Journal DIRASSAT

in Humanities and Social Sciences

Adjunct academic international scientific journal dealing with specialized studies, Published by Sakarya University Turkey and the Center for Research and Development of Human Resources Jordan

ISBN 978-9957-67-204-1 ISSN (ISSN-L) : 2617-9857

Volume 04 Issue 01 (30)

15 /03/ 2021

ISSN (ISSN-L):2617-9857 – ISBN :978-9957-67-204-1

Assessment of Scientific and Technical Knowledge Rights in Higher Education and R&D, an Empirical Study

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Date of filing: 19/12/2020 Date of arbitration: 03/01/2021 Date of publication: 15/03/2021

Abstract

Many countries, including Iraq, the public research sectors face an ongoing predicament of how to, efficiently and fairly allocate the revenues of research projects to researchers, scientists, professionals, and administrators, working in project teams. This work aims at assessing the rights of scientific and technical knowledge of scientists and technicians working in the fields of R&D.

It suggests a precise economic mechanism, derived from a mathematical model, developed here. The work implements a supposed 'D coefficient', a competitive edge denoting the rights of knowledge, and a counterpart 'd coefficient' for technical rights. Three sections included, namely: valuation of scientific and technical human resources, R&D as a production input, and developing a mathematical model.

An empirical instance approved the logic of the route. It suggests, among many, introducing a four-digit pronged accounting classification according to what is adopted in Iraq, for example, for development, and/or any coding. As well as taking advantage of the mathematical method implemented.

Keywords: R&D; Intellectual Property; Scientific Knowledge; Technical Knowledge; Knowledge rights

JEL Classification: I23, O34, H43, E24, Q56

1. Introduction

Public research sectors have a permanent problem of a dual nature, in the light of the laws of the state that directs the developing economy. The problem, which is the study's one also, is summarized as how efficiently and fairly to distribute revenues from research projects to researchers, scientists and technicians, as well as administrators, working in research teams as members of a research company. The problem nature in first is an economic one, regarding mechanisms of returns distribution, in the absence of

ISSN (ISSN-L):2617-9857 – ISBN :978-9957-67-204-1

knowledge rights valuation. Secondly, it is accountancy one, to justify the mistaken remedies of expenditures allocation to offset knowledge rights, In many environments, such as in Iraq.

To rectify the intellectual and technical rights to scientists, technicians, and assistants involved in R&D, this paper addresses the individual Intellectual Property rights in collective action. The problem is that the economic literature lacks a published or documented work on revenue allocation mechanisms, given the variable scientific characteristics and qualifications of each team member! It dealt with a problem of dual nature, i.e. economic and innovation.

So many developing countries, including the Arab States, have no intellectual property rights laws ensure the individual rights within collective work. If existed they're not sufficient to protect those rights. It sounds that making decisions of knowledge rights still need efforts to have minimum requirements to be fair for researchers.

Innovations, as known guarantee their patent rights, while activities of development and innovations, as well as quantitative and extensive applications, i.e. updates and modifications of old products with large quantities, specifically weapons, military equipment, and maintenance works with development, all, remain in need of evaluation and motivation, given the collective contributions of development teams.

Works of literature on the advanced economies consider the importance of knowledge rights in the rising of scientific research nations [Zhou 2018], the absence of government funding, its importance, and Who picks up the tab for Science, instead [Jahnke,2018; Marnick,2015]. The closer treatment, maybe was the assessment of scientific knowledge and skills in scientific reasoning institutional student learning outcome, in considering metrics [ECAC,2009]. The knowledge Economies classify SKRs within IP assets and patents tenant, focusing on evaluation and its approach [Zacco,2016; European Commission,2014, pp 12-20; Wirtz,2012; Park and Kim,2012, pp 73-96].

The Arab states have concerned with knowledge rights but didn't assist it enough [Malhas,2005; Malhas,2007], although its role in promotion and importance in technological development in industry sustainability under global competitiveness [Mrayati,2010]. The World Bank was one of the

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

forerunners of working papers on investment in scientific capacity and returns [Almedia and Carneiro,2006].

The issue on the ground, in the public research sectors directed by a lot of developing countries, there is still an insurmountable problem for valuators: how to evaluate the contributions of researchers those joining research projects. In the sense of treating them as researchers, not employees. In fact, the financial assessment systems of each institution operating, as is known as a black box of scientific secrets. In contrast, all published economic literature on science and technology environments do not publish their methods of assessing the rights of scientific and technical knowledge and do not declare methods depending on how to allocate returns of R&D to team members in a project. In other words, the performance and competitiveness standards do not reveal how R&D returns been allocated to the research team.

A closest work to assess the right-to-know, i.e. Know-How may be [Hirsch,2005, pp 16569–16572]. Hirsch promoted an index to quantify an individual's scientific research output. However, it does not indicate how the R&D's returns are allocated. Another work, for 'the Royal Academy of Foreign Sciences' that undertakes to build up the capacity of researchers and research institutions to conduct development research in what so-called the North and South environments. The Academy's focus is on developing guidelines for the development of tools to evaluate research, research projects, researchers and scientific publications. That is the setting of a 'specific guide' for actual evaluators aimed at developing assessment methods, with the modification and evaluation of development research and evaluation as a reference for arbitration [RAOS,2017]. In China, a work affirmed that the relationship between the wages of technological innovation talents and technological innovation efficiency has become more complex and sticky [Dai et al,2018].

This work aims at developing a mechanism to provide a "fair assessment of the rights of scientific and technical knowledge in R&D, higher education, and scientific research." This includes independent or affiliated research centers in industry, higher education institutions and scientific research. However, there is no past documented work on the topic.

