







The role of digitalization of transfer pricing in the company's management accounting system


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Abstract

The aim of the article was to study the theoretical and methodological aspects of the use of digital technologies in transfer pricing for the collection of the information background for management accounting. The study involved methods, such as the calculation of financial indicators, methods of finding separate data and their synthesis, system analysis, grouping, and ranking. These methods allowed for the calculation of the coefficient of innovation and technical business development in 27 countries of the European Union. The data obtained allowed us to determine the effectiveness of digitalization of transfer pricing by different methods, depending on the stage of the product life cycle, and to show the impact on the company's financial performance. Return on Equity and Return on Assets are directly affected by transfer pricing in companies of selected sectors of the economy. In conclusion, 74% of the respondents noted positive changes in the financial result after the introduction of digital technologies in transfer pricing when making management decisions. The study will be useful for managers of different levels to convince them of the need for the digitalization of business processes. A promising area of further research is determining the impact of transfer prices on the overall state of tax payments of businesses.

1. Introduction

Hemling, Rossing, and Hoffjan (2022) state that the digital transformation of the global economy, as well as technological innovation, business trends, and technical breakthroughs in the modern world, directly affect all businesses, creating new, more dynamic forms of cooperation and requiring flexibility and systemic development. According to Rogers and Oats (2022), the synergistic effect and unlimited potential of new digital technologies, such as block chain, business automation, remote access, and artificial intelligence, have challenged the entire management accounting system. Besides, the digital age has opened up access to a variety of data resources that require special software and hardware for data processing, as well as advanced analysis techniques.

There is also a growing need for forecasting for decision-making at all levels of management, both within the company's internal units and between business entities. In this case, as Hemling et al. (2022) note, management accounting assumes the responsibilities of the systemically important background for ensuring the company's viability because it forms a holistic picture of it. Tytenko and Bohdan (2020) add that it provides cooperation in developing planning and efficiency systems, as well as support in management decisions when determining and implementing strategies of the organization to direct the efforts of managers towards improving the financial results of the business entity as a whole.

Tiron-Tudor and Deliu (2021) state that the digitalization of companies has created large datasets that continue to grow at an accelerated pace while becoming increasingly diverse, which is changing the business model of all business entities combined with technological change. This raises the issue of transfer pricing (the price at which one subsidiary or unit of the company sells goods and services to another subsidiary or unit) in management accounting:

- Firstly, transfer prices determine income and expenses between operating units, affecting the performance of each of them.
- Secondly, transfer prices affect the incentives of department heads in choosing the vector of transfer of goods along the supply chain, which could potentially interfere with the company's goal to maximize profits.
- Finally, transfer prices affect the company's tax liabilities.

The use of this information by the company's management can significantly expand the assessment of the quality of middle-level managers' decisions. The Organization for Economic Co-operation and Development has published the Transfer Pricing Guidelines recommending the application of the transaction profit method to guide financial transactions between associated parties (OECD, 2022). However, the existing accounting and tax regulations, which impose certain restrictions on settlements between associated parties, have a number of gaps and are undergoing transformation, creating additional difficulties for companies that implement transfer pricing. These problems are poorly studied, which justifies the need for further research on the impact of automation of transfer pricing processes on the company's overall financial situation and the determination of its development strategy.

The aim of the research is to determine the effectiveness of the digitalization of transfer pricing for the establishment of a comprehensive system of management accounting for the company under the current conditions of information development. The aim involves the following research objectives:

- Study the nature of digitalization of transfer pricing as a management accounting tool in the context of current economic development.
- Arrange methods and models of transfer pricing in the system of management accounting depending on the task sets.
- Substantiate the effectiveness of digital transfer pricing accounting methods in the management decision-making system.

2. Literature Review

The widespread use of digital technologies in order to change the business model and provide new opportunities for generating income and creating added value has become the background for the rapid transition to digital business. Andreassen (2020) states that this has had both internal and external impacts on all types of business activities, including supply chains of goods and services, directly affecting transfer pricing. Rogers and Oats (2022) note that digitalization has contributed to the emergence of new forms of cooperation among companies, suppliers, customers, and employees, resulting in new product and service offerings. Ouelhadj and Bouchetara (2021) define digitalization as a challenge for existing companies, as they need to reassess their current strategy and explore new business opportunities.

Ahrens and Ferry (2018) maintain that routine processes have been automated and robotized, and business intelligence and the use of data analytics have been introduced as a result of digitalization in management accounting. This provides a significant advantage, as every decision relies on relevant and reliable data from a reliable and secure database. Andreassen (2020) holds that the key responsibility of managers is the creation and maintenance of a "single source of truth", which is used, among other things, for controlling transfer pricing. Rieg (2018) found that only 50% of middle-level managers in large German

companies report to the chief financial officer (CFO). In other words, as Goretzki and Messner (2019) emphasized, in half of the companies, the person responsible for data quality does not report to the person who is considered the “only source of truth” for the company regarding financial data and their interpretation.

