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Valuation of software product: a systematic literature review

Umi Suhana binti Abdul Rahman [1,*], Adila Firdaus binti Arbain [1], Wan Mohd Nasir bin Wan Kadir [1], Dayang Norhayati bte. Abang Jawawi [1], Cik Feresa binti Mohd Foozy [2], Endah Sudarmilah [3]

[1] Faculty of Computing, Universiti Teknologi Malaysia, 81310, Johor Bahru, Johor, Malaysia
[2] Faculty Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, Malaysia.
[3] Faculty of Communication and Information, Universitas Muhammadiyah Surakarta, Jawa Tengah, 57169, Indonesia

* Correspondence author; Email: usuhana2@graduate.utm.my.

Abstract: Software valuation is a complex analytical process that determines the value of software product as intellectual property or an asset for software companies. However, the intangible nature of software makes it challenging to appraise using traditional calculation methods. This study presents a systematic literature review (SLR) conducted to identify suitable valuation approaches for software. The SLR examined existing research on software valuation, resulting in the identification of key methodologies and insights. By synthesizing the literature, this review sheds light on the significance of utilizing appropriate software valuation methods in software businesses. Moreover, it highlights the emerging issues and provides valuable recommendations for future research in the field of software valuation. This review illustrates the importance of addressing the complexities of software valuation and sets the stage for further exploration and development of effective valuation approaches.

Keywords: software valuation; software worth; intellectual property value; fair market value; valuation method; cost approach; market approach; income approach

1. Introduction

The expansive growth of the software industry has made software an essential component across various sectors. To create high-quality software, multiple factors such as technical aspects, human resources, costs, and cash flow need consideration, ultimately requiring quantification of its value. Determining the worth of software products aids owners in comprehending the benefits and potential utilization of their software. Consequently, an

appropriate valuation method is crucial for informed decision-making, considering the complexity involved [1].

Software valuation involves a range of assessments and techniques aimed at estimating its monetary value. The economic landscape, characterized by globalization and market dynamics, underscores the importance of software appraisal [2]. Expert valuation professionals collect and analyze data to provide credible valuations. As a result, researchers and practitioners have shown an increased interest in effective valuation frameworks for software.

Enhancing existing software valuation methods reflects the growing awareness of the need for accurate valuation models. Initially, traditional methods used for tangible assets were applied to software valuation, but the unique intangible nature of software necessitated specialized approaches. Scholars and professionals have proposed a variety of procedures, including the established cost, market, and income approaches, as well as newer techniques like the Real Option, Monte-Carlo, and Royalty Rate methods [3,4]. These approaches consider factors such as development costs, market demand, intellectual property rights, and technological advancements. The choice of valuation approach depends on available information and specific circumstances to yield accurate estimates.

Given the dynamic economic landscape, establishing norms and standards for valuers is crucial. International bodies like the IASB, IVSC, and WIPO offer guidelines for intellectual property valuation, though adoption can vary due to demographic factors. Researchers and practitioners from various countries are keen on developing effective valuation methodologies for software products [5–7].

In Malaysia, the field of software valuation is nascent, with challenges such as limited studies, insufficient valuation inputs, and absence of standard regulations [8]. The expense of hiring valuers hampers software valuation, hindering recognition of software's value as an organizational asset. Despite progress, the evolving software landscape poses challenges for valuation methods, as traditional approaches might struggle to adapt [7]. Addressing these issues requires innovative techniques that incorporate software's intrinsic value, technological advancements, and sector-specific characteristics, while promoting transparency and standardization to bolster decision-making confidence.

2. Research methodology

A SLR of Software Valuation was conducted in order to acquire a knowledge of the challenges, methods, and methodologies connected with software valuation. Our findings have the potential to benefit both academics and practitioners, especially in terms of guiding future research on software evaluation. To conduct this systematic literature review (SLR), we followed the methodological guidelines provided by Kitchenham *et al.* [9] and Zhang *et al.* [10] to ensure that our evaluation of the previously published research was objective and reproducible.