Here, I set in place a mechanism to evaluate the researchers working as members of research teams, assuming Point 'coefficient D', as simple,

ISSN (ISSN-L):2617-9857 - ISBN :978-9957-67-204-1

special and useful method to characterize the *Scientific Knowlege Rights*, SKR and *Technical Knowlege Rights*, TKR of researchers. Namely, a mechanism in response to the need to focus attention on how accurately to calculate, not approximate. How to calculate, will be the basic requirement to address the. The proposed mechanism assists the evaluator or the senior manager in evaluating performance efficiency as well.

The analysis assumes that "the evaluation is based on four main elements that shape the qualifications of the researcher scientific. They're level of education, degree of assessment, scientific title and scientific experience alongside the outcome of previous scientific titles." That is, the knowledge rights depend on the detailed scientific qualifications, evaluated in weights that provide the total result of the measurement. The mechanism draws a ladder for all the researchers working together, and the scores of researchers provide a measure of the company's human capital, intimately. Thus, the evaluation is closer to the concept of marginality in production.
The model presented in this study considers the scientific and technical qualifications, and the degree of knowledge-know-how, and knowledge-know-why for each individual researcher. Qualifications are weighted by points. The total score of the researcher shapes his weight in performance. The total number of members in the research project determines the value of one point of the contract. The amount of researcher return can be calculated from that value. Because of qualifications diversity and the differences in their stages of development, the framework of the model requires the formulation of a package software facilitating application. With ongoing developments of qualifications, the Foundation also needs an accurate database that is updated from time to time. This approach is in line with the philosophy of intellectual and human capital development [Bontis & Fitz-enz,2002], but it differs in dealing.

Methodology: Mathematical relations are being formulated for the proposed model of tracking the current research and applied for work in one of the research sectors in Iraq, Al-Kindi State Company for R&D in Mosul. It is specialized in electronic applications, signal processing, communication and control systems. There are no published or unpublished data on the subject. By studying the reality of research and development activities and the constraints of innovation in their projects for three months, it was possible to diagnose the problem that hinders the launch of innovations and

ISSN (ISSN-L):2617-9857 - ISBN :978-9957-67-204-1

inventions and formulating relationships in a mathematical model. The application of the model is the one that needs the questionnaire data on the research field, to assess the rights of scientific knowledge and technical knowledge at the level of one researcher, then at the research team as well.
The next section explains the stages, steps, and dimensions of the evaluation, and briefly reviews the wrong traditional mechanisms. Section three deals with R&D, a factor of production, and explains the costs of working in R&D's activities. Section four considers stages of building the mathematical model, which are concerned with: characterization of the right of scientific knowledge; formulation of the model; computer work; an example of the subject of the application; and the value of the right of technical knowledge. In conclusion, many findings reached. The study proposes the introduction of a four-digit account in the public accounting system in Iraq to include the calculations of scientific and technical knowledge, for the reasons indicated.

2. Valuation of Scientific and Technical Human Resources

Human resources rise with the growing human capital. The individual's motivation to develop his or her scientific abilities is the return on his or her research work. This incentive is linked to two things: investing in and developing human capital; and having an internal "right-to-know" system for an appropriate distribution of returns to members of research teams. Here is the importance of a mechanism for valuing the rights of knowledge, and thus the development of human capital will prevail. The mechanism for valuing these rights comes from two sources: scientific theory; accumulation of research and scientific expertise; and training and internal development. This topic showing the importance of valuing scientific and technical human resources on reality.

Approaching Case: Developing environments generally suffer from a lack of a mechanism that simulates full competition in the labor market to raise efficiency. They have to develop their own mechanisms, through local development and regional knowledge spillover [Kijek and Kijek,2019], because each one has its own system. Assuming that a research entity has developed an evaluation mechanism, it remains private and confidential. Through a scientific visit, for a research course to a public R&D establishment in Iraq, Al-Kindi State Co., the above-mentioned truth has been confirmed. Researchers still suffering from a serious problem in the

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

fields of R&D. The problem is to assess the returns to scholarly researchers and technical assistants in a joint team to implement a particular research project.

In reality, the problem was observed in 40 contracts for a research project implemented during the first half of 2002 in Al-Kindi. Office of Financial Supervision confirmed the situation is common in most research companies. In addition, many research experiments fail before the pioneer model succeeds. Failures involve cases of superficial and/or ineffective and serious involvement of many members of the research team. The success of the scientific theoretical basis depends on the efforts of one or two researchers in the team, while the experiment and development are left to the rest. That's to say lack of scientific and competitive efficiency. I argue with the absence of excellence and creativity; patents or development; unprecedented breakthrough. Often, the research project returns are allocated from the contract amount in incentives by a minister or general manager. It is in three categories of the research team members: A, B, C. Except for the head of the team, and sometimes his ranking be in A, with some bonuses for administrators. This pattern prevails in dozens of research companies and research sectors in manufacturing.

Public sector research activity is based on monthly salaries and incentive bonuses during the work stages, followed by bonuses at the end of the project. Rewards are often higher than in monthly salaries. Management systems are administratively determined by employees who have nothing to do with valuing the value of knowledge rights. I found that most researchers are dissatisfied with the mechanisms of the financial system adopted. The powers of the Board of Directors play a role in the distribution of bonuses. The wages of researchers are classified as an added cost in the company.

In fact, it is a return on R&D activity to researchers. The difference of total cost and total revenues of the research projects represents annual profits to be distributed according to points for each researcher, administrative, employee, and service, according to the table of the job degree including the academic qualifications. Here, the beginning of the problem.

