Understanding the success motivators in scholarly publishing: A case of high ranked Malaysian scientists

M.K.M.Napiah[1], A.Abrizah[2*] and K.Kiran[2]
[1]The Library, Universiti Sains Malaysia,
Pulau Pinang, MALAYSIA
[2]Department of Library & Information Science,
Faculty of Arts and Social Sciences,
Universiti Malaya, Kuala Lumpur, MALAYSIA
e-mail: mohdkamal@usm.my;
*abrizah@um.edu.my (corresponding author); kiran@um.edu.my
ORCID: M.K.M. Napiah: 0000-0003-0631-613X
A.Abrizah: 0000-0002-8224-5268
K.Kiran: 0000-0003-3021-2576

ABSTRACT

Research is the cornerstone of the development of a nation, and its researchers play pivotal roles for social and economic progress of the country. Among those researchers, there are groups of successful scientists with outstanding accomplishment in research; who are experts in their field, productive in delivering quality papers, highly cited by peer researchers and receive prestigious recognition locally and globally. This study aims to identify the motivation that influences top Malaysian scientists to be successful in scholarly publishing. The data presented comes from interviews with nine high ranked Malaysian scientists with an attempt to demonstrate that scientists' success in scholarly publishing is derived from four motivational needs, namely achievement, affiliation, authority and avidity, represented by quotes or comments. The findings show that high ranked scientists were motivated mainly by inclination towards affiliation and achievement, as compared to authority and avidity. Overall, findings from this study have provided useful information on the characteristics and motivation of high ranked scientists that may be of value as reference indicators for future top scientists in the country.

Keywords: Scientific productivity; Scholarly motivation; Scholarly publishing; Top scientists; McClelland's Human Motivation Theory.

INTRODUCTION

The American Council on Library and Information Resources (ACRL) described scholarly publishing or scholarly communication as the process of producing research and other scholarly materials, assessing their quality, disseminating them to the scholarly community, and archiving them for future use (Steele 2014). The system comprises both formal and informal communication channels, such as publication in peer-reviewed journals and electronic listservs. The phases involved in the development, publication, diffusion, and discovery of scholarly research are typically characterized or depicted as a life cycle in scholarly publishing.

The landscape of scholarly publication has proven to be exceedingly challenging for scientific societies and research groups. Commercial scholarly publishing succeeded to create scholarly journals on a solidly profitable basis over the same period in the 1950s. They were indirectly aided by Eugene Garfield's Science Citation Index and its accompanying Journal Impact Factor a few years later (JIF). The JIF eventually became the metric tool required to create a competitive journal market (European Commission 2019).

Meanwhile, publication data is becoming the primary source for evaluating the performance of scientists and their academic institutions. In Malaysia, the Ministry of Higher Education (MOHE) aims to rank one local university in Asia's Top 25, two in the Global Top 100, and four in the Global Top 200 by year 2025 (Ministry of Education Malaysia, 2015). Meanwhile, the recent performance of Malaysia's universities in the QS World University Ranking 2022 shows that there is one university within the Top 100 (Universiti Malaya – rank 70 globally and rank 19 in Asia), and five universities in the Top 200 globally (Universiti Malaya-70, Universiti Putra Malaysia-123, Universiti Kebangsaan Malaysia-129 and Universiti Sains Malaysia-143) (QS Quacquarelli Symonds Limited 2022). The Ministry aspires to raise its U21 ranking for research output from 36th out of 50 countries to the top 25. Currently, Malaysia is ranked at 27 based on Overall U21 Ranking 2020. This current achievement cannot be achieved unless the people inside the organisation performed and contributed very well as translated in the ranking. Accordingly, excellent talent drives organisations' excellence, and becomes a positive magnet for others to follow (Ministry of Education Malaysia 2015).

The Ministry of Science, Technology and Innovation (MOSTI) Malaysia clearly stated in the Malaysia Direction Plan of Science and Technology that research and development (R&D) is one of the critical areas that should be strengthened towards achieving the goal of Vision 2020. In achieving that goal, the Malaysian government has invested tremendously in R&D so that the nation could be on par with other developed countries (Ministry of Science 2010). Meanwhile one of the elements in the Malaysia Education Blueprint (Higher Education) 2015-2025, which was launched with the aim to spur continued excellence in Malaysia's higher education, focuses on *New Academia* which aims to drive academic excellence among academic staff to transform from traditional elements of research to meaningful elements of discovery, integration, interpretation, and knowledge application.

The Academy of Sciences Malaysia (ASM) initiated the Top Research Scientists Malaysia (TRSM), a profile database of top Malaysian researchers in the field of Science, Technology and Innovation (STI). This project aims to highlight the contributions of scientists as well as to showcase the top scientists as idols of excellence and role models, especially for young Malaysians to pursue their interest in STI. This compilation of best scientists also provides useful resources for academicians; industries and STI related organisations to seek opportunity for strategic collaboration. Besides, it also serves as a gateway for identifying the country's areas of need and discovering the knowledge gap that should be fulfilled. Nomination for top national and international awards can also be derived from the list (Akademi Sains Malaysia 2012).

Previous studies confirmed that eminent scientists have a prime role in the development of a research system, specifically the STI system within the context of an emerging economy (Gonzalez et al. 2018) such as Malaysia. This is due to the potential ground-breaking scientific discoveries that create and develop national and international renowned research centres, improve the universities' capacity for generating and applying new knowledge, train the next generation of highly qualified researchers, enable the

establishment of successful high-technology start-ups for income generation, develop novel techniques, tools, materials or equipment that may be useful, and patent them in order to ensure that they or their employer can benefit financially from their work (Latimer 2005). As such, there is growing interest within research administrators, policy makers, scholars and the research community on the roles and responsibilities of eminent scientists in the development of a STI system.

One of the important responsibilities of the scientists is the need for motivation in pursuing research and identifying research performance i.e. having a lifelong interest in science and desire for intellectual challenge. Universities as well as research-related organisations are making great use of every facility to achieve this motivation. This study postulates that a scholar's excellent achievement in research publication is derived from certain motives that pushes scientists ahead. Collectively, it must be interesting to understand what are the scholarly motives that bring them towards their current state of excellence to be recognised as top Malaysian scientists. Thus, the prolific researchers warrant our attention as they have been "drivers" of research activity and impact. Recent studies have systematically analysed factors associated with successful researchers and their academic engagement and publication productivity (Heng, Hamid, and Khan 2020; Perkmann et al. 2021; Wahid, Warraich and Tahira 2021) and the public's views of scientists' motivation for their research work (Johnson and Dieckmann 2020), however studies that focus on why some researchers publish prolifically, especially in top journals in their fields and their motivation for success has not been yet explored within the field of Library and Information Science (LIS) research, despite the importance of this topic. For these reasons, it is timely to address key characteristics and their motivation associated with being highly prolific in scholarly publishing.

LITERATURE REVIEW

Measuring performance of scientists

The nature of scientific contributions in the form of published research offers a window into the relationships among the disciplines, as well as their association with the economic status of a country (Jaffe et al. 2020). Although the link between a country's research profile and its wealth is still under rigorous investigation, the performance and output of the country's scientists is undeniably pertinent to the success of the country. Studies show that highly prolific scientists accounted for the very high output of publications and bulk of the citations (Fox and Nikivincze, 2021), thus without this group, the output of the given nations would be reduced significantly. In the academic world, prolific people are appraised in various rating systems to reveal how much they have contributed to scientific discovery and the body of knowledge with comparison to others in the group or discipline. Nobel Laureate, Thomson Reuters's Most Scientific Minds, Merdeka Award (Malaysia) and Top Research Scientists (Malaysia) are among the existing ratings to provide ranking of prolific scientists. The number of publication (productivity) and the number of citations (influence) are quantitative measures for research performance (Chang, Chen and Huang 2020; Abramo, D'Angelo and Di Costa 2011; Fox and Nikivincze 2021).

