Research-Productivity at Engineering-School: Number of Publications per Faculty-Member

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Abstract
Research-productivity has been attracting a lot of attention, globally, among scientists, researchers, administrators, and policy-makers. The present study was conducted at micro-level (sample-size 15), to evaluate total and average annual research-productivity, of individual academicians, in an Engineering school, over their publication career (from the year of their first publication, through 2017). Moreover, research-productivity was evaluated against: academic rank, teaching experience, age, gender, and the field of engineering. Publications, in peer-reviewed scientific journals, were used, as a proxy, for research productivity. Questionnaires, interviews, and document analysis were the main instruments, for this study. Descriptive statistics were used, to analyze both; qualitative and quantitative data, via EasyCalculation software. The obtained data was analyzed, by SPPS-17 (version 22). Moreover, to bridge knowledge gaps, the following issues were looked into: The role of universities in research and development; Trends of scientific publications; Challenges in research and publishing, at the African, and local context; Basic concepts and measurements of Research productivity; and Reading culture. The study revealed that the sample faculty published, cumulatively, 230 papers, over their productive publishing career. The most productive, with the highest average number of total publications, were: (1) Associate professors, with 31.5; (2) Faculty members, between 51 and 60 years old, with 37; (3) Female faculty, with 41; (4) Faculty, having over 25 years of teaching experience, with 33; and (5) Faculty members, from Civil and Structural department, with 33 publications. The analysis also revealed that the identified average number of 2.1 publications, per faculty, per year, compares favorably with estimations, of several previous authors; however, examination of research productivity, at individual-level, showed great variations, e.g., the most productive faculty member (based on both; total number of publications, and average number of publication, per year), a female associate professor, reported 41 articles, published over 4 year period (2012-2016), giving the max individual average number of 10.3 publications, per year. The min number of publications was 8, in the period of 9 years (2006-2015), giving the min individual average of 0.9 publications, per year. Besides, if individual faculty is evaluated, for 70% of the respondents, their average number of publications, per year, exceeds the estimations, of one publication, per capita. The study also identified lack of any international, or national guidance, or institutional policy, on how many publications, an average faculty member should produce, per year, to provide a reliable benchmark, for comparison. In addition, several recommendations were given, for future research.

Keywords: academic staff, measurement research productivity, reading culture, university.

1. Introduction.
1.1. The role of universities in research and development
Research plays a vital role, in promoting the prosperity, of a nation, and the well-being, of its citizens, in this knowledge-based era (Abbott & Doucouliagos, 2004). Universities are considered as modern entrepreneurial engines and generators of knowledge, through research, thereby, promoting national and global development (Okiki, 2013). Mosha (1986), identified three principal roles for the African universities: (1) the promotion of learning, and the pursuit of truth; (2) preparation for service, including training, for problem solving; and (3) the fostering of (applied) research and consulting. Moreover, Braimoh (1999) reviewed the role of African universities, in national and continental developments, emphasizing upon the significance of research and publication efforts, among university lecturers, in their abilities, to create and disseminate knowledge, to solve existing societal problems. Majority of research findings are disseminated via scientific publications, in peer reviewed journals (see Starovoytova, 2017d).

1.2. Trends of scientific publications
The number of scientific publications grows faster, than the global economy, and significantly faster, than the production of goods and services, in industrial countries, from where the largest number of publications originates. The annual growth rate of scholarly publications is at 5%, at the time OECD (2008) was published. According to SBF (2007), the largest share of world production of scientific articles comes from the U.S.A. (25%), followed by Britain with 6.9%; Germany produces 6.3%; Switzerland 1.5%; and Austria 0.7%. However, calculating published articles, per capita, Switzerland becomes the world’s leading country, because there are 2.5 published scientific articles per 1,000 inhabitants, while in the U.S.A. there are 1.2 articles, and only one article, in Germany. The same picture emerges if one applies the number of publications to the number of...
researchers. In this case, in Switzerland for each 1,000 researchers there are 725 publications, while there are 295, in Germany, and 240, in the U.S.A. (SBF, 2007).

In more recent studies, for example, STM (2015), there were about 28,100 active scholarly peer-reviewed English-language journals, in late 2014 (plus a further 6,450 non-English-language journals), collectively publishing about 2.5 million articles, a year. The global yearly revenues, produced from English-language journals publishing, were $10 billion, in 2013 (up from $8 billion, in 2008), contributing about 55% from the U.S.A., 28% from Europe/Middle-East, 14% from Asia/Pacific, and 4% from the rest of the world. The number of articles, published each year, and the number of journals has grown steadily, by about 3% and 3.5%, per year, respectively. The U.S.A. continues to dominate, the global output of research papers, with a share of 23%, China is second (17%), followed by UK (7%), Germany (6%), Japan (6%), and France (4%). The rank-order changes, for citations, however, with the U.S.A. strongly in the lead, with 36%, and China at 11th place, with 6%.

Moreover, recent study by Van Noorden (2014) declares, that global scientific output doubles, every nine years. Articles are also getting longer, for example, Tenopir & King (2014) found that the length of a scientific paper grew from an average of 7.42 pages, in 1975, to 14.28 pages, in 2011. Besides, according to Tanecheva et al. (2016), researchers also complained, about information overload and too much literature, to read, and therefore, time required, to adequately cover an introductory literature review.

Even in developing countries, the proportion of scientific publications, in recognized bibliometric databases, have increased markedly. In 1973, developing countries, as a whole, accounted for 5% of the world’s scientific publications; and only India, South Africa, and Argentina, made the list of top 25 countries (Garfield, 1983). In 2006, scientific publications, from developing countries, accounted for 20% of the global share, largely due to Asia (14.8%) and in particular to China (7%). China experienced a growth, in publications, of over 100% in the last decade, while in Latin America, Brazil has increased its contribution, to global publications, by almost 50%, during the same period (Gaillard, 2010). On the other hand, according to the Bulletin on Science and Technology Statistics, of the UN Institute of Statistics’ (UIS), the whole continent of Africa contributed only 1.4%, of the world scholarly publications, in 2000 (UIS, 2005). In some African countries, research and publishing activity may present some methodological challenges.

1.3 Challenges in research and publishing, at the African and local contexts.

According to Ondari-Okemwa (2007), scholarly publishing, in sub-Saharan-Africa, is faced with many challenges, in the 21st Century, such as: lack of visibility and, even, alleged discrimination, particularly, in citing, of African authors. Publications, from periphery countries, rarely rise to the same elite status, as those of North America and Europe, primarily, because of perceived lower research capacity and relative inexperiance (as scientific publishing does not have a long history, in the African continent, and in sub-Saharan Africa, in particular). In addition, there is also alleged lack of interest to and relevance, of African problems, to outside readers. These alleged attitudes might subdue the voices of periphery scholars and prevent their contributions, to collective knowledge.

Moreover, an important reason for low research outputs is closely related, to the high rejection rate of manuscripts, especially those by first attempt authors. Worsham (2008) confirms that the acceptance rate, of any good scholarly journal, is typically, quite low, so the chance of rejection is always relatively high. Summers (2001), mentions that the rejection rate of leading international research journals, currently averages, around 90%. A study by Kapp & Albertyn (2008), among the editors of 73 accredited, South African journals, also confirmed an exceptionally high rejection rates. Moreover, recent study by Starovoytova (2017c) pointed out on commonality of rejection experiences, that majority of respondents (64%) indicated that they have experienced rejection, in their publishing endeavors.

In addition, the great majority of mainstream academic journals is written, in English; multilingual periphery scholars must translate their work, for their papers, to be accepted (Canagarajah, 1996); this demands additional time, English language proficiency, and/or finances (in case of outsourcing, of a translator, or a proof reader). See Starovoytova (2017c) on English, as de facto language, of scientific communication.