The value of the secrets of scientific and technical knowledge is not governed by clear scientific foundations and does not stimulate scientific development. The same situation is found in the higher education sector in Iraq, and perhaps also in the Arab countries. The company cuts a percentage

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

of all contracts values in return for providing infrastructure, superstructure and administrative facilities. Remain sum goes to the research team: scientific, technical, supportive and administrative. This is beyond the current processing range.

2.1 Erroneous Mechanisms

Most research in developing environments is carried out by the public sector of the state, whether in higher education or research institutions. In Iraq, Al-Kindi State Company, for example, the cost of research work is estimated. It was noted that it has three types:

1. Basic theoretical and scientific research, which is limited.
2. Applied Apparatus. Including the adapting of imported technology, depends on readiness.
3. Reverse engineering and tests and then development, the bulk of research projects, especially military ones.

The latter includes theoretical readings, scientific simulations, plans with diagrams, designs, final designs, operating and presentation programs, scientific calculations of electrical networks and conversion from software to hardware. Costs, often estimated at about 5% of the total value of the research project. Reverse engineering costs include disassembly and substitutions with alternatives, are determined at 10% of the total value. The tests are calculated according to the types of tests, namely:

1) Laboratory tests of the parts to be developed or updated (chemical, mechanical, electronic, electrical, technical devices used in calibration and experiments as frequencies, refractories, rays, measurements, spectra, etc.) which it occupies 5% of contract costs.
2) Trade and environmental testing and compound use, that allocates 10% of the total value.
3) Tests of sophisticated or dangerous scientific cycles with specific or one-time use structures called suicidal costs. It is highly sensitive and has an environmental impact … of up to 10% of the total value.
4) Field tests for large equipment and instruments for signal processing, in the field of communications, with remote sites, called ballistics tests, or in military fields such as firing, bombing, marches, and limited operation. Up to 20% of the total value.

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

5) Analysis cost includes analysis of materials, alloys, and compounds, or chemical and biological analysis and self-operation of plants, devices and systems. Allocates 10% of the total.

It is natural for specialized scientists to take responsibility for leadership and implementation in assessments. But this does not happen and is left to the administrators and accountants. The responsibility of scientific researchers is limited to planning, drawing and achieving results. Development work is at a standstill by experiments, attempts, successes, and failures, until the success of pioneer sample is achieved. Then move on to normal production. Here come the activities of technologists and assistants.

It is commonly well-known that costs of R&D stages are usually determined at 70% of the total value of the research project. What actually happens is a great exaggeration in guessing the cost of the elements and stages of the work, especially the designs. For accounting considerations derived from financial control laws, management avoids violating laws. Of these laws, profits do not exceed 15-20% of the value of total contracts. The weapons contracts for developing and rehabilitation of weapons and military equipment, although even these research activities are characterized by a monopoly in the R&D market.

In the cost planning, the remaining 15% -20% of the research contract value is assessed to cover administrative and indirect supportive labor costs referred to in the above 3 and 4 items.

In terms of the second classification of the planned costs, the cost of the tests is determined at 10% of the contract value, 15% for the movement, mobility & transportation as well as travel, and 20% for the materials and purchases, local and imports, but the performance is usually not more than 3% for the total tests due to the limited material costs of the theoretical study and/or reverse engineering. The value of scientific know-why knowledge and technical know-how one is absent from calculations, since employees, employed in a public sector or in the private sector, as is common.

As a result, actual profits exceed 50% of the total value, and in many cases up to 60% and even 70%. The gap between 20% and 70% is being bridged by the adoption of remuneration scales, rather than by the assessment of fair and stimulating values of knowledge rights. These rights are absent or ignored inadvertently. The remuneration includes individuals from senior or

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

senior officials on both sides of the contract. And often they occupy top rankings in bonuses. In general, this issue involves many different flaws:

1. Absence of the rights of secrets of scientific and technical knowledge
2. The lack of planning, besides not based on scientific grounds
3. Failure to develop human resources in development and growth
4. Failure to build a solid scientific base for subsequent development
5. Absence of the correct database information from which a subsequent evaluation is derived
6. Loss of motivation to reflect the true value of the SKR
7. Lack of motivation for scientific staff to do more
8. Lack of competition to ensure the convergence of the efforts of scientific leaders in the expected scientific breakthroughs
9. Distorting the market of scientific research, and finally
10. Lack of use of the private sector to assign some items for implementation. That is, no private sector development. If it is found, the financial differentiation, rather than the quality, is adopted to refer the supplementary contracts.

3. R&D an Input

The system for the allocation of researchers' returns depends on the Unified Accounting System of the state departments. Such systems do not distinguish between scientific performance and functional performance, except by certification. Scientists' researchers are just employees. In this, a disregard for the productivity of scientists and their role in growth and development, and motivating them is an essential part of advancing scientific research [Melhes 2004]. Of course, research work is part of the labor element (L) in production:

$$Y = f(L, K, M)$$

If we considered R&D a productive process, with its well-known Innovations, Inn, for new and improved goods and products or new production processes, all are covered by patents. The output is a function:

$$Inn = f(R, H, K, Su) \quad (1)$$

Where:

R: research work, H: human capital, K physical capital, and Su: supportive or administrative work. The support's works here has two types. They're:

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

1) Craftsmen and professional work in direct services, such as drivers of experimental vehicles, scientific devices, mobile laboratories, transport of equipment, materials and research instruments.

2) Employees working in administrative, financial, legal, quality, commercial relations, industrial security and safety, guards and cleaners.