Furthermore, new information procedures may result in a more decentralized approach to reporting and decision-making, based on the “self-servicing” of the units, which can potentially change the nature of control and the controllers’ role. Rikhardsson and Yigitbasioglu (2018) note that the use of chatbots and other tools for automating robotic processes can improve efficiency but requires clear management.

Recent studies (Horton & Wanderley, 2018; Moll & Yigitbasioglu, 2019; Tran, 2023; Ukubassova, Primzharova, Daribayeva, Galiyeva, & Nurgaliyeva, 2020) provide substantial evidence of the fundamental impact of digitalization and growing globalization on the transformation of the financial function of management accounting. Rieg (2018) found empirical evidence that CFOs and controllers in Germany are increasingly expecting changes in the overall financial situation of their companies as a result of the introduction of digital technology in the management process. The author describes the initial stage of actual implementation: 50% of surveyed controllers indicated that their company did not have a digitized controlling strategy, while 30% reported having a prior strategy, and only 6% reported having a relatively mature digitized controlling strategy. Schäffer and Brückner (2019) state that only 12% of respondents consider their company’s financial investment in the digitalization of controlling to be adequate.

In Sweden, Holmgren, Mårtensson, and Tamm Hallström (2018) found that less than 50% of transactions are processed by using digitized process automation. Only a small number of respondents use business analytics for financial planning and analysis. One of the reasons behind this is that the overall digitalization of a business unit takes precedence over the digitalization of a particular management function, such as transfer pricing control within the company. According to Appelbaum, Kogan, Vasarhelyi, and Yan (2017), CEOs (Chief Executive Directors) usually overlook the transfer price generated by production units, as they focus on areas that directly contribute to the creation of corporate value, such as marketing and supply chains. Domestic suppliers of goods and services do not prioritize sales in this case. Hence, the digital transformation of transfer pricing becomes a priority in management accounting, which can have an impact on the company’s financial situation.

Goretzki, Lukka, and Messner (2018) leave no room for doubt that the expanding volumes of accounting data in companies and their impact on control and information in management accounting, as well as decision-making, are alerting managers’ reliance on more traditional information. Big data and new methods of analysis, associated with the advancement of digital technologies, enable managers to use both structured and unstructured information for control purposes. Actions based on such new information demonstrate a significant departure from those based on consistent and linear connections between the company’s operations. According to Goretzki and Messner (2019), there is an increasing recognition that the digitalization of management accounting has a significant impact on corporate strategy, organizational mechanisms, and structures of information systems. Moreover, as stated by Holmgren et al. (2018), the costing architecture has changed due to the development of links between data, information, and processing methods. Horton and Wanderley (2018) hold that information flows in companies have undergone a transformation to the extent that a few dimensions of business management processes remain untouched by digital technologies.

We will further use the definition of “digitization of transfer pricing”, which refers to the formation of a single repository of accounting and analytical data from all operating units across the vertical and horizontal elements of goods (services) production. The objective is to obtain reliable information regarding all contracts of the company’s structural units. This form of storing primary information enables real-time monitoring and prompt notification of any deviations that arise in the production process concerning the composition and magnitude of direct and indirect costs in terms of each structural unit, as required for transfer pricing.

Schäffer and Brückner (2019) emphasize that transfer pricing serves as a tool to assess the quality of management in terms of cost and revenue centers, employing efficiency criteria for each structural unit within the company. Moreover, Möller, Schäffer, and Verbeeten (2020) suggest that transfer pricing plays a role in determining domestic sales volumes, profit, and profitability. It also directs managers’ attention to various aspects, such as coordinating the parent company and its management policies, ensuring proper allocation of costs and assets among units, including mutual supplies, accurate distribution of costs in inventory storage, the need to improve financial reporting indicators, and the implementation of applicable cost accounting systems.

According to Appelbaum et al. (2017), the use of transfer pricing as a management accounting tool raises the question for management analysts whether the product should be sold to other structural units of the company at special prices (Bhimani, 2020), or sold externally. Clempner and Poznyak (2017) explain that a positive answer to the first question leads to the implementation of a transfer pricing system, which can be differentiated based on the methods and models applied. Researchers identify the following methods of transfer pricing:

- Market transfer price: This refers to the list price at which the product could be sold in a competitive market (Smolarski, Wilner, & Vega, 2019).

- Transfer price with adjusted market rate: This method sets the transfer based on the specific market situation, often aligning with the market method (Klassen, Lisowsky, & Mescall, 2017).
- Transfer price by agreement: This method is applied when justifying the market price is not feasible due to the uniqueness of the product or limited market availability (Garbowski, Tiutiunyk, Tiutiunyk, Kondukotsova, & Karpenko, 2021).
- Margin transfer pricing: As an alternative to the market method, this approach sets the price based on the marginal contribution of each unit (Rogers & Oats, 2022).
- Costs-based transfer pricing: This method calculates the transfer price based on the cost of production of goods incurred by a specific unit (Klassen et al., 2017).
- Cost plus transfer pricing: This involves establishing the transfer price using the “costs plus marginal profit” method (Eden, Srinivasan, & Lalapet, 2019).

