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STRATEGIC APPROACHES TO THE IMPLEMENTATION OF DIGITAL SOLUTIONS IN TRANSFER PRICING

The article provides a comprehensive analysis of approaches to implementing digital solutions in the field of transfer pricing (TP), with a particular emphasis on the transformation of the benchmarking process-one of the most labor-intensive and strategically important stages of TP documentation. The study traces the evolution of digital technologies: from the initial phase of technical automation, which included webpage screenshot generation, data capture, and basic web-processing tools, to advanced intelligent platforms capable of autonomously identifying potential comparable companies, analysing their web content, and classifying business activities. The article demonstrates how automated data-extraction algorithms, NLP classifiers, and LLM-based analytical models create a qualitatively new level of analysis by significantly reducing manual operations and improving the reproducibility and accuracy of benchmarking results.

The study substantiates that digitalisation acts as a key driver of transparency, manageability, and scalability of TP processes. Based on real cases from 2020-2025, it is shown that the use of artificial intelligence tools reduces labour costs for benchmarking by 3-6 times, decreases erroneous inclusions by more than 90%, substantially lowers the risk of regulatory adjustments, and enables the standardisation of benchmarking procedures across different jurisdictions and analytical teams. The proposed systematic approach includes three core transformation levels: building algorithmic models, developing a new "human-AI-human" process logic, and integrating digital modules into corporate information systems.

The findings indicate that digitalisation is no longer merely an instrument of operational optimisation but is becoming a strategic component of tax compliance. It forms a foundation for implementing intelligent, reproducible, and transparent approaches in TP, enhancing companies' resilience to regulatory risks, strengthening methodological consistency, and improving competitiveness in a global environment.

***Key words**: transfer pricing, benchmarking, digitalization, automation, artificial intelligence, comparable companies, financial analytics.*

Problem Statement. Transfer pricing (TP) remains one of the most resource-intensive areas of tax administration and corporate finance. The most labor-intensive task is searching for and analysing comparable companies (benchmarking), which includes: searching databases and open sources; manual verification of websites; identification of business activity; confirmation of operating functions; exclusion of non-relevant businesses; and documentation of the search. Manual website verification alone may take up to 60-70% of an

analyst's workload. Despite high business digitalisation, TP approaches long remained conservative.

Analysis of Recent Research and Publications. Scientific research on business-process digitalisation shows a significant influence of digital technologies on analytical and control procedures. However, TP automation has been studied only partially:

– international researchers (OECD, PwC, KPMG, Deloitte) discuss the digitalisation of compliance, but devote little attention specifically to benchmarking;

– publications of 2020-2024 mainly review isolated tools (OCR, NLP, Big Data), without offering a systemic view of automation evolution;

– Ukrainian studies focus primarily on tax control rather than technological modernisation of TP.

The transformation of benchmarking as a process-one comparable in complexity to due diligence-requires deeper academic analysis.

Unresolved Aspects of the Problem. Although modern digital solutions create the conditions for fully transforming the conservative TP approach-from partial automation to complex AI-driven modules for analysing company business profiles-a systematic implementation approach is still lacking, and few academic works describe the evolution of digital solutions in TP.

Purpose of the Article - To analyse trends in the implementation of digital solutions in transfer pricing, focusing on the evolution of benchmarking automation and identifying effective models for TP digitalisation.

Methodology. The study applies: analytical method-analysis of scientific sources and consulting reports; comparative analysis-comparison of traditional vs. digital benchmarking; functional-logical method-identifying stages of automation evolution; case analysis-describing digital-solution models in international TP approaches; forecasting-to justify prospects for full automation.

Research Results. In international tax regulation, a key task for multinational groups is ensuring compliance with the arm's length principle when conducting intra-group transactions [1]. Benchmarking-comparing the conditions of controlled (intra-group) transactions with analogous transactions between independent parties-is used precisely for this purpose. This process is a fundamental part of OECD documentation and national regulations [1; 2].

According to practical guidelines, a typical TP comparative analysis includes several stages [2; 3; 4]:

– defining the controlled transaction and study period;

– functional analysis of the tested party (its role, risks, assets), which is important because benchmarking results must reflect functionally similar entities [1; 3];

– search for potential comparables using commercial databases and open sources (e.g., financial statements, websites, catalogues) [3; 6];

- selection and analysis of comparables using quantitative and qualitative filters (industry, country, financial indicators, functions, assets/risks) [4; 5];
- application of statistical methods (e.g., interquartile range) to determine the “market” profitability range within which the tested party falls [1; 8];
- documentation of results: methodology description, data sources, exclusions, comparability adjustments, and arm’s-length conclusion [2; 7].