Total costs, TC of traditional production are composed of fixed FC costs and variable VC costs. Whatever the first to the second ratio:

(2) $$TC = FC + VC$$

The first include costs of physical and technological base of research K; costs of new investments in modern and advanced equipment I; as well as depreciation and maintenance costs, Kλ:

(3) $$FC = K + I + \lambda K$$

3.1 Labor Costs

In fact, total wages and salaries are taken as labor (variable) costs. In reality, labor should be classified in this sector into: research, scientific, administrative, and service, for all types:

(4) $$L = Lsi + LT + Lse + Lm$$

L: Total labor costs

Lsi: Labor of scientists specialists, those who have a master's and doctorate and scientific names in the industrial sector.

L_T: Technicians working with BA and Technical Diploma (Assistants).

Lse: Indirect (Services) labor.

L_m: Administrative labor in support.

Total costs, including: labor, materials, devices, and scientific inputs, as databases and information systems, all with contributions and quotas (α, β):

(5) $$VC = \alpha L + \beta M$$

In research sectors, there is often no typical output. Total "labor costs" are inadequate. Revenues from all research contracts are included in the Company's "total revenue". Here the company has one of two things:

The first is to continue to work as an owner of the research project, in this case, its revenues will be a specific percentage, about 20% of the total value of the research contracts executed there. The company shall continue to apply the prevailing accounting system. Its profits are derived from that total. But here the research sector in the company regulates its productivity as an entity for research. Or;

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

Secondly: the company has to obtain the relevant approvals to legislate the law of (knowledge rights), in support of the consolidation of the knowledge and information society (Milad,2005), and include it in the followed accounting system. This requires that the value of knowledge rights, which exceed 60%, should not be limited due to the nature of the market of scientific research and the protection of patents. The company's 20% revenue is accounted for. Here the company does not resort to inflating the costs of tests and experiments. It only needs a mechanism to distribute revenues to researchers. This mechanism is the task of this study.

3.2 R&D a Process

Since the state owns the research company, it is the owner of the capital. According to the laws in force the state takes 20% of the profits, capital will be met the rent and profit. In this case, the value of this share of profits is excluded, after deducting the necessary material costs from the completion of the research project, such as raw materials, spare parts, semi-finished materials, local and imported. The residual will be R&D activities returns. These activities are productive, their inputs are research labor as detailed. The members of the research team are the element of research labor. The output is the achieved pioneer sample for the research authority.

In case the production requires the application of the pioneer model to mass production in the amount needed by the beneficiary, then the work becomes a typical production. The R&D be a factor of production, but for the executing party, it is a production process. Then:

Value of knowledge rights (scientific and technical) = profits of R&D = Sum of research contract - Capital costs (State share of profits) - Costs of production inputs

The value of the knowledge right (scientific and technical), from which the incentives of supporting staff (management and services) are subtracted and presented to the research team. The rest is the net profit of the R&D activity.

The net return on research work consists of:

1. Value of the research contract, minus
2. Share of the physical and technological base, fixed ratio
3. Share of incentives of the administrative staff in the research institution, a fixed percentage
4. Share the administrative staff of the research team and material costs

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

The act of the model assumes that the net of the first item about 50-60% of the total search value. The total cost of the second item is 20%. The third item 5-10%, and the fourth item 10-20%.

3.3 Net Returns on Research Work

Research returns are good sources of funding for scientific research and the research in the event of a lack of government funding. This issue is slowly becoming an established tradition in the Arab countries (Otaibi,2007). The evaluation method adopted here focuses mainly on the individual researcher's assessment of the elements that most evaluators discuss, in one way or another. But the analysis here bears a bar differs than what they suggest with the objective dimensions. It is the result of: *'scientific certificate' with its 'grade'; scientific efficiency by 'title'; and scientific experience, detailed in each scientific title.* This assumed assessment is sufficient to measure the most accurate differences in scientific and technical knowledge for every researcher within a single team. The evaluation is formulated by weighting those qualifications with weight points at each level until the last level.

The scientific level of the researcher is either a doctorate or a master's degree, which can be equivalent to a Bachelor's degree plus creations that grant them the status of a scientist, such as patents. That is, those who contribute to scientific and technical knowledge, of a doctorate, master's degree and innovators of a higher diploma or bachelor's degree. The result is two degrees; either a doctorate or a master's degree, as is shown shortly.

Scientific titles of scientists in the fields of R&D or higher education are: (according to Iraqi law, for example): *Assistant Lecturer, Lecturer, Assistant Professor, Professor, and/or equivalent corresponding in different research sectors: Researcher, Researcher Scientific, Senior Scientific researcher, Chief Researcher.*

BSc, and Technicans-Assistants

Research capacity building long-term goals, including the development of creativity among bachelor's degree holders, for a better future for scientific research [Reesha,2011]. They are types. At least have two patents 'classified under the law of scientists and scientific staff care' of engineers and scientific specialties, with the following virtual classification:

ISSN (ISSN-L):2617-9857 – ISBN :978-9957-67-204-1

First / Bachelor level

- Two patents: equivalent to a master's degree, i.e. Researcher.
- Three patents: equivalent to a master's degree as a scientific researcher.
- Four patents: equivalent to a master's degree as a senior scientific researcher.
- Five patents: equivalent to a doctorate degree as scientific researcher.
- Six patents: equivalent to a doctorate as a senior scientific researcher.
- Seven patents and more: equivalent to a doctorate as researcher in chief.

Second / Engineers: scientific and technical diploma holders, who work in R&D, have real scientific and technical expertise in the research sectors and have the right of technical skills, i.e., possess the right of technical knowledge. In addition to high-school graduates, such as industrial, agricultural, and the like.

Third / Employees in the administrative & supportive fields: down to the minimum levels, from bachelor's degree to secondary in non-scientific disciplines. These employees are covered by the civil service law and their development in the public sector, and the like in the private sector. Always, a good wage system improves employee performance [Sturman 2006]. In Iraq, their incentives are calculated based on certificate and years of work, as well as periodic salaries and other allocations and administrative expenses.