Devereux and Vella (2018) point out that transfer prices have an impact on the costs and revenues of the transaction unit, regardless of the chosen method of accounting. According to Apostol and Pop (2019), if the transfer price is set too low, the unit located up in the sales chain receives fewer profits, while the unit lower down benefits from lower costs for goods or services. For this reason, many operating units assign value to their products and services as if they were selling them to an external customer at a market price.

Apostol and Pop (2019) also note that if the head of the higher unit has a choice to sell goods and services to external customers, and the transfer price is lower than the market price, the unit may choose to prioritize external orders and decline internal ones. According to Anesa, Gillespie, Spee, and Sadiq (2019), such operational measures can generate additional profits in the short term, but they undermine the overall goal of profit maximization in the long run. Similarly, as found by Radcliffe, Spence, Stein, and Wilkinson (2018), a high transfer price can create an incentive to deal exclusively with external suppliers, but in such a case, the company’s production units may suffer from underutilized capacity.

Transfer pricing significantly increases the volume of information which needs to be identified, recorded, analyzed, processed, and transferred for decision-making by the management accounting service. The reason for this is the growing volumes of accounting information that reflect differentiated transactions at transfer prices, financial flows, as well as changes in costs and performance across the company’s structural units.

The processing and transfer of accounting information should be ensured by transfer pricing digitalization systems. Moll and Yigitbasioglu (2019) emphasized that this information needs to be analytically grouped and detailed. Moreover, transfer pricing in the management accounting system involves large initial data volumes, and processing them manually can be time-consuming in the absence of an automated system.

In our opinion, digital transfer pricing is a component of the digitalization of the company’s management accounting system. Its possible implementation can take the form of a functional unit within a comprehensive automation program or as a specialized program integrated with the automation program of the general management accounting function.

3. Research Methodology

The following procedure was proposed to assess the role of transfer pricing digitalization in the company’s management accounting system in order to achieve the aim of the research and fulfil the objectives:

1. First of all, a sample of countries and industries with the most developed digital infrastructure (measured by factors such as the percentage of electronic payments, access to electronic reporting, and remote management) was selected using the official website of the European Statistics Service (EU-27). The assessment was carried out by calculating the arithmetic mean of ranked indicators on a scale from 1 (least developed) to 10 (most developed). This allowed for the calculation of the coefficient of innovation and technical development of the country’s business:

$$K_{itd} = \sum_{i=1}^n k_n / n, \tag{1}$$

Where K_{itd} is the coefficient of innovation and technical development of the country’s business, k_n are the values of individual variables in the ranked series, and n is the number of variables.

2. The data obtained served as the background for studying the adequacy of implemented digital technologies for transfer price calculation and making management decisions based on them. Five indicators were selected as descriptors for the assessment: vision and strategy of digitalization, digital talents of managers, key digital processes of the economy, flexible sources and technologies, and management and administration of the economy.
3. A questionnaire consisting of 20 questions divided into 5 descriptor blocks was developed for managers in order to implement this assessment. The study involved 160 managers from the fields of mechanical engineering, energy, and agriculture from four countries — Germany, Slovakia, the Netherlands, and Poland.
4. The adequacy of implemented digital technologies to calculate transfer prices and make management decisions on their basis was assessed using Harrington’s scale (Harrington, 1965), as shown in Table 1. The scale assigns numerical values to verbal descriptors, ranging from “Very bad” to “Very good”. The construction of the function is based on the transformation (reflection) of the measured values of d

parameters of the object under study ($d \in M$, where $\{M\}$ – a set of possible values corresponding to the scale that corresponds to the limits and accuracy of measurements for this parameter) in a dimensionless scale q in the range from $q=0$ to $q=1$.

Table 1. Numerical values of Harington's verbal-numerical scale.

Very bad	Bad	Satisfactory	Good	Very good
0-0.19	0.20-0.36	0.37-0.62	0.63-0.79	0.80-1.0

5. At the third stage, an integrated indicator of the company's readiness to implement digital solutions in the system of management decisions on transfer pricing was calculated using the formula:

$$d = (\sum_{i=1}^n q_i)^{1/n}, \tag{2}$$

Where n is the number of features,

And the value of a single descriptor, which is translated into a dimensionless scale of possibility, is denoted by q_i ($i=1,2, \dots,n$) and has an interval from 0 to 1.

6. The next step involved ranking the obtained indicators on the adequacy of implemented digital technologies for calculating transfer prices and making management decisions on their basis. The data obtained through correlation and regression analysis were compared with the company's financial results (ROE, ROA), which take into account the hierarchy and relationship at each stage of transfer pricing.

7. The data obtained allowed for determining the effectiveness of digitalization of transfer pricing using different methods depending on the stage of the product life cycle. In addition to these specific methods, the study involved general economic and statistical methods, such as calculation of financial indicators, methods of finding separate data and their synthesis, system analysis, grouping, and ranking.