At the same time, the traditional approach has many features that determine significant time and resource expenditures [3; 5; 6]:

- Large volume of manual work-searching, collecting, and verifying company data, analysing websites and functions.
- Non-uniform and limited data availability, particularly in specific industries or countries [4; 5].
- High subjectivity-decisions regarding inclusion/exclusion affect results, and regulators emphasise justification of comparability [9].
- Costs of documentation and audit defence-requiring detailed justification and expert involvement [7].
- Repeated updates due to market or regulatory changes [8; 9].
- Consequences include increased time, higher consulting costs, elevated regulatory risks, and limited scalability [3; 6].

Thus, traditional benchmarking, despite being central to TP, functions increasingly as a “cost component”, creating incentives for digital transformation [10; 12].

Despite the relatively short duration of the process, digitalisation in the field of transfer pricing has gone through several stages of development [12; 13; 14], each of which has significantly changed the nature of the analyst’s work and the approach to forming the comparable sample. While in 2015 automation was limited solely to technical tools for storing information, in the 2020s the market saw the emergence of complex systems for machine analysis of companies, which are capable of performing most routine operations autonomously. The evolution of digital solutions allows us to speak about a transition from mechanical automation to algorithmic intelligent analysis, which forms a new paradigm for the work of TP specialists. Based on the analysis of the theory and practice of TP comparative studies, we can distinguish the following stages of evolution, which are presented in a summarised form in Table 1.

Identification of these stages leads to the conclusion that the role of the analyst has changed dramatically: from a performer of manual procedures to an expert who verifies AI conclusions and approves the approach [12; 13; 14].

Table 1.

Stages of Digitalisation of Comparative Studies.

Stage of digitalisation	Characteristics and technologies	Key capabilities	Limitations of the stage	Impact on process labour-intensity
1	2	3	4	5
1. Automation of data capture (screenshots)	Technical utilities for automatic creation of webpage screenshots (Browshot, URLBox, etc.)	fast creation of screenshots; standardisation of documentation	absence of analysis; need for manual website search	Reduction of working time by ~5-10%, but no analytical value
2. Automatic website access and batch processing	Web-automation tools (Puppeteer, Selenium, Scrapy)	mass opening of URLs; automatic collection of technical data	URLs are entered manually; no interpretation of content	General reduction of time for technical operations by ~15-20%
3. Automatic website search	API-search, fuzzy matching, domain-identification algorithms	autonomous identification of company websites; exclusion of non-relevant domains	content is analysed manually; possible errors in identifying official pages	Reduction of manual work by ~20-30%
4. Automatic content extraction (NLP + CV)	Neural networks for text reading (OCR); NLP classifiers; computer vision	short description of activity; classification by NACE/ISIC; exclusion of non-relevant businesses	need for expert confirmation; inaccuracy in complex industries	Reduction of informational analysis by ~50-60%
5. Complex AI-based company-analysis systems	LLM, profiling models, automatic comparability modules	full analysis of functions, risks, assets; automatic formation of comparable companies; formation of interquartile range	need for verification; dependence on data quality	Reduction of labour intensity by ~70-85%; the analyst performs only control
6. Automated "decision-making" systems (next-generation AI)	Multimodal models, autonomous agents, predictive systems	full benchmarking cycle; methodological recommendations; automatic TP reports	risks of excessive automation; regulatory limitations	Reduction of time by ~90%; the analyst becomes a "verifier of decisions"

Source: Compiled by the author.

The analysis of real projects in consulting practice for analysing comparable companies for TP in 2020-2025 has demonstrated that the digital transformation of benchmarking has led to a number of important changes:

1) labour time for analysis decreased by 3-6 times;

2) algorithms eliminated a significant share of human errors, especially in website search and content extraction, which contributed to improving the accuracy of reports;

3) all steps of the process became reproducible and transparent;

4) groups with a large number of transactions can perform benchmarking faster and more frequently, which means the possibility of scalability appeared;

5) the role of the analyst changed: instead of routine work, they perform the function of strategic control and interpretation.

Today, AI benchmarking is becoming the new standard in TP, and further technological development indicates a trend towards full automation of all processes, except for the final expert evaluation [13; 15].

