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Modelling of Technology Valuation in the Process of its Commercialization

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Abstract
Commercialization processes are modeled and analyzed from the point of view of the implementation of activities under particular stages. These issues are the subject of many studies and analyzes, which is why the extensive literature is available on this subject. Technology valuation at various stages of the commercialization process is a separate issue. Such valuation is prepared in most cases by consulting companies for determining the price in the buying and selling processes. These valuations use known methods also used in other cases, e.g., real estate valuation.
The work carried out presents the author's concept of the commercialization process model, taking into account the costs and value of the technology at various stages of the product life cycle. The model uses a stochastic approach to determine future revenues and costs, which allows estimating the value of the technology by or in determining the probability of assessment validity. The proposed stochastic approach greatly increases the chances of using the presented solutions in practical activities related to technology valuation for the purposes of purchase and sale transactions.

Keywords
Model of commercialization process, technology value, product life cycle.

Introduction

Commercialization and development of technology are an important element of building the competence of enterprises and competing with the market. New products and technologies, related to both the needs of the market and future customers, stimulate the development and increase of production capacity of enterprises. The commercialization process begins when a new idea is generated within the enterprise and ends with the introduction of a new product to the market. All development activities require resources, which in the case of enterprises include human and financial capital as well as know-how. People use their knowledge and creativity to carry out research and create new solutions which, after a successful commercialization process, are introduced to the market, supported by financial capital from the business side. Know-how is the expertise and ability to use ideas, technologies, and capital to develop the enterprise based on innovative products (Gibson and Gurr, 2001; Trzmielak, 2013).

The concept of technology is interpreted in a number of ways. Traditionally, it is considered a method of carrying out the process of production or processing or as a field of technology involved in developing new methods of manufacturing products or processing raw materials (Polish dictionary, 2020). This traditionally is an engineering point of view, directed at machines and equipment (hardware) used in an enterprise in the production process (Klincewicz and Manikowski, 2013; Orlikowski, 1992).

Currently, the concept of technology covers a much broader scope of issues and its essence is knowledge (materialized and nonmaterialized) which enables people to carry out a purposeful economic activity consisting in the processing of goods (Jasiński, 2006). Another definition describes technology as organized inorganic matter (Stiegler, 1998). The Organisation for Economic Cooperation and Development (OECD) defines technology as all possessed knowl-

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edge in a tangible form that enables the production of new products and processes as well as an intangible form manifested in projects, research results and organizational techniques. Knowledge may come from internal or external sources. Internal sources include R&D activities, the knowledge of the enterprise's employees, and the knowledge contained in tangible and intangible assets (e.g., machines, software). Knowledge from external sources is the knowledge contained in licenses, patents, know-how, external databases, published or purchased research results, knowledge gained through acquisitions, and mergers or cooperation with other entities (universities, R&D institutions, enterprises) (OECD, 2006).

With reference to contemporary definitions, for further consideration, technology shall be interpreted as a tangible effect of actions using human knowledge related to business activity. The analyzed model of the commercialization process will be identified with products offered as a commodity intended for sale in the final stage of the commercialization process.

The issue of technology valuation

The valuation of technology is an analysis allowing to learn the monetary value of technology. If it is related to a purchase and sale transaction, a specific price should also be indicated. As in all market transactions affecting the efficiency of the commercialization process, two values are of importance here (Razgaitis, 2003):

- values determined using selected valuation methods and tools,
- price agreed during the negotiations between the buyer and the seller.

The value of technology in a purchase and sale transaction should not transform its price. The problem arises when the value is higher than the achievable market price, in which case the commercialization process must be considered inefficient. This does not explicitly mean that it should not be carried out, as it may provide nonfinancial benefits.

The value is mainly determined by the related potential or actual income, the value of comparable or alternative technologies (Trzmielak, 2013). Often in the valuation process, the value of intellectual property closely related to various knowledge is allocated, for which the estimation of cost proves to be quite difficult. In such cases, the value of intellectual property is estimated based on the costs of research related to the preparation of technology for implementation (Krattinger et al., 2007).

The significant factors influencing the valuation of technology include (Trzmielak, 2013):

- current state of the art;
- level of development and associated implementation and financial risk, resources needed;
- life cycle stage of technology;
- field and type of technology and length of income generation cycle;
- degree of specialization, standardization, and uniqueness of technology;
- the level and duration of financing technology development for intellectual property protection strategy.

There is a number of methods of technology valuation, and the decision on the choice of the valuation method should be preceded by defining the goal, analysis of the technology itself, the market to which it is directed, as well as the model in which the technology will be commercialized (Trzmielak, 2013; Urbanek, 2008; RICS 2017). These are a few examples of such methods:

- cost method,
- income method,
- comparative method.