The use of bibliometrics has been widely accepted as a mechanism to ascertain research performance in terms of: (a) assessing a researcher's or a research group's productivity; (b) a journal's, researcher's, or research group's quality, and (c) connections between publications, authors, or study domains (Lundberg 2006). Bibliometrics studies have been conducted to reveal the research performance of a country or institution (Salisu and

Salami 2020; Avanesova and Shamliyan 2018); research performance of researchers (Abramo, Aksnes and D'Angelo 2020; Ahmad and Jilani 2022; Lai, Saxena and Allen 2022) and scientific award contributors (D'Anniballe, Lee and Grimm 2022; Chang, Chen and Huang 2020).

Salisu and Salami's (2020) analysis of Nigerian publications covered in Scopus database allowed them to identify not only the trend and growth of the country's research output, but also leading institutions in national and international collaborative patterns for future strategic efforts. At the same time Baccini, De Nicolo and Petrovich (2019), based on the case study of Italy, had cautioned that the research performance systems may suffer from inwardness (low rate of international collaborations) caused by self-citations in the quest to meet the indicators of professional success. Though the citation practices are constantly in question, the indicators used somewhat shapes the activity of researchers as their behaviour adapts to the demands of the evaluative indicators. Another study in Italy revealed that it is not necessary that academics at higher rank are more productive than lower ranked ones. Abramo, D'Angelo and di Costa (2011) found that in the discipline of medicine, the greater part of the 'top' scientist in Italy was found to be the assistant professors. Changing practices of academics since the introduction of quantitative metrics measures of research performance has induced much debate. Bruton et al. (2020) implies that career-oriented incentives may have had a bad influence leading to scientific misconduct.

Studies have shown that academics' engagement in research and their research productivity are influenced by personal as well as environmental factors. Heng, Hamid and Khan's (2020) review of the literature to reveal factors influencing academics' research engagement and productivity, especially in the developing county contexts, found six national level factors, 15 institutional level and 13 individual factors. Interestingly the individual level factors included, among others, motivation, self-efficacy and desire for recognition and achievement.

Scholarly Motivation

Motivation is the force that pushes someone towards an action. It drives someone to work hard to achieve a certain goal and success. There are also various kinds of motivation and everyone might attribute to one or more motivations that drive him/her forward based on their personality. The importance of understanding one's motivation lies in the ability to determine one's real needs that inspire towards a certain pattern of behaviour.

Studies of motivation among the researchers can be found in various literature. Paiva et al. (2017) studied the personal and professional characteristics that distinguish the researchers who publish in high-impact and low-impact journals. They found that researchers who published in high-impact journals spent more of their free time on research. When asked whether they would like to be very well paid or be regarded as leaders in their fields, the majority of the participants (85%) said they would prefer to be leaders, with no obvious difference between the two categories.

In a study of Polish top researchers, Kwiek (2018) compared their practices with the lower performing counterparts and found that these top performers typically spent less time on teaching-related activities and are more research oriented with higher working hours (including research hours) per week. The Polish top academic performers (10%) are contributing to almost half of the country's research publication output, with a mean productive average of 7.3 times higher than other academics. Drennan et al. (2013)

concluded in a cross-national study that institutional factors were found to have very little impact on research productivity, this finding is also consistent with the conclusion about the American professoriate that intrinsic motivations rather than institutional incentive structures stimulate research productivity (Teodorescu 2000). This might mean that, generally, neither institutional policies nor institutional support matters substantially in becoming a top performer, possibly because top performers and low performers are scattered across the whole system (Kwiek 2018).

When discussing top scientists, the Nobel Laureate is the most coveted recognition in the science community. The people with outstanding contributions are selected every year to receive this prestigious award as a symbol of excellence and pinnacle achievement. As prolific figures, the laureates become centre of attention by all including the information professionals who are eager to know their successful research characteristics and impacts, thus embark to study them. While Nobel Laureates are energetic producers from the start, creating works with extraordinarily high impact, their careers prior to winning the prize followed relatively similar trends to that of ordinary scientists, with hot streaks and a growing emphasis on collaborations (Li et al. 2020).

The review of the literature suggests that a scientist's research career performance may be rooted in specific motivational tendencies and can be driven by perspectives supported by the organisational culture and environment. Despite the research discussed above, no studies have systematically analysed the motivational need associating with successful researchers and their scholarly publishing behaviour. It is in this context that the study investigates the research productivity and scientific impact in order to point to success motivators associating with their publishing strategies. Furthermore, this study uses scholarly publishing data of top researchers that spans for almost one decade and is the one to look at the research system of a developing country.

THE RESEARCH FRAMEWORK

McClelland's Human Motivation Theory (McClelland 1961; 1975; 1985) is used in this study to identify people's dominant motivating drivers. Also known as McClelland's Need for Achievement Theory or Learned Needs Theory, it is a theory that is based on the notion that people's needs are acquired as they live their lives or through experiences of life. It is an influential achievement motivational theory consisting of three elements: achievement, power and affiliation, that affect people's action in a managerial context. In a review of motivational theories, Acquah et al. (2021), conclude that McClelland's theory is more or less equivalent to Maslow's social needs. This theory has been applied in many studies across disciplines such as education, psychology, and management. Most of the time, the studies tried to identify motives behind one's performance or achievement (Arkes and Garske 1977). The use of McClelland's Need theory in literature can be seen from different perspectives and methodology, including measuring achievement with environmental settings (Smith 2015), studying relationship between McClelland's theory, Big Five personality and cultural dimension (van Emmerik et al. 2010), explicit and implicit divergence (Kazén and Kuhl 2011) and McClelland's theory with organisational sociology (Spangler et al. 2014).

Three elements of needs

Achievement need describes a person's drive to excel with respect to some established set of standards. Individuals' achievement needs are satisfied when they are able to actualize

their own purposes relative to and regardless of the situations of others. Those having high achievement needs dislike succeeding by chance and seek personally identifiable sources for their success or failure rather than leaving the outcome to probability. High achievement needs motivate individuals to seek relatively difficult vocations, leading to more satisfaction in jobs that involve both high skill levels and difficult challenges. Similarly, individuals high in achievement needs frequently seek feedback toward goal completion.

The need for power denotes individuals' desires to be influential. Individuals high in this need seek positional power to have authority in compelling the actions of others. They prefer being in competitive, status-driven situations, and actively seek the trappings of status. Additionally, they are concerned with ensuring that the methods they choose to influence others are within their control. However, in order to maintain viable interdependent relationships with others, individuals with high power needs must often restrain these desires. Central to one's need for power is gaining influence over others. Individuals with influence can then parlay informal accountability for others into the accumulation of additional resources that serve to enhance their status

The need for affiliation reflects the desire to have close, friendly, relationships with others. Those high in this dimension tend to spend considerable time seeking interactions. Further, those with strong affiliation needs pursue team activities in which interdependence and cooperation with others are paramount. For those who value friendship and prefer cooperation over competition, demonstrating a willingness to meet stated standards of conduct, and to accept accountability for others might be taken as a sign of organisational desired civility. High levels of affiliation motivate individuals to be both sympathetic and accommodating toward others.

