PUBLICITY MODEL FOR HUMAN CAPITAL FORMATION AND EVALUATION AT UNIVERSITY LEVEL /THE CASE OF THE UNIVERSITY OF PLOVDIV/

Mina Angelova
University of Plovdiv Paisii Hilendarski, Bulgaria, mina.angelova@uni-plovdiv.bg
Atanas Vladikov
University of Plovdiv Paisii Hilendarski, Bulgaria, avladikov@uni-plovdiv.bg

Abstract: This paper illustrates a publicity model, which delivers computed data for human capital formation and evaluation at the University of Plovdiv "Pasii Hilendarski", Bulgaria. **Financing** of this paper is provided by the project "Vita Plus" (2021-2022) – a transdisciplinary project at University level in Bulgaria. **The object** of the paper is to explain to the public and interested parties how a University-Business partnership might be constructed achievable by building public-private partnerships through adequate profiling of research teams. **The focus** of this research is to illustrate how a decade-long accrued expertise in the field of human capital formation and evaluation at the University of Plovdiv may be translated to construct various academic teams in a transdisciplinary mode and present themselves under a research team brand to the public, as well as public and private stakeholders for doing for-profit science. **The aim** of the authors is to present good research practices and efforts for effective publicity and public awareness activities of the human capital capacity at publicly funded Universities and institutions. Successful public outreach practices are essential for team motivation and reputation of scientific branding of University research teams. Thus, this paper delivers theoretical and methodological reasoning behind the idea, coupled with some University of Plovdiv data, retrieved by the authors. The presented research study seeks to introduce to private stakeholders the Model for Human Capital Evaluation by using various methods and techniques. The suggested model and summarized results of the scientific expertise under the project activities portray an actual know-how to innovative businesses. The authors' intent is to provide practical and straightforward presentation of human capital formation in transdisciplinary projects and to illustrate why the need for applying innovative solutions in academia in Bulgaria is seemed necessary. A wide range of research methods was used to successfully achieve the goals and tasks, i.e., secondary analysis of empirical data based on human capital formation (CVs), structured interview with the project team members (23 people), unstructured (in-depth) interviews with experts in project management and university professors (15 people), and triangulation. As a result of the authors efforts, an own questionnaire was developed, and empirical evidence are yet to come (forthcoming survey using online inquiry based on Google Forms software).
Keywords: human capital, public-private partnership, team profiling, transdisciplinary teams, collective public image, research team branding, reputation management, for-profit science

1. INTRODUCTION

A team of researchers at the University of Plovdiv employed the concept of "human capital" as early as May/2007 – the year Bulgaria turned into a full member of the European Union. The research team employed the internationally recognized human capital model, delivered by Gary Becker in 1962-1964 (Becker, 1962, 1964). It is worth reminding that Gary Becker is a Nobel laureate, awarded for his contributions in Economics in 1992 for delivering the fundamentals of Theory of Human Capital. Based on the fundamental terms of "general human capital" and "specific human capital", delivered by Becker, the University of Plovdiv research team performed a three-year academic research (2007-2010) to estimate human capital endowment and to evaluate the validity of Becker's model into Bulgarian market reality (Vladikov, 2012). It was found that the returns on human capital - returns from investments in tertiary education human capital on the Bulgarian national labor market - estimated through the Internal Rate of Return (IRR%) may be taken for valid in the range 14%-17% (Vladikov, 2015a). Detailed computations on IRR% demonstrated that the best approximate valid value is 12,38% for 2011 (Vladikov, 2015b). These figures are comparable in international plan – 5%-15% (Psaharopoulos, 1994) or early Becker's estimates: 13%-28% (Becker, 1964), for example. Later, in 2018 an academic course in Human Capital Management was started for students in economics and management in a Master Program at the University of Plovdiv to familiarize students with the theoretical concepts and recent studies in human capital (Vladikov, 2018).

In another University of Plovdiv financed research project, it was computed that the IRR% is upheaved to 17% within the 2016-2019 (Vladikov, 2020). The latest results were obtained thankfully to the financing of the University of Plovdiv Scientific Fund to investigate whether the University brand is adequate to the public image.