The calculations were performed using AnyLogic software. This procedure for assessing the role of transfer pricing digitization in the company's management accounting system, through the mentioned methods allowed for advancing a research hypothesis: the higher the company's readiness to implement digital innovations in the transfer pricing system, the higher the quality of management decisions at each income and expenses center, leading to better financial result for the company.

4. Research Results

Economy 4.0 is unable to bypass the digital transformation, as computer technology has spread across all its spheres. European companies have experienced the benefits of digital development, which have significantly reduced administrative costs, revealed weaknesses in the production chain, and reduced the time required for management decisions. The study involved the analysis of the state and coverage of digital infrastructure (percentage of electronic payments, access to electronic reporting, remote management), which allowed for the calculation of the coefficient of digital business development in different sectors of the economy (Figure 1).

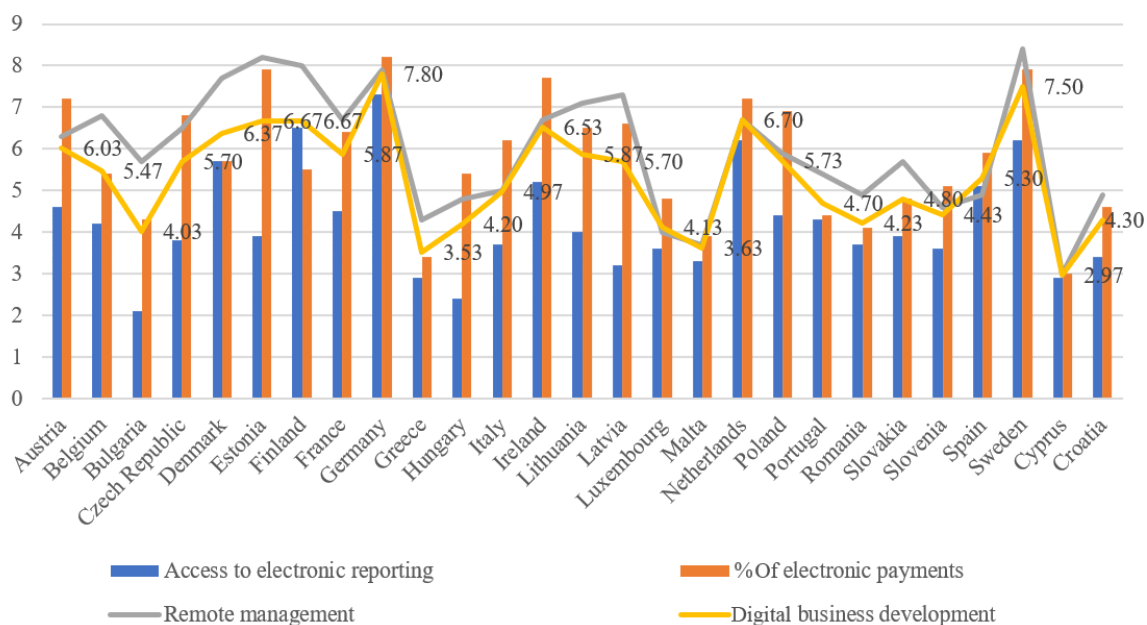


Figure 1. Digital business infrastructure coverage in the 27 countries of the European union (2021 data).

The analyzed data show that the percentage of electronic payments (64.5%) has the highest coverage, while access to electronic reporting (an average of 46%) has the lowest coverage. This means that less than half of managers at all levels of business management are able to clearly monitor the work of their centers of

responsibility. The highest rate of digital development was recorded in Germany (7.8), followed by Sweden (7.5), and the lowest rate was in Cyprus (2.97). Therefore, the current situation of transfer pricing for products may be interpreted inappropriately due to the lack of digital information.

The situation is also ambiguous in terms of the sectors of the economy. The energy sector, mechanical engineering, and agriculture were selected for the study, which are the industries with the most extensive production chain, meaning they have the largest number of centers of responsibility with gradual transfer pricing. The study involved 160 managers from four countries — Germany, Slovakia, the Netherlands, and Poland, who agreed to answer the questions of the questionnaire provided in [Appendix 1](#) regarding readiness to implement digital technologies to calculate transfer prices and make management decisions on their basis ([Figure 2](#)).

The analysis of the questionnaires revealed that the overall assessment of the state and readiness for the implementation of digital technologies to calculate transfer prices and make management decisions on their basis is 0.67 in agriculture, 0.7 in the energy sector, and 0.73 in mechanical engineering. All of these indicators correspond to the level of the “good” on the Harrison Scale. This means that the managers have the necessary information to make management decisions regarding transfer pricing based on data from all centers of responsibility throughout the entire production chain.

The rethinking of the actions taken by business management as part of the digital transformation of business is ongoing. Under the influence of Agile and Lean-technologies, which include transfer pricing digitalization, businesses are moving towards lean and agile production. Agile means dividing the production into several stages, and in the case of transfer pricing, this means having responsibility centers with the aim of minimizing losses at each stage of production and focusing on the consumer, whether internal or external, as much as possible.