Figure 1 illustrates the whole search and study selection procedure, along with the number of publications obtained at each stage of the process. In April of 2023, both the search

and the study selection process were carried out. After going through our study selection procedure, we ended up with a total of 38 studies, all of which may be found in the References. Our goal was to answer the three research questions (RQs) listed in Table 1, which served as a guide for our investigation. The goal of this SLR will be to investigate the questions about further research that are indicated below. In this article, the answers to these three research questions will be provided in accordance with the primary studies that have been chosen and analyzed.

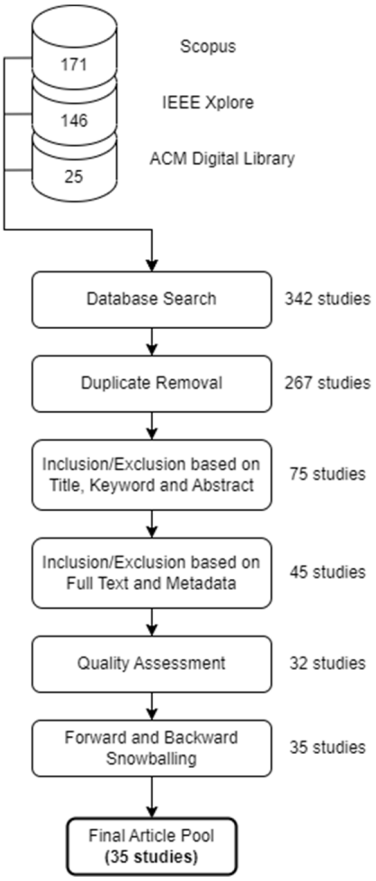

Figure 1. Stages of the study selection process.

Table 1. Research questions.

RQ	Research Question
RQ1	What are the valuation approaches recommended by researchers to valuate a software product?
RQ2	What are the challenges and issues in software valuation?
RQ3	How do researchers choose which valuation approach is the most suitable to value a software?

2.1. Search strategy

Developing a search strategy to retrieve potentially relevant research articles and resources from academic digital databases is the initial step in conducting this investigation, which begins with the strategy's development. With the PICO (Population, Intervention, Comparison, and Outcomes) paradigm in mind, we constructed the search string. Table 2 provides an overview of the most significant PICO component characteristics. The search strings are generated by concatenating all PICO components with the AND operator [11]. In addition, the search terms were adjusted to comply with the numerous variances in search capabilities provided by each database.

In certain instances, we matched the pertinent keywords in the titles, abstracts, and keywords of the publications, with the exception of exclusion keywords (preceded by NOT), which were only matched in the titles. When available, wildcard matching was used to catch different word variants; otherwise, we manually defined the term variants, such as value and valuation. Despite this, we implemented additional search filters to fulfil the given exclusion criteria. Table 2 defines only the base strings. This search string is executed on the two most popular academic digital libraries for software engineering, namely IEEE Xplore and ACM digital library. In addition, this search query was also applicable to SCOPUS, the largest available academic literature database that indexes several lesser academic databases. We initially obtained 342 studies, including 171 from SCOPUS, 146 from IEEE Xplore, and 25 from ACM Digital Library. We manually deleted duplicates from the downloaded studies, bringing the total number of studies down to 267.

Table 2. Formulation of search string.

Category	Subject	Search Term
Population	Software	“software industry” OR “software products” OR “intellectual property” OR “software companies”
Intervention	Valuation	“valuation model” OR “valuation methodology” OR “valuation approach” OR “valuation procedure” NOT (“tangible asset”)
Comparison	Comparative Study	"comparative study" AND "software valuation methodology"
Outcomes	Software Product Value	“software product” AND (“valuation” OR “calculation” OR “value” OR “price” OR “financial performance” OR “accuracy”)

2.2. Study selection

To conduct this research, our aim was to identify papers discussing software valuation. We define software valuation as the process of assessing a software product's value using accepted valuation methods. Our goal was to select relevant studies that contribute to understanding software or intangible asset valuation in terms of methodologies, approaches, and validations. Included studies address valuation objectives, employed methodologies, and any proposed valuation techniques, assessing their strengths and weaknesses [12]. We also consider resources related to confirming evaluation outcomes' validity. The aim is to ensure the credibility of obtained software valuation results.