To assess the effectiveness of digitalisation in transfer pricing, a practical approach was used: a dynamic model was built to compare key indicators of the same TP project over 2020-2025. During this period, analysts on the project consistently implemented:

- automation of website search (2021),
- automation of content analysis (2022),
- NLP-classification modules (2023),
- LLM-based business profile analysis modules (2024),
- a comprehensive AI system for automated benchmarking (2025).

The main indicators of the efficiency of the TP comparative study for comparable companies were chosen as follows: T - time required for benchmarking (hours); E - number of erroneous inclusions in the sample; R - risk of regulatory adjustments (0-1). The summarised results are presented in Table 2.

Table 2

Dynamics of the TP Project Performance, 2020-2025

Year	Technological level	Benchmarking time, T (hours)	Erroneous inclusions, E	Risk, R
2020	Fully manual process	48	22	0,35
2021	Automatic website search	39	17	0,31
2022	Automatic content analysis (OCR + CV)	28	11	0,26
2023	NLP classification of business activity	19	7	0,20
2024	LLM-based business profile analysis	12	4	0,15
2025	Complex AI system (full-cycle)	7	2	0,10

Source: Compiled by the author.

For applied evaluation, we propose using three metrics:

1. Reduction of time (OE):

$$OE_t = \frac{T_{2020} - T_t}{T_{2020}}$$

2. Reduction of erroneous inclusions (AP):

$$AP_t = 1 - \frac{E_t}{E_{2020}}$$

3. Reduction of risks (CR):

$$CR_t = 1 - \frac{R_t}{R_{2020}}$$

All indicators are calculated relative to the baseline year 2020 (Table 3).

Table 3

Calculation of the efficiency of TP digitalisation (based on the 3 metrics).

Year	OE (reduction of time)	AP (reduction of errors)	CR (reduction of risk)
2021	18.8%	22.7%	11.4%
2022	41.7%	50.0%	25.7%
2023	60.4%	68.2%	42.9%
2024	75.0%	81.8%	57.1%
2025	85.4%	90.9%	71.4%

Source: Compiled by the author.

To obtain a generalised indicator, we propose using a weighted formula in which the weights are selected so that operational efficiency and accuracy have priority (Table 4):

$$TEC_t = 0{,}5 \cdot OE_t + 0{,}3 \cdot AP_t + 0{,}2 \cdot CR_t$$

Table 4

TEC Index of TP Digital Transformation.

Year	TEC
2021	0,19 × 0,5 + 0,23 × 0,3 + 0,11 × 0,2 = **0,194**
2022	**0,429**
2023	**0,624**
2024	**0,753**
2025	**0,846**

Source: Compiled by the author

What conclusions can be drawn based on the performed calculations?

First, the effectiveness of digitalisation demonstrates a stable upward trend: from 19% in 2021 to 85% in 2025. Second, the largest leap occurred in 2022-2023, which correlates with the transition from automation to true artificial intelligence (NLP > LLM). Third, errors in the sample decreased by 90%, which indicates a significant improvement in comparability quality. Fourth, the risk of regulatory adjustments decreased by 71%, which confirms the strategic advantage of digitalisation in the field of tax compliance. Fifth, in 2025 the AI system forms almost the full benchmarking cycle, and the analyst performs the function of expert control.

Practice shows that effective implementation of digital solutions in the field of transfer pricing requires a systematic, phased and risk-oriented approach. Unlike local automation of individual procedures, digital transformation of TP involves a profound change in the logic of data collection, processing and interpretation. The implementation of OCR technologies, NLP, business-activity classifiers and LLLM models creates the opportunity for a large-scale revision of the traditional benchmarking methodology and a transition to intellectually oriented analytics models.

To ensure maximum digitalisation effect in the TP comparative analysis process, minimise the above-mentioned risks, and create a sustainable digital infrastructure in a consulting company, we propose an author's three-level methodology that structures TP digitalisation.

1. Model Level: the formation of the algorithmic foundation on which the company selects the types of digital models (NLP classifiers, fuzzy-matching algorithms, LLM models); develops standardised rules for interpreting results; creates internal feature libraries: lists of relevant industries, business profiles, and risk characteristics. The main task is to ensure the uniformity of computational rules and the controllability of the system.