Scientific elites deserve special consideration not only because of their status and prestige in research, but also due to their mutual contributions to scientific progress in the country. Understanding the characteristics and motivations that govern the careers of scientific elites will lead to the discovery of useful indicators for exceptional scientific careers, which can be useful to future scientists and decision-makers who hope to develop more distinguished scientists in the country (Li et al. 2020). This study attempts to demonstrate that each of these need dimensions affects scientists' scholarly productivity and impact.

OBJECTIVE AND METHODS

This study takes an exploratory approach by presenting micro-level data of individual comments which furnished an illuminating or interesting take provided by high ranked scientists when they were asked about their scholarly publishing practices and their motivational needs for publishing prolifically. The research objective, then, is to identify the motivational drivers behind the research productivity of top Malaysian scientists". The research question that drives this study is: "What is the motivation behind the publication success of high ranked Malaysian scientists?".

Productivity is the quintessential indicator of efficiency in any production system (Abramo and D'Angelo 2014) and it has become a norm in bibliometrics to define research productivity as the number of publications per researcher (Abrizah and Wee 2011; Fox and Nikivincze 2021; Kwiek 2018). High ranked Malaysian scientists in this study refer to highly productive scientists in terms of research publications indexed in Science Citation Index Expanded (SCIE) of the Web of Science (WoS), the world's oldest, most widely used and

authoritative database of research publications and citations (Birkle et al. 2020). For many years, almost all advances in the understanding of the global science system and its evaluation and management were based upon WoS data sources, used by research management offices, government agencies, and research funding organisations, to quantitatively measure and evaluate the comparative performance of universities and groups of researchers.

The participants of the study were purposively sampled from a list of 100 top Malaysian scientists extracted from WoS. The approach to purposive sampling helped ensure that we included representing a wide geographic spread, rich data and a focus that most appropriately answers the research question. The inclusion criteria for purposive sampling of the scientists are as follows, they must be:

(a) Productive, having wide experiences in scholarly publishing in impact factor journals;
(b) Malaysian-based scientist, with Malaysian citizenship; and
(c) Science-based disciplines, i.e. researchers with research fields in Mathematics, Computer Science, Physics, Chemistry, Earth Sciences, Biology, Medicine, Agricultural and Veterinary Sciences, and Engineering.

The data were collected from the WoS Core Collection, by searching through address (Malaysia) and time span of 10 years i.e. 2006 to 2015. The year 2006 was used as a starting point, as since 2006 the theme of measuring research productivity and impact has begun to capture increased scholarly attention by Malaysian researchers (Abrizah et al. 2013; Karno et al. 2016; Lee, Hew and Loke 2018). The SCIE was chosen to identify top scientists in the Science, Technology and Medicine (STM) field. Document types were refined by 'article' and 'review' type. Results were filtered by author names and the top 100 names based on the number of publications were extracted from the list. Since the study aimed to investigate Malaysian scientists only, biographical data of each scientist was searched and manually checked from the institutional website to verify nationality, and those non-Malaysians were excluded from the list.

Names disambiguation was one of the issues that needed to be addressed. Author name disambiguation is a type of entity disambiguation in which no unique IDs are assigned to the entities. The problem of author name disambiguation can usually be divided into two parts. The first step is to distinguish between numerous authors with the same name. For instance, a common Malay name such as "Abdullah, A." may refer to a scientist in Medicine from Universiti Malaya or a full professor of Chemical Engineering at Universiti Kebangsaan Malaysia. The second task is to find authors who have used various names. For example the Chinese names, "Hoong Kun Fun", "Fun, Hoong Kun", "Fun, H.K." may all refer to the same scientist. In bibliometric databases, these issues are equally important (McKerlich et al., 2013). In order to address this issue, manual checks were applied to the web and institutional CV of each scientist to identify the real affiliation and specialization to ensure all publications are assigned the right name.

Bibliometrics data from WoS were tabulated and analysed to identify the affiliation and research discipline of top 100 scientists, as well as their scholarly publishing performance in terms of publication counts and distribution, authorship pattern, citations, field-normalized citation impact indicator, the number/proportion of highly cited papers, h-index and collaborating pattern - indicators that are often used as a proxy for research quality. The top 100 most productive Malaysian scientists within the period of observation (2006 to 2015) are affiliated to the following six public universities; Universiti Malaya (UM,

29 scientists), Universiti Sains Malaysia (USM, 28), Universiti Putra Malaysia (UPM, 23), Universiti Kebangsaan Malaysia (UKM, 12), Universiti Teknologi Malaysia (UTM, 7) and Universiti Malaysia Perlis (UNIMAP 1). Productivity from the five research-intensive universities (UM, USM, UPM, UKM and UTM) is expected (99%) as since of 2006, where the government started providing research universities with greater institutional independence from the central government (largely in terms of governance), and increased the expenditure on research and development as a proportion GDP. In ten years' period, the 100 top Malaysian scientists have published a total number of 15,031 papers garnering a cumulative citation of 109,930. Appendix A presents the top 100 Malaysian scientists ranked based on their publication productivity.

After their names and the contact information were identified, a link to an online open-ended questionnaire was sent to the 100 top Malaysian scientists via e-mail. The online questionnaire has a total of 14 questions on scholarly communication attitudes and behaviours, and the last question asked the respondents' willingness to be interviewed, as the researchers thought that this was the best way to recruit potential participants. A total of 30 scientists completed the questionnaire and nine of them consented to be interviewed. Initial contacts were made through emails and followed up with more details so the nine participants can make an informed decision about whether they wish to be interviewed. They were informed of the consent procedures, what to expect in terms of length of time, purpose of the study, why they had been selected and who would be there for the interview. In addition, participants should be informed that they can refuse to answer questions or can withdraw from the study at any time, including during the interview itself.

The semi-structured interviews are an effective method for data collection when the researcher wants: (a) to explore participant thoughts, feelings and beliefs about a particular topic; and (b) to delve deeply into personal and sometimes sensitive issues (DeJonckheere and Vaughn 2019). Critical incident technique using semi-structured interview guides was utilized to further explore the motivating drivers behind the publication performance of scientists. This qualitative method of performance appraisal involved identifying and describing specific events (or incidents) to determine which communicative actions or behaviors would lead to the best possible outcome of a given situation (Allen 2017). During the interview, the participants were asked to reflect on and identify a specific publishing incident they perceive they did exceptionally well, and this allows interview data to be sorted into patterns or relationships, and then summarized and described effectively.

The interview sessions were conducted in English, as it is widely used in academia; done face to face and at locations suggested by the participants, and depend on their time availability, to avoid (or at least minimise) interruptions and be appropriate for the interview (quiet, private and able to get a clear recording). Almost all participants' suggested their administrative offices as the best interview location and each interview session lasted about 90 to 100 minutes. Audio recording of the interviews were done so that the first researcher can concentrate on the interview and build rapport rather than being distracted with extensive note taking. The interviews were transcribed verbatim from the audio recording. The transcriptions were exported into NVIVO 12 for further analysis and theme construction. From the interview, this study attempts to demonstrate that scientists' success in scholarly publishing is derived from certain motivational needs and understand the main drivers for motivation. The interview questions are available at https://doi.org/10.6084/m9.figshare.20153450.v1.

RESULTS

What is the motivation behind the publication success of high ranked Malaysian Scientists? The findings reported here are based upon data arising from interviews with nine scientists who consented to share their insights on their motivation for publication success. These nine scientists comprise active researchers from Malaysian research-intensive universities and they are ranked at number 5, 6, 8, 12, 15, 24, 40, 66, 90 out of 100 in terms of publication productivity (see Appendix A - their affiliation is disclosed). They have published frequently, and their works are widely acknowledged. Five of them are males and four females, specialize in various research fields including physics (2), chemistry (2), engineering (2), mathematics (1), industrial technology (1) and medicine (1). The participant code identifies the rank number, gender and field (e.g. R5FPhy denotes Researcher ranked 5, Female, Physics). All of them have held various university management positions, including as Deputy Vice Chancellor (DVC) (3 participants). These scientists are able to assemble teams of outstanding research students, postdocs, technologists and technicians, secure substantial research funds, and produce the majority of most cited papers. They are also extremely well-connected to other researchers especially in their niche areas of research. Table 1 presents the demographics details for each participant interviewed.