Staff

The rest of headlines in the organizational structure of research sector, such as boards of directors, sales and exhibitions representatives, deserve monthly salaries and traditional wages, under the career ladder of testimony, years of work and prevailing social aspects. Also, the profits derived from the company's share of project revenues from sales of patents and investments.

Thus, the share of scientific labor αL composes the largest variable cost items in equation (5) within the total costs. Naturally, the value of productivity will increase in quantitative terms, due to the diversity of activities involved in R&D; qualitative, as knowledge production differs from the large traditional quantitative production of knowledge, that it is the modular production. Here R&D is an element of production and a cost within the variable costs of production. The individual marginal output factor can be measured by the Internal Rate of Return method. Assuming

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

that the technical relation of knowledge production takes the form of a Cobb-Douglas production function, for example:

$$Q = A^{ent} L^{\alpha} M^{\beta} K^{\lambda}$$

This is for the research institution. As for the research team, R&D is a process whose output is patents of innovation and invention or industrial development processes, the attention focus of this study. Net returns may be distributed according to the proposed mechanism here.

4. Mathematical Model

In light of the above classification, valuable sources of knowledge are:

1. Higher academic certificate: Master or doctorate or the equivalent of each.
2. Degree of certificate: when awarded: Good, Very Good or Excellent.
3. Academic title: Assistant Lecturer, Lecturer, Assistant Professor, Professor, or equivalent: Researcher, Scientific Researcher, Senior Scientific Researcher, and Researcher in Chief, respectively.
4. Scientific experience: measured by the number of years of actual work after each scientific certificate and/or next to each scientific title.

The degree of master's dissertation and PhD thesis are calculated in three weights: Good, Very Good and Excellent, or maybe, more precisely by adopting the percentage of appreciation, in the weighting with the recognized scientific titles approved in writing and publishing the scientific research. Which is known as the conditions of granting scientific titles in the industrial sector corresponding to scientific titles in higher education, as follows:

MSc:

1. Researcher: or research assistant in the laboratory, who does not have a scientific title, corresponds to an assistant lecturer in higher education.
2. Scientific Research: with minimum duration of 3 years besides many published papers. Corresponding to a lecturer.
3. Senior scientific researcher: minimum duration of 4 years and many published papers, corresponds to assistant professor.
4. Researcher in Chief: a minimum duration of 4 years and original papers, or patents corresponds to a professor.

PhD:

1. Scientific Researcher/ Lecturer: Treated as from the certificate's date.

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

2. Senior Scientific Researcher/ Assistant Professor with published Research.
3. Researcher in Chief/ professor with published papers.

4.1 SKR

The current work claims that the right-to-know is preferred evaluated for the last year of work. The value consists of the qualifications of scientific specialization and the accumulation of knowledge and experience represented by work years. Accumulation involves phases of qualifications gradation. Most often the new researcher has a Master's degree, at the age of 24 years, as 'researcher'. If the legal age of retirement is 65 years and he or she lives to reach it, the experience will be 41 years, with academic and creative gradient accumulating experience and knowledge, assuming:

1. A point for each working year, the balance of the right-to-know in the third year been 3 points. With the weight of a master's degree, one point, the result multiplied by the degree of certification. For example, a 3-point rating is multiplied by the weight suggested here. Naturally, the new researcher is without a title until the fourth year. Then the weight of the scientific title and the value of knowledge: $3 \times 1 \times 3 \times 1 = 9$ points.
2. Then, weights of knowledge sources:

First- Master Degree: At each year of experience:

(A) Scientific title: (researcher) one point; (scientific researcher) two points; (senior scientific researcher) three points and (researcher in chief) four points.

(B) Degree of certificate: of 70% or 85% ... or weight points: one for good class; two for very good class and three for excellence.

Second- PhD Qualification: with years of experience started from the Master degree, above adding the new gradient:

(A) Scientific title: starts from (scientific researcher) two points; (senior scientific researcher) three points; (head of researchers) four points.

(B) - degree of scientific certificate: as item B of first for the doctoral thesis.

4.2 Proposed Model

Years of actual work measures practical experience. For Master's degree, T:

(6) $T = 65 - 24 = 41$ years ($=T_1$)

Number of years worked before the first scientific title, scientific researcher: N is the minimam period for the promotion. In this case (N1=3) years. Evaluated alone, and then the rest years evaluated, namely 38:

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

(7) $T_1=T-N_1$, $T_2=T-N_2$, $T_3=T-N_3$ and $T_4=T-N_3$

Whareas:

N1: Pre-sessional working years (scientific research): (3) or more.

N2: total working years pre-title of (senior scientific researcher): (7) and more.

N3: total working years pre-title of (researcher in chief): (12) and above, for PhD only.

N4: total working years post- title of (Chief Researcher). In this case:

(N1 + N2 + N3), (N1 + N2 + N3 + N4), or

(8) $Nk=\sum_{i=1}^{k} Ni$, k = (N1), (N1+N2), (N1+N2+N3), or (N1+N2+N3+N4).

(9) $Vc_j = VC_i$, $n_j = 0.70 \ldots 0.99$

(10) $Vn_i=\sum_{j=n1}^{ni} V_j$, i = (Vn_1), (Vn_1+Vn_2), ($Vn_1+Vn_2+Vn_3$), or ($Vn_1+Vn_2+Vn_3+Vn_4$).

Vc: The certificate degree, equivalent to the final score of the master's or doctorate.

Vn: weights of Name Vn, from (1, 2, 3, to 4) for the four levels of scientific titles.

