A Preliminary Analysis of the Use of Valuation Methods by Technology Transfer Offices

António Rocha[1][a], Fernando Romero[2][b,*], Manuela Cunha[1][c], Rui Lima[2][d] and Marlene Amorim[3][e]

[1]*IPCA Polytechnic Institute of Cávado and Ave, Vila Frescainha S. Martinho, Barcelos, Portugal*
[2]*Centro ALGORITMI, School of Engineering, University of Minho, Guimarães, Portugal*
[3]*GOVCOPP, Governance Competitiveness and Public Policies, University of Aveiro, Aveiro, Portugal*

Keywords: Technology Transfer, Technology Evaluation and Licensing, University and Industry Relation, Innovation.

Abstract: Valuing invention disclosures in universities involves an assessment of research outcomes that go well beyond the opportunity to make financial profits. Valuation is also about determining what technical solutions are worth, either in terms of technical and scientific achievements but overall, what benefits does it bring to industry and the larger society. The good use of valuation methods to estimate and predict the outcomes of continuing to invest in the technical solution, is a major issue addressed by universities' Technology transfer Offices (TTOs), which have to decide whether to file or not a patent to enforce industrial property rights and to gain the exclusivity to use and grant exploration rights over the new technical solution. University Technology Transfer Offices, in close connection with the research teams, must also make decisions regarding the technology roadmap and what avenues of investment will be used, and what valorisation routes will bring greater benefits to move the technology to industry where the results are developed into new products, compounds or systems or even services that benefit multiple stakeholders. This paper provides evidence on what are the main technology valuation methods in use by technology transfer offices. Qualitative and quantitative data has been collected by surveying eight Portuguese University TTOs. The statistical data has been treated using the one-sample T-test to identify the most common technology valuation methods. From the data it was possible to conclude that rating/ranking methods and models are the most frequently used valuation methods, followed by market valuation approaches. Previous agreements and discounted cash-flow projections are mainly used when a spin-off firm is under consideration or when there is a manifestation of interest from a potential investor. Royalty standards are used to prepare licensing negotiations, and Real Options, Monte Carlo simulation and Auctions are hardly ever used.

1 INTRODUCTION

Technology transfer corresponds to the process of transferring technical solutions and scientific and technological knowledge from one organization to another, with the aim of harnessing and exploring research results in favour of the development of science, technology, economy, industry and society.

Technology transfer processes in universities are often carried out by research team members in close collaboration with Technology Transfer Offices (TTOs) and interested companies.

TTOs promote the use of R&D results through the evaluation and protection of intellectual property rights and through the dissemination of information, the negotiation of technology transfer agreements and the support for the creation of spin-off companies (start-up companies created to explore research results). TTOs also proceed to the administration and monitoring of licensing and material transfer

[a] https://orcid.org/0000-0003-0863-6567
[b] https://orcid.org/0000-0002-7540-8540
[c] https://orcid.org/0000-0002-7709-8777
[d] https://orcid.org/0000-0002-7991-0132
[e] https://orcid.org/0000-0002-0901-0614
* Corresponding author

Rocha, A., Romero, F., Cunha, M., Lima, R. and Amorim, M.
A Preliminary Analysis of the Use of Valuation Methods by Technology Transfer Offices.
DOI: 10.5220/0010599901360143
In *Proceedings of the 18th International Conference on e-Business (ICE-B 2021)*, pages 136-143
ISBN: 978-989-758-527-2

contracts, to the management of university equity participations, and they are responsible for collecting and sharing revenues from technology transfer agreements.

The stronger the bound between the technology transfer offices and researchers, the more efficient they are in establishing a relationship of cooperation, which paves the way to encourage researchers to provide regular information about their research activities and results.