While research environments, in most of the developed world, are characterized by an abundance of resources, and supporting infrastructure, the same does not apply to much of the developing world (Luo & Olson, 2008; Duque et al., 2005). For example, Murithi (2013), in her Doctoral dissertation, surveyed problem areas in research and publication, among sample of 248 academic members of staff, in four disciplines, across four major Kenyan universities. The surveyed 17 problem areas were; availability and access to special equipment, ease of getting funding, amount of funding, administration of the funding, availability of skilled personnel, defining roles, coordination of member’s activities, timely delivery of results, diverse disciplinary training of collaborators, cultural differences, resolving conflicts, scientific competition, information security, authorship inclusion and order, selection of a publication forum, leadership and control, and availability of time, to commit to research. Their study concluded, that major problem is the ease of getting funding (76%).
amount of funding (79.1%), availability and access to special equipment (67.8%), and availability of time, to conduct research (58.4%).

Furthermore, more recent study by Starovoytova (2017b), on the Engineering School (the subject of this research), stated, with brutal honesty, that:

The main finding, with no fear of exaggeration, is that the current state of scientific research, at the institution, can be perceived as a crisis in the making. The profound lack of, or in some cases, non-existence of essential ingredients for effective research, were identified, and can be grouped into: (1) Economic (inadequate funding for research and research infrastructure; low remuneration; and self-sponsored publishing); (2) Institutional (lack of code of practice, for researchers; and mushrooming campuses); (3) Behavioral (publishing prostitution; brain drain; complex of intellectual superiority; and lack of time, motivation, recognition, and mentorship); (4) Demographic (gender imbalance; and aging faculty); and (5) Managerial (lack of marketing of library services, and training, for technical staff), among others. In particular, absolute majority (100%) of respondents pointed out on the Research Funding and Low remuneration of teaching staff, as major barriers to effective research. 82% also indicated lack of the following: (a) Laboratory testing equipment; (b) brochures; Facebook Twitter/Google+; Podcasts, YouTube, slide shares, blogging, and Online Reference publishing outlet (Middaugh, 2001). Different types of published works were identified, such as: book or book institution, can be perceived as conduct research (58.4%).

1.4. Basic concepts of Research productivity
In higher education, research productivity serves as a major role in attaining success, in academics circles, as it is related to: promotion, tenure, salary, and other benefits (Bassey et al., 2007; Kotrlik et al., 2002; Bloedel, 2001).

According to Creswell (1986):

Research productivity includes research publications in professional journals and in conference proceedings, writing a book or chapter, gathering and analyzing original evidence, working with postgraduate students on dissertations and class projects, obtaining research grants, carrying out editorial duties, obtaining patents and licenses, writing of monographs, developing experimental designs, producing works of an artistic or creative nature, engaging in public debates, and commentaries.

Besides, Massy & Wilger (1995) define productivity as the ratio of outputs to inputs, or of benefits to costs. Meyer (1998) also distinguishes productivity from workload and time allocation: ‘Workload . . . captures how their [the faculty] time is spent, while productivity is a measure of what is produced with that time’.

Academic staff members conduct research and their research productivity is measured in various ways. Academic institutions primarily measure research productivity, based on: (1) published works; (2) externally funded grants; (3) the number of citations, the published works received; and (4) the impact factor, of the publishing outlet (Middaugh, 2001). Different types of published works were identified, such as: book or book chapter, peer-reviewed journal articles; policy briefs; press releases; institutional newsletter; video clips; brochures; Facebook Twitter/Google; Podcasts, YouTube, slide shares, blogging, and Online Reference Managers, among others (see Starovoytova, 2017d; Vakkari, 2008; Bassey et al., 2007; Kusure et al., 2006; Torchich, 2006).

A number of studies have tried to compare research productivity, across countries, or academic disciplines, and to explore the main factors, which enhance the research productivity, of faculty members (Shin & Cummings, 2010; Horta, 2009; Stephan & Ma, 2005; Keith et al., 2002; Baird, 1991; Allison & Long, 1990). According to Porter & Ambach (2001) faculty productivity can be grouped into: (1) individual demographics; (2) teaching load; (3) academic status; (4) personal career preferences; and (5) dimensions of human capital (knowledge, skills, values, education, and training). Several authors (such as: Fairweather & Beach, 2002; Porter & Ambach, 2001; Long, 1990; and Golden & Carstensen, 1992), also pointed out on interaction of factors, such as: additional funds, received; size of academic department; number of high achievers; and mentor experiences, in one’s early career.

In particular, number of publications, per researcher, may depend on various factors, such as: gender, age, academic position and rank, availability of research funds, teaching loads, equipment, research assistants, workload policies, department culture, and working conditions, size of department, and organizational context (Dundar & Lewis, 1998; Ramesh & Singh, 1998; Kyvik, 1993).

Differences in research productivity have been also explained, in terms of individual background (e.g., ambition, motivation, and self esteem) (Bellas & Toutkoushian, 1999); previous experience (e.g., doctoral training, reputation of doctoral program, post doc experience) (Horta, 2009; Stephan & Ma, 2005); institutional characteristics (e.g., mission, collegiality, governance, and reward system) (Keith et al., 2002; Golden & Carstensen, 1992); and disciplinary context (Shin & Cummings, 2010; Cresswell, 1985). Regarding disciplinary context, Biglan (1973) grouped academic disciplines into: (1) hard vs. soft; (2) life vs. non life; and (3) pure vs.
applied.

1.5. Measurements of research-productivity of an-individual-faculty-member

Reputation of an-academic-faculty, most of times, is associated-with so-called ‘productivity’ or publication-performance. Publications, in a-peer-reviewed-journal, are an-important-measure of performance. Increasingly, it-is-vital, for-faculty, to-develop, and maintain, a-prominent and continuing-publication-track-record (Schneider & Whitehead, 2012).

In-the-recent-past, the-researcher’s input was-measured, simply, by the-number of publications, and the-impact-factor (IF), of the-publishing-journals. Nowadays, rating research-quality relies, mainly, on the-number of citations, per-article. Citation shows how-many-times an-article has-been-cited, by other-articles (Fooladi et al., 2013). Citation impact quantifies the-citation-usage of scholarly-works (Moed, 2005), and it-is a-result of citation-analysis, or bibliometrics. Among the-measures, that have-emerged, from citation-analysis, are: the-citation-counts, for an-individual-article, for an-author, for an-academic-journal, for an-affiliated-institution, and for a-country. Readers, interested how-to-increase citation-rates, of their-publication, could refer to Starovoytova (2017d).

On-the-other-hand, the ‘publish or perish’ attitudes impacts academic-career-development-systems, at-a-large-number of universities (Lichtenberg, 1997) and research-centers, all-over-the-world. For-illustration, the-Medicine-department, at-the-Imperial-College, insists that its-members ‘publish three-papers, per-annum, including one in-a-prestigious-journal, with an-impact-factor of at-least-five’ (Forgues & Liarte, 2013). Such-requirements can-be immensely-stressful, for some-researchers, particularly in-the-absence, of funding and conducive-environment, for the-research. The-obligatory ‘publish or perish’ customs, also-perpetuate bias, in-academic-environment. For-example, Camille Paglia has described the ‘publish or perish’ paradigm, as ‘tyranny’ and further writes that ‘The [academic] profession has become obsessed with quantity rather than quality. [...] One brilliant article should outweigh one mediocore book’ (Paglia, 1991). Moreover, scientific-writers are often-evaluated on-the-basis of the-number of articles, they-have-published, in-journals with a-high-IF, favoring prestige, of publication, in a-particular-journal, over content; and quantity, over quality. These-forces are contributing to-the-current-dysfunction, of the-editorial-system, for peer-reviewed-science and engineering, causing a total-stalemate (Delzon et al., 2016).

The-best-known-measures, of research-productivity of an-individual-author, include the h-index (Hirsch, 2005), and the g-index. Each-measure has its-advantages and disadvantages, spanning from bias, to discipline-dependence, and limitations, of the-citation-data-source (Egghe, 2006).

The-calculation of citation-impact h-index, for-example, is based on two-types of information: (1) the-total-number of papers, published; and (2) the-number of citations, for each-paper. It-is-defined by how-many h of a researcher’s publications have, at-least, h citations, each. This-means that if an-author has one-publication, with, at-least, one-citation, their h-index is 1, if one has two-publications, with, at-least, two-citations, each, their h-index would-be 2, and so-on. Beside, two-separate h-indices can-be-displayed, for each-author: (1) first is an h-index, that includes self-citations; and (2) the-second h-index, which excludes self-citations. Easy-comparison can-be made of the-two-indexes, to-have a-real-number of citations, by other-researchers.