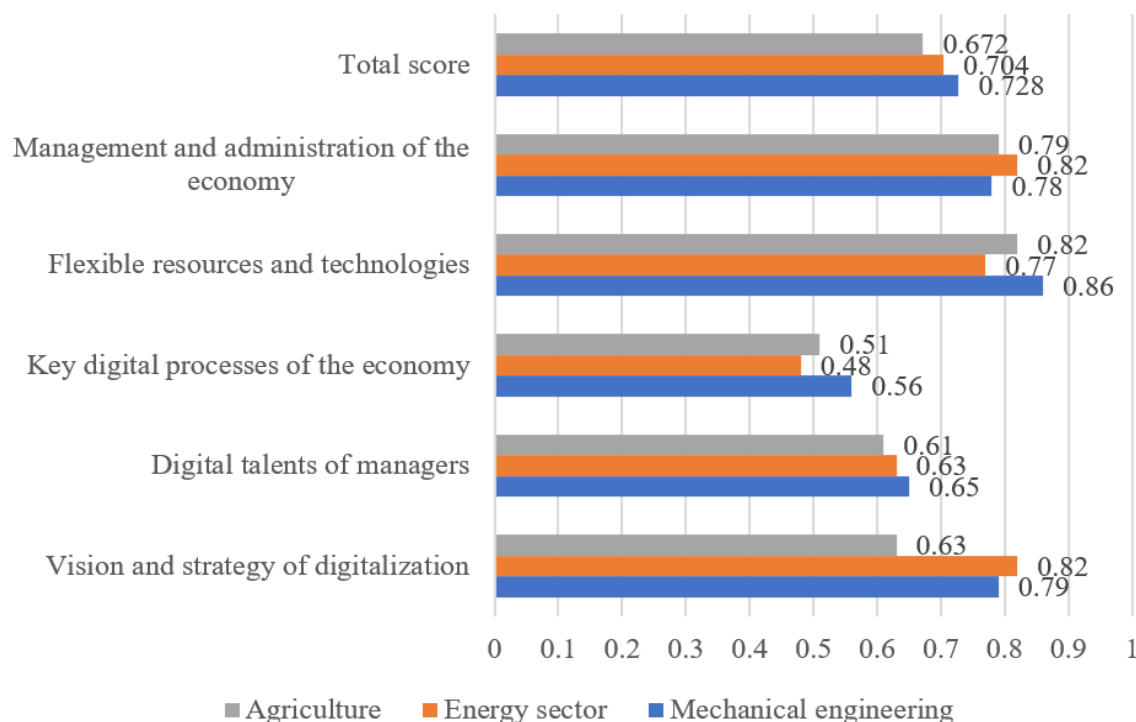


Figure 2. Assessment of the state and readiness to implement digital technologies in selected countries and sectors of the economy.

This is an example of one of the companies surveyed for the research. Entwhistle Electric (UK), a manufacturer of compact batteries for a variety of mobile devices, was acquired by Razor Holdings (Germany) during the restructuring. Razor Holdings also owns Green Lawn Care (UK), a manufacturer of low-emission lawnmowers. The guaranteed supply of batteries for the new line of all-electric Green lawnmowers was the reason for Razor’s acquisition of Entwhistle. Razor’s corporate planning staff ordered Entwhistle to set a transfer price for batteries supplied to Green equal to their cost. They also required Entwhistle to meet all of Green’s needs before it could sell these products to other customers. The Green orders are very seasonal, so Entwhistle decided that it could not fulfil other customers’ orders during the high season for Green. Moreover, the management of Entwhistle decided that they no longer had reason to reduce their costs, so production efficiency has been depressed because the transfer price is set at cost.

A year later, Razor’s management realized that Entwhistle had lost 80% of its previous client base and now relies solely on selling batteries to Green to continue operating. Entwhistle’s profit margin disappeared

because the product was sold within the company at cost, and the competitors took a share of the foreign market.

So, working with data involves a kind of rethinking. Interviewed managers noted that the past work with management data was structured as follows: a layer of data for past periods was accumulated and analysed, reports were prepared and some decisions were made on their basis. It was followed by extrapolation: calculations based on past periods for future development. The work with data has changed with the implementation of digital technologies. Now, artificial intelligence is capable of processing data sets, which allows for making decisions in a situation with incomplete and asymmetric information. In such a case, internal communications and relationships within the company become crucial, which means that transfer pricing is a litmus test for assessing the financial standing of the whole company. Studies have found that Return on Equity (ROE) and Return on Assets (ROA) are directly affected by transfer pricing in companies in selected sectors of the economy (Table 2).

As noted by many managers who participated in the study, the most important advantage of transfer pricing is that this mechanism gives companies a unique opportunity to conquer new markets by artificially lowering prices for certain goods or services. On this basis, practical approaches to transfer pricing in corporate structures were monitored to minimize risks depending on the stages of the product life cycle Table 3.

