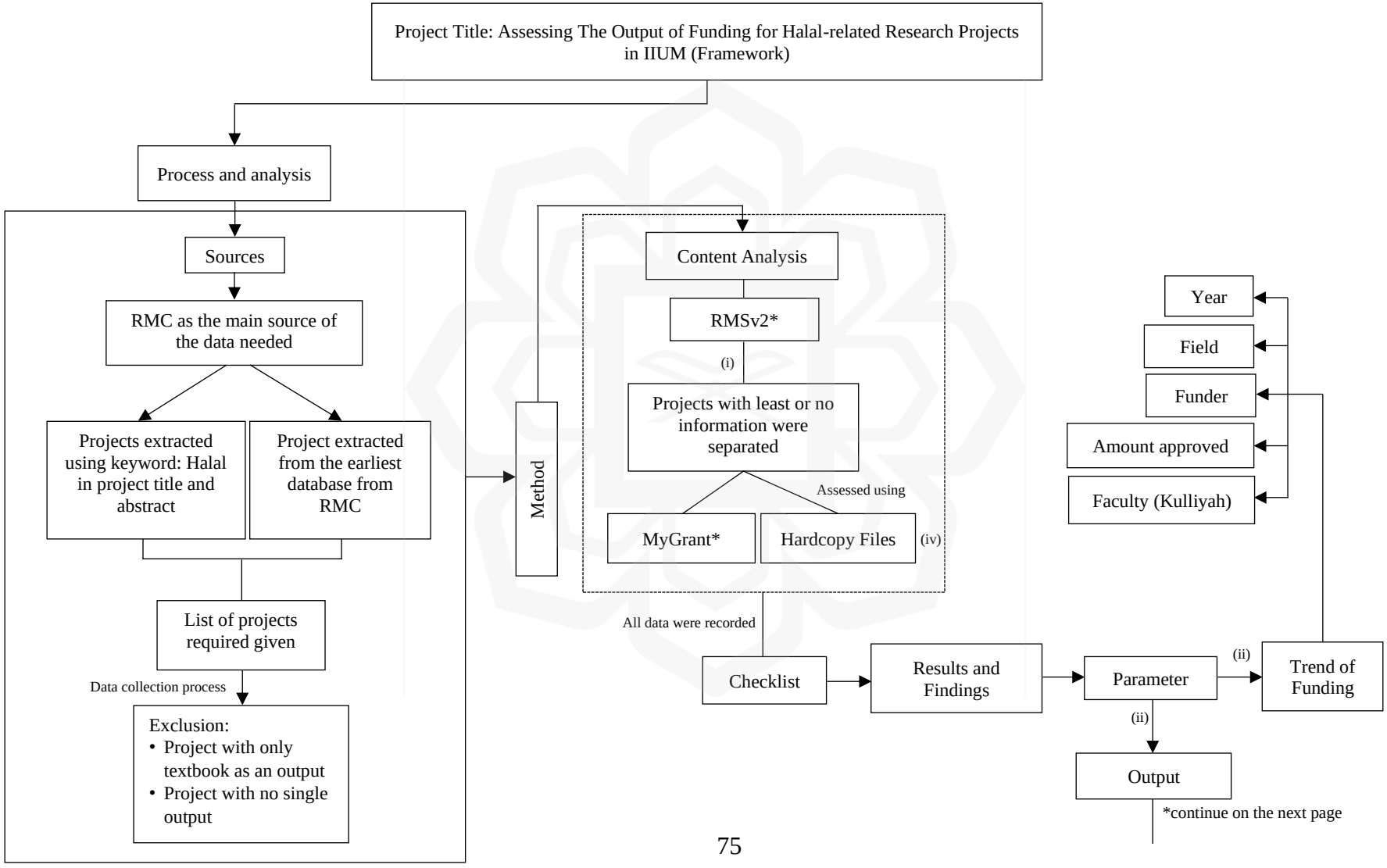
Funder :