One of the-major-limitation is that the h-index varies, among bibliographic-databases (Sharma et al., 2013). In-other-words, the-same-author will-have a-different h-index, depending on which-database, one uses, to-define its h-index.

Besides, a-means of normalizing the h-index, for-younger-authors, Hirsch proposed the m-value, which adjusts for-time by correcting for the-number of years, since an-author’s first-publication. According-to Hirsch, the m-value is an ‘indicator of the successfullness of a scientist’, and the-parameter m should-provide a-useful-benchmark, to-compare scientists of different-seniority. The m-value can-be-seen as an-indicator for ‘scientific-quality’, with-the-advantage (compared to the h-index) that it-is corrected, for-age (Hirsch, 2005).

The g-index, developed in-2006 is an-improvement, of the h-index. It considers a-drawback of the h-index (of not taking into-account the-citation-scores, of the-top-articles). The-index is calculated, based on the-distribution of citations, received, by a-given researcher’s publications, such, that, given-a-set of articles, ranked in decreasing-order, of the-number of citations, that they-received, the g-index is the-unique-largest-number, such, that the-top g articles received together at-least g2 citations.

Besides, the hc-index adjusts for-the-age of the-publication, while weighting authorship-value by author-position, and the-journal-IF (Khan, et al., 2013). The Carbon h factor also-integrates a scientist’s research-age into the h-index (Carbon, 2011). The Profit index (p-index) estimates contributions of co-authors relative to-the-work, of individual-authors (Aziz & Rozing, 2013). The Absolute index (Ab-index) takes into-account the-impact of research-findings, while weighting the-physical and intellectual- contributions of the-researcher. The-rate of change of the Ab-index, per-year, is the-Productivity (Pr) index (Biswal, 2013). The Bh-index only assesses the h-index of articles in h-core journals (Bharathi, 2013). Finally, one particularly-interesting-index is the s-index, which includes the-proportion of time, devoted to-research, to-normalize, e.g., for clinical-
academics, who may devote only 40% to 50% of their time, to research (Sheridan, 2005).

Various alternative methods, for quantifying author’s scientific accomplishment have been also proposed (Hutchins, et al., 2016) including: (1) Citation-normalization, to journals or journal-categories (Bornmann & Leydesdorff, 2013; Waltman et al., 2011; Zitt & Small, 2008), one of these, is a previously described as Relative-Citation-Rate (RCR) (Schubert & Braun, 1986); (2) Citation-percentiles (Bornmann & Marx, 2013); (3) Eigen-vector-normalization, and (4) Source-normalization (Zitt & Small, 2008; Moed, 2007), including both; the mean-normalized citation-score (MNCS) (Waltman et al., 2011); and source-normalized-impact, per-paper, metrics (Waltman et al., 2013; Bollen et al., 2009). Yet, another alternative approach, is to measure a scholar’s impact, based on number of downloads, from publishers, and analyzing citation-performance, often, at-article-level (Bollen et al., 2006; Brody et al., 2006; Moed, 2005; Kurtz et al., 2004). For more comprehensive information on the different types of evaluation, refer to: http://libguides.oulu.fi/c.php?g=124852&p=816781 Prestige of journals.

Vis-à-vis scientific-social-networks, the RG Score is a metric, which measures scientific-reputation, based on how both; one’s published-research and contributions, to Research-Gate, are received, by their-peers. A contribution is anything, one shares, on Research-Gate, or adds, to their-profile, from published-papers, and questions and answers, to negative-results and raw-data-sets. A special algorithm looks at how one’s peers receive and evaluate contributions, and who these-peers are. This means that the higher, the RG Scores of those who interact, with one’s research, the more their own-score will increase. For more information, refer to: https://www.researchgate.net/publicprofile.html.

Besides, RG Reach is a way, to gauge the visibility of one’s work, on Research-Gate. It shows, how many unique researchers, can get notified, when one adds new research. The total reach is calculated, by adding the number of direct-connections, one has, to the number of people connected, to one’s work, through co-authors and project collaborators. The higher the reach, the more visible one’s work will be, to others, on Research-Gate. Having a higher reach helps one to get more reads and citations, for their publications.

In addition, software applications (free and subscription-based) are available, for authors, to use for capture of document-level metrics, for their works: Altmetric (http://www.altmetric.com/), Impact Story (http://impactstory.org/), and Plum Analytics (http://www.plumanalytics.com/).

Although some of the methods, presented, have radically enhanced theoretical understanding, of citation dynamics (Wang et al., 2013; Stringer et al., 2010; Radicchi et al., 2008; Walker, 2007), none so far, have been universally adopted, as a golden standard.

1.6. Research purpose

According to Science in Africa, Kenya ranks third, amongst sub-Saharan-nations, in its output of scientific papers, published in international peer-reviewed journals, following South Africa and Nigeria. According to Zeleza’s study (2005): ‘regions and groups with concentrations of economic and political power tend to dominate the production and dissemination of knowledge’. Even in Africa, South Africa, Nigeria, and Kenya, are dominant, in scientific-publishing, for the same reason.

Kenyan scientific publishing, in the areas of environment, ecology and immunology, even outranks that of economic-heavy-weight Nigeria. On the other hand, according to the recent African Union survey, Kenya has scored as last, in terms of the increase in the numbers of published research papers (normalized for population size). Moreover, according to the Web of Science SM for the period between 2004 and 2008, Kenya is 2nd in Africa, in the area of Economics & Business, with 54 publications (0.07% of global papers in the field); Environment/Ecology - 420 (0.32%); and Immunology - 269 (0.45%). Besides, according to Ogbu (2010), only 0.1% of the patents, registered in the United States Patent & Trademarks Office, originate from sub-Saharan Africa. This situation clearly pointing out, at a microscopic contribution, to global publishing, as well as, to innovation, by sub-Saharan Africa, including Kenya. Besides, it also provides an indication of the low research capacity, dissemination of research findings, and knowledge production, by the region.

Moreover, Vijayaragavan et al. (2017) in their study identified that variables influencing research productivity of scientists belonged to different categories, e.g. psycho-social, psychomotor, demographic, organizational, and environmental. They also probed 11 major factors, determining research productivity of scientists, namely: (1) organizational-research-environment; (2) creativity; (3) perseverance and commitment; (4) research facility; (5) ability to work under constraint; (6) incentive policy; (7) proactiveness; (8) purpose driven orientation; (9) achievement motivation; (10) involvement in teaching; and (11) job satisfaction. The authors concluded, that optimum research productivity, of scientists, can only be harnessed, when personal and organizational factors, work in harmony.

Besides, according to a study by Muia & Oringo (2016): ‘Constraints on research productivity in Kenyan universities: case study of University of Nairobi, Kenya’, research productivity depends on the following independent variables: (1) research culture (research policy, students’ involvement in research strategies, budget-guidelines and incentives, and benefits to faculty-staff); (2) research environment (supportive leadership,
clear-goals, and less teaching-load, to faculty-staff); (3) institutional factors (level of University, level of supervision, recruitment and selection-policies, disparities among-faculties, training, department-support; and (4) resource-factors (expenditure on materials and equipment, better-salary and qualified-staff).

Furthermore, Sulo et al. (2012) in-their-study on ‘Factors Affecting Research Productivity in Public Universities of Kenya: The Case of Moi University, Eldoret’, concluded that the-staff-qualifications, research environment, funding, and time, available to-staff, could-predict, significantly, the-research-output by the-university-staff.

In-addition, according-to Magoha (2006), even-in-the-largest-research-university, in-Kenya--the-University of Nairobi (UoN) -- the-efforts, to-enhance-research, and publication-activities, have-been hampered, by lack of adequate-funds, and other-resources. Likewise, more-recent-study by Starovoytova (2017b) pointed-out, that “The-main-finding, with no-fear of exaggeration, is that the-current-state of scientific-research, at-the-institution, can-be-perceived as ‘a-crisis in-the-making’, This-conclusion, is in accord with the-conclusions of the-Commission for University Education, Kenya. Moreover, the-finding by Waswa et al., (2013) on 45 academic-staff, drawn-from Kenyan-public Universities, in 2011, shown that university-academic-staff are generally-marginalized, when it-comes to-decision-making, even, on-issues, that directly-affect-them. Besides, ‘top-down’ management-approach is-still-applies and impacts, negatively, on service-delivery.