Table 2. Calculation of correlation and regression dependence of financial results.

Sectors of the economy	ROE		ROA	
	Simple regression	Multiple regression	Simple regression	Multiple regression
Mechanical engineering	2.29	3.00	1.13	1.21
Energy sector	1.63	1.78	1.24	1.51
Agriculture	1.56	1.66	1.00	1.12
R ²	0.68	0.78	0.70	0.78
Adjusted R ²	0.79	0.82	0.68	0.63

Table 3. The choice of the method of transfer pricing (TP) in selected sectors of the economy depending on the product life cycle stage.

The product life cycle stage	Product (Total)	Goods for sale	Works and services
Entering the market	<ul style="list-style-type: none"> Market transfer price; Cost-based TP 	<ul style="list-style-type: none"> Transfer price with adjusted market rate; Cost-based TP 	<ul style="list-style-type: none"> Market transfer price; Cost-based TP
Growth phase	<ul style="list-style-type: none"> Market transfer price; Margin transfer pricing; cost plus 	<ul style="list-style-type: none"> Market transfer price; Cost-based TP; Margin transfer pricing; Cost plus 	<ul style="list-style-type: none"> Market transfer price; Margin transfer pricing; cost plus
Maturity phase	<ul style="list-style-type: none"> Market transfer price;- Margin transfer pricing; Cost plus 	<ul style="list-style-type: none"> Market transfer price; Cost-based TP; Margin transfer pricing; Cost plus 	<ul style="list-style-type: none"> Market transfer price; Margin transfer pricing; Cost plus
Exit from the market	<ul style="list-style-type: none"> Market transfer price 	<ul style="list-style-type: none"> Margin transfer pricing; Market transfer price 	<ul style="list-style-type: none"> Market transfer price; Negotiable TP

According to research, the choice of method depends on the stages of the product life cycle (for works or services) and generally affects the company’s financial results. However, transfer pricing for works or services during the final stage of the product life cycle — exit from the market — was the exception. This is explained by the fulfilment of the previously assumed obligations to counterparties.

In general, 74% of respondents noted positive changes in the financial results after the introduction of digital technologies in transfer pricing for making management decisions. This was noted by 76% of managers surveyed in the energy sector, 78% in mechanical engineering, and 68% in agriculture. This fully confirms the hypothesis of the study: the higher the company’s readiness to implement digital innovations in the transfer pricing system, the higher the quality of management decisions at each income and expenses center, which yields a higher financial result of the company.

5. Discussion

Digitization of economic processes is a significant indicator of the impact on the quality of management decisions. The digital transformation of transfer pricing accounting can identify shortcomings in the distribution of resources or overspending of resources at every step of the production chain, in every centre of responsibility.

The study revealed a significant gap between theory and practice despite the practical significance of digitalization. Researchers have hardly discussed the impact of digitalization on financial function, which, in our opinion, is highly relevant. Many practitioners (Andreassen, 2020; Halkiv, Kulyniak, Shevchuk, Kucher, & Horbenko, 2021; Hemling et al., 2022) have noted that the potential impact on management accounting practices and financial function is enormous. Large global corporations have special transformation departments (e.g. in marketing, human resources and finance) to oversee the digital transition (Devereux & Vella, 2018).

Most researchers on the digitization of management decisions (Garbowski et al., 2021; Schäffer & Brückner, 2019) support full digitalization of business and implementation of automated accounting processes. However, authors like Moll and Yigitbasioglu (2019) and Rikhardsson and Yigitbasioglu (2018) still engage in scientific debates regarding the replacement of accountants with automated technology, focusing on the moral and social components as key factors.

Therefore, the issue of comprehensive digitalization of management decision-making processes, including transfer pricing, requires careful study. There are many poorly studied areas that may have a different impact on the final financial result. We should agree with the ideas and considerations of Bhimani (2020) regarding the choice of transfer pricing methods and models when introducing changes to management approaches, considering the strategic development factor. He suggests using them based on the concept of key performance indicators as a tool for operational control. Moreover, sharing the opinion of Appelbaum et al. (2017), we add that the information and management support of transfer pricing based on the income maximization model, are key performance indicators in the balanced scorecard structure.

Thus, the study complements the achievements of the mentioned authors and confirms that the effectiveness of decisions that must take into account various factors and their dynamics largely determines the company's success. Management accounting aims to provide users with the information necessary to make informed decisions about reducing or expanding certain areas of activity, focusing on the most promising segments. These functions require efficient handling of information, enabled by digital data processing systems.

6. Conclusions

Transfer pricing digitization systems are designed for the processing and transfer of accounting information for management decisions at all levels. Moreover, large volumes of initial data are used for the purposes of transfer pricing in the management accounting system. Their processing is time-consuming without an automated system. An integrated effective system of transfer pricing digitalization requires complex implementation. The effectiveness of decisions, which must take into account different factors and the dynamics of company development, determines the result of its implementation. A study of the development of digital infrastructure, which directly affects the company's development, confirms this. It was found that less than half of managers at all levels of business management were able to clearly monitor the work of their centres of responsibility.