The invention disclosure triggers the valuation process to define the protection and commercialization strategy for the new technical and knowledge solution, which must combine its unique characteristics with the needs and interests of the organizations concerning economic, scientific, industrial and societal development dimensions. The acquisition of technology and its transformation into new or improved products and processes reinforces the organizations' competitive advantages, either by (1) gaining solutions not owned by other companies, (2) updating and improving their range of products and services, or (3) by answering to specific customer needs that other companies do not serve. The acquisition of intellectual property rights may also enhance the possibly of developing better quality solutions or more competitive solutions either in terms of industrial manufacturing savings or in terms of the costs associated with the commercialization process.

To further expand our knowledge regarding valuation processes used in technology transfer this paper provides evidence on what are the main technology valuation methods in use by Portuguese university Technology Transfer Offices.

2 METHODOLOGY

The heads of staff of eight Portuguese University Technology Transfer Offices have been inquired by employing a semi-structured survey.

The eight TTOs that answered the semi-structured survey are linked to eight Portuguese Universities:

1. TecMinho, University of Minho;
2. UPIN, University of Porto;
3. UATEC, University of Aveiro;
4. DITS, University of Coimbra;
5. Innovation and Development Office, University of Beira Interior;
6. RIA – Research and Innovation Accelerator, University Nova of Lisboa;
7. Technology Transfer Office, University of Évora;
8. CRIA, University of Algarve;

This sample was purposefully chosen due to the high regional and national influence of the universities, and to the experience and ability of the TTOs to provide data that would expand the understanding of technology transfer processes. Five out of the eight universities appear regularly in world rankings of the top 1000 universities (CWUR, 2019).

The semi-structured survey was focused on technology valuation methods. A Likert scale has been used to classify the frequency of each method. The higher the value the higher was the frequency of use, in a scale between 1 and 5.

A statistical analysis was done using one-sample T-tests for the means of relevant variables. IBM SPSS Statistics 19 was used to perform this analysis.

As a framework for the one-sample T-test analysis we used throughout the article two hypotheses, considering a 95% confidence interval:

H0 – the average frequency is equal to 4, meaning that the method is quite frequently used.

H1 – the average frequency is not equal to 4, meaning that the method is not quite frequently used.

This approach lend us the opportunity to get to know the frequency of use of different valuation methods used by Portuguese University technology transfer offices.

3 INVENTION DISCLOSURE AND VALUATION METHODS IDENTIFICATION

Technology evaluation is a task that sweeps across different moments of the technology transfer process. From the invention disclosure until the negotiation valuation methods are used. At an initial stage, methods based on rating/ranking scales or on brief assessment models are frequently used. At a later stage, more in-depth valuation models are used like the projection of discounted cash flows.

Among the valuation practices assuming greater importance to understand the new technical solution are (Rocha, 2009): (1) Analysis and description of the technology, including its maturity level, claims and identification of all possible applications; (2) Analysis of further development stages, sources of finance and the definition of a roadmap to bring the technical solution to market; (3) Assessment of the

technical solution innovativeness and possibility to be redesigned (at what cost, time and technical and legal risks) to decide whether to patent; (4) Competitive advantages of the technical solution relative to comparable technologies.

To assess the value of a technical solution, we must get to know every aspect of the invention and all tasks to prove the technology-concept must be clarified to define the steps ahead and a value proposition. The proof of the technology-concept is essential to identify its applications, potential market and commercialization value. Having this assessment, the most promising applications must be selected, and licensing efforts must start. To this end, a market study makes possible to establish the bound between technology, its applications and its market, identifying the end consumers and their needs, and identifying competing companies and applications.

The information gathered is used to screen the technology applications that might have better acceptance, and it also provides information to define the technology value proposition to market, attract and start negotiations to license the technical solution.

To value the invention and its market potential, there are several methods with different levels of depth that can be used at different stages of the technology transfer process.

The most common valuation methods according to Razgaities (2007) are:

- Rating/Ranking methods to determine valuation;
- Market value assessment;
- Valuation based on technology costs;
- Evaluation based on development costs;
- Economic value assessment;
- Valuation rules of thumb;
- Real options and Monte Carlo valuation;
- Valuation through auctions.