Such-analyses reflect a grim-picture of the-barriers to local-research and publication, however, none of the-studies, the-author came-across with, provided some-assessment of the actual-research-productivity, in-the-local-context, in-particular, among engineering-scholars.

On-the-other-hand, during the-past-few-decades, considerable-attention, has-been dedicated to the-topic of faculty-research-productivity. Such-attention is warranted, since productivity is often used ‘as an index of departmental and institutional prestige and is strongly associated with an individual faculty member’s reputation, visibility, and advancement in the academic reward structure’ (Creamer, 1998). Likewise, more-publications, can lead to-higher rankings, of academic-programs, and entire-institutions (Budd, 2005). While many-studies that have-examined research-productivity, in-Africa have used an-evaluative-approach, with an-emphasis on bibliometrics (see, for-example, Arencibia-Jorge et al., 2012; Boshoff, 2009; Tijssena, 2007 in Mouton, 2008), this-study, like the-HERANA-project, used an-exploratory-approach, to-study faculty-research-performance (see Avital & Collopy, 2001).

Consistent with Massy & Wilger, the-authors of this-paper define productivity, in-terms of individual-faculty-member outputs, while number of publications, in-peer-reviewed scientific-journals, was used as a-proxy, for research-productivity, and it-is also a-main-subject, of this-study. Feldman (1987) found that majority (21 of 29) studies, he reviewed, used the-number of publications, as the-measure of research-productivity.

The-overall-purpose of this-study was to compare publication-output, among-faculty, in-the-School of Engineering, and with the-available-global-data, for research-productivity. Although there-are several-outputs from scientific-research, the-notion that scientific-publications capture the-essence of its-productive-output, is widely-accepted (Inklaar & Timmer, 2009; Bonaccors & Daraio, 2003). Journal-articles are the-publications most-readily measured, and thus, most-susceptible, to-evaluation, through any-system, of performance-assessment. According to RIN (2009) journal-articles are the-most-frequent-form of publication, for researchers, in-all-groups of disciplines, and the-bibliometric-analysis indicates, that the-scholarly journal-article-dominance is increasing. Besides, ‘Given the increasing emphasis on performance indicators, the measure of the ratio of publications to-full-time faculty member can fill an important gap in how institutions [and individual-faculty] are evaluated and compared’ (Budd, 2005). Moreover, ‘Comparisons over time are best made by examining articles in the population of influential-journals’ (Javitz et al., 2010). The-journals in this-group, change, over-time, as new-journals may-appear, and attain-influence, while a-few older-journals may-decline or, even, cease to-exist (Javitz et al., 2010).

In-this-study, hence, complete (absolute) counting of peer-reviewed-articles, was conducted, where each-author, which appears in-the-author-list, receives one-credit, for an-article, according-to Javitz et al. (2010). The-reputation/prestige/standing of journals, where articles were-published, were excluded from consideration, as this-study was largely, preliminary. Moreover, in-this-study, research-productivity was evaluated against: (1) academic-rank; (2) active-publishing-career; (3) age; (4) gender; and (5) field of engineering. The-evaluation was done, on-the-basis of lifetime-of active-publishing-career, of a-faculty-member.

In-addition, to-give wide-ranging-view, on the-subject-matter, the-following-relevant-issues were also addressed: Basic-concepts and measurements of Research-productivity; and Reading-culture.

The-study followed the-steps, which shown in-Figure 1.
2.2. Sample size and details
To-evaluate the research-productivity, by the-engineering-faculty, a designed-confidential self-report questioner was used, as the-main-instrument, with the-sample-size of 15-subjects. The-sample was drawn, from the-five-departments, at the-school of Engineering, such-as: (1) Mechanical & Production (MPE); (2) Electrical &Communication (ECE); (3) Chemical & Process (CPE); (4) Civil & Structural (CSE); and (5) Manufacturing, Industrial & Textile (MIT). Professors, Associate-professors, Senior-lecturers, and Lecturers, form these-departments, were chosen, at-random.

2.3. Main-instruments and measures, used in the-study.
This-study applied a-projective-technique, by requesting questionnaire-respondents questions, about their-research-productivity. Protecting the-rights and welfare, of the-participant, is a-major ethical obligation of all the-parties-involved, in a research-study (Mugenda & Mugenda, 2010). In this-regard, the-respondents were-guaranteed-confidentiality, and the-questionnaires were filled in-anonymously, with no-identification information. The-designed self-report-questionnaire was used in eliciting information, from the-subject sample; it consisted of two-sections, first-section is the-demographic-characteristics of the-subjects; second section, is the-self-report, by the-faculty, on their-scientific-publications and other-relevant-issues.

In-addition, phone-interviews were also-conducted, to-get some-additional-information, not-covered, in the-questionnaire. Moreover, document-analysis was done, to-bridge the-gaps of information, and to-provide comprehensive-coverage of the-topic.

On-the-other-hand, in general, productivity-measures can be categorized into single-factor productivity-measures (relating a-measure of output to a single-measure of input) and multi-factor productivity-measures (relating a-measure of output to a bundle of inputs). Another-distinction is between productivity-measures, which relate gross-output to one or several-inputs and those, that use a-value-added-concept, to-capture movements of output. The-choice between the-various measures depends on the-focus and the-purpose of the-comparison (Inklaar & Timmer, 2009). In this micro-study single-factor productivity-measure was used.

2.4. Data Analysis
The questioner was pre-tested, to-establish its validity and reliability, according to Hardy & Bryman (2009) and Kothari (2004). Kothari (2005) defines reliability as the consistency of measurement, or degree, to which an instrument measures the same-way, each-time, it-is-used, under the-same-conditions, with the-same-subjects. Validity refers to-the-degree, to which the-instrument truly-measures what it is-intended, to-measure. In other words, validity ensures content, construct, and criterion, related validity in the study (Kothari, 2005). Mugenda & Mugenda (2008), also-advocate that the pre-test-sample should be 1% to 10%, depending on subject-sample-size. Cronbach’s alpha-coefficient was calculated, as per Cortina (1993), using the-Statistical-Package for Social Sciences (SPSS-17, version 22)-computer software-program. Descriptive-statistics was utilized, to-analyze both; qualitative and quantitative-data, via EasyCalculation-software.
3. Results and analysis.

3.1. Validation of the instrument
The instrument was found adequate; the length of the entire instrument established was suitable and the material was logically organized. It was considered as acceptable, with some minor editing. The responses were coded, entered into SPSS and checked for errors. Data were analyzed, list-wise, in SPSS, so that the missing values were ignored. Cronbach’s alpha-test of internal consistency was performed, for perceptions and self-reports, on research productivity, and established good inter-item consistency (Cronbach’s $a > 0.8$), according to guidelines, for interpreting correlation coefficients by George & Mallery (2003), $>0.9$ - Excellent, $>0.8$ - Good, $>0.7$ - Acceptable, $>0.6$ - Questionable, $>0.5$ - Poor and $<0.5$ - Unacceptable.

3.2. Analysis of the responses to the questioner.
Total of 15 questioners were administered, out of which, 11 were submitted back, giving a response rate of 73%.

3.2.1. Analysis of part 1: Demographic Characteristics
Figure 2 shows the demographics of respondents.

![Figure 2: Demographic characteristics of the respondents](Starovoytova, 2017a)

Readers could refer to Starovoytova (2017a) for analysis of gender imbalance and ageing faculty, at the school.

In this study, faculty was to report, the year, they have published their first-paper, and the last-paper, respectively. One faculty member indicated, that they have published ‘many’, with no provision of exact number, this resulted in the exclusion of that reply, from the analysis, of the said question. Consequently, the number of respondents to this question was 10, giving a corresponding response rate of 67%.