Furthermore, the author's definition of "transfer pricing digitalization" confirms the appropriateness of creating a single repository of accounting data from all operating units of the vertical and horizontal elements of the production of goods (services) to obtain reliable information on all contracts of structural units.

References

- Ahrens, T., & Ferry, L. (2018). Institutional entrepreneurship, practice memory, and cultural memory: Choice and creativity in the pursuit of endogenous change of local authority budgeting. *Management Accounting Research*, 38, 12-21. <https://doi.org/10.1016/j.mar.2016.11.001>
- Andreassen, R.-I. (2020). Digital technology and changing roles: A management accountant's dream or nightmare? *Journal of Management Control*, 31(3), 209-238. <https://doi.org/10.1007/s00187-020-00303-2>
- Anesa, M., Gillespie, N., Spee, A. P., & Sadiq, K. (2019). The legitimization of corporate tax minimization. *Accounting, Organizations and Society*, 75, 17-39. <https://doi.org/10.1016/j.aos.2018.10.004>
- Apostol, O., & Pop, A. (2019). 'Paying taxes is losing money': A qualitative study on institutional logics in the tax consultancy field in Romania. *Critical Perspectives on Accounting*, 58, 1-23. <https://doi.org/10.1016/j.cpa.2018.05.001>
- Appelbaum, D., Kogan, A., Vasarhelyi, M., & Yan, Z. (2017). Impact of business analytics and enterprise systems on managerial accounting. *International Journal of Accounting Information Systems*, 25, 29-44. <https://doi.org/10.1016/j.accinf.2017.03.003>
- Bhimani, A. (2020). Digital data and management accounting: Why we need to rethink research methods. *Journal of Management Control*, 31(1-2), 9-23. <https://doi.org/10.1007/s00187-020-00295-z>
- Clempner, J. B., & Poznyak, A. S. (2017). Negotiating transfer pricing using the Nash bargaining solution. *International Journal of Applied Mathematics and Computer Science*, 27(4), 853-864. <https://doi.org/10.1515/amcs-2017-0060>
- Devereux, M. P., & Vella, J. (2018). Debate: Implications of digitalization for international corporate tax reform. *Intertax*, 46(6/7), 550-559. <https://doi.org/10.54648/taxi2018056>