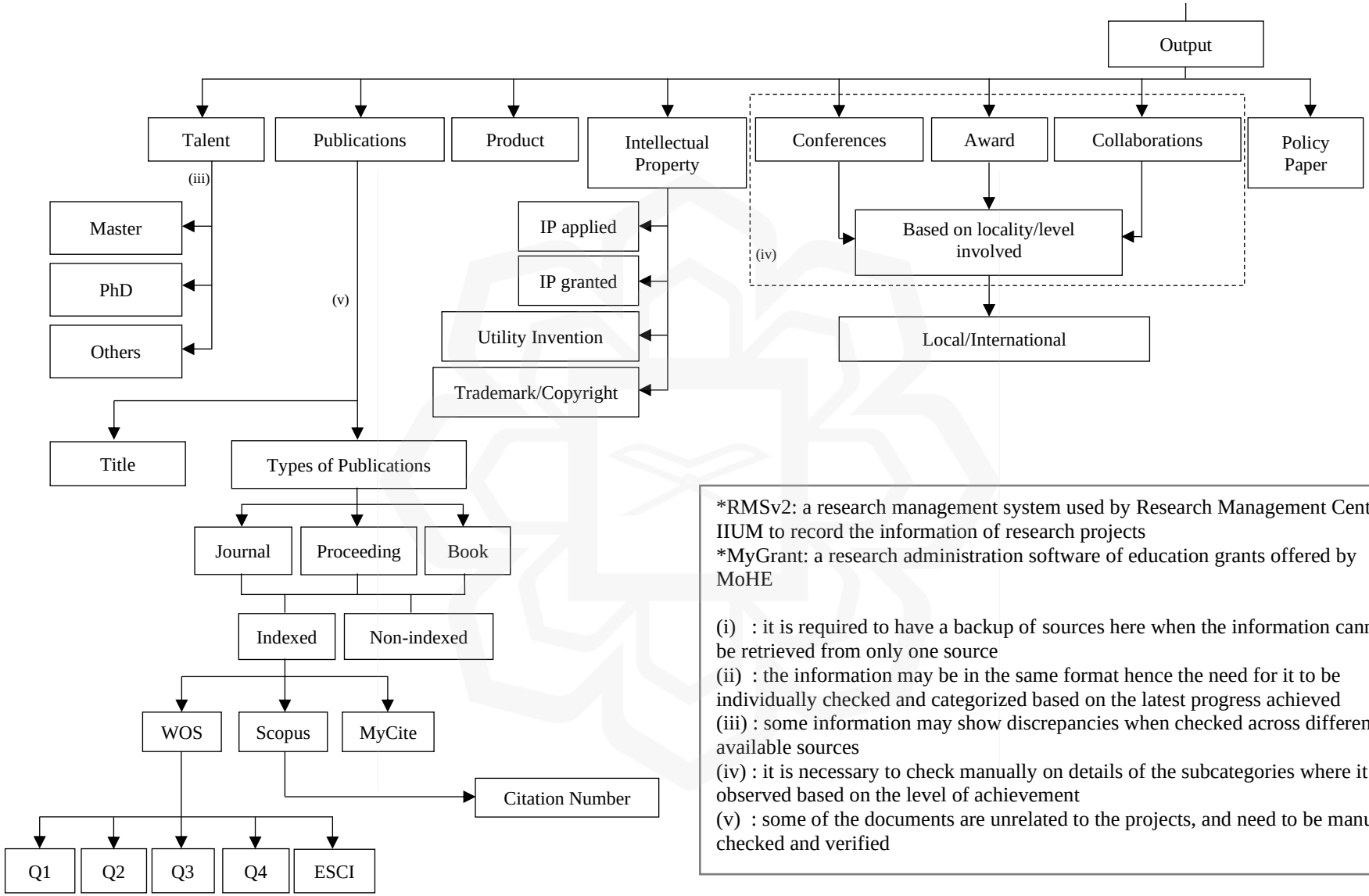
Amount :

Kulliyah :

Output	**Detail**
Product, prototype/commercialization	
Publication (number, citation, quality index)	
Intellectual property	
Talent	
Collaboration	
Award	
Conference	
Policy paper	

APPENDIX II: FRAMEWORK FOR ASSESSMENT OF RESEARCH FUNDING TRENDS AND OUTPUTS





*RMSv2: a research management system used by Research Management Centre, IIUM to record the information of research projects
*MyGrant: a research administration software of education grants offered by MoHE

(i) : it is required to have a backup of sources here when the information cannot be retrieved from only one source
(ii) : the information may be in the same format hence the need for it to be individually checked and categorized based on the latest progress achieved
(iii) : some information may show discrepancies when checked across different available sources
(iv) : it is necessary to check manually on details of the subcategories where it is observed based on the level of achievement
(v) : some of the documents are unrelated to the projects, and need to be manually checked and verified