To make an estimation of the effort, devoted to publishing by counting the number of publications, per year $=X/Y$, where $X$ is a faculty member’s total number of publications, and $Y$ is the number of years of active scholarship (2017 minus year of the first publication). The average number of publications, per faculty, per year, was obtained at 2.113 (with Standard deviation of 1.36883; Variance (Standard deviation)-1.87369; Population Standard deviation-1.29858; and Variance (Population Standard deviation)-1.68632).

The following table, Table 1, presents a summary, of evaluation of the number of articles, published, against the following: (1) Rank; (2) Age; (3) Gender; (4) Teaching-Experience; and (5) Engineering-Discipline.
Table 1: Summary of results: total-number of articles, published.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Number of faculty</th>
<th>Min</th>
<th>Max</th>
<th>Mean (average)</th>
<th>Standard Deviation</th>
<th>Variance(Standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate professor</td>
<td>5</td>
<td>22</td>
<td>41</td>
<td>31.5</td>
<td>13.43503</td>
<td>180.5</td>
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<tr>
<td>Senior Lecturer</td>
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<td>10</td>
<td>9</td>
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<td>2</td>
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<tr>
<td>Lecturer</td>
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<td>9</td>
<td>23</td>
<td>16</td>
<td>9.89949</td>
<td>98</td>
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</table>

<table>
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<tr>
<th>Age</th>
<th>Number of faculty</th>
<th>Min</th>
<th>Max</th>
<th>Mean (average)</th>
<th>Standard Deviation</th>
<th>Variance(Standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-40</td>
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<td>16</td>
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<td>19.5</td>
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<td>24.5</td>
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<td>41-45</td>
<td>2</td>
<td>9</td>
<td>10</td>
<td>9.5</td>
<td>0.70711</td>
<td>0.5</td>
</tr>
<tr>
<td>46-50</td>
<td>2</td>
<td>33</td>
<td>41</td>
<td>28.5</td>
<td>9.19239</td>
<td>84.5</td>
</tr>
<tr>
<td>51-60</td>
<td>2</td>
<td>8</td>
<td>33</td>
<td>20.5</td>
<td>5.65685</td>
<td>32</td>
</tr>
<tr>
<td>Over 60</td>
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<td>8</td>
<td>33</td>
<td>20.5</td>
<td>17.67767</td>
<td>312.5</td>
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<table>
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<tr>
<th>Gender</th>
<th>Number of faculty</th>
<th>Min</th>
<th>Max</th>
<th>Mean (average)</th>
<th>Standard Deviation</th>
<th>Variance(Standard deviation)</th>
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<td>Male</td>
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<td>35</td>
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<th>Teaching Experience</th>
<th>Number of faculty</th>
<th>Min</th>
<th>Max</th>
<th>Mean (average)</th>
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<td>6-15</td>
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<td>21</td>
<td>10.73934</td>
<td>115.33333</td>
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<tr>
<td>16-24</td>
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<td>8</td>
<td>41</td>
<td>26</td>
<td>14.30618</td>
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<tr>
<td>Over 25</td>
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<th>Number of faculty</th>
<th>Min</th>
<th>Max</th>
<th>Mean (average)</th>
<th>Standard Deviation</th>
<th>Variance(Standard deviation)</th>
</tr>
</thead>
<tbody>
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<td>33</td>
<td>33</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ECE</td>
<td>2</td>
<td>10</td>
<td>33</td>
<td>21.5</td>
<td>16.26346</td>
<td>264.5</td>
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<tr>
<td>MPE</td>
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<td>22</td>
<td>23</td>
<td>22.5</td>
<td>0.70711</td>
<td>0.5</td>
</tr>
<tr>
<td>MIT</td>
<td>3</td>
<td>8</td>
<td>41</td>
<td>21.66667</td>
<td>17.21434</td>
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<tr>
<td>CPE</td>
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<td>35</td>
<td>22</td>
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<td>338</td>
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</table>

4. Discussion.


Getting-published, particularly, in-leading-academic-journals, is perceived as a-reflection of the-quality of the-research-effort, of a-scholar. In-this-study, however, the-assessment of publication-productivity, was limited to only quantitative-evaluation (the-number of publications).

It is well-established, that there-are large-differences, in-productivity, between scientists: a-relatively-small-proportion of scientists, generate the-majority, of the-publications. In 1926, Lotka formulated his-famous Inverse square law of productivity, which states, that the-number of authors, producing \( n \) papers is approximately \( 1/n^2 \) of those, producing one (Lotka, 1926). This-means that, for-example, of all-authors, in a-given-field, 60 % will-have produced just-one-publication. This-law also implies that, if the-most productive-scientist produces \( n \) papers, the-second most-productive produces \( n/2^2 \), the-third produces \( n/3^2 \) and so-on, with a-sharply-decreasing-function (Lotka, 1926). If scientists of different-individual-productivity, are-mixed-together, in an-organization, then the-distribution, of average-productivity, per-organization, should-be less-asymmetric. The-results of several-later-studies have, however, shown, that productivity-differences, in-scientific-publishing, are-less, than indicated by Lotka, and that Lotka’s law overestimates, the-number of papers produced, by the-most-prolific-scientists. Nevertheless, according to Kyvik (1991); Price (1986); and Reskin (1977), a-highly-skewed-pattern of productivity, does exist, in-scientific-publishing.

Worldwide, it-is-estimated there-are over-50 million-journal-articles, since they-first-appeared, in 1665
be-important, in-some-studies. Besides, previous-st udies have-pointed-out, that publication-rate also- depends on per-researcher was found at 5.75 total-publications , and 3.5 publications, per-year, per-capita; (7) Lee & Bozeman (2005) established productivity of American-Scie ntists to- publication, in a-high-quality international-journa l, in four-years (Wolszczak-Derlacz & Parteka, 2010), giving be-approximately 3.8 articles, per-year; (8) Kenyan -academic-scientists-publish a-mean of 0.5 articles , per-year, during the-4-year-period (2012-2016), giving the-max individual average-number of 10.3 publications, per-year. Therefore, if indivi dual-faculty is evaluated, for 70 % of the-responde nts, their-

frontiers of research-production, in the-school. As-reported-earlier, Full-Professors, of the-school, did not submit their-responses; hence the-following-data shows average-number, of the-total-publications, over the-active-publication-career, of a-faculty, rank-wise, as-follows: Associate-professors--31.5; Senior-Lecture rs--9; and Lecturers--16; hence associate-professors were the-most-productive-group, with 31.5 publications, suggesting that academic-seniority does not slow-down research-productivity, in the-school.

These-findings are not unexpected, as according, for-example, to Aksnes et al.(2011); Abramo & Di Costa
productive. Personnel, while people in lower academic positions tend to publish fewer publications, per year. The junior professors (Shaw & Vaughan, 2008).

Planning, supervising, and leading, of the research projects, but most of the work will be carried out, by other beginning, of their careers, receive reward and resources, which will be used, to carry out further research; the disproportionate number, of significant discoveries. And then, declines (see Aksnes et al., 2011).

The average production of publications, increases with age, and reaches a peak, at some point, during the career, output, as being 41-60 years; they also note that the earlier and later years of one’s career, may affect research-productivity. On the other hand, in a study of 228 colleges and universities in the U.S.A., Kotrlik et al. (2002) found, that age does not affect research-productivity.

Moreover, Merton suggested that age is a component, of the stratification system, of science: with age, scientists escalate the hierarchy, of the scientific community, and increase their productivity, impact, and rewards. In other words, the scientific community could be seen as a gerontocracy. Likewise, more recently, Wray (2003) found that, it was not young scientists, but middle-aged scientists, who were responsible, for disproportionate number, of significant discoveries.

The relationship, between age, and publication rate, has been found, to be curvilinear, in several studies. The average production of publications, increases with age, and reaches a peak, at some point, during the career, and then, declines (see Aksnes et al., 2011; Gonzalez-Brambila & Veloso, 2007; Barjak, 2006; Bozeman, 2005; Kyvik, 1990; Cole, 1979). This life-cycle aging-effect was found by Levin and Stephan, for most scientific areas (see Levin & Stephan, 1991).