- Eden, L., Srinivasan, N., & Lalapet, S. (2019). Transfer pricing challenges in the digital economy: Hic sunt dracones? (Part I of II). *Tax Management International Journal*, 48, 1-5.
- Garbowski, M., Tiutiunnyk, S., Tiutiunnyk, Y., Kondukotsova, N., & Karpenko, O. (2021). Digitalization of transfer pricing as an element of the management accounting system in the company. *Academy of Accounting and Financial Studies Journal*, 25(1), 1-8.
- Goretzki, L., Lukka, K., & Messner, M. (2018). Controllers' use of informational tactics. *Accounting and Business Research*, 48(6), 700-726. <https://doi.org/10.1080/00014788.2017.1407627>
- Goretzki, L., & Messner, M. (2019). Backstage and frontstage interactions in management accountants' identity work. *Accounting, Organizations and Society*, 74, 1-20. <https://doi.org/10.1016/j.aos.2018.09.001>
- Halkiv, L., Kulyniak, I., Shevchuk, N., Kucher, L., & Horbenko, T. (2021). *Information and technological support of enterprise management: Diagnostics of crisis situations*. Paper presented at the 11th International Conference on Advanced Computer Information Technologies (ACIT). IEEE.
- Harrington, E. C. (1965). The desirable function. *Industrial Quality Control*, 21(10), 124-131.
- Hemling, L., Rossing, P. C. J., & Hoffjan, A. (2022). The use of information technology for international transfer pricing in multinational enterprises. *International Journal of Accounting Information Systems*, 44, 100546. <https://doi.org/10.1016/j.accinf.2021.100546>
- Holmgren, C. M., Mårtensson, M., & Tamm Hallström, K. (2018). The development of the management accountant's role revisited: An example from the Swedish social insurance agency. *Financial Accountability & Management*, 34(3), 240-251. <https://doi.org/10.1111/faam.12156>
- Horton, K. E., & Wanderley, C. D. (2018). Identity conflict and the paradox of embedded agency in the management accounting profession: Adding a new piece to the theoretical jigsaw. *Management Accounting Research*, 38, 39-50. <https://doi.org/10.1016/j.mar.2016.06.002>
- Klassen, K. J., Lisowsky, P., & Mescall, D. (2017). Transfer pricing: Strategies, practices and maximum tax reduction. *Contemporary Accounting Research*, 34(1), 455-493.
- Moll, J., & Yigitbasioglu, O. (2019). The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *British Accounting Review*, 51(6), 100833. <https://doi.org/10.1016/j.bar.2019.04.002>
- Möller, K., Schäffer, U., & Verbeeten, F. (2020). Digitalization in management accounting and control: An editorial. *Journal Managerial Control*, 31, 1-8. <https://doi.org/10.1007/s00187-020-00300-5>
- OECD. (2022). OECD transfer pricing guidelines for multinational enterprises and tax administrations. <https://doi.org/10.1787/0e655865-en>
- Ouelhadj, A., & Bouchetara, M. (2021). Contributions of the base erosion and profit shifting BEPS project on transfer pricing and tax avoidance. *Financial Markets, Institutions and Risks*, 5(3), 59-70. [https://doi.org/10.21272/fmir.5\(3\).59-70.2021](https://doi.org/10.21272/fmir.5(3).59-70.2021)
- Radcliffe, V. S., Spence, C., Stein, M., & Wilkinson, B. (2018). Professional repositioning during times of institutional change: The case of tax practitioners and changing moral boundaries. *Accounting, Organizations and Society*, 66, 45-59. <https://doi.org/10.1016/j.aos.2017.12.001>
- Rieg, R. (2018). Tasks, interaction and role perception of management accountants: Evidence from Germany. *Journal of Management Control*, 29(2), 183-220. <https://doi.org/10.1007/s00187-018-0266-0>
- Rikhardsson, P., & Yigitbasioglu, O. (2018). Business intelligence & analytics in management accounting research: Status and future focus. *International Journal of Accounting Information Systems*, 29, 37-58. <https://doi.org/10.1016/j.accinf.2018.03.001>
- Rogers, H., & Oats, L. (2022). Transfer pricing: Changing views in changing times. *Accounting Forum*, 46(1), 83-107. <https://doi.org/10.1080/01559982.2021.1926778>
- Schäffer, U., & Brückner, L. (2019). Role-specific competency profiles for future controlling. *Controlling & Management Review*, 63(7), 14-31.
- Smolarski, J. M., Wilner, N., & Vega, J. G. (2019). Dynamic transfer pricing under conditions of uncertainty—the use of real options. *Journal of Accounting and Organizational Change*, 15(4), 535-556. <https://doi.org/10.1108/jaoc-08-2018-0083>
- Tiron-Tudor, A., & Deliu, D. (2021). Big data's disruptive effect on job profiles: Management accountants' case study. *Journal of Risk and Financial Management*, 14(8), 376. <https://doi.org/10.3390/jrfm14080376>
- Tran, N. H. (2023). Factors impacting strategic management accounting adoption: Empirical evidence from an emerging market. *International Journal of Innovative Research and Scientific Studies*, 6(3), 710-717. <https://doi.org/10.53894/ijirss.v6i3.1877>
- Tytenko, L. V., & Bohdan, S. (2020). Transfer pricing as a management accounting tool. *Galician Economic Bulletin of the Ternopil National Technical University*, 64(3), 87-95.
- Ukubassova, G. S., Primzharova, K. K., Daribayeva, A. K., Galiyeva, A. H., & Nurgaliyeva, A. S. (2020). The development of small and medium-sized enterprises in the modernization of industrial production in the case of the power complex enterprise. *Industrial Engineering & Management Systems*, 19(1), 103-119. <https://doi.org/10.7232/iems.2020.19.1.103>

Appendix 1

Questionnaire to study the readiness for the implementation of digital technologies to calculate transfer prices and make management decisions on their basis

General questions:

1. Country of business registration and seat of the company

2. Business area
3. Business size according to the European classification (micro, small, medium, large)

Section 1: vision and strategy of digitalization

- 1.1. Existence of digital transformation department
- 1.2. Use of digital infrastructure:
 - Electronic payments - ___%
 - Electronic reporting - ___%;
- 1.3. Further digitization of operational processes - (Yes/no, which processes)
- 1.4. The rate of compliance of the digital strategy with the overall development strategy

Section 2: digital talents of managers

- 2.1. Remote access to management - (Yes/no, which processes)
- 2.2. Existence of a chain connection between managers of different levels — (Yes/no, in what way)
- 2.3. Implementation of measures to develop digital skills and abilities of staff
- 2.4. The share of IT employees in the management structure

Section 3: key digital processes of the economy

- 3.1. The level of flexibility and iterativeness of solutions for the development and implementation of digital technologies in the company
- 3.2. The level of use of digital transfer pricing throughout the life cycle

Section 4: flexible sources and technologies

- 4.1. Accounting of transfer pricing — yes/no
- 4.2. Application of operational and strategic controlling — yes/no
- 4.3. Implementation of lean production — yes/no
- 4.4. The company's ability to provide flexibility of the technological budget

Section 5: management and administration of the economy

- 5.1. Availability of a technical network of internal communication of employees
- 5.2. The level of consistency of intentions of managers and employees regarding the benefits of the company's digitalization
- 5.3. The level of readiness of functional managers to provide (transfer) all the necessary resources when implementing company digitalization measures