The researchers applied descriptive codes to the interview data and condensed and categorised codes to look for patterns, and report themes that describe the broad range of experiences evidenced in the data. Four base themes emerged in terms of the motivation drivers needs, driven from the participants' research experiences and the views of their ethos. Three base themes are consistent with McClelland Human Motivation Theory, showing the participants were typically motivated by need to succeed (Achievement), need to belong to, affiliate with and be accepted (Affiliation) and the need to authorize or exercise one's will over others (Power). To explain the driving motivators, the study adopts Achievement and Affiliation in McClelland, and adapts Power in McClelland as "Authority" which captures the need to authorize. A new theme emerges in the findings, showing how passionately engaged are top scientists with their research works - they are being motivated by passion and curiosity for their research topic. This fourth base theme is operationalized as "Avidity" which describes "Passion for research".

Achievement Motivation

All participants consider the need for achievement, that is the urge to achieve something as their motivation. Achievement motivation in this study is referred to as the need for attainment of excellence. The desire for achievement expresses itself as an emotional urge to progress rapidly, to perform tasks, to excel, to obtain high performance standards and other potentially competitive results. The specific topics that come up repeatedly under achievement are such as research strategy, urge to progress, high performance standard, drive to excel, and key performance indicator (KPI). They explained themselves fully and in their own way using terms that reflect achievement such as: *target, productive, challenge, satisfaction, aim, KPI, outcome, produce, quality, publish, efficient, opportunity, result, move forward, goal, work hard, change,* and *strategy.*

Table 1: Participants' Demographics

Participant Code (Gender, Field of Research)	Areas of expertise indentified in the Web of Science	1st paper in WoS (Year of research experience)	Year of birth (Age during interview)	Highest management position held
R5FPhy (Female, Physics)	Materials Science, Physics,Semiconductor Devices,Wide Bandgap Semiconductors,III-Nitrides Semiconductor Materials and Devices	1999 (23)	1962 (55)	Director of Research Institute
R6MEngr (Male, Power Engineering)	Membrane Technology for Oil and Gas Separation, Membrane Technology for Water and Waste Water Treatment, Nanomaterials for Energy and Environment	1999 (23)	1966 (53)	Deputy Vice Chancellor (Research & Innovation)
R8MEngr (Male, Chemical Engineering)	Air Pollution Control, Nanoscience Nanotechnology, Reaction Engineering, Wastewater Treatment	1986 (36)	1964 (53)	Deputy Vice Chancellor (Research & Innovation)
R12MMath (Male, Mathematics)	Computational Fluid Dynamics, Fluid Dynamics, Fluid Flow, Fluid Mechanics, Fluid Structure Interaction, Numerical Methods	1999 (23)	1969 (49)	Programme Coordinator (Faculty)
R15MPhy (Male, Physics)	Laser Diodes Simulation, Materials Science, Nitrides, Optics, Photonic Band Gaps Simulation, Physics, Science & Technology - Others, Spectroscopy, Surface Phonon Polaritons	1988 (34)	1960 (57)	Director of Research Institute
R24FChem (Female, Chemistry)	Chemistry, Natural Products Chemistry, Organic Chemistry, Spectroscopy	1989 (33)	1963 (54)	Deputy Dean (Research & Development)
R40FTech (Female, Industrial Technology)	Utilization of bioresources	1994 (28)	1960 (59)	Programme Coordinator (Faculty)
R66MMed (Male, Biomedical Imaging)	Public Health and Health Services	1983 (39)	1954 (65)	Director of a Regional Research Federation
R90FChem (Female, Chemistry)	Biochemistry and Molecular Biology, Chemistry, Drug Design and Synthesis, Environmental Sciences and Ecology, Modeling and Simulation, Organic Pollutants in the Environment, Organic Reaction Mechanism, Synthesis of Biologically Active Compounds	1988 (34)	1961 (58)	Deputy Vice Chancellor (Research & Innovation)

Five participants (R6MEngr, R8MEngr, R12MMath, R24FChem and R90FChem) were found to be dominant towards the need for achievement in scholarly publishing. R6MEngr especially talked a lot about achievements. He explained about establishing a legacy as one of his main targets in research, stating "*I want a legacy. When I was doing my PhD, I had these dreams and I always talked to myself about them. I read and cite other people's research, but when will other people want to read and cite my own paper?*" He also put high performance standards in getting research done, *"I always tell my students that I don't want to see their face in my lab, if after three years, they are still without PhD. That's my work, I have been planning for 3 years. So, among engineering [Professors] I have the highest track record of supervising PhD students through to completion, or producing graduates on time".* R6MEngr also acknowledged that besides having a strong journal publication record and actively producing research graduates, he is also widely involved in book writing and has produced around 50-60 book chapters. He also has very wide experiences serving in journal editorial boards as editor-in-chief and international advisor.

Even though R6MEngr holds a significant management post at his institution (as DVC), his commitment towards publishing in high impact journals is endless; *"If you see my profile, I have one paper published in a journal with an impact factor more than 40. And in some others in journals with 26 or 27".* Ranked sixth among top 100 scientists with 324 papers in 10 years, producing an average of 32 papers per year, R6MEngr also performed very well in terms of scientific impact (ranked second in citations, 5456; ranked first in h-index - 30). He has 242 papers (75%) in the first quartile (Q1) where 94 percent (5111) of the citations garnered came from these Q1 journals.

R8MEngr is quite similar to R6MEngr in terms of publication productivity and impact. *"My motivation is because I have to do it, every year, and I cannot have this year's achievement the same as last year. I have to keep doing new things, achieve more and that motivates me. As a professor, you must have your own niche area or strength. Otherwise, you don't know anything new and subsequently you keep doing the same things".* R8MEngr acknowledged giving his students with potentially publishable papers all the help they need. "*Many times we heard people say we can't publish because we don't have post-grad students. Not true, actually final year [undergraduate] students can publish too. But you have to be serious, encourage and guide them, and publish at a young age!"* R8MEngr's first WoS-indexed journal article was published in 1986, when he was only 22 years old. He further explained *"You have to teach them to be confident. It's their paper. That's why I gave them to be the first author. That's my philosophy! For my papers, I will not find my name as the first author. All students. I am a co-author. You must empower your students, appreciate them. Value them. Then there are rewards coming"*. Based on the bibliometrics data, R8MEngr served as the first author for only 2 papers (0.87%); 2nd author in 27 papers; 3rd author in 78 papers; 4th and above in 123 papers.

R8MEngr also discussed setting a high goal in scholarly publishing. He also believes that whoever wants to reach a distant goal must take small steps. "*Of course, I always try to target three Q1 per year. It started like running. I didn't want to run a long distance to Alor Setar, but run first short distance on campus. Just to try and see if the run is hard or easy".* Most of his papers were published in Q1 journals (144 papers, 63%), followed by Q2 (41, 18%), Q3 (29, 12%) and Q4 (16, 7%).