2.2.1 Inclusion/exclusion criteria

This inclusion/exclusion strategy was established to ensure that we acquired a collection of high-quality publications, as shown in Table 3. These techniques were inspired from the studies in [9,10]. Studies addressing software valuation approaches, models, financial performance, market value, and economic impact are selected based on the inclusion criteria. This review focuses on English-language academic journal and conference proceedings publications. Non-peer-reviewed sources, irrelevant topics, and non-English publications are excluded by exclusion criteria. These criteria guarantee the inclusion of pertinent, high-quality content to facilitate a thorough comprehension of software value. Using information gathered from the title, abstract, and keywords, we eliminated 192 research. After processing the entire text and metadata, we then rejected an additional 30 studies, resulting in a total of 35.

Table 3. Inclusion/exclusion criteria.

Inclusion Criteria	Exclusion Criteria
I1. The study has implications for software engineering practise and is related to the topic of software valuation.	E1. The article is purely a literature review or survey piece.
I2. The study offers pertinent software valuation techniques or strategies.	E2. Academic publications such as book chapters or dissertations that are neither conference nor journal publications.
I3. The research is a publication that exceeds six pages.	E3. Articles not composed in English.
	E4. Articles for which the complete text is not available.
	E5. Publications that were published in a forum unrelated to computer science.

2.2.2 Quality assessment

In the case of SLRs, it is essential to evaluate the quality of the primary studies to ensure that we can construct an accurate and objective depiction of the research efforts [9]. The examination of the validity and methodological rigor of the selected studies is part of the quality assessment process in an SLR. Researchers examine characteristics such as study design, sample size, data collection methods, statistical analysis, reporting transparency, and the potential for bias. The trustworthiness and credibility of the review are enhanced when research that does not meet quality standards is omitted. This enables evidence-based decisions to be drawn from reliable evidence. Thirteen studies were removed because they did not meet the criteria for the quality evaluation.

2.2.3 Snowballing

Due to its limits in recognizing studies with cryptic language and the inability of the chosen digital libraries to hold all peer-reviewed literature [11], it is anticipated that the initial automated search approach may not capture all pertinent research. This is due to the method's inability to detect research. Manual search techniques, such as forward and backward snowballing, were used to identify additional relevant studies that were not present in the

required digital libraries or discovered by the automated search. This was done to supplement the initial selection of studies. Both forward and reverse snowballing involve the discovery of additional relevant research. This is accomplished by examining the reference lists of the included studies and the publications that cite the included research [11]. The inclusion/exclusion and quality evaluation criteria were used to this group of publications in order to reach a conclusion. The original selection of 32 papers was followed by the retrieval of five more, bringing the total number of studies to 35. The approach of snowballing led to the purchase of five additional periodicals.

2.3. Overview of the primary studies

During this SLR, numerous relevant journals, articles, and resources were reviewed to enhance comprehension of the research topic. The primary studies are summarized in Figure 2, illustrating their frequency across different years.

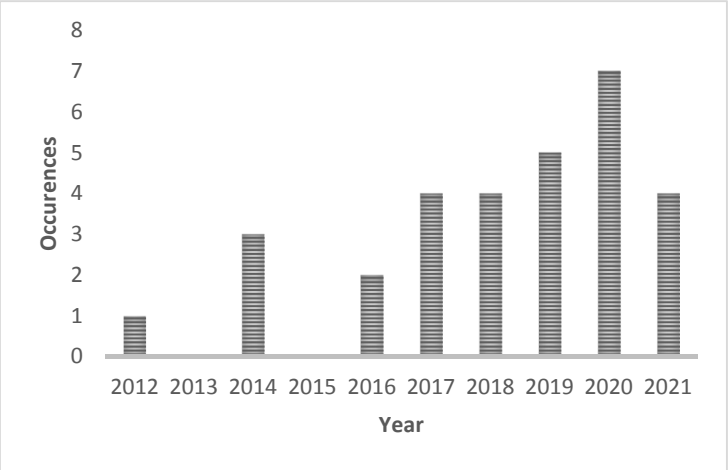

Figure 2. The number of selected primary studies by year.