4 VALUATION METHODS

4.1 Analysis and Description of the Technology

The application of valuation methods implies a close review of the technical solution. With this aim the Technology Transfer Offices screen several considerations. In here some of those considerations are briefly presented.

To thoroughly understand the invention the TTOs, together with the research team, perform an analysis and description of the technology, its attributes and claims, to identify new development stages and to define an action plan or an industrial roadmap specifying what to do and what can be done to bring the technology to market (see Table 1, a, c and d). They also carry-out a patent search to figure-out if it is new, unique and has industrial application, and if there are other technical solutions with the same scope of applicability or targeting same purposes. Simultaneously the information from this search is used to assess patentability, to figure-out how the patent claims and applications must be described to enforce protection rights, and to identify the strongest links between the invention, its applications and its market (see Table 1, b and e).

Table 1: Invention analysis and patentability.

Results: One-sample T-test Test-value = 4	p-value	t-value	*Average*	*Std. Dev.*
a) Support in the identification of new technology development stages and the definition of an action plan to gather the necessary resources for its implementation	0,516	-0,68	3,8	1,0
b) Analyse with the research team all product alternatives and technological applications, seeking to determine what applications or products have a stronger relationship between technology, product and market to define the protection strategy and to identify potential licensees	0,351	1,00	4,3	0,7
c) Assess the technology maturity (Little achieved? Reduced to practice? Commercially proven?	0,763	0,317	4,1	1,1
d) Identify the availability of public funding sources to continue the technology development	0,732	0,357	4,1	1,0
e) Assess whether protecting intellectual property rights creates an efficient and effective barrier against current and potential alternatives	1,00	0,00	4,0	0,8

TTOs want to know every aspect of the invention to clarify all tasks necessary to obtain the invention proof of concept (if not already attained) and to obtain a complete commercial product. With this aim, several assessment considerations must be thoroughly analysed. Table 2 presents the most frequent practices carried out by TTOs to evaluate the technical solution and its market to gain information for further stages of the technology transfer process and also to be used as a baseline for the application of valuation methods.

After all aspects of the invention have been understood, and after having done initial insights regarding the invention market, a more in-depth analysis is performed by applying technology valuation methods.

Table 2: Invention analysis and its market.

Results: One-sample T-test Test-value = 4	p-value	t-value	*Average*	*Std. Dev.*
a) Assess to what extent there is a technology demand from companies or from target markets (market pull)	1,00	0,00	4,0	1,1
b) Prepare the technology value proposition	1,00	0,00	4,0	1,3
c) Analyse the possibility of licensing the technology to an organization willing to assume the costs of later developments	1,00	0,00	4,0	0,8
d) Analyse whether the technology can improve production factors (avoid or reduce costs, promote stability and ease of production, increase scalability and production speed, or improve product quality)	0,516	-0,683	3,8	1,0

4.2 Rating/Ranking Methods to Determine Valuation

The rating/ranking methods are based on checklists and on pre-defined models to speed up the evaluation process considering multiple dimensions, from its intrinsic quality to its market potential and profitability. These methods are the most widely used in the evaluation of invention disclosures.

Table 3: Pre-defined evaluation models.

Results: One-sample T-test Test-value = 4	p-value	t-value	*Average*	*Std. Dev.*
Predefined evaluation models and matrices	0,329	-1,04	3,4	1,7

In Table 3, the test presents a p-value=0,329 with a t=-1,04 which means that we do not have evidence to reject the null hypothesis, meaning that the average frequency does not differ significantly from 4, a quite frequent practice.