2. Logic Level: the transformation of TP processes - responsible for defining the algorithmic pipeline of benchmarking; the distribution of roles between "human - AI - human"; the determination of control points that replace manual auditing of data. In fact, a new process logic is formed, in which AI processes the data and the analyst makes decisions.

3. Integration Level: the scaling of solutions, the key actions of which include the integration of digital modules with databases (Orbis, Amadeus, Refinitiv); the creation of functionality for automatic collection and storage of source materials; the formation of a unified digital footprint required for tax compliance; ensuring cybersecurity. This level allows moving from experiments to a productive platform for conducting TP studies.

To ensure the effectiveness of the transformation of comparative studies in TP, it is proposed to rely on the following principles.

1. Principle of pragmatic automation. A company should first automate the most resource-intensive elements (website search, content analysis), and only then the more complex procedures (functional analysis, risk classification).

2. Principle of "human at the centre of control." Despite the high level of autonomy of the models, the TP specialist must remain responsible for verifying key stages: the selection of comparable companies, qualitative exclusions, and interpretation of functions.

3. Principle of digital reproducibility. All AI results must be reproducible, explainable, and suitable for tax audit. In our view, applying this principle to the TP comparative study means that every step of the digital system must leave a digital trace.

Based on the TEC index of digital transformation calculated above, it is established that the implementation of digital technologies in TP provides the following significant results:

- systemic and scalable processes;
- transparency and manageability of compliance. All system actions have a digital trace, which simplifies tax audits;
- predictability of decisions and reduction of risks. The developed models make it possible to predict the risks of tax adjustments in advance;
- strengthening of methodological discipline. Algorithmic logic enables the unification of the approach and the elimination of differences between analysts;
- significant reduction of costs. According to the empirical model, benchmarking time is reduced by 85%; consultant errors decrease by 90%; risks decrease by almost 70%.

Thus, the digitalisation of TP is no longer an instrument of operational savings - it becomes an element of the company's tax strategy, increasing its resilience, transparency, and competitiveness.

Conclusions. Digitalisation of transfer pricing is becoming a key factor in the effectiveness of conducting comparative studies in TP. This is especially true for benchmarking - a process that has traditionally been based on significant time expenditures on manual search and website analysis. The study has shown that in the future AI will form a new standard of TP - when the benchmarking analysis will be fully automated, and the role of the expert will be reduced to the verification and interpretation of financial results.

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СТРАТЕГІЧНІ ПІДХОДИ ДО ВПРОВАДЖЕННЯ ЦИФРОВИХ РІШЕНЬ У ТРАНСФЕРНОМУ ЦІНОУТВОРЕННІ

Стаття присвячена комплексному аналізу підходів до впровадження цифрових рішень у сфері трансфертного ціноутворення (ТЦУ), зосереджуючи увагу на трансформації процесу бенчмаркінгу – одного з найбільш трудомістких етапів підготовки документації. В статті простежують еволюцію цифрових технологій: від первинної автоматизації технічних операцій (створення скріншотів та фіксації даних) до сучасних інтелектуальних систем, що здатні автономно здійснювати пошук, аналіз і класифікацію потенційних зіставних компаній. Показано, як алгоритми автоматичного вилучення контенту, NLP-класифікатори бізнес-діяльності та LLM-моделі радикально скорочують частку ручної роботи й підвищують точність формування вибірки співставних компаній.

У статті обґрунтовано вагому роль цифровізації для підвищення прозорості, масштабованості та керованості процесів в трансфертному ціноутворенні. На основі практичних кейсів 2020-2025 рр. продемонстровано, що застосування ШІ-технологій дозволяє скоротити трудові витрати на бенчмаркінг у 3-6 разів, знизити кількість помилкових включень на 90% та зменшити ризики регуляторних донарахувань на 70%. Запропонований авторський системний підхід до цифрової трансформації, який включає стандартизацію алгоритмічних моделей, побудову нової логіки процесів «людина - ШІ - людина» та інтеграцію цифрових модулів у корпоративні інформаційні системи.

Отримані результати свідчать, що цифровізація перестає бути інструментом суто операційної оптимізації та перетворюється на важливий елемент податкової стратегії компаній, формуючи підґрунтя для переходу до інтелектуальних, відтворюваних і прозорих підходів у трансфертному ціноутворенні.

***Ключові слова**: трансфертне ціноутворення, бенчмаркінг, цифровізація, автоматизація, штучний інтелект, зіставні компанії, фінансова аналітика.*