Figure 2 presents the total number of software evaluation-related academic articles published over the years. The 2022 occurrences are not included because there is insufficient data to support their inclusion. The number of individuals interested in this subject of study has increased exponentially during the past five years. This indicates that this field is experiencing a major expansion at the time this study was conducted. Consequently, this research offers a significant and timely amount of value to this fast-emerging area by synthesizing the existing understanding of valuation approaches and procedures that are used in these investigations.

2.4. Data labeling

The research on valuation approaches categorizes valuation methods into three basic procedures: the cost approach, income approach, and market approach. These fundamental methods are commonly used to evaluate intellectual property. Figure 3 illustrates the distribution of proposed valuation methods across studies. These primary valuation

methodologies offer distinct perspectives on value, as noted by Zanni and Reilly [13], with different techniques yielding varying indications of value in diverse contexts.

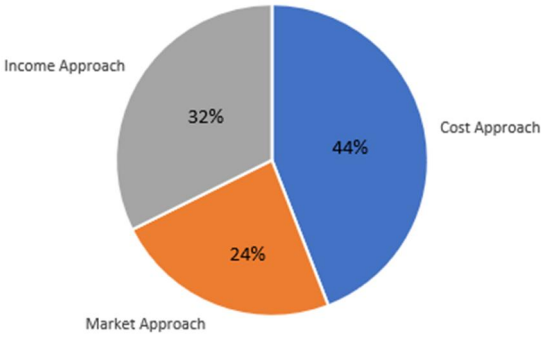

Figure 3. The ratio of valuation approaches. a study may suggest more than one approach.

Among these methods, the cost approach emerges as the most recommended in the studies. This approach assesses intangible assets by evaluating their development costs. It provides an asset valuation based on construction or acquisition expenses while excluding potential future earnings [14,15]. The cost approach comprises historical and future-oriented techniques, including the reproduction and replacement cost methods [3,16]. This approach suits valuing new software due to its alignment with limited data availability, where income and market data are insufficient.

Conversely, the income approach forecasts potential future revenue generated by the evaluated intellectual property. It underscores the asset's earning potential, forming a legitimate basis for valuation decisions and is widely accepted economically [17]. This method is suitable for valuing long-established software, leveraging past earnings data. However, it is inappropriate for new software lacking significant income records.

The market approach determines asset value based on comparable intangible assets' market value. This method compares prices paid for similar properties to estimate an item's value [18–20]. It assesses intellectual property value by contrasting it with comparable licensed or sold assets and using transactional value as a benchmark [21]. Difficulties lie in identifying comparable assets, given each IP's uniqueness and significance in terms of novelty and originality for IP protection [22]. Consequently, this method is infrequently used for asset valuation.

Each valuation method has its own merits and drawbacks. The choice of approach for software valuation must align with the specific characteristics of the subject assets [23].

3. Discussions

There is a substantial amount of keyword searches in software evaluation. The methodology for determining the worth of software as an asset is still in its infancy. Most of the selected primary studies imply that conventional valuation procedures or approaches used to evaluate a software product may not provide the most accurate software value since they do not

account for every component of evaluation to ensure the optimum value is computed. Some of the primary researches have also demonstrated the experimental valuation methodology, which is a modification of the old methodologies that ensures a more accurate appraisal.