Cost method

The value of the technology is equal to the sum of the expenditure incurred for its creation, marketing, and intellectual property protection. Two approaches are possible – historical cost or replacement cost. In the historical cost approach, the costs incurred are determined and referred to the valuation date. The replacement cost approach determines the costs that would theoretically have to be incurred to create a similar technology. The cost method does not take into account the efficiency of the expenditure incurred, the market potential of the technology, or the cash flow that the valued technology could generate. It is most often used at an early stage of technology development, with relatively low research costs.

Income method

The income approach is based on capitalization or conversion of current and future income streams (cash flows) which may take various forms into one current capital value. Therefore, in this method of valuation, the value of the technology is determined by the sum of the financial benefits that will be achieved through its application. The expected cash flows are uncertain and for this reason discounted values are used, using an appropriate rate. The higher the risk, the higher the discount rate and by extent the lower the value of the technology. This method allows the inclusion of market potential, considering different market scenarios. The problem, however, is the application of numerous assumptions related to the expected revenue, costs, customer demand for the technology, and economic life of the valued technology. These limitations are easier to assess if the technology is at a higher stage of development – implementation readiness, as at this stage the on – the market and its potential is available.

Monte Carlo method generates several scenarios based on future costs, sales revenue, and cash flows. In addition to cash flows in particular periods of technology development, the data include: costs of technology launch and growth, under informed sales, and development stage. The value of technology as a function of under informed sales and unexpected costs is also analyzed. As a result, it is possible to obtain the value of the technology that determines the increase in costs at individual stages of development – the optimum investment sequence for a specific project, and to calculate the income from the project. In this method, it is much easier to take into account other sources of uncertainty than in the case of other numerical models. The disadvantage associated with the implementation of this method is the requirement of a large number of calculations (Trzmielak, 2013; Dritsas, 2011).

Comparative (market) method

This method assumes the comparability of value for similar technologies and therefore, to carry out the valuation using this method, the actual purchase and sale transactions of similar technologies that occurred in the recent past must be subjected to analysis. This method is difficult to use for breakthrough technologies, for which a reference is difficult to find, and information about such transactions is often confidential. This method is used for the valuation of modifications to known or frequently traded technologies, where the price and terms of the transaction are commonly known to market participants.

One strictly defined method is seldom used in the technology valuation process. More often selected elements of several methods are used, thus creating so-called mixed methods. The financial criterion dominates in the applied valuation methods and processes. There are, however, valuation methods and cases where a social criterion is taken into account, linked to nonfinancial benefits for buyers, which entails an increase in quality of life.

Valuation of technology is a difficult task with a high degree of uncertainty. These are activities determining estimation values that are later verified by the market. Hence, the need to develop in this area, expand the offer of available valuation methods related to the commercialization process, keeping in mind that these will not be definitive solutions to the valuation problem, but only an indication of other possibilities.

Such an activity is the presented paper, the aim of which is to present the author's concept of the model of the commercialization process taking into account the costs and value of the technology at various stages of the technology life cycle. The model uses a stochastic approach to determine future revenue and costs, which allows to estimate the value of the technology and determine the probability of valuation accuracy. The proposed stochastic approach significantly increases the chances of using the presented solutions in practical activities related to technology valuation for the purposes of purchase and sale transactions.

Commercialization process model – financial flow

The commercialization process is a complex task with a high risk of failure, however the idea behind this or it is quite simple. All known models start with an idea and in case of success, and with a commodity, its sale, and profits gained (Gierulski and Kaczmarska, 2020; Gierulski, 2016; Gierulski and Kaczmarska, 2014). Fig. 1 presents a model with three stages of activities being part of the commercialization process and a stage of maintaining sales being part of the product life cycle:

- Conceptual work – transition from an idea to a future product
- Research work – transition from an idea through prototype stages to a final product form
- Organizational work – launching production, launching the product on the market so that it

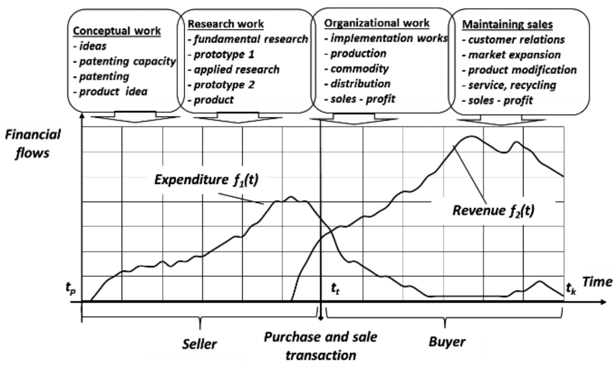

Fig. 1. Commercialization process model – continuous financial flow. Source: *Own elaboration*

becomes a product offered for sale and generates profit
- Maintaining sales – activities aimed at maintaining sales for as long as possible with an acceptable level of profit.