(11) $$T_k = T_1+T_2+T_3+T_4=\sum_{i=1}^{4} T_i$$

(12) $$N_k = N_1+N_2+N_3+N_4=\sum_{i=1}^{4} N_i$$

The SKR:

(13) $Ws = T_k.N_k$,

The value Ws for a Scholar is:

(14) $Ws = T_k.(Vc_j)(Vn_i)$, Therefore:

(15) $Ws = N_1.(Vc_1)(Vn_1) + N_2.(Vc_2)(Vn_2) + \ldots + N_k.(Vc_j)(Vn_i)$

(16) $Ws_t = \sum N_k . Vc_j . Vn_i$, *were*: *the period* $t = T - N_k$

The empirical field of the model needs to prepare qualification tables for each scientist cadre. The value of the SKR will be calculated accurately and gradually in the differentiation between the different and overlapping levels. Weight of the right to know Calculated in points.

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

Instead of adopting the degree of certificate evaluation, the grade of the dissertation can be weighted by units, known categories: A good, one degree; B very good two degrees; C grade excellence 3 degrees (points) Assuming that the researcher (s) has an MA, he worked as a graduate researcher at age of 24 years. If he worked five years before the title of a scientific researcher, and then seven years after, before the title of a senior scientific researcher, then his scientific scholar interrupted him at that title throughout the rest of his work years. The sum of his points is calculated in the twentieth year of work, according to the model in equation (16) for each stage:

$$Ws1 = 5*(1)*(1) + 7*(2)*(1) + 8*(2)*(1)$$
$$= 5 + 14 + 16 = 35 \text{ points},$$
$$Ws2 = 5*(1)*(1) + 7*(2)*(1) + 8*(2)*(2)$$
$$= 5 + 28 + 32 = 65 \text{ points},$$
$$Ws3 = 5*(1)*(1) + 7*(2)*(1) + 8*(2)*(3)$$
$$= 5 + 35 + 48 = 88 \text{ points}.$$

Thus, all qualifications weighted in units of measurement that's the number of points mathematically multiplied by the presumed valuation factor … and by the number of working hours for each level of the four scientific titles, according to their respective quorum and the calculation of additional wages, for example, as well as the value of one point out of all points of the knowledge right.

4.3 Model & Assessment

Note that the experimental work needs to be a more accurate calculation method suitable for computer programming and application.

The approach to valuation adopted here focuses initially on the assessment of individual researcher qualification around whom most of the above discussion by the steps will revolve. The evaluation of research team members will in the first place depend on the points computed from members specifications enjoyed. So, number of facts typical for an individual score: certificate level and its degree, the expertise of work years, the researcher scientific name, will be considered

The scholars of a certain project auto are explicitly and clearly known for the evaluator who responds. What is it that the evaluator and/or programmer will want to know in a specific case is a sheet of dates of MSc and PhD graduations; stepwise name; and degree of dissertation and theses.

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The formulation of the periods of evaluation will also depend on the scholar characteristics, the scientific stepwise as well as expertise, and on patents and specific considerations, the like here people are directly concerned.

The evaluator will focus on his/her scientific scores, with an addition aspect linked to the team as such, all expressed via given weights. The points of evaluation are listed in detail on the page of assessment of individual researchers. They will do not depend on whether senior or junior researchers are evaluated, or research teams; or whether the evaluation is ex-ante or ex-post. However, weights will be hypothetical up to the system of department review or carefully defined valuation process with fair and smooth logic for a consistent bar to be adopted. The following (table-1) summarizes the weights.

Table (1): Levels of Certificate, University Degree, Scientific Title, and Default Weights

Certificate	Certificate Degree	Certificate Weight	Academic Title	Research Title	Title Weight
PhD, Doctorate	Excellence	3	Professor	Researcher in Chief	3
	Very good	2	Assistant Professor	Senior Scientific Researcher	2
	Good	1	Lecturer	Scientific Researcher	1
MA, MSc, Master	Excellence	3	Professor (rare case)	Researcher in Chief	3
	Very good	2	Assistant Lecturer	Senior Researcher ln Chief	3
	Good	1		Scientific Researcher	2
				Researcher	1

Summing up grades of the stages of the master's degree and the corresponding PhD:

The weight of the researcher = Sum of the researcher's work when he or she was a master + weights of his/her graduations, as a doctorate.

ISSN (ISSN-L):2617-9857 – ISBN :978-9957-67-204-1

Total Weights:

- The weight of the researcher in a particular year (@) = the weight of the work with Master + work weight with doctorate:

1) Certificate weight: Master level 1, one point; PhD level 2, two points.
2) The weight of the certificate rating: one point to a good degree; two points to a very good degree; and 3 points to a degree of excellence
3) Work years' experience, one point for each year
4) Weight of scientific title: gives:
   1- One point for the researcher (or assistant teacher)
   2- Two points for the title of the scientific researcher (or Lecturer)
   3- Three points for the title of the senior scientific researcher (or assistant professor)
   4- Four points for the title Researcher in Head, i.e. in chief (or Professor)
   Calculating the weight of the number of years before the date of the title of scientific researcher:

The minimum duration of the master's researcher, e.g., researcher or assistant lecturer, in Iraq and many countries): (3) years of junior or more, before obtaining the title of the Scientific Researcher (lecturer). So: $N1 \geq 3$. Also, the minimum duration of the title of Senior Scientific Researcher (Assistant Professor) is 4 years, and the same for the title of Researcher in Chief (Professor). That is:

Number of working years before the title of scientific researcher: $N1 \geq 3$

Number of working years before the title of Senior Scholar: $N2=(\geq 7)-N1$

Number of working years before the researchers in chief: $N3=(\geq 11)-N1-N2$

Number of years of worke after the title of Researcher in Chief: $N4=41-N3$

So: The researcher either continues to the end with a master's degree:

(17) $\sum Ni^{MAi}$

Or begin work with a doctorate degree:

(18) $\sum Ni^{PhDi}$

Or he or she gets a doctorate during the working years (Table-2):

(19) $\sum Nj^{MAi} + \sum Nj^{PhDi}$

Assuming third case most familiar, the date of a doctorate at year @, and after its weight is:

(19a) $\sum Nj = @$ for MAi

(19b) $\sum Nj = \sum Ni - @$ for PhDi

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

For emperical application of the model's computation steps, see (appensix A) with a typical example.