R8MEngr acknowledged the importance of citation metrics,*"That shows how relevant your work is. We used to target to publish, but now whether the work is to be cited or not. If not cited, it means that the work is not relevant. Whether your research area is no longer*

relevant or what you produce is not important, it depends on how you want to interpret. Citation is very important. You can publish one or two papers, but your citation can be very high. That's better than having the most number of papers, but your citation is low." Indeed, his citation impact explained the statement further whereby he received 4613 citations, among the highest within the top 100 scientists (ranked 4). Meanwhile, citation-per-paper (CPP) is also among the top 4 with 20.06 and h-index ranked third with 37 h-index.

According to R8MEngr, hard work is a must for every scientist, *"I used to ask why so many people go to Japan, now I have visited Japan five times. Because I do believe…that's how they become. In some labs there are beds. As long as you don't finish your work yet, don't go back. The culture there is different. We have the potential, but not the culture here"*. His comments about collaborative research culture with Japan are illustrative: *"If it's Japan, it's okay. I just got a grant with Japan for five years. They paid for everything. For me to go there for a presentation, the grant was paid by them. But wanting to gain their confidence is not easy. You have to deliver. If you promise to do something, you have to do it. We talk a lot, but we don't do it. With Japan reputation is very important. If you can't deliver, just say you can't deliver. I have published around 15 papers with the Japanese".* R8MEngr collaborated with Japan in 17 papers, namely Osaka University (12 papers), The National Institute of Health Sciences (1), Hoshi University (1), Tokyo Institute of Technology (2) and Nagaoka University of Technology (1).

Achievement motivation describes those who are driven to finish tasks because they give a sense of accomplishment. As one scientist (R12MMath) explained *"we need to compete to be the first to publish. That's my only motivation, not for salary increase or promotion purpose".* He added *"I don't set any target. My target, I want to go first. Not that I want ten papers, right? My target, I want first. Then there are students, so I have to plan for that student. He is for this paper, another student for another paper. Then I will monitor, students must come every week. That's all".* He fully utilizes the students to boost productivity – he is first author for only 7 percent of his total publication.

R12MMath shared his strategy in getting ideas to publish a research paper, *"I used to open the database every day, Scopus and ScienceDirect. So, I went to the journal in my field. I would look at it every day. I will spend, I will browse the topic and title, I think hundreds in one day. Sometimes there is a new pattern. I also sometimes know more than students. My students just want to make a paper and want to understand other papers as well. I already have a new paper that is very close to his topic. So, I shared it with him".* Later he shared another strategy that worked for him *"In my early days, I would read to myself. Read the table of contents. You have to look at the table of contents and get an idea there. The idea is important, get the idea when we browse the table of contents of the latest issue of the journal. Then go to the major journals in our field, go into content. Sometimes it can send us something, like an alert. That's a good strategy. But now if you ask, many researchers do not do so. Each of us has a strategy right. That's a strategy that works for me".* Another strategy related to searching for related papers to find out next research topics, *"We have to go to the website, look at the in-press article. If possible, every day. Another strategy, there is a database, I forgot the name. It can do forward citation. If we do a literature review, it looks at what people have done. We look at one paper; we find related papers, then just collect the papers. Then look for backward citations, if we find another relevant paper, look cited by. Let's say ten people cited the paper, so we click on it, see what the person did".*

Despite the strategies that he applied, R12MMath acknowledged that his publication productivity is decreasing lately, "*Publications have also decreased in number. I used to be able to reach more than twenty in a year. But now, getting ten is good enough, but I want quality. Previously I just focused on publishing only, ahead of others".* The data showed that within 10 years, he published more than 20 papers in a year several times (2008, 2009, 2012, 2013), then in the following years the number decreased to 14 (2014) and 7 (2015). But in terms of quality, he published 8 Q1/Q2 papers in 2014 and 5 Q1/Q2 in 2015.

R12MMath declared the importance of students as a mechanism to produce more papers, *"My students, that's it. I have to tell students to come frequently. I usually do it once a week. Ask them to come to report their progress. Because we also rely on students to make papers. If we just rely on ourselves alone, we can't because we need to teach, attend meetings and so on".* R12MMath confessed fully utilized the students to boost productivity – he is the first author for only 7 percent of his total publication. He preferred to be 2nd author (42%) and 3rd author (44%).

Even though R12MMath majored in Mathematics, he also published in other fields as a strategy for getting more citations, *"In Maths, we can get citations but not much because this field is classic. So now there are people still publishing in my field, but not as much as what I was doing before. So, wanting to continue is also a risk. It's not like before. Other people start looking at the more advanced ones. So don't be so obsessed with your own field, must be open. Be prepared to change".* He obviously ventures into a wider field or niche area such as Computational Fluid Dynamics (CFD), and Thermal Convection – research topics related to Mechanical Engineering, together with Numerical Methods.

R12MMath also talked about publishing in the right journals for better impact, *"So, things have to change. Citation depends on publishing in the right place. Don't publish in a journal that you have never heard of for the sake of KPI. We can do it for KPI, that's another issue, but make sure you choose the right path, then the KPI will settle on its own."* He went on emphasising the importance of publishing in journals of prestige, *"So if you don't meet your KPI, you want to publish it here? But what is the impact? People don't cite, right? Let's try to send it to the top prestige journal, it's really hard to get in, but when people read, we are satisfied. People see our paper and cite. So, there's a point there, impact".* Apparently, he published 40 percent of his papers in Q1 journals and 29 percent in Q2, which bring impact in term of citation received with 1272 citations from Q1 (53%) and 861 from Q2 (36%) – almost 89 percent of his total citations coming from his Q1/Q2 papers.

R90FChem on the other hand talked about achievement in meeting her KPI, *"So I personally target that every year at that time, there must be a paper published. So, at least one Q1 publication a year".* Then she added *"That is my KPI. That's how I set my KPI. Holidays, long-term break of three months, I will look for funds, find fellowships and spend time in people's labs."*

R24FChem explained her strategy to publish as many papers as possible because early publication tends to be understood as a reliable indicator of future productivity and influence in academic and scientific careers. For her, postdoctoral fellows who are expected to come up with long publication list are very helpful in guiding other researchers to write papers that are still pending, *"If you have post-docs, they will help to increase the number of papers published, and they will even assist lecturers who have problems with pending papers, because postdocs need to look very good to hiring committees and funding agencies".*

Affiliation Motivation

The need for affiliation presents itself as an emotional drive to be liked and embraced. Individuals with a high desire for affiliation want to have friendly and cooperative working relationships and a harmonious social atmosphere with others. All participants consider the need for affiliation, that is the urge to achieve something as their motivation in research. They show that they are doing research to help others, and not for personal gain. Four of them (R5FPhy, R24FChem, R40FTech and R66MMed) are more inclined towards affiliation as their motivational needs. The topics under affiliation are such as helping others, value collaboration, value relationships, do not like to stand out, and sense of belonging. The words that reflect affiliation expressed by the participants are as follows: *help, share, friends, collaboration, keep in touch, team, group, networking, support, empathy, together,* and *relationship.*

One scientist (R24FChem) highlighted the importance of helping other researchers, especially the early career to develop their strength and foundation in research. She pointed out *"so far I help young researchers especially those without grant",* and she elaborated *"for new researchers with insufficient lab facilities, I allow them to use my lab, and use my chemical; that's how I help others".* She described this feelings about helping others, *"actually for me, I feel like what I got and produced has actually been shared with people, my papers. I wish I could produce and share more. Actually, don't be stingy. What you can share, share. What you can help, help. Especially young researchers who have just come back from their study".* In terms of publication productivity, R24FChem produced 152 papers within 10 years, range from 3-37 papers each year. On average, she published around 15 papers per year.