Some of these models and matrices are:

a) TEC algorithm, phase 1 functional assessment, developed by the North Carolina State University. This tool aims to find the strongest T-P-M (Technology-Product-Market) connections. A market study is carried out to verify whether the product concepts derived from the technology are viable and have potential to be licensed and valued.
b) EPO IPscore, is a tool to evaluate patents, technologies and research projects, available at the European Patent Office website. This tool can be used to (1) evaluate patent portfolios, individual patent applications and granted patents; (2) analyse complex patented technologies; (3) assess research projects before filing a patent application. IPscore has 32 factors grouped in four categories (legal status, technology, Market conditions and finance), and the results are presented in a ranking radar graph.
c) IPR Valuation checklist, developed by the UK Intellectual property Office, consists of sixty questions devised to help realise the value of IPR to assess and discussions with potential licensees.
d) COAP – Commercial Opportunities Appraisal Process, developed by Warwick University, in which ten evaluation criteria are scored;
e) Quicklook Commercialization Assessment, developed by the University of Texas, consisting in a four steps study allowing the collection of information to prepare a final report about the technology commercial potential.
f) Checklist of 100 important considerations in setting value of technology license, by Tom Arnold and Tim Headley presented by Razgaitis (2007). This checklist includes an assessment in nine categories: (1) Intrinsic quality; (2) Protections and threats of protection; (3) Market; (4) Competitiveness; (5) Value brought to the table by the licensee; (6) Finance; (7) Risk; (8) Legal issues; (9) Government regulatory considerations.

Some TTOs have also created their own pre-defined evaluation models that usually group a set of criteria into six major categories: technology stage of development, intrinsic quality, market potential, strategic importance, patentability and profitability.

4.3 Market Value Assessment

The market approach consists of obtaining information about the invention market to estimate its value, using, usually, the analysis of predecessor or competing inventions, technologies and products, when existing, and the observation of (1) comparable agreements, (2) market values and (3) standard payments practiced in the industrial sector. This approach is very frequent alongside the use of ranking/rating methods.

The analysis of previous licensing agreements (Table 4, a) and payment values practiced in industry, known as royalty standards (Table 4, b), may provide guidance to define and defend the payments structure and its value during the negotiation of a technology transfer agreement (WIPO/ITC, 2005; Nabulsi & Belt 2015; Stevens, 2016; Pressman *et al*, 2017; Heiden & Petit, 2017). The search for comparable licensing agreements and royalty standards is an effort which usually pays-off (Razgaities, 2003), although the specificity of each technology does not call for standard agreements. However, it is important for the TTOs to build and maintain a portfolio of reference agreements which can be used if needed (Dodds & Somersalo, 2007).

Table 4: Industry standards assessment.

Results: One-sample T-test Test-value = 4	p-value	t-value	*Average*	*Std. Dev.*
a) Comparable agreements	1,00	0,00	3,8	0,9
b) Royalty standards	1,00	0,00	4,0	0,9

The results in Table 4, show that for a) and b) we do have evidence to accept the null hypothesis, meaning that their average frequency by Portuguese TTOs does not differ significantly from 4, a quite frequent method.

4.4 Valuation based on Technology Costs

The cost approach aims to quantify the costs incurred to obtain a technology. However, knowing how much it cost does not mean we know how much it is worth. This approach can be used before the start of a project to estimate future costs or to determine if it is worth to license a technology instead of further developing it into a product or to create a spin-off firm to value the investment done or to be done.

Evaluation based on development costs is rarely a base on which firms negotiate licensing agreements (Razgaities, 2003; Lagrost, 2010). Firms are interested in obtaining technology in an easy and cheaper way than it would cost if they developed the technology by themselves, and the cost of creating a technology may have little to do with its value (Speser, 2006). The evaluation based on development costs should not be used to put a price on a technology.

The evaluation of the technology development costs for a Test-value equal to 4, the null hypothesis is rejected, the average frequency is not equal to 4, meaning that the evaluation of the technology development costs is not very frequently used by TTOs.