In short, based on our decade-long academic and business experience to investigate how the idea of public investments, public funding, and public remunerations in the academic field may be transformed into real up-market

standards for human capital accrual and financial costing as preconditions for business talks and negotiations in establishing a new field in the Bulgarian economy – the field of for-profit science. Taking this standpoint in mind, we observed numerous differentiated discriminatory pay modes, which do not correspond to individual private and collective public funding and investments in Bulgarian sciences. In summation, we present in this paper some theoretical considerations and methodologically reliable tools to evaluate the intrinsic academic values of scientists of various backgrounds for the sake of signing market-based contracts for delivering professional team expertise and establish modern for-profit science in Bulgaria.

The paper is structured as follows: following the introduction, in the second part is described the nature of the university transdisciplinary project. This analysis paves the way for the third part, in which is highlighted the importance of the scientific project. The fourth part illustrates the methodological framework for human capital evaluation and establishing an authors' model for human capital formation. The article closes with conclusions and recommendations for future research in the field of transdisciplinary projects, potential and expertise of Bulgarians scientist from different scientific fields in collaboration and common activities.

2. NATURE OF THE UNIVERSITY TRANSDISCIPLINARY PROJECT "VITA PLUS"

The University of Plovdiv (UP) "Paisii Hilendarski" is a leading cultural and scientific higher education institution, the largest in Southern Bulgaria, and the second largest Bulgarian university. The profile of UP spreads across a wide range of disciplines and forms of training in the natural and social sciences, in the field of culture and technology, based in ten faculties. Nowadays, UP employs over 910 academic and non-academic members of staff. The innovative idea for project creation relates to the specific expertise of scientists and the common efforts to build both new kind of knowledge and optimization of the collaboration "business-science-education" as a prerequisite for the increase of the university competitiveness (Angelova et al, 2019).

This paper is to investigate within the University of Plovdiv transdisciplinary project "Vita Plus" (2021-2022) possible ways to evaluate, retrieve and brand human capital potential of various research teams in an adequate and modern way. Our main hypothesis is that building successful public awareness of a transdisciplinary/mixed research team should be identified through a reputable and apprehensible brand. And this research team brand is deemed to serve as a precondition for building successful public-private partnerships between the University of Plovdiv as a public stakeholder and defendant of publicly-funded research and researchers, on the one hand, and interested businesses or organizations, on the other hand – which need to consume tailor-made scientific solutions and/or scientifically proven decision-making or problem-solving procedures.

The 23 University experts, which form for the next 2 years a pool of unique collective expertise in the field of "Green Technologies" need to set a path-finding way to work together and to enter into stronger collaborative professional relations, so that a common team brand is produced, and delivered as a distinguished intellectual team product, which is to provide capitalization patterns over contracted for-profit researches, financed by private stakeholders or other interested organizations. Thus, the concept of "for-profit" science must be introduced to the team of experts, which all hold PhDs in various areas, such as Biology, Chemistry, Physics, Economics, Political Sciences, Law, and others.

Speaking straightforward, all PhDs employed in the private sector have "for-profit" individual contracts, which is not the case in the PhD graduates and scientists, employed to work for public stakeholders, such as the Universities. Public institutions in Bulgaria have equalized rates of pay or modes of remuneration to all scientists and PhD graduates under strict rules for expensing public funds. And they do not have the option to benefit from private contracting, selling their intellectual capital powers to interested parties under the protection of the intellectual brand of the University.

This is particularly noticeable for advanced fields of science, such as Bioeconomy and Biotechnologies, where collective high-class expertise is a must for conducting research of long-lasting patterns and/or requiring lump-sum funding and/or highly intensive streams of financing, to do for-profit science, based on real monetary returns in scientific investments. When we discuss the pay-rates of scientists and PhDs, we are aware that this is specific human capital of high-profile, which may provide only high expertise for high pay rates, if employed to work professionally for the qualification he/she delivers.

To illustrate our high expectations for monetary returns of University research teams from delivering high-end products, because of possible contracted public-private partnership in doing for-profit science, we can deliver Table-1 to demonstrate some partially researched numbers of the investments in tertiary education, delivered by the University of Plovdiv and estimated for market-based financial returns.