R24FChem also explained about the importance of collaboration with researchers of different ages, *"I can't work alone, so I need colleagues who are older than me, the same age and also younger than me. Because the older ones will retire and leave us, while the younger ones will replace us and they really need our help".* The bibliometrics data shows that R24FChem fully collaborated with others (100%) in producing all her papers. She produced more national collaborative papers (64%) as compared to international collaborative papers (36%). Even though the number of international collaborative papers are lesser, the impact in terms of CPP are bigger with 6 CPP as compared to 4 CPP for national collaborative papers.

Meanwhile, R40FTech considers the students as the backbone to her success, hence, concerns very much about students' future and fulfilling the current needs of students such as the need for publication as part of graduation requirements, the need to graduate on time and getting jobs. In other words, she believes that scientists must be sincere in helping the students. She firmly stated that she would continue to supervise the students until they graduate even after her retirement (in one-year time from the interview period). R40FTech also emphasises the importance of publication as an essential mechanism to assist the students, *"if not with a research article, then a review paper. Certainly students who ask for a fellowship, if they do not have a publication, (then) getting a fellowship is very difficult. That's what I can help them with".* This statement can be seen clearly from the bibliometrics data which indicated that she rarely became 1st author (9 papers - 7% only) but prefers to play a supporting role as 2nd author (53 papers), 3rd author (25 papers), 4th and above (39 papers). Apart from the importance of publication productivity, R40FTech also considers the importance of publishing in high impact journals, "*I sent my student's paper to Q1 journals, indeed I will get it published. Student is also happy to know when he goes to Persada Kencana, so he is motivated. Some people say, we want to*

*publish in Q1 because we are going for monetary rewards. Okay, I acknowledge that but we have to think that this student also wants to find a job, he needs recognition, so from here he can be recognised. So this university has a Q1 from us, it will have more fun if the supervisor apply for Sanggar Sanjung, then student apply for Persada Kencana"***.** The *Sanggar Sanjung* or Hall of Fame event which began in 2001 in R40FTech's university is a special ceremony held to celebrate outstanding contributions of staff and academic staff in research, publications, personality, quality, creativity and teaching categories and who had received awards from both national and/or international agencies for their efforts and achievements. Meanwhile, *Persada Kencana* is a special event for honouring and rewarding undergraduate and postgraduate students who have achieved outstanding performance in the areas of research, publication, leadership, sports, culture, volunteerism, social, environment and entrepreneurship. R40FTech has published 57 papers in Q1 journals, which represent 45 percent of her total publication.

R40FTech also values her research collaborators by developing a long-standing relationship and trust between them. Her story describing her close relationship with international collaborators, reflects her high motivation for affiliation, *"I have a long relationship with the research team from Japan, and almost all my Japanese team members have retired, but I'm still in good contact with them.* She seems to easily blend in, and like spending time networking *"My collaboration with Imperial College London research team for instance, I know the husband and wife, I know their children too. It's the same with my colleagues from Germany and Japan. It is nice to think of any collaboration as a scholarly marriage!* Indeed, collaboration has become an essential part of efficacious research for R40FTech, who has extensive international collaboration involving 14 different countries. She has produced 39 papers with Japan, 20 papers with USA and 16 papers with India. She collaborated more with international collaborators (56%) as compared to national collaborators (44%).

R66MMed who also shows a strong need for affiliation collaborated extensively with international researchers, and involved in mentoring programmes to guide postgraduate students from various countries, *"I also conduct a lot of guidance meetings on Friday night. I do international mentoring, and it's interesting. Mentor some young researchers, three from Brazil, one Peru, two from Vietnam, one England, one Malaysia*." As far as international collaboration is concerned, 77 percent of his papers are collaborated internationally, 21 percent nationally and 2 percent self-authored. His international collaborators come from 30 different countries, the highest are Singapore (34), Australia (25), USA (9) and India (9). The CPP for international collaborative papers is 6, whereas for national collaborative is 2.

Affiliation motivation makes an individual wants to give back and R66MMed talked about knowledge transfer to help others, *"I want my research works to help the society in knowledge advancement. For me, it is easier to measure my research impact because I'm in healthcare, a discipline that benefits others".* He is also also concerned about the lack of papers authored by prolific scientists published in local journals, leading to local journals not readily visible to the rest of the international scientific community. He attacked the whole notion of achieving publishing success: *"For example if I do research on local health issues in Pahang, ideally the work is relevant to the national audience, so I publish in a good local journal like Medical Journal of Malaysia. It's not even Q4. But some top scientists are not willing to do it, unfortunately they want promotion and achieve KPI, so they don't bother to publish in local journals. But look at Singapore Medical Journal, many Malaysians publish in this Q2 journal, but not in our medical journal, because it is not*

indexed by Scopus. So, if they publish in here, they'll lose. But then no one will support our national journals. So how? The time has come for us to recognize local journals as a resource for health." R66MMed unsolicitedly highlighted the issues regarding publishing ethics and practices and believes that measuring scientific success by the indexation status of journals is wrong. Admittedly, for researchers in the developing countries, there is a strong push to publish their research in journals of developed countries indexed in WoS and/or Scopus. Ofori-Adjei et al. (2006) viewed that this problem is compounded by the fact that many policy makers are not aware of what is published in local journals, and so the findings of research published locally are not put to their full use.

Authority Motivation

Only four participants (R6MEngr, R8MEngr, R15MPhy and R90FChem) consider the need for authority, demonstrating that they have an urge to give orders, make decisions and enforce obedience as their motivation in scholarly publishing. The desire for authority expresses itself as the right possessed by a person to give the command to others and typically used in professional capacity. They are usually inspired by competition and they love winning arguments. They gain power, i.e. having authority over other people and influence others' behaviour (Haynes 2016), and aspire to rank and respect and do not want to be on the losing side (van Emmerik et al. 2010). Authority motivated scientists sampled in this study hold leading research positions in their respective universities. The topics that reflect authority motive expressed by the participants are as such: post, position, director, setup, manage, lead, recognition, and agreement. *The* words that reflect authority motivation expressed by the participants are as follows**:** *enjoy holding position, pioneering new research institute, enjoy status and reputation, play leading role, seek recognition, enjoy competition, like to win arguments, want to control, in-charge,* and *influence others.*

R15MPhy who shows a strong need for authority emphasizes the importance of leading by example, *"when you are in top management, you have to show a good example. You can't tell all staff to do research and publish paper, but you don't. So, you must take charge and you have to lead by example".* This leadership style of "leading by example" was practically modelled by R15MPhy whereby he lets his actions do the talking by producing an average of 18 papers per year. He describes his experience in pushing postgraduate students towards scholarly publishing, *"I was appointed as Acting Dean Research for 5 months, and there were issues about publication requirement. I made a new rule, I said I want two papers from PhD students. Everybody didn't want to. They said the Graduate School and the University did not make such rules. But I said I want to. Otherwise we will not have paper published in a high impact journal. Then I wanted all academic staff to have a grant. Again they didn't want to. When I finished my acting term, everyone is happy".* R15MPhy actively demonstrates his publishing excellence, where he has published 95 papers in Q1 & Q2 journals (represents 54% of his total papers).

Meanwhile, R8MEngr talked extensively about the university management position that he has held since early in his academic career and has pushed him to support the university's purpose and values: *"I became Dean very early when I was 32 years old, then hold the post for 9 years, and from then holding various research management posts. When you are there, you must work just as hard and accomplish just as much as you got to do your part for the university, so that your team will follow, so I can expect to receive respect not only from my superiors but also from people who work alongside".* R8MEngr has held various positions of authority such as being the director of Centre of Engineering Excellence and DVC (Industry and Community Engagement) and DVC (Research &

Innovation). He also actively demonstrates his publishing excellence, publishing consistently for the past 10 years (range between 7 - 35 papers), with an average of 23 papers per year.