4.5 Economic Value Assessment

The economic approach consists of forecasting the profits from the technology license from a certain period to derive financial return metrics, such as the return on investment, the payback period, the internal rate of return and the net-present value considering specific hurdle rates, that some time can be rather high, for example, they may reach 30% due to the investment risk involved (Razgaities, 2003).

The economic approach uses the discounted cash-flow method to deal and license technology (Degan & Horton, cited by Kemmerer and Jiaquing, 2008). The discounted cash-flow calculus is important for business profitability discussions and to provide a basis for setting up royalties and other payments. It is also important when the deal involves a single lump sum payment for the utilization of a technology during a specified period of time, or when the creation of a firm is under consideration, providing a basis for equity participation (Parr, 2007).

The discounted cash-flow method when tested with the On-sample T-test for a Test-value equal to 4, the null hypothesis is rejected, the average frequency is not equal to 4, meaning that the discounted cash-flows is not very frequently used by the TTOs.

4.6 Valuation Rules of Thumb

The 25% rule divides the value of technology into four parts, according to Razgaities (2003): (1) the creation of the invention, (2) the preparation of the invention for its industrial reproduction, (3) the industrial reproduction of the invention, and (4) the sale of the invention by itself or incorporated into a larger product or platform. Each of these parts represents a quarter of the value of the invention, in this sense, the creation of the invention is one of four parts (25%) through which the value and the commercialisation process of the invention is distributed. If the invention is ready to be reproduced on an industrial scale, it makes sense to define a value of 33% or higher, this argument is that the technology has already reached a portion of the production component, in this way, the production itself and the marketing-sales yet to be made are the two big steps out of three that must be taken, so the technology is two-thirds of the way. In the case of software, these values can ascend to 50%, if the technology is ready for commercialization (Grandstrand, 2006).

The 25% rule is usually applied to the EBIT – Earnings before interests and taxes (Kemmerer & Jiaquing, 2008), suggesting that the licensee pays a fee equivalent to 25% of the invention contribution to the operational results obtained by the product that embodies the technology.

The 25% rule when tested with the On-sample T-test for a Test-value equal to 4, the null hypothesis is rejected, the average frequency is not equal to 4, meaning that the use of the 25% rules is not a very frequently used by the TTOs.

4.7 Real Options and Monte Carlo Valuation

The real options method evaluates multiple assumptions involved in a cash-flow projection, having each assumption different levels of uncertainty for which risk-adjusted hurdle rates are defined. This is a complex and time-consuming approach, but it contributes to a more complete analysis of the investment return (Soares, *et al*., 2007; Lazzolino, 2015). Other authors like Speser, 2006 tells us that real options make the evaluation process unnecessarily complicated, and they do not provide an accurate and precise assessment regarding the profitability of the technology. The author adds that real options work better for planning R&D or developing IP strategies, than they do for preparing deal making processes. The Monte Carlo simulation is a probabilistic model that generates multiple scenarios regarding the profitability of the investment and the probability of attaining a predefined critical value.

The real options and the Monte Carlo simulation method are not frequent methods in use by the TTOs: both methods when tested with the One-sample T-test for Test Value equal to 4, the tests present a p-value=0,000 with a t=-9,354, and their average frequency of use is 1,5 which means that we do have evidence to reject the null hypothesis, real options and the Monte Carlo simulation method are not frequently used by the TTOs.

4.8 Valuation through Auctions

Patent auctions are used to transfer the technology by interacting with multiple investors on a bidding process. Patent auctions are gaining increasing importance on technology transfer processes (Jarosz, 2010). Auctions may be a quick way to commercialize patents, provided they are of high quality (EPO, 2008). Auctions can be a way to license patents that otherwise would fall for absence of payments of patent fees. The planning of auction events requires a considerable organization and advertising effort and it is not easy to have several bids for just one piece of technology (Perchorowicz *et al*, 1991).