Table 1: Human Capital Evaluation and Potential of Tertiary Education Delivered by the University of Plovdiv

№	Component	2016	2017	2018	2019
1	Number of Respondents	67	57	72	48
2	Collective Investments	€ 1 456 980	€ 1 373 002	€ 1 897 684	€ 1 379 982
3	Average Value of Investments	€ 21 746	€ 24 088	€ 26 357	€ 28 750
4	Median Value of Investments	€ 24 420	€ 26 754	€ 26 372	€ 28 794
5	Collective NPV	€ 8 243 177	€ 13 422 211	€ 24 179 719	€ 16 858 947
6	Median Value of NPV	€ 118 112	€ 153 963	€ 264 402	€ 302 977
7	Average Value of IRR%	19,32%	18,43%	14,63%	17,44%
8	Median Value of IRR%	17,00%	15,24%	12,03%	16,00%

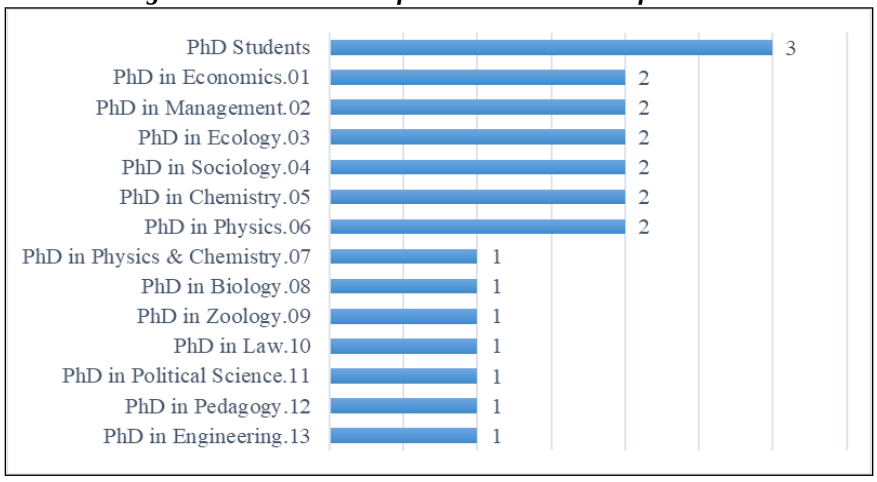
Source: (Vladikov, 2020, p. 137; all sums are based on the pegged rate of 1,9958 BGN to 1 EUR)

One can look at Table-1, where students of the Master Program "Human Resources Management" of different educational backgrounds were researched – to apprehend the true investment levels, and the true levels of financial returns – computed through the financial indicators: Net Present Value (NPV) and Internal Rate of Return (IRR%). It is obvious either by the average or median value of investment per respondent, that this value is very high – € 22'000/€ 24'000 (with approximations) in 2016 and increases to roughly € 29'000 in 2019 for both values. Surprisingly, the median value of NPV almost triples from € 118'000 to € 303'000 for a life cycle of 45 consecutive working years after graduation until legal age of retirement. Correspondingly, the IRR% is averaged at 17%.

3. IMPORTANCE OF THE SCIENTIFIC PROJECT

To the best of our knowledge, there is no evidence for University projects of similar nature, such as the transdisciplinary project "Vita Plus", where scientists from Life Sciences and Human and Social Sciences have taken the challenge to get together and pivot a project into Bioeconomy and Biotechnologies (fig. 1). Based on our previous experience, we expect to compute a very high intrinsic value of the human capital of the research team, as we have detected very high investment levels, and very high levels of expected returns (NPV and IRR%) on the Bulgarian labour market in the recent years, as it was demonstrated in the previous section.

Figure 1. PhD Team Profile – VITAPLUS as of Feb/2021



Source: A. Vladikov-M. Angelova Database Computations Extract

Having into consideration all the above, we delve into the problem of human capital calculation for the market level of expert potential research teams of various and transdisciplinary nature.

These human capital data may be extended and adjusted to different teams of different Universities or publicly funded institutions and organizations, engaged to work in science. The theoretical framework and our practical experience in human capital evaluation and projects for increasing public awareness of the potential of research teams of various educational background are to be validated in the "Vita Plus" project. We plan to test and utilize

different analytical tools (Pastarmadzhiev, 2016) and to offer an economic and managerial model to mobilize intellectual powers of highly educated professionals, employed into publicly funded Universities - to commercialize and internationalize their high-profile knowledge into business appreciated contracts in doing for-profit science.