An important cause of age-related productivity declines is likely to be reductions in cognitive abilities, across the lifespan. Recent study, by Starovoytova (2017b), cited Nyberg et al., (2012), pointing out, that the working-memory (short-term memory) and episodic memory performance remain relatively stable, until 60-65 years of age. Episodic memory is a long term memory, which relates to personal experience (Umanath &
Marsh, 2014). Although, in-general, performance on episodic and working-memory, decline with the-advancement of age, it-depends on inter-individual-variability. Some-individuals start declining, as-early-as, in-their 50s, while-others preserve-well into-their 70s and 80s (Nyberg et al., 2012).

Besides, some-abilities, such-as: perceptual-speed, show relatively-large-decrements, from-a young-age, while others, like verbal-abilities, show only small-changes, throughout, the-working-life. Although older-individuals have longer-experience, they learn at a-slower-pace, and have-reductions, in-their-memory, and reasoning-abilities. In-particular, senior-faculty, is-likely to-have-difficulties, in adjusting to new-ways of working, and thinking (Skirbekk, 2003). Further-evidence on that older-researchers have decreased research-output is found in Bratsberg et al. (2003) and Bayer (1977). On-the-other-hand, Kylvik (1990) also-noted, that the-researchers, with-more-recognition, keep-publishing-frequently, after their-less-recognized-colleagues, reached their-peak.

Another-issue involves the-relationship, between-age and the-quality, significance and impact, of the-research. A traditional-assumption has-been, that science is a ‘young man’s game’ where the-best-work is done at a comparatively-young-age (Merton & Zuckerman, 1973). Already, in 1953, Lehman in a-classical-study found, that the-most-important-discoveries tended to-be-made by younger, rather than older-scientists (see Lehman, 1953). Lehman also-concluded, that the-majority of scientists, is-most-creative, when they-are in-their late-thirties or early-forties. According to Cole (1979), however, the-study of Lehman, has-been-shown to-be flawed, methodologically. On-the-other-hand, more-recent-research still-shows, that young-researchers (measured-by either; chronological or professional-age) are more-productive and creative, than older-ones, as they-have a-fresh-look, at-scientific-problems.

4.1.3. Publications, per-gender

The-following-data shows average-number, of total-publications, over the-active-publication-career, of a-faculty, gender-wise, as-follows: females-41; males-21. Females were most-productive, with 41 publications. This-finding of the-study is comparable with a-recent-study on Dutch-social-scientists, Van Arensbergen et al., (2012), who found that female-researchers outperformed male-researchers, in-terms of number of publications, and to-a-lesser-extent, a-conclusion of Muriithi’s study of 2013, that ‘…differences across institutions, age and gender-categories were non-significant’.

Many-studies, however, had opposite-findings, generally, revealing, that women-publish-less, than men (Aksnes et al., 2011; Sax, 2002; Bellas & Toutkoushian, 1999; Sax et al., 1999; Xie & Shauman, 1998; Creamer, 1998; Kylvik & Teigen, 1996; Long, 1992; Hamovitch & Morgenstern, 1977; Astin, 1969), although there has-been some-convergence of the-gender-gap, over-time (Ward & Grant, 1996). For-example, Aksnes et al., found that for almost-all age-groups and domains, men are more-prolific, than women. Female-scientists tend to-publish, generally, between 20-40% fewer-publications, than their-male-colleagues. Larivière et al. (2011) also-conclude that women tend-to-publish between 70 and 80 %, as-many-publications, as-men. In-addition, according to Rorstad & Aksnes (2015), overall, men have higher-publication-rate, than women, up to the-age of 55–59 years; and in-their-study, men produced 0.63 articles, per-year, while females produce 0.47 articles (Rorstad & Aksnes, 2015).

In-an-attempt to understand these-differences, many-researchers have focused on family-related variables (Creamer, 1995, 1998; Hamovitch & Morgenstern, 1977) such-as: being-married (Astin & Davis, 1985; Astin, 1969; Hamovitch & Morgenstern, 1977; 1978), the-number of children, in-the-household (Astin, 1978; Hamovitch & Morgenstern, 1977), and having a-spouse, who is an-academic (Creamer, 1995). Family-related factors have-been-used, as-the-object of inquiry, in previous-studies, primarily-due to-the-potential-time-conflicts, that-arise, between family and career-responsibilities. On-the-other-hand, Sax (2002), suggests that a-career ‘interruption’ (due-to-childbirth, and associated-child-care-responsibilities), may-actually-enhance research-productivity, for some-faculty.

It was also-found, that usually, the-proportion of female-researchers decreases, within the-hierarchy of positions. Particularly among-professors, there are few-females, while there is more-gender-balance, among PhD students (see e.g., European Commission, 2012). One-possible-explanation for the-gender-difference, is that women-occupy fewer of the-highest-academic-posts, and also are-less-integrated, in-the-scientific community, for-example, by positions/membership in-scientific-associations, and on-the-editorial-boards of journals (Puuska, 2010; Prpic, 2002; Xie & Shauman, 1998; Bentley & Blackburn, 1992). Nevertheless, studies have also-showed, that differences in-publication-rate, among men and women, can-be found at-all-levels, of academic-positions (Aksnes et al., 2011; Kylvik, 1991).

Yet another-explanation of the-gender-differences, it has been-suggested, that women and men, choose differently (Ward & Grant, 1996). While women devote-more-time, to-teaching (including: part-time, and teaching in-fields, outside their-specialization) and administrative-work (Collins, 1998), male-scientists focus-more, on-research and supervision, of PhD-students. These-distinctions, often-viewed as inequities; moreover female-faculty faces substantial-challenges, in-their-pursuit of jobs, tenure, and promotion. Further, these-multiple-challenges also-serve, to-detractions, from women’s overall satisfaction, with their chosen-academic-career.
Examining, the issue of gender, much deeper—at the root of the problem, one should look back, into perceptions of high-school-girls, on engineering, as a profession (when they are choosing their future career), and resulting from it, female underrepresentation, at Engineering-schools; Challenges, faced by female engineering university-students, which in-turn, results in gender imbalance in engineering-profession, and in academia, as well; largely, it is a global trend. For example, at a local context, the study by Starovoytova & Namango (2016b) identified an interesting phenomenon, which could be one of the major contributing factors, to-female underrepresentation, in Engineering-education. This phenomenon happens, when redundant stereotypical perception, about engineering, and very persistent out-dated Gender stereotype, meet ‘head-to-head’, when female candidates choosing, their future career. Further, the authors also reported that: ‘Engineering female-parity-index was found to be 0.0038, meaning that on average for 260 female students, admitted to the university, only 1 (one) female student was admitted to SOE. The situation, in Engineering-school, is more distinct as the admission ratio of F/M is 0.143, meaning that for every 7 male students, admitted to SOE, there was only one female student. Logically, in order to attract, much more females, into engineering, both stereotypes (Engineering and Gender) should be challenged and, in the long-run, changed (Starovoytova & Vol.8, No.28, 2017). In addition, another study by Starovoytova & Cherotich (2016c) identified that: ‘it is apparent, that the female students, indeed, faced numerous gender related challenges, and, even, harassment, from teachers and classmates, in studying, at the School of Engineering’.

SOE, not surprisingly, is male-dominated, with female staff contributing only around 16%, moreover, majority of which is in junior positions, such as: Graduate assistants and Tutorial fellows. In this study, a selected female (an associate professor) was the most productive, in both; total number of publications, and the average number of papers, published, per year. This implies, that family related factors do not interfere, with scholarly productivity, for some female faculty. This finding is in accord with conclusion of Sax (2002). On the other hand, single faculty do not paint an entire picture, of the population, from which the ‘cream of the crop’ stand out, and what might be referred to, as the long tail of lesser achievers. The study, hence, recommends, that further investigations should be carried out, to get more inclusive gender representation and, hence, obtain more conclusive data.

4.1.4. Research/Publications and teaching experience
Faculty members, with the teaching experience of over 25 years, were the most productive, with 33 publications, followed by faculty group, having teaching experience of 16-24 years, with 26 publications.