Table (2): Proposed Model for Estimating Weights of Researcher's Qualifications and Experience

Nj, years of experise $Ni \leq 41$	Name	Weight	MA = 1 & Grade degree	PhD = 2 & Grade degree
$N1 \geq 3$	Researcher	1	di = 1 × 1 ai	..
N2 = (≥7) – N1≥ 4	Scientific Researcher	2	di = 1 × 2 ai = 2 ai	Di=2 × 2 Ai = 4 Ai
N3 = (≥11) - N1- N2 ≥ 4	Senior Scientific Researcher	3	di = 1 × 3 ai = 3 ai	Di=2 × 3 Ai = 6 Ai
N4 = 41- N1 - N2 - N3 ≤ 30	Researcher in Chief	4	di = 1 × 4 ai = 4 ai	Di=2 × 4 Ai = 8 Ai
For Nj = 20, N1+N2+N3≥11 N4= $N_i \leq 20 - 11 \leq 9$	Researcher in Chief	4	di = 1 × 4 ai = 4 ai	Di=2 × 4 Ai = 8 Ai

4.4 Value of TKR

I, here argue that by the same way, the value of TKRs, TKR can be assessed. Technical knowledge is the applied cognitive skills of research assistants who work as auxiliary, technical or applied researchers. That's to work with the scholars although they're of bachelor or technical diploma. They treated as staff in the technical field. Entitled to monthly salaries plus technical knowledge allocations, neither hold higher scientific degrees nor titles.

The value of the assistant's work is calculated first from the values of the employee's work in light of the years of experience (work), the certificate of educational achievement and the factors of the career progression. What is added to this is the wages that distinguish them from their peers, working in productive areas.

Like what is stated with the calculation of the value of the right of scientific knowledge, except for the scientific title, by a certain percentage. The technical research parameter d can be called 'coefficient d' from the

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

corresponding scientific knowledge value in gradient with a difference in the level, and it may need detailed supplements which are outside the current work range.

Table (3): Calculation of the Weights of the Researcher's Qualifications and Experience

Year	Expert Years Ni Ni ≤ 41	Name	Weight	MA Weight =1 × Grade Degree Weight	PhD Weight =2× Grade Degree Weight
1970* 1971 1972 1973	N1 ≥ 3	Researcher (Assistant Lecturer)	1	*di = 1 ×1 ai = 1 ai + 1 or = 1 ai + 2 or = 1 ai + 3 or more*	
1974 1975 1976	N2 = (≥7) – N1≥ 4	Scientific Researcher (Lecturer)	2	*di = 1 × 2 ai = 2 ai = 2 ai + 4 or = 2 ai + 5 or ..*	Di = 2 × 2 Ai = 4 Ai = 4 Ai + 4 *or* = 4 Ai + 5
				.. →	.. ↓
1977		=		= 2 ai + 6 or = 2 ai + 7 or more	*= 4 Ai + 6 = 4 Ai + 7 Or more*
1978 1979 1980 1981	N3 = (≥11) - N1- N2 ≥ 4	Senior Scientific Researcher (Assistant Professor)	3	di = 1 × 3 ai = 3 ai = 3 ai + 8 or = 3 ai + 9 or	*Di = 2 × 3 Ai = 6 Ai = 6 Ai +8 = 6 Ai +9 = 6 Ai*

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

				= 3 ai + 10 or = 3 ai + 11 or more	*+10* *= 6 Ai* *+11 or* *more*
1982 1983 1984 1985	N4 = 41- N1 - N2 - N3 ≤ 30	Researcher In Chief (Professor)	4	di = 1 × 4 ai = 4 ai = 4 ai + 12 or = 4 ai + 13 or = 4 ai + 14 or = 4 ai + 15 ….. Nj	*Di = 2 ×* *4 Ai = 8* *Ai = 8 Ai* *+ 12* *= 8 Ai +* *13* *= 8 Ai +* *14* *= 8 Ai +* *15 .. Nj*
1986- 1991	For Nj = 20, N1+N2+N3≥11 N4= N_i = 20 - 11 ≤ 9	Researcher In Chief		di = 1 × 4 ai = 4 ai = 4 ai + 20	*2 × 4 Ai* *= 8 Ai* *=* *8 Ai +20*
	=301			$\sum Ni^{MAi}$	$\sum Ni^{PhDi}$

* A virtual graduation year for the researcher.

5. Conclusions

The model suggested in this study provides a precise mechanism for characterizing tradeoffs, to evaluate researchers' abilities in higher education and beyond. The mechanism included the assessment of the rights of knowledge, and thus the estimation of the returns on knowledge in equation (19) using scientific 'coefficient D'. This model can be formulated with a ready software. All that required is by introducing the years of progression and promotions for the researcher of certificate; the degree of appreciation; scientific title and grades. The information can be quoted from the updated CV from the database. It can be assured that the derived mechanism was not simply as observed, and it resolves a major and old problem in the public research sectors. The mechanism facilitates the allocation of incentives to members of the research team. It provides a fair incentive to develop the revenues of research projects and the development of scientific and technical staff, and finally resolve the debate on the benefits go to researchers.