Avidity Motivation

A new theme emerged in this study as another motivational driver in scholarly publishing, i.e. avidity. This theme is about the participants' feeling of enthusiasm with a passion for their research field, a form of willingness and eagerness, and a positive feeling of wanting to push ahead with their research. Five participants (R5FPhy, R6MEngr, R8MEngr, R40FTech, R90FChem) acknowledged that they engaged in research into passion and they are keen to publish from their research. They declared that carrying out research projects is not a burden to them, but rather rewarding. Being passionate towards research led them to prioritize it and engage in the activity frequently, over many years and still being productive, despite holding high administrative posts at their respective institutions. The topics that reflect avidity expressed by the participants are: internal initiative, passion, happiness, enthusiasm; and sincerity; and the words that reflect avidity expressed by the participants and extracted from the interview data are as follows: *happy, passionate, sincere, intention, grateful, exciting, enjoy, fun, soul, heart,* and *sacrifice.*

R8MEngr has the most mentions in terms words associated with avidity as his success motivator. His comments are illustrative,*"even though I am a DVC, I still maintain to supervise many PhD students. They can always take away the administrative post from me, but not my research. I'm very happy with what I'm doing. I'm very passionate. I can't stop my research, I really want to do it and publish with my students".* R8MEngr seems to feel that passion in research is an essential part of his identity. He added further *"Yes forever. Does that mean I have to stop research? I cannot. I can't, I can't. No way, no way. Even though I got everything I wanted. You have to be passionate about your work, you do it not because you have to.".*

R6MEngr also have his own views about engaging in research into passion, *"I and my Professor friend, produce two PhD students in this field , one focused on the technology, one on the process, there's always problem and challenges to find the most efficient and sustainable solution, but we did it! Being passionate is the keyword, it can set our mood and enthusiasm can sweep through the team".* He also highlighted the importance of passion in research team: *"So, in research, teamwork, hard work, smart work, passion must exist. We need soul in our work".*

The tendency to associate passion with responsibility and sincerity and share enthusiasm is also striking, and this is very noticeable in the participants' voices.

"Of course research is my passion, but responsibility is also there that needs to be fulfilled. If I am given any responsibility, I'll do it and if not, I still can pursue my passion in research. Maybe for some people research is a burden but for me it's ok, I'm happy to do it". (R5FPhy)

"*Being passionate is the key to a researcher's success. If you don't have heart in publishing your research, you only work because you want to achieve your KPI, then, forget it, just forget it. You will not go that far. So for me it is passion, and what I am thinking right now is more about sincerity, willing to work hard to go after it, even it it means making sacrifices along the way".* (R90FChem)

Here is R40FTech, thinking much along the same lines: *"In research collaboration, you have to be sincere, you have to really commit to that collaboration. Put aside your self-interest and collaborate. If the paper needs to be completed that night, I need to do it. If the review*

*arrives at 12 o'clock that night, and my collaborators are waiting for my response, I have to do it, but still all must be sincere. There is always more to read, more to learn, and more to d*o. *Whatever we do, our intentions must be sincere".*

DISCUSSION

To answer the research question of "What is the motivation behind the publication success of high ranked Malaysian scientists?", this study, using McClelland's Human Motivation Theory as the research framework has illustrated that the scientists are driven by four needs which affect their motivation in scholarly publishing. The study adopts "Achievement" and "Affiliation" in McClelland's; adapts "Power" in McClelland as "Authority" which captures the need to authorize, and operationalizes "Avidity" which describes "passion for research" as the four motivation needs for success. The mentions of the words, phrases or themes that describe or reflect the types of the motivation needs in general suggest that Achievement needs are dominant among the scientists, followed by Affiliation, Authority and Avidity. At least two types of motivation needs are present in each participant, but one need will be more dominant than the other.

The interview findings show that achievement motive is indicated by the high ranked scientists in their stories as wanting to perform in their research and accomplish their research output in a manner that they are proud of. Achievement-motivated scientists have the following characteristics:

a) Have clear research strategy to enhance publication productivity and impact, such as publishing in collaboration with other researchers, fully utilize human resources especially postgraduate students and postdoctoral fellows as well as targeting the right journals to publish in.
b) Have the urge to progress and aim for the best, especially in choosing the prestigious and top-tier journals for publication.
c) Have high performance standards as their KPI and a clear publication target every year.
d) Drive to excel in everything they do, whereby they always strive for the best in publication for themselves and students under their supervision.

Affiliation motive is indicated by the high ranked scientists as wanting to be with and contribute to their university, value collaboration and relationship with research teams, and enjoy mutual relationship with their colleagues. Affiliation-motivated scientists have the following characteristics: (a) Enjoy helping their peers and especially junior researchers in producing good and high-quality publication; and (b) Value collaboration and long-term relationship with other research colleagues in scholarly publishing activities.

Authority motive is indicated by the high ranked scientists as desiring to have impact and make an impression on others in scholarly publishing. They seem to be motivated by the opportunity to control others in their research group. Authority-motivated scientists have the following characteristics: (a) Give priority to scholarly publishing, despite holding important post at their institutions; (b) Play a leading role in research team to produce high quality research publication; and (c) Like to be in charge and able to lead their subordinates to emphasize on high quality scholarly publishing culture.

Avidity motive is indicated by the high ranked scientists as having passion for research and publishing, and they can be seen as persons who are in need of a continuous state of

motivation, regardless of time and busy schedule, with respect to their research work. Vallerand and Houlfort (2003) define passion as a strong inclination toward a self-defining activity that people like or even love, find important, and in which they invest time and energy. Passion or avidity-motivated scientists have the following characteristics: (a) show enjoyment and enthusiasm doing research and have good attitude and good energy in producing a lot of papers; and (b) sincerity is their priority in scholarly publishing and do not aim for immediate recognition in this activity.

The Malaysian Ministry of Higher Education aspires to place Malaysian universities at the highest rank at par with the best universities worldwide. The country has a pool of prolific researchers who have contributed greatly to the rise of Malaysian universities in the global university rankings. These researchers or scientists are extraordinary individuals with remarkable productivity traits. The motives behind their accomplishment are explained in this study. Top scientists in Malaysia is typically motivated by the need to succeed (ACHIEVEMENT), the need to belong to, affiliate with and be accepted (AFFLIATION), the need to authorize or exercise one's will over others (AUTHORITY) and the need to follow one's passion for research (AVIDITY). Although the scientists were found to be mainly motivated by the need to succeed, belong to and exercise their power, they too were highly driven by their passion for research.

This paper is important for two reasons. Theoretically, the study has showcased evidence to extend the McClelland's Human Motivation Theory from three attributes to include another key attribute which is Avidity. Practically, high ranked scientists' voices on the motivation behind the publication success have now been heard (and published), because they should be given full attention in an effort to identify the list and series of successes that have been achieved, and even more importantly, to study the uniqueness of their point of view and the strategies applied in achieving publication success to a level that one could be proud of. It should be noted that the participants whose experiences were drawn on here were highly competent communicators, and the findings presented in this study can provide a true picture of what high ranked scientists has gone through. This useful information can be used by many parties that attempt to find the best method to produce more high-quality, productive, and impactful scientists in the future. By emulating their mindsets, mid-career and younger scientists may set themselves on the path to publication success. Finally, with more great scientists, the benefits can not only be enjoyed by researchers in particular, but also benefit the general public, institutions, and the country in general.