Prince et al. (2007), pointed out, that the research vs. teaching debate has been raging, for a long-time, and there is much to justify. On the other hand, Weimer’s (1997), characterized the debate as: ‘old, tired, boring, and not productive’. A large part of the problem is that those, who claim research supports teaching, generally argue that synergies, between research and teaching, can occur, in principle, while their opponents, contest that synergies occur, in practice.

Currently, three different positions do exist, on the relationship between teaching and research, as follows:
(1) Astin (1994) found a significant negative correlation, between a university’s research orientation and a number of educational outcomes. He concluded, that:

Attending a college whose faculty is heavily research oriented increases student dissatisfaction and impacts negatively on most measures of cognitive and affective development. Attending a college that is strongly oriented toward student development shows the opposite pattern of effects.

Besides, Bates & Frohlich (2001) pointed out on a number of researchers view, that faculty research and teaching roles, as being in conflict (Friedrich & Michalak, 1983; Veysey, 1965). Blackburn (1974) noted, for example, that unsatisfactory classroom performance might result from academics, neglecting their teaching responsibilities, in order to pursue research and publications.

The time and energy, required to pursue research is limited, by the time demands of teaching, and vice versa (Marsh, 1987). Marsh also suggested, that the motivation, and reward structures, that support the two activities, might be antagonistic, as well. Moreover, Felder (1994) and Ruggaica (1991) stated that, research and teaching, have different goals and require different skills and personal attributes. The primary goal of research, is to advance knowledge, while that of teaching, is to develop and enhance abilities.

Barnett (1992) claimed, that teaching and research, are obviously incompatible. He argued, that universities have already begun, the process of dividing the university structure, into components, devoted to undergraduate education, taught by non-tenure track teachers, and graduate students, and to full-time research (in this case teaching becomes secondary).

Besides, Hattie & Marsh (2004), point out, that time, on research, is related to research productivity, but not teaching effectiveness, whereas time, on teaching, is not related to teaching effectiveness and slightly negatively related to research productivity.

(2) On the other hand, a number of authors view research productivity, as adding to the quality and substance, of the classroom experience (Demski & Zimmerman, 2000; Braxton, 1996; Allen, 1995; Allen, 1996, 2000).
The three-main-functions of a-university are: teaching, research and service (outreach). The-functions are completely-independent; in-most-universities, only teaching is compulsory. Majority of universities, however, give the-most-emphasis to-research, especially, in the-faculty evaluation-process, for-promotion. As they say ‘it is a bad-soldier, who does not dream to-become a-General’, in-the-same-spirit, almost-every faculty’s desire is professional-advancement, hence they have-to-do-research. In-the-author’ opinion, teaching and research is mutually-reinforcing, subject to-time and effort-balancing, of these-two-functions.

4.1.5. Publication per-Engineering-disciplines

CSE was the-most-productive with 33 publications, the-rest of the-departments produced within the-range of 21.5-22.5 publications.

Previous-studies, point-out to significant-differences, in knowledge-production-processes, across-disciplines and specialist-areas (Fry, 2003; Becher & Trowler, 2001; Whiteley, 2000).

In-addition, according to Starovoytova & Namango (2016b): ‘Most engineers specialize. Engineering encompasses a vast diversity of areas of specialization (over 36 major branches and more than 200 sub-fields and areas of expertise)’.

Regardless of the-engineering-discipline, the-fundamental-role of engineers is to-solve societal-problems and to-make life, better, for-all. For-example, Seliger et al. (eds.) (2011) indicated, that the-National-Academy of Engineering has-announced, on 15 February 2008, the-following ‘Engineering Grand Challenges’: (1) Make solar-energy economical; (2) Provide energy, from fusion; (3) Develop carbon-sequestration-methods; (4) Manage the-nitrogen-cycle; (5) Provide access to-clean-water; (6) Engineer better-medicines; (7) Advance health-informatics; (8) Secure cyberspace; (9) Prevent nuclear-terror; (10) Restore and improve urban-infrastructure; (11) Enhance virtual-reality; (12) Advance personalized-learning; and (13) Engineer the-tools, of scientific-discovery.

In-addition, in 2015, countries adopted the 2030 Global-Agenda, for Sustainable-Development, and its 17 very-ambitious Sustainable-Development-Goals, namely: (1) End poverty, in all-its-forms, everywhere; (2) End hunger, achieve food-security, and improved-nutrition, and promote sustainable agriculture; (3) Ensure healthy-lives and promote well-being, for-all, at-all-ages; (4) Ensure inclusive and equitable-quality-education, and promote lifelong-learning-opportunities, for-all; (5) Achieve gender-equality and empower all-women and girls; (6) Ensure availability and sustainable-management of water and sanitation, for-all; (7) Ensure access to-affordable, reliable, sustainable and modern-energy, for-all; (8) Promote sustained, inclusive and sustainable-economic growth, full and productive-employment and decent-work, for-all; (9) Build resilient-infrastructure, promote inclusive and sustainable-industrialization, and foster innovation; (10) Reduce inequality, within and among-countries; (11) Make cities and human-settlements inclusive, safe, resilient and sustainable; (12) Ensure...
sustainable-consumption and production patterns; (13) Take urgent-action, to-combat climate-change and its-impacts; (14) Conserve and sustainably-use the oceans, seas and marine-resources, for sustainable-development; (15) Protect, restore and promote sustainable-use of terrestrial-ecosystems, sustainably-manage forests, combat desertification, and halt and reverse land-degradation, and halt biodiversity-loss; (16) Promote peaceful and inclusive-societies, for sustainable-development, provide access to-justice, for-all and build effective, accountable and inclusive-institutions, at all-levels; and (17) Strengthen the-means of implementation, and revitalize the Global Partnership, for Sustainable-Development (UN, 2016).

Engineering-faculty should use these-challenges and goals, as-a-focus, in-their-research, to-make life-better, for-all.

As a-final-point, the-number of publications, per-faculty-member, gives much-more clearer-reflection, of personal-publishing-tempo, regardless of the-academic-rank, teaching-experience, gender, and engineering-discipline. The-study, hence, suggests, that there is, probably, a-lack of mentorship and facilitation, from the-most-published-faculty towards the-junior-ones (see Starovoytova, 2017b). In-this-regard, engineering-faculty should-be encouraged to greater-collaboration, across-disciplines and professions (see Starovoytova, 2017b), produce ethical-research (see Starovoytova, 2017a), and avoid plagiarism (see Starovoytova, 2017e; Starovoytova & Namango, 2017; and Starovoytova & Namango, 2016c), among other-possible-activities.

Phone-interviews were also-conducted, to-get some-additional-information, not-covered, in-the-questionnaire.

4.2. Reading and reading-culture

During phone-interviews, on-the-question: ‘Do you usually read, daily?’, only 73% answered affirmative, moreover, on-the-genre of literature, that they usually-read, most of the-faculty-sample (82%), reported reading only technical-literature, and mainly, for literature-review, when they are writing, a-new-manuscript. They also spend varied-amount of time, on-literature-review, ranging from 40-500 hours/paper. In-addition, they confessed, rarely-reading, the-entire-article; instead they just ‘scanning’ it, to-quickly-choose only the-relevant, to-their-inquiry, information. These-findings pointing-out, that the-faculty’s reading-habits was out of balance; in-addition, majority of the-respondents, read very-little, and not on a-daily-basis, meaning that reading is not their-habit, or culture. The-findings also in accord with Ware & Mabe (2015), who stated, that researchers reading-more, averaging 270-articles-per-year, but spending less-time per-article, with reported reading-times down from 45-50 minutes, in the mid-1990s, to just over-30 minutes, in 2014.

Previous-researchers reported, that the-poor-reading-habit has-been-attributed to-factors, such-as: (1) the-colonial-education-system; (2) limited-access, to-reading-materials; (3) dominant-effect, of the-mother-tongue (Ruterana, 2012a); (4) poor-government-policies (Aliyu & Bilksiu, 2012; Otiike, 2011); (5) poor-parental-training and nurturing-reading; (6) limited-disposable-income; (7) reluctance by teachers to-cultivate it; and (8) the-rooted-use, of oral-communication, in-African-culture (Kaberia 2012; Doiron & Asselin 2010; Nalusiba 2010). In-Kenyan-context, in-particular, contributing-factors are: (1) Poverty-levels and hardship (2) Current Kenyan-academic-curriculum (3) Preoccupation with money, that has eroded the-interest, for-the-search of knowledge (4) Being too-lazy and un-interested, to-read; (5) Lack of well-organized and adequately-stocked-libraries; and (6) Poor-publishing-industry, among-others (Kaberia, 2012; Nalusiba, 2010).