Patent auctions are not frequent: when tested with the one-sample T-test for Test Value equal to 4, the test presents a p-value=0,000 with a t value of -16,803, and their average frequency of use is 1,25 which means that we do have evidence to reject the null hypothesis, patent auctions are not frequently used by the TTOs.

5 VALORIZATION ROUTES

The valuation methods to be used are also linked to the routes of valorization that are defined for the technical solution. Those routes include the establishment of licensing agreements, the sale of intellectual property rights, the creation of spin-offs or joint ventures and the establishment of research and cooperation agreements, that might include CRADAS – Cooperation Research and Development Agreement, MTAs – Material Transfer Agreements and NDAs – Non-disclosure Agreements, which allow the University to keep control of the technology and at the same time access the resources, knowledge and technology from other Research, Development and Innovation parties to continue or to develop new R&D+I projects.

A licensing agreement creates contractual rights, duties and obligations between the University and the licensor, which regulate their relationship in a legally binding manner. Exclusive licensees may be granted, for use (purpose and application) and for territorial exploitation. Alternatively, non-exclusive licenses can be granted for any scope of use or territory, and the University may, in any case, reserve the right of exploitation for himself, provided that this possibility is explicit in the transfer agreement.

The sale of a technology or patent must be considered as an option when this asset is peripheral to the University or firm activities and is not necessary to further develop new knowledge and technology. Selling the technology or patent should also be considered when there is no intention on creating a spin-off company to gain profit from it.

The creation of a spin-off company is the right option when there is a proof-of-concept, and particularly when it is possible to develop a full product that can demonstrate its worth and applicability. The creation of a spin-off company is a good option when licensing is a less profitable

strategy and when it is not likely to be found a suitable licensor to value the technology applications.

After reviewing the valorization routes, decisions must be taken to protect or not to protect the technical solution and to devise a roadmap to make it valuable.

The good use of information available in patent directories can reduce the costs and time of R&D projects and gives access to information about the changes that have occurred in the field of the invention and information about patents with the same purpose of the invention, if existent (Smith, 2005).

6 CONCLUSIONS

Valuation methods can be used in different stages of the evaluation process. At an initial stage, preparatory to file a patent application, patent databases are extensively used, to understand the invention and the state of the art, scoring matrices and rapid report models are used to understand the invention technical and market potential. At a later stage, usually when there is a manifestation of interest from a company, technology transfer professionals, tend to use market and economic value assessment methods, to prepare negotiations.

This article provides a comprehensive assessment of the valuation methods used by Portuguese technology transfer offices, which lead us to conclude that rating/ranking methods to determine valuation are the most frequent methods in use, followed by market value assessment methods, such as looking for comparable technical solutions, and making market forecasts for the technology at hands.

Previous agreements and discounted cash-flow projections are mainly used when a spin-off firm is under consideration or when there is a manifestation of interest from a company.

Royalty standards may be used to support the definition of the agreement payment structure and figures.

Rules of thumb are hardly ever used, since there are doubts regarding its reliability, and because every agreement is unique values can vary according to the rights granted, the invention development stage, production and distribution requirements and other constraints. Real options and Monte Carlo simulation are also hardly ever used. Technology transfer professionals prefer valuation methods that are simple and faster to assess the technology value.

To reinforce these conclusions, and to overcome one of the main limitations of this study, one avenue of research would be to expand it by including not only technology transfer offices from Portuguese universities but also from other countries. Furthermore, the study of the value created by licensing agreement should be explored in search of a possible correlation between technology licensing and its impact over research teams and technology transfer offices performance and financial profitability. These research lines would create the opportunity to better understand the application of technology valuation methods and the overall impact of university-industry relations on the outcomes of research teams and technology transfer offices.

ACKNOWLEDGEMENTS

This work has been supported by FCT – Fundação para a Ciência e Tecnologia within the R&D Units Project Scope: UIDB/00319/2020.