3.1. RQ1: What are the valuation approaches recommended by researchers to valuate a software product?

In earlier years, numerous valuation approaches have been evaluated and studied to determine the fair worth of software. However, there is still a great deal of debate and uncertainty around the identification of the most suitable valuation approach for software valuation. In the selected primary papers, researchers have investigated and advocated a variety of valuation procedures and approaches. Most of the suggested valuation procedures are adaptations of the classic valuation approaches, which are the cost approach, the income approach, and the market approach.

The method of relief from royalties, the incremental income approach, and an assessment of the cost incurred have been presented as evaluation methodologies for software, as Visconti explained in his study. The first technique presupposes that the market worth of an intangible resource may be determined by discounting the sum of the royalty's exemption [24]. Next, the second way establishes the worth of the intangible resource in proportion to the present value of the sum of the differential revenue it will likely generate in the future. Lastly, this method focuses on the cost invested in the past to build intangible assets and to occupy on the market the positions obtained by those assets at the moment of appraisal [25].

Yousefi has also suggested a few valuation methodologies that can be used to determine the appropriate value of software. COCOMO II, for instance, is a practical cost approach method for estimating the cost of software. In addition, the software valuation of income methodology can be examined utilizing direct evaluation for projecting future income using the multi-period excess earnings and relief from royalty approaches. In addition to EV/EBITDA and EV/sales, the multiples method under the market approach can also be used to compare software values. On the other hand, the actual option and cost-benefit analyses can be used to examine various valuation aspects [26–28].

The cost approach consists of two methods: the past-based method and the future-based method. The future-based method includes the reproduction cost method and the replacement method, both of which are popular and recommended. The reproduction cost new approach indicates the cost incurred to produce an identical replica of the software asset in issue utilizing the same materials, standards, design, and craftsmanship at current market pricing [29,30]. Consequently, the replacement cost new approach represents the current cost to copy a comparable new software asset with the same functionality as the software being evaluated. Replacement cost new is frequently the most basic and useful cost-based measure for evaluating the value of an asset [31].

In general, the valuation methodologies and approaches that have been studied and proposed by the researchers reveal that each valuation methodology encompasses a variety of components in the estimation of the software's fair value. Examining the big picture

demonstrated that this is the case. In order to assign value to the software asset in question, it is crucial to select the valuation methodology that is most suitable and acceptable.

3.2. RQ2: What are the challenges and issues in software valuation?

The primary purpose of this SLR is to examine the software valuation methodologies applied in the process of determining the value of a software product. It is essential to note that a huge number of academics have proposed multiple valuation methodologies, each addressing a separate component, with the aim of determining the software asset's fair value. As a result, it is evident that there is not yet a best and acceptable technique for valuing a software product that takes into consideration all its vital components.

Yousefi has highlighted the demonstration of several features of existing valuation methodologies for determining software value in a study. Therefore, he concluded that there is no comprehensive consistent regulation for systematically evaluating the value of software [26]. Moreover, an intangible product such as software cannot be valued in a straightforward manner, and few existing approaches appear to provide a reasonable assessment of software value [32–34]. Existing valuation approaches that can be used to determine the true value of a software are still debatable about their applicability, which is regarded as the greatest difficulty in software valuation.

In addition, there are other elements that must be taken into account during the assessment, including the availability of sufficient information about the software product, its marketability, and the selection of the appropriate valuation approach [35]. Consequently, a second aspect of software valuation is the ability to collect necessary information and valuable data about the software that will be utilized as valuation input in the software valuation process. The availability of information is the determining element in determining which evaluation approach can be used to assess the software. The correctness of the valuation is dependent on the information and data obtained; hence it would be challenging to value software due to insufficient of valuable information and data of the software product.

In addition, the complexity of valuing intangible assets such as software makes the process difficult to complete without the assistance of experienced valuers. Diverse professional valuers continue to develop hybrid approaches that are separate from conventional procedures, demonstrating that IP valuation methodologies are not holistic. However, the high expense of hiring a professional valuer prevents business owners from valuing their intangible assets, making it difficult for product owners to perceive their software as a contributory asset to the organization [7].