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

The model contributes to the stimulation and development of the human capital of the institution, stressing the need to accelerate higher scientific progress within its time. Additions in weights of educational qualifications measure the growth of the individual and total human capital at the institution.

It is notable that the adoption of the proposed weights, or the like, gives higher weight to higher scientific titles. The earlier this is, the higher the value of the SKR 'coefficient D' as well as the right of technical knowledge 'coefficient d '. It is concluded, the proposed mechanism is fair and stimulating scientific competition, through:

- Interest in academic scientific research throughout all the researcher's work time.
- The importance of accelerating the early scientific gradation of the higher title.
- Interest in attaining doctorate and not stay with a master's degree.
- Care for creativity and work with the highest qualifications possible.

The higher the points in the model, the better the rights to know and to invest in it. Generally, weights and categories are subject to scrutiny and testing, and change does not alter the results at all. The second and third sections presented the rationale for relying on the model instead of the traditional methods adopted by Al-Kindi and others.

Given the secrecy of global systems for calculating R&D values, it is not possible to refer to a particular source or experience. In this study, it was possible to distinguish between scientific knowledge of a know-how and know-Why for each level of scientific titles and experience. The proposed model provides treatment for two issues:

First: Correction and amendment of the items of the unified accounting system for the public sectors, regarding R&D in the accounts (Acc./332) for research and consulting and (Acc./1667) for studies and designs, and the proposal to create two accounts in a quadruple classification:

1. An account of SKR with 'coefficient D' for scientists and specialists with a figure (*Acc./3321*).
2. An account of TKR with 'coefficient d ' for technicians with a figure (*Acc./3322*).

Second: Adopting scientific-economic reforms to calculate the right of scientific and technical knowledge.

ISSN (ISSN–L):2617–9857 – ISBN :978–9957–67–204–1

Expansion of the Account (Acc./ 332) addresses the problem in accountancy manner rather than the wrong erroneous tabs for R&D expending, avoids improper documentation of data, and avoids the discrepancy between inflated profits and financial control regulations, with formal recognition of proper high returns on those rights.

In summary, increasing demand for, and involvement in, scientific research is a natural consequence of the better allocation of financial resources and increased expenditure on R&D. Spending on R&D costs for the enterprise, but it is a return for researchers when R&D is seen as a productive process for knowledge and its applications. The higher the returns the more incentive they are. They are legitimate rights to scientific and technical knowledge. The returns are useful for real scientific competition and contribute directly to the development of human capital and the development of technical skills. In other words, contribute to the development of total knowledge capital and technological progress of the economy.

Acknowledgments: The author would like to thank the Institute of International Education, IIE, the Scholar Rescue Fund, SRF and Council for Assisting Refugee Academics, CARA for the grateful fellowships granted to the author, worked as a Visiting Fellow at SOAS. Thank also goes to GM of Al Kindy State Co., Prof. Dr. Sa'ad D Shammaa', for permission to reach and use the research projects database, thanking the seminars attendees for the useful & typical discussions at both; SOAS, and RSC at the University of Mosul in Feb. 2020. The first draft of this work was written at the Department of Economics - School of Oriental and African Studies, SOAS, The University of London. Presented as a working paper at the Mustang Journal Conference, Nevada Las Vegas, USA, 21-23 February 2013. [FollowLink]. Thanks to colleagues at RSC for encouragments at the panel discussion. [FollowLInk]

Appendix A

A Typical Example [Section 4-3]

The model assumes that a researcher (x) pursued his, or her doctoral graduation in the years 1974-1976, but did not meet the requirements of promotion from 'Scientific Researcher' (Lecturer) to 'Senior Scientific Researcher' (Assistant Professor) until the end of 1976. As of 1977 has been awarded the new scientific title.

ISSN (ISSN-L):2617-9857 – ISBN :978-9957-67-204-1

At this interval year, @ = 1977, the calculation proceeds in (table 2) to the last column, the new title column, a scientific researcher (Assistant Professor), and then the calculation process continues to the end of the work.

Assuming that this researcher continued his scientific carrier within the minimal periods, that is, there are no years covered by the process steps (or more). The ratings of the weights of the qualifications will be the Knowledge Right Value, KRV, as follows

$KRV = \Sigma$ Ni Mas + Σ Ni PhDs

$\sum$ Ni MAs = [(1+1) + (1+2) + (1+3) + (2+4) + (2+5)] = 22.

$\sum$ Ni PhDs = [(4+6) + (4+7) + (6+8) + (6+9) + (6+10) + (6+11) +

(8+12) + (8+13) + (8+14) + (8+15) +

(8+16) + (8+17) + (8+18) + (8+19) + (8+20)

= 21 + 42 + 86 + 102 + 28 = 279

KRV = $\sum$ Ni PhDs + $\sum$ Ni MAs = 22 + 279 = 301 point.

If the number of research team members is 11 researchers, and (s) is the least researchers in weight, the researcher in chief is the team leader, the researcher's site, whether he is the head of the researchers or a member, that site has nothing to affect his weight. Other member's weights of the research team were, for example, 403, 505, 3(607), 2(709), 811, 2(913). The total weights of these researchers are the sum of their weights, here: 7085 points. Note the frequent of members with the same eight, forming 11 members.

If the net amount of the research contract, presumably: US$ 106,275, then the value of a single point is found. This value multiplied by points of researcher weight to obtain knowledge right for each member, not only (s), using 'coefficient D' for the scientific researcher. This has to be included in the contract in case of the presence of technical members with the research team. This way the project manager gets the scientific research bar and technical research bar. The points of each member are usually included in a table of the research company staff, according to the curriculum vitae documented.

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