REFERENCES

CWUR (2019). *Center for World University Rankings.* https://cwur.org/2018-19.php

Dodds, J. and Somersalo, S. (2007). *Practical Considerations for the Establishment of a Technology Transfer Office*. In A. Krattiger, R.T. Mahoney, L. Nelsen & A. B. Bennett, Satyanarayana, K., Graff, G. D., Fernandez, C., & Kowalski, S. P. (Eds.), *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices, Vol. 1 and 2* (pp. 575-579). MIHR and PIPRA.

EPO (2008). *Patents up for auctions*. European Patent Office.

Grandstrand, O. (2006). *Fair and reasonable royalty rate determination. When is the 25% rule applicable?* Les Nouvelles, September, 179-181.

Heiden, V. and Petit, N. (2017). *Patent Trespass and the Royalty Gap: Exploring the Nature and Impact of "Patent Holdout*". Hoover Institution Working Group on Intellectual Property, Innovation, and Prosperity, Stanford University.

Jarosz, J., Heider, R., Bazelon, C., Bieri, C. and Hess, P. (2010). *Patent Auctions: How Far Have We Come?* Patent auctions. Les Nouvelles, September.

Kemmerer, J. E. and Lu, J. (2008). *Profitability and Royalty Rates Across Industries: Some Preliminary Evidence*. KPMG Global Valuation Institute. https://ssrn.com/abstract=1141865 or http://dx.doi.org/10.2139/ssrn.1141865

Lagrost, C., Martin, D., Dubois, C. and Quazzotti, S. (2010). Intellectual property valuation: how to approach the selection of an appropriate valuation method. *Journal of Intellectual Capital*, 11(4), 481-503.

Lazzolino, G. and Migliano, G. (2015). The Valuation of a Patent through the Real Options Approach: A Tutorial. *Journal of Business Valuation and Economic Loss Analysis*, 10(1), 1-18.

Nabulsi, B. and Belt, E. (2015). *The patent is dead; long live the royalties!*. VIVO – The business and Medicine Report. Informa Business information Inc.

Parr, R. L. (2007). *Royalty Rates for Licensing Intellectual Property.* John Wiley & Sons.

Pressman, L., Planting, M., Yuskavage, R., Okubo, S., Moylan, C. and Bond, J. (2017). *The Economic Contribution of University/Nonprofit Inventions in the United States*. Association of University Technology Managers and Biotechnology Innovation Organization.

Razgaities, R. (2003). *Valuation and Pricing of Technology-Based Intellectual Property*. John Wiley & Sons.

Razgaitis, R. (2007). *Pricing the Intellectual Property of Early-Stage Technologies: A Primer of Basic Valuation Tools and Considerations*. In (A Krattiger, R.T. Mahoney, L. Nelsen & A. B. Bennett), *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices, Vol 1* (pp. 813-860). MIHR and PIPRA.

Rocha, A.M.S. (2009). *Avaliação e Licenciamento de Tecnologia em Universidades*. [Unpublished master's thesis]. Universidade do Minho.

Smith, H. (2005). *What innovation is – How companies develop operating systems for innovation.* CSC White Paper. European Office of Technology and Innovation.

Speser, S. (2006). *The Art and Transfer of Technology Transfer.* John Wiley & Sons.

Soares, I., Moreira, J., Pinho, C., & Couto, J. (2007). *Decisões de Investimento. Análise Financeira de Projectos*. Edições Sílabo.

Stevens, A. (2016). *Intellectual property valuation manual for academic institutions.* WIPO – World Intellectual Property Organization. https://www.wipo.int/meetings/en/doc_details.jsp?doc_id=332588.

Perchorowicz, J. T., Dakin, K. J., & Lindsey, J. (1991). Technology transfer: Financing and commercializing the high tech product or service from research to roll out. *Journal of Technology Transfer*, 16(3), 62-63.

WIPO/ITC (2005). *Exchanging value: negotiating technology licensing agreements. A training Manual*. World intellectual Property Organization.