As a result, the appropriate valuation approach or methodology for determining the value of software is necessary to ensure that the software will be recognized for its contribution, as the value of intellectual property, such as software, continues to rise in numerous developing-nation enterprises [36]. The challenges that arise when valuing software can be circumvented by presenting a strategy to valuation that can be easily implemented by the software's stakeholders using readily available data and information.

3.3. RQ3: How do researchers choose which valuation approach is the most suitable to value a software?

The valuation approaches for software product valuation proposed by the scholars each have their own distinct advantages and shortcomings. Therefore, in order to select the proper valuation methods, it is necessary to analyze the type and nature of the asset being assessed, the context and objectives of the evaluation, and the availability of trustworthy and meaningful information regarding the software asset in question. Therefore, the choice of valuation method depends on the essential characteristics of the thing being appraised. Each technique of valuation has its own set of benefits and drawbacks, both of which must be considered thoroughly. Based on the observation, it is necessary to map the valuation approach's benefits to the important features of the subject software. These factors include the nature of the subject asset and the availability of relevant data relative to the subject software.

The strengths and weaknesses of the evaluation procedures are described by the selection of concepts that were employed in evaluating each assessed methodology. The availability of data, the type of software being evaluated, and the organization's structure all influence the recommended approach as the most reliable [37]. Several aspects, such as how to establish which method is the best to employ, must be considered while determining the optimal software evaluation technique. On the basis of these factors, a comparison table may be constructed in order to gain a greater understanding of which valuation method would be most appropriate for evaluating the asset's worth.

Academics are in agreement that there is currently no method for valuing software products that can be applied evenly and comprehensively. This is owing to the fact that the characteristics of the software vary between software. Consequently, selecting the most effective valuation methodology for valuing the subject asset is vital to ensuring that it resulted in a relevant software value, and in most circumstances, multiple valuation methodologies must be implemented to obtain the most trustworthy result [38]. Choosing the most appropriate valuation method for valuing the subject asset is vital to ensuring that a relevant software value is determined.

4. Threat to validity

To ensure the validity of this systematic literature review (SLR), we followed the guidelines outlined by Kitchenham *et al.* [9]. In addressing potential validity threats, one notable concern is selection bias, where relevant publications might be overlooked during the selection process. To mitigate this, we adhered rigorously to SLR criteria and recommended practices. Our search methodology involved SCOPUS, a meta search engine encompassing reputable digital libraries like IEEE and ACM. To ensure comprehensive retrieval, we iteratively refined our search string using the quasi-gold sensitivity approach proposed by Zhang *et al.* [10]. Additionally, we employed backward and forward snowballing techniques to capture potentially missed studies.

Throughout quality assessment, data extraction, and theme analysis, we remain alert to potential validity threats. Human error and researcher bias can introduce inaccuracies. To ensure consistency, pilot exercises were conducted by the first two authors for each process. Furthermore, the data extraction steps were cross-validated, with conflicts resolved through thorough discussions.

Publication bias is another concern, where researchers might lean towards publishing positive outcomes rather than negative ones. Researchers might also downplay significant data limitations if not central to the study. Our findings are derived directly from source studies, acknowledging that our report might not cover all aspects comprehensively. Nevertheless, we believe that the selected primary studies, subjected to rigorous inclusion/exclusion and data quality evaluation, offer valuable insights into key data challenges and considerations within this field.

5. Conclusions

Software valuation approaches have gained considerable attention in the software engineering community due to the increasing significance of intangible assets like software in today's economy. With factors like cloud computing and rapid economic development, the need for accurate software valuation has become essential. However, existing research reveals that various valuation approaches have their limitations. Given the limited literature in this field, further investigation is crucial to establish appropriate valuation methods for software assets.