Reading is a-rather-complex, mentally-stimulating, interactive-process, of simultaneously--thinking, reasoning, predicting, questioning, evaluating, interpreting, cognitive-visualization, and comprehension, from printed or hand-written-words, phrases, sentences, and from visual or pictorial-illustration. Academicians read to-learn; to-synthesize and to-integrate-information; to-evaluate; to-critic, and for-general-comprehension, among-other-reasons. Throughout-reading, all-types of thinking are utilized, such-as: analytical, critical, evaluative, imaginative, judgmental, creative, and problem-solving, among-others.

One’s reading-habit is developed over-time; it-goes beyond, the-ability, to-just read and write, to a-point, when it-evolves, into a-habit and, ultimately, into a-culture. Junuis (2009) defines reading-culture as: ‘Learned-practice of seeking knowledge, information, or entertainment, through the-written-word’. He also argues that ‘Reading-culture-process involves the-perception of words and comprehension of text, and reaction, to-what is read, and even the-fusion between the-old and new-ideas’. According to Jonsson & Olsson (2008): ‘a-reading-culture means, that reading, is a-part of a-specific-culture and a-habit, which is shared and valued, highly, by that-particular-society’.

The-African-culture, for-example, is ‘an-oral-society’, where people-do more-chatting, than reading (Nalusiba, 2010). It-is also believed, that Africans developed, a-highly-effective-oral-tradition and over-reliance, on the-spoken-word; therefore they, usually, commit all-important-matters, to-memory. Even though, the-oral-culture of Africans allows for interaction, within-their-society, reading and writing, is a-global and dominant-culture, that must-be-encouraged and fully-adopted, for proper-understanding, and overall-productive-relations, with other-cultures (Jönsson & Olsson, 2008).

Research on-reading-culture, in-the-African-context, has-been-conducted, in-recent-times, by-many-
4.3. Importance of reading

The global-reading-culture has been almost-destroyed, by the-never-ending-explosion of home-videos, e-books (in any-genre); video-games; social-media; the-absence of good-libraries, right from the-secondary school-level and a national-trend, towards giving a-higher-priority to money-making, than rigorous scholarship (Henry & Neville, 2004).

Bradford (2012) found-out that, technology has rewired the-brain-infrastructure and, thus, impacted our-reading-habits, specifically looking at deep-reading or intensive-reading. **Intensive-reading** is an-activity, involving reading, for-details, according to the-author: 'The-aim of intensive-reading is to-arrive at profound-details', understanding a-text not only what-it-means, but-also of how meaning is created; it-means very-detailed-reading, to-attest-everything, in-the-text.

For-academicians, in-addition to-intensive-reading, other-strategies of reading are also-important, such-as: **Scanning**, which requires a-quick-glance, through a-text; it-is to-read-quickly, in-order to-look for specific-information, rather than reading the-whole-text. Another-strategy is **skimming**; according to Williams: 'Skimming means pecking-rapidly through a-text’ by merely dipping-into-it, and sampling it at-various-points, in-order, to-comprehend its-general-content; he-also emphasizes that the-purpose of skimming is to-briefly-summarize, what-the-text is-all-about.

Information is power, and a-key-enabler, for personal and societal-development (Ruterana, 2012a; Ogwu, 2010; Nalusiba, 2010; Ifedili, 2009). To-get-information, however, as a-mere-minimum, one, must-know how-to-read. A-survey, by the-Kenya-National-Adult-Literacy, conducted in-2006, revealed that there-were over 7.8 million (38.5%) illiterate-adults and youth, in-Kenya. There-are also very-wide regional-disparities; for-example, Nairobi had the-highest-level of literacy, of 87.1%, compared to North-Eastern-Province, the-lowest, at 8.0%. UNESCO (2015) had-set a-target to-attain 50% literacy for all-countries; but as things are now, Kenya, is yet-to-achieve the-target.

**Reading** is a-key to-success, in any-academic-pursuit and, indeed, in-life. The-benefits of reading, according to Brad (2007) include: (1) mental-stimulation, as it keeps the-brain active and engaged; (2) builds self-esteem and determination; (3) it spreads wisdom and knowledge; (4) it provides mental and physical-relaxation; (5) it acts, as a-communication-tool; (6) reading keeps one up-to-date; and (7) reading transports the-reader, to-another-realm. Moreover, it has-been-established, to-improve ‘fluency, comprehension, vocabulary, cognitive-development, verbal-skills, content-knowledge’, among-others. Besides, as Okebukola (2004) states that reading provides the-tools, for transmitting-ideas, to-succeeding generations, as-well-as the-opportunity of partaking, of the-wisdom, of past-generations.

Moreover, according to Denchant’s-statement (1993): ‘If the-first-button of a-man’s-coat is wrongly-buttoned all-the-rest are certain to-be-crooked. Reading is the-garment of education’. A-huge group, of ignorant-population, can-poses a-serious-problem, in-a-country, as it-is commonly-said ‘little-knowledge is dangerous’. Therefore, reading-culture should be encouraged, advocated and supported, at all-levels, of human-development, starting from nursery-school and maintained thought-out the-life-time of a-person, for continuous self-improvement.
On the other hand, academicians must read constantly, broadly, as well as selectively, and also they must read a lot, to be relevant and up-to-date, with the new developments, not only in their own fields, but also on any other major global developments. This implies that failure to generate or tap into information leads to a slowing-down of growth and development, not only of a person, but of the whole country, at large.

In addition, Ifedili (2009), also emphasizes the significance of good reading culture, which includes improvement of individual’s welfare, social progress, and international understanding. The importance of reading is placed on its ability to foster personal and national growth (Ogwu 2010, Ribeiro as cited in Nalusiba, 2010). Therefore, it is important to encourage a reading habit, so that people grow up mentally, to be able, to fulfill their potentials, to achieve personal and societal growth, at every level of social status, from a villager to a university professor.

5. Conclusion and Recommendations.

5.1. Conclusion
Understandably, this micro-scale unfunded study is of introductory nature; nevertheless, author strived to give a foretaste of the current research productivity situation, at the school, which can serve as a point of reference, for future studies. Moreover, an interconnected issues were also incorporated, to bring deeper grasp, on the subject matter.

The author believes this study will make a contribution (in its small way) to the body of knowledge on research productivity.

5.2. Recommendations
Some academicians and, even, publishers, criticize the evaluation of a quality of a publication via quantitative reflection. San Francisco Declaration on Research Assessment (DORA) provides a set of recommendations regarding assessment of individuals and institutions, without emphasizing the IF http://am.ascb.org/dora/. DORA general recommendation suggests that, while evaluating research performance, focus should be given, on scientific content, rather than publication metrics. In this spirit, the university should also modify, their exclusive emphasis on the number, of publications, and shift to qualitative evaluation, which shows real intellectual contribution of the author(s), to their field.

The study focused on an absolute number of publications, produced by an individual faculty; the total account of 230 publications, however, could be over estimations, as some faculty co-authored some of their papers with their colleagues, from the school or from outside, resulting in repeated counts. The study, hence, recommends to conduct a more comprehensive study, taking into account co-authorship in each of the publications (so-called fractional counting).

Moreover, number of publications, is just one measure, of research productivity, of a faculty; the quantity of publications, on its own, reflects nothing, about their quality, therefore, other issues, such as: workload, citations, and impact factor of the journals, where papers were published, should be considered, in future studies.

In addition, other forms of publications, such as: books, monograms, conference presentations, and patents, among others, should be included, in future large scale studies, on research productivity.

Finally, the study, also recommends, that further investigations should be carried out, to get more inclusive gender representation and, hence, obtain more conclusive data.

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