In "Vita Plus" project we shall stream into analyzing the human capital capacity by calculating the possible levels of financial returns, and utilize these results, as a managerial tool to brand the intellectual powers of the research team, and to promote collective University high-class expertise to end-users through entering public-private partnership contracts. Hence, this paper is an essential attempt to delineate (from economic and managerial standpoint) important vectors of future in-depth intra-group analyses of the "Vita Plus" human capital potential. We are aware that this is a totally new approach to the Bulgarian scientific reality and there is no actual paradigm of generating and transferring knowledge through market pricing or business model, per se. Therefore, this paper shall be taken to stand as the first of a series of to-be papers, publicizing and announcing new hands-on approaches to commercialize the end-products of Bulgarian research teams, composed of individuals of different scientific career-oriented background.

Moreover, this paper shall be an educated attempt to search for real adequate financial resource for digital marketing awareness by building information systems/platforms to present and promote teams of high-profile scientists, which can deliver real business valuable results, and not only theoretical publications. This paper is also an attempt for an "open dialogue" to activate academic communities and public and private stakeholders to invest more in break-through research to deliver high value-added scientific products and technologies.

We believe that early-diagnosing of the human capital potential is a beneficial strategy to prevent or diminish brain-draining patterns, which are typical in the recent years for the academic communities in Bulgaria.

Also, a milestone for such type of new research practices is the management of reputation – reputation design, scientific branding construct and brand awareness management by digital means of marketing and management of web-based and hyper-linked dynamic contents. We plan to couple the utilization of the human capital concept with the internet-of-things concept, because the culture of adding economic values through human capital modelling of individuals of academic background transforms economic reality by widely recognition of the public and private businesses. Having said all this, our algorithm to follow in the "Vita Plus" project in the next two years may be summarized into the following three points:

- To valorize the human capital of the "Vita Plus" research team;
- To create market-oriented University brand of the research team in doing advanced research in Bioeconomy and Biotechnologies;
- To build managerial culture of adding scientific value against monetary returns, based on public-private partnership contracts, establishing sustainable for-profit scientific model.

We realize that this type of thinking and intellectual intentions is a direct challenge to traditional interpretations of the human factor in the academic communities in Bulgaria. The establishment of Bulgarian Universities should be seriously redesigned, to adopt new, modern, and creative methods, models, approaches, and practices to extract the best modes of thinking and working, endowed into different individuals in the form of human capital. The National Strategy for the Development of Research in Bulgaria 2017-2030 (NSDR) considers interdisciplinary as a "prerequisite for the development of all the major scientific areas in which Bulgaria can build the necessary scientific capacity" (NSDR, p.27). The project team consists of researchers from thirteen scientific fields. The research team is thus designed to cover the different aspects of the researched scientific problem focused on Biotechnology and Bioeconomy. The universality under consideration allows for the combination of scientific expertise and the achievement of high results both in the field of scientific knowledge, and those that could be the basis for concrete practical actions. In addition, we are to deliver an alternative explanation and interpretation of the human capital endowment and use in the Bulgarian academic communities by inputting new elements in the Bulgarian academic domain, such as public-private partnership, research team branding, for-profit science, transdisciplinary teams, and reputation management.

4. METHODOLOGY - RESEARCH DESIGN AND DATA COLLECTION

The objective of the previous sections was to review and outline the conceptual development of both a multi-dimensional Human Capital construct based on prior theory and the specifics of transdisciplinary projects. The following sections outline the methods used to empirically develop and substantiate this construct. The approach used in this process consists of three distinct data collection phases carried out sequentially.

Although there is some past research precedent in this area, the Model for Human Capital Evaluation as it has been described here is largely a new development. The conceptual framework from interviews to surveys is bridged by pre-testing the various concepts with experts. This creates a three-phase data collection process that spans the different ideas, different methods, and different samples of respondents to create a unified picture of Human Capital

Evaluation (the methodology was pre-tested in another research in Bulgaria (Angelova and Pastarmadzhieva, 2020a; Alexieva and Mihova, 2017).