Conducting a systematic literature review on 35 studies, we aimed to identify the most suitable software valuation method for assessing software's asset value. Our findings offer valuable insights into the challenges of software valuation and recommended strategies. This review's outcomes will guide future research in addressing gaps where current studies lack optimal valuation methodologies. This research is a crucial step towards advancing software valuation techniques, empowering product owners to accurately assess the value of their software assets.

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References

[1] Hitchner JR. *Financial Valuation: Applications and Models*. John Wiley & Sons, 2017.

[2] Ben‐Menachem M, Gavious I. Accounting software assets: A valuation model for software. *J Inf Syst*. 2007, 21(2):117-132.

[3] Canadian Intellectual Property Office. Intellectual property valuation. 2023. Available: https://ised-isde.canada.ca/site/canadian-intellectual-property-office/en/intellectual-property-valuation (accessed on 23 March 2023).

[4] Sharma D, Kumar A. Methods for Intellectual Property Valuation. *Handb Intellect Prop Res* 2021:597–612.

[5] Japan Patent Office. Valuation of Intellectual Property. 2017. Available: https://www.jpo.go.jp/e/news/kokusai/developing/training/textbook/document/index/Valuation_of_Intellectual_Property.pdf (accessed on 17 February 2023).

[6] Miciuła I, Kadłubek M, Stępień P. Modern methods of Business Valuation—case study and new concepts. *Sustainability*. 2020, 12(7):2699.

[7] Okonkwo IE. Valuation of intellectual property: prospects for African countries. Boston University Law & Economics Research Paper Series, 2019.

[8] Shahdzul Bakri MI. Intellectual Property: Valuation & Commercialization. 2016. Available: https://www.biomass.org.my/files/editor_files/files/Articles/IP%20Valuation%20%26%20Commercialization%2012%20May%202016.pdf (accessed on 1 March 2023).

[9] Kitchenham B. Procedures for performing systematic reviews. *Keele, UK, Keele University*. 2004, 33(2004):1-26.

[10] Zhang H, Babar MA, Tell P. Identifying relevant studies in software engineering. *Inf Softw Technol*. 2011, 53(6):625-637.

[11] Schardt C, Adams MB, Owens T, Keitz S, Fontelo P. Utilization of the PICO framework to improve searching PubMed for clinical questions. *BMC Med Inform Decis Mak*. 2007, 7:1-6.

[12] Valuation Standards Board. ICAI Valuation Standard 302 Intangible Assets. In *ICAI Valuation Standards 2018*. Institute of Chartered Accountants of India. 2018, pp. 86- 104.

[13] Zanni KM, Reilly RF. Valuation of Intellectual Property as Part of the Asset-Based Approach Property Valuation Thought Leadership. 2018. Available: https://willamette.com/insights_journal/18/winter_2018_7.pdf (accessed on 5 February 2023).

[14] Bochańczyk-Kupka D. The measurement of intellectual property value at the microeconomic level. 2017. Available: https://www.academia.edu/108289964/The_Measurement_of_Intellectual_Property_Value_at_the_Microeconomic_Level (accessed on 20 March 2023).

[15] Tran LH, Vrublevskaya I. Methods for Valuing Customer Relationships: Use of the Multi-Period Excess Earnings Method or the Distributor Method? *Forensic Anal Insights* 2016:70-77.