CONCLUSIONS

This study contributes as the first study to gauge the characteristics of high ranked scientists in Malaysia from the motivational point of view. Most studies have focused on the tangible outputs of top researchers thus far. Understanding the motivates of top research scientist can compel research performing organisations to better prepare the other researchers and even groom the younger researchers though a conducive environment suitable to these motivating factors to increase research productivity for the country.

Methodologically, this study has successfully employed a qualitative approach to deepen our understanding of the motives and reasons behind the scholarly publishing behaviour of high ranked scientists. This understanding is not merely based on quantitative data,

mainly as evident in bibliometric studies, but actual description of characteristics and traits as expressed by the researchers themselves. Although the numbers of participants were limited, further studies using this method may be able to reveal more in-depth characteristics that will be useful for nurturing future scientist in the country.

Future studies can extend this investigation to include the other academic disciplines in the social sciences, arts and humanities, to ascertain similarities and variations in findings. Productivity output measures of these group of researchers can be extended to include books and awards received, because the inclusion of citations is still a problem when using Malaysian social sciences, arts and humanities sample since a high number of academics are either not publishing in journals indexed by WoS, or are publishing in low impact journals and works published are rarely cited.

Since this study focuses on scholarly publishing success gauged through traditional based metrics, informal modes of publication such as pre-prints and scholarly blogs as well as altmetrics to gauge research performance are not considered. Every day, thousands of scientific papers are posted on pre-print servers and discussions about scholarly content take place online. Altmetrics can keep track of the attention surrounding the work, through a variety of sources to gather and compile this activity. Therefore, future studies may also involve investigating how far the research outputs of high ranked scientists are communicated online, especially on alternative sources such as the social web platforms, and what motivates them to share or report preliminary/early research works.

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APPENDIX A

Top Malaysian Scientists ranked by publication productivity

In the dataset, only two (R1, 1559 papers; R2, 1477 papers) had contributed to 1000 or more articles and obviously should be acknowledged to be the most productive scientists. Almost half of the scientists (62 scientists) produced more than 100 papers (10 papers per year) and they could reasonably be considered to be successful scientists. There is a big gap of 999 publications between the third scientist in the list (R3, 478 papers) with R2. A total of 28 scientists produced between 50 - 99 papers, and another 10 produced less than 50 papers. Overall, using this dataset in terms of productivity, a high ranked Malaysian scientist produces an average of 150 papers over a ten-year period.

No.	Researcher code	Institution	Field	TOTAL	
				No. of Paper	Times cited
1	R1	USM	Physics	1559	5105
2	R2	UM	Chemistry	1477	4512
3	R3	UM	Physics	478	2839
4	R4	UM	Electrical Engineering	477	2832
5	R5	Disclosed	Physics	357	1917
6	R6	Disclosed	Power Engineering	324	5456
7	R7	USM	Materials & Mineral Resources Engineering	283	2176
8	R8	Disclosed	Chemical Engineering	230	4613
9	R9	UM	Chemistry	224	658
10	R10	USM	Chemical Engineering	208	5500
11	R11	UKM	Mechanical and Material Engineering	197	2054
12	R12	Disclosed	Mathematics	192	2408
13	R13	UKM	Medicine	186	559
14	R14	UPM	Biotechnology & Biomolecular	182	1068
15	R15	Disclosed	Physics	177	899
16	R16	UPM	Engineering	172	1370
17	R17	USM	Chemical Engineering	170	3714
18	R18	USM	Physics	164	592
19	R19	UPM	Engineering	162	1388
20	R20	UKM	Chemical & Process Engineering	159	2589
21	R21	UM	Physics	159	1455
22	R22	UPM	Food Technology	157	1643
23	R23	UM	Medicine	155	2939
24	R24	Disclosed	Chemistry	152	704
25	R25	UM	Chemistry	150	272
26	R26	UM	Physics	147	1263
27	R27	UM	Chemical Engineering	140	2558
28	R28	UKM	Chemistry	137	407
29	R29	UPM	Chemistry	137	1045
30	R30	UM	Biological Science	136	753
31	R31	UM	Physics	133	905
32	R32	UPM	Chemistry	131	969

33	R33	USM	Physics	130	192
34	R34	USM	Physics	129	454
35	R35	UTM	Chemical and Natural Resources Engineering	129	989
36	R36	UPM	Chemistry	128	956
37	R37	USM	Industrial Technology	128	1456
38	R38	UNIMAP	Electrical Engineering	128	674
39	R39	UM	Biomedical Engineering	127	484
40	R40	Disclosed	Industrial Technology	126	1357
41	R41	UKM	Electrical Engineering	126	718
42	R42	USM	Material & Mineral Resources Engineering	126	935
43	R43	UM	Chemistry	125	809
44	R44	UPM	Veterinary Medicine	124	758
45	R45	UM	Chemical Engineering	122	1700
46	R46	USM	Industrial Technology	118	1317
47	R47	USM	Electrical Engineering	114	762
48	R48	USM	Materials and Mineral Resources Engineering	112	837
49	R49	USM	Medicine	112	535
50	R50	USM	Materials and Mineral Resources Engineering	111	1049
51	R51	UPM	Pharmacology and Toxicology	110	808
52	R52	UM	Medicine	110	1451
53	R53	USM	Physics	109	414
54	R54	UM	Biological Science	109	770
55	R55	UM	Medicine	109	1950
56	R56	UPM	Agriculture	108	250
57	R57	UPM	Agriculture	107	378
58	R58	UM	Mechanical Engineering	106	870
59	R59	UTM	Physics	104	515
60	R60	UPM	Chemistry	104	1273
61	R61	UM	Electrical Engineering	103	361
62	R62	UPM	Food Technology	102	1325
63	R63	UPM	Biotechnology & Biomolecular	99	1168
64	R64	UKM	Physics	98	424
65	R65	Disclosed	Molecular Biomedicine	96	741
66	R66	UM	Biomedical Imaging	95	490
67	R67	UPM	Chemistry	94	539
68	R68	UM	Biomedical	91	523
69	R69	USM	Biological Science	89	426
70	R70	UM	Pharmacology	82	400
71	R71	UTM	Electrical Engineering	78	310
72	R72	UM	Physics	78	323
73	R73	UPM	Biotechnology & Biomolecular	74	655
74	R74	UKM	Mechanical & Materials Engineering	73	233
75	R75	USM	Pharmacology	71	568
76	R76	UTM	Chemical and Natural Resources Engineering	66	899
77	R77	UTM	Chemical and Natural Resources Engineering	66	273
78	R78	USM	Biological Science	65	136

79	R79	USM	Pharmaceutical Science	64	345
80	R80	UM	Biological Science	64	379
81	R81	USM	Molecular Medicine	62	418
82	R82	USM	Materials and Mineral Resources Engineering	58	816
83	R83	UM	Physics	56	322
84	R84	UPM	Food Technology	55	463
85	R85	UPM	Computer Science	55	115
86	R86	UKM	Chemical Sciences and Food Technology	54	319
87	R87	UPM	Chemistry	52	1455
88	R88	UKM	Physics	51	222
89	R89	UTM	Computer Science	51	197
90	R90	Disclosed	Chemistry	50	313
91	R91	UKM	Chemical Sciences and Food Technology	49	601
92	R92	UM	Civil Engineering	48	211
93	R93	UM	Civil Engineering	48	302
94	R94	UM	Chemistry	47	117
95	R95	UPM	Engineering	46	253
96	R96	UKM	Pharmacology	42	302
97	R97	UPM	Chemical and Environmental Engineering	42	459
98	R98	USM	Molecular Medicine	40	220
99	R99	UPM	Biotechnology & Biomolecular	38	324
100	R100	USM	Chemistry	36	160