The first phase consisted of 15 interviews conducted with experts in project management, HR management, university professors, and business executives that elaborate EU and/or scientific projects. The Research Design method is deemed to employ direct interviews as a tool for investigating the Research Problem. These interviews are based on open-question sessions with fixed timing of 1 hour. The advantages of using direct interviews are related to the in-depth information, openness in discussions, and direct hands-on approach when exploring such kind of sensitive professional issues. The information provided by the experts supports the analysis of the human capital expertise and experience in project management. This will define the current project performance status and the current positioning of the transdisciplinary teams. The interview inquiry includes 15 questions. The participants will be asked about their observations and experience in other transdisciplinary teams, the results (scientific publications in valued journals), the scientific value of the exampled teams/projects, etc. An important focus in developing the operationalization and measurement of this construct is high real-world fidelity. A close correspondence to the thoughts and opinions of experts and the human capital formation of the projects is essential to specifying this new construct. Since the Model for Human Capital Evaluation might be considered conceptually abstract or vague, it is critical to ensure that the eventual construct be easily recognizable and interpretable by practitioners and researchers alike. Data Collection in the first phase is based on interview replies and statements. They were our primary source of information. Based on data gathering, analytical information was synthesized and produced for the purposes of the research. Thus, we got consistent information on the problem under scrutiny. In addition, to the interview sessions, desk research was conducted, to countercheck the information against inconsistencies and to build correct and up-to-date logical model of reasoning (Angelova and Pastarmadzhieva, 2020b, 2021).

The second phase of data collection is planned to be a content validity assessment drill undertaken by PhD students. This drill was explained earlier (Hinkin and Tracey, 1999) and it was used to help determine the appropriate structure and wording of the Human Capital concepts. The rating exercise utilizes an analysis of variance approach with PhD students rating prospective questionnaire items (from Phase One) against dimension definitions. The initial results of this phase were a subset of questionnaire items, which tapped the core concepts of the Human Capital construct. After examining where potential item confusion might exist and discussing this subset of items with faculty advisors, the subset of items could be re-evaluated, if it is deemed necessary. This refining step produced the finalized questionnaire next employed in the third phase.

The third and final phase consisted of the deployment of this questionnaire to "Vita Plus" project team members to survey Human Capital formation in greater details. The results of this phase shall be the evaluation figures, model adjustments, and validation of a reliable Model for Human Capital Appraisal in the scientific sector. Due to the scale and scope of the data collected in this phase, this phase featured an intensive analytic component. Analysis of the third phase data will be consisted of multi-level confirmatory factor analysis and structural equation modeling techniques (cf. Dedrick & Greenbaum, 2011; Kostopoulos, Spanos, & Prastacos, 2013; Mehta & Neale, 2005), as well as evaluating several inter-rater agreement indices (e.g., LeBreton & Senter, 2008). Our approach is to make Team Profiling, based on 6 panels of data to form the Model for Human Capital Appraisal of R&D Teams of Publicly Financed Universities:

1. Demographics Team Profiling (Age, Sex, Education);
2. Project Skills Team Profiling (Project Participation, Project Management);
3. Professional Competences Team Profiling (Foreign Languages Affluence, Digital and E-Skills, Job Positions, Work Experience, other professional competences);
4. Scientific Team Profiling (H-index, Number of Citations, Publications in Global and Local Data Bases; other scientific metrics);
5. Team Motivation Profiling (Personal Incentives and Expectations);
6. International Exposure Profiling (Specializations Abroad, Participations in International Programs, Teaching in Foreign Universities, Participation in International Conferences and Seminars, others);

5. CONCLUSION

The establishment of a Model for Human Capital Evaluation in transdisciplinary projects is focused to strengthen the relation of the so called "triangle of knowledge" - science-business-education. According to the statement that nothing in science has any value to society if it is not communicated (Angelova and Pastarmadzhieva, 2020c), the paper discusses the opportunities for enhancement of the science communication and the idea that science should be communicated with the public in transdisciplinary projects, the established results and public recognition. Furthermore, the interdisciplinary of the current project team is a precondition for more opportunities for public relations that is connected with the main purposes laid in the Innovation Strategy for Intelligent Specialization of the

Republic of Bulgaria. The paper introduces the unique transdisciplinary collaboration in the current scientific project called "Vita Plus" and its importance to create value and new type of for-profit science. The results gathered by the statements of stakeholders (i.e. professors, students, young researchers, representatives by the National science fund of Bulgaria, etc.) indicate that the teamwork and efforts are highly appreciated. This is a "good practice" in the field of science and can be elaborated as a model for dissemination of the results gathered by the researchers.

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