[16] Thurman C. Application of the Cost Approach to Value Internally Developed Computer Software. 2018. Available: https://www.willamette.com/insights_journal/18/summer_2018_4.pdf (accessed on 25 February 2023).
[17] IPOS. Best Practices on Intellectual Property (IP) Valuation and Financing in APEC. 2018. Available: https://www.apec.org/publications/2018/04/best-practices-on-ip-valuation-and-financing-in-apec (accessed on 10 March 2023).
[18] Dandekar MP. Valuation of Intangible Assets and Intellectual Property. 2017. Available: https://cdn.ymaws.com/www.depr.org/resource/resmgr/2017_Conference/2017Presentations/MDandekarValuationIntangible.pdf (accessed on 15 March 2023).
[19] Perek AA. Valuation of Intangible Assets. PhD Thesis, Marmara Universitesi (Turkey), 2007.
[20] IVSC. Time To Get Tangible About Intangible Asset. 2021. Available: https://www.ivsc.org/wp-content/uploads/2021/09/Part1TheCaseforRealigningReportingStandardswithModernValueCreation.pdf (accessed on 1 April 2023).
[21] Annual IFRS Reporting. Multi-period Excess Earnings Method – Annual Reporting. 2020. Available: https://annualreporting.info/multi-period-excess-earnings-method/ (accessed on 26 February 2023).
[22] Reilly R. Relief from Royalty Method of Intellectual Property Valuations. *Nouv J Licens Executives Soc*. 2022, 57(1).
[23] Tockey S. Aspects of software valuation. In *Economics-driven software architecture*. St Louis: Elsevier, 2014. pp. 37-58
[24] Álvarez JT, González SA, Daguerre JC. Pricing and Valuation of Intangible Assets. *J Mod Account Audit*. 2012, 8(12):1780-1788.
[25] Moro-Visconti R. The Valuation of Software and Database. In *The Valuation of Digital Intangibles: Technology, Marketing, and the Metaverse*, Lodon: Palgrave Macmillan Cham, 2022. pp. 237-264.
[26] Yousefi H. The Valuation of Modern Software Investment in the US. *Int J Manag Technol*. 2021, 8(1):1-4.
[27] Allee KD, Erickson D, Esplin AM, Yohn TL. The characteristics, valuation methods, and information use of valuation specialists. *Account Horiz*. 2020, 34(3):23-38.
[28] Anastasio LE. Valuation of Intangible Assets Methods to Value Intangible Assets. 2020.
[29] Puca A, Zyla ML. The Intangible Valuation Renaissance: Five Methods. 2019. Available: https://blogs. cfainstitute. org/investor/2019/01/11/a-renaissance-in-intangible-valuation-five-methods. 2019 (accessed on 5 May 2023).
[30] Rotkowski AM, Reilly RF. Market Approach Methods for Intangible Asset Property Tax Valuations. 2014. Available: https://willamette.com/insights_journal/14/spring_2014_1.pdf (accessed on 1 March 2023).

[31] Chartered Global Management Accountant. Three approaches to valuing intangible assets. 2012. Available: https://www.aicpa-cima.com/resources/download/three-approaches-to-valuing-intangible-assets (accessed on 25 May 2023).

[32] De Groot J, Nugroho A, Bäck T, Visser J. What is the value of your software?. In *2012 Third International Workshop on Managing Technical Debt (MTD)*, Zurich, Switzerland, June 5, 2012, pp. 37-44.

[33] Gonnella E, Talarico L. Strengths and Weaknesses of the Excess Earnings Method for Valuing Backlog. *Res J Financ Account*. 2020, 11(22):122-134.

[34] Heberden T. Valuation of intellectual property rights. 2020. Available: https://www.rics.org/content/dam/ricsglobal/documents/standards/Valuation%20of%20intellectual%20property%20rights_rebrand_approved.pdf (accessed on 24 February 2023).

[35] APEC Intellectual Property Experts Group. Intellectual Property (IP) Valuation Manual. 2018. Available: https://www.apec.org/docs/default-source/Publications/2018/4/IP-Valuation-Manual/218_CTI_IP-Valuation-Manual.pdf (accessed on 13 February 2023).

[36] Ryan D. Valuation of businesses and intellectual property assets. *Wealth Tax Comm Backgr Pap*. 2020:144.

[37] Kossecki P, Korc Ł, Kossecki S. Valuation of intellectual property—Income approach and scenario analysis: Software on early stage of implementation. In *2017 IEEE 14th International Scientific Conference on Informatics*, Poprad, Slovak Republic, November 14–16, 2017, pp. 173-178.

[38] Smith, T. Multiples Approach Definition. 2021. Available: https://www.investopedia.com/terms/m/multiplesapproach.asp (accessed on 5 March 2023).