This model was juxtaposed with financial flows covering the expenditure incurred in the commercialization process and the stage of maintaining sales, as well as the revenue obtained in the sales period, which are the source of profits. Treating financial flows as continuous processes of expenditure, revenue, and profit over a given period of time $(t_p - t_k)$ can be defined as follows:

$$F_1 = \int_{t_p}^{t_k} f_1(t)\,\mathrm{d}t\,, \tag{1}$$

$$F_2 = \int_{t_p}^{t_k} f_2(t)\,\mathrm{d}t\,, \tag{2}$$

$$E = F_2 - F_1\,, \tag{3}$$

where: F_1 – expenditure, F_2 – income, E – profit.

Expenditure calculated in selected monetary units is described as function $f_1(t)$ and revenue as function $f_2(t)$. The change in the value of money over time, i.e., discounting and capitalization, is not included in these calculations.

Commercialization is a continuous process carried out in the economic environment. At each stage of its implementation, as well as the later stage of maintaining sales, a purchase and sale transaction may occur. Hence, the need for valuation, which, particularly in the case of tangible products, is called technology valuation. The sale and purchase transaction is carried out within a specific time during the process implementation. Therefore, the valuation concerns this time, taking into account the current conditions of the close and farther environment. Figure 1 shows an example transaction time marked as t_t. Before that time, the operations and financial flows concern the seller and after that time – the buyer.

Figure 2 shows the financial model for the purchase and sale transaction processing time. The seller's expenditure (A_1) is covered by the invested capital (A_3) and revenue from the beginning of sale of goods until the time of the transaction (A_2). Before the beginning of sales, these revenues are not generated $(A_2 = 0)$. The capital invested by the seller determines the minimum price of the transaction $(W_{\min})$, at which the transaction does not generate profit for the seller. The buyer's income (B_2) covers the buyer's cost (B_1), which determines the buyer's income (B_4) and the maximum transaction price $(W_{\max})$ at which the buyer makes no profit. Between the minimum and maximum price of transaction, there is an area that determines the sum of profits of the seller and the buyer. The transaction price (W) is the result of an agreement, usually resulting from negotiations. It determines the amount of funds transferred between the parties carrying out the transaction and the proportion of profit distribution. For the buyer, these are transaction costs (B_3) and for the seller, revenue from the transaction (A_4). As a result, the seller's profit (E_S) and the buyer's profit (E_k) are determined.

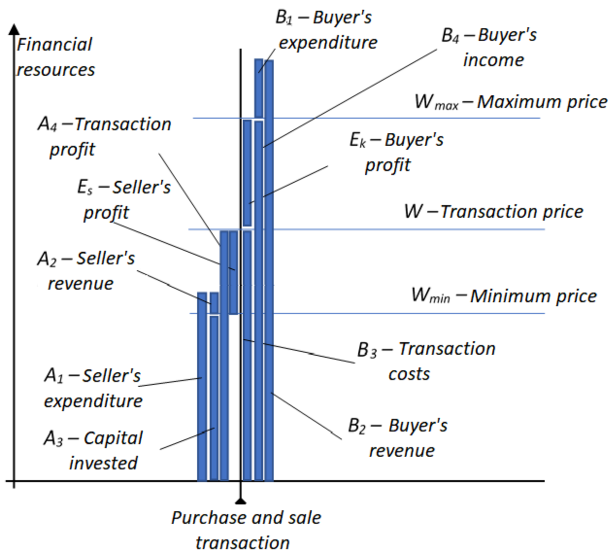

Fig. 2. Purchase/sell transaction – financial model Source: *Own elaboration*

The description of expenditure and revenue in the form of continuous functions (Fig. 1) is of little use in practical analyses. A better solution is a discrete approach and allocation of financial resources to periods of time related to the implementation of subsequent tasks (Fig. 3).

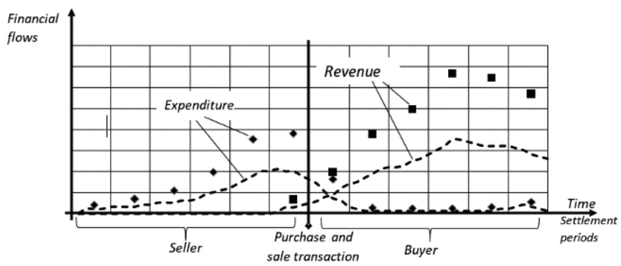

Fig. 3. Commercialization process model – discrete financial flows. Source: *Own elaboration*

In this approach, the amount of funding allocated to individual activities or groups of activities (Fig. 2) can be calculated as follows:

$$A_1 = \sum_{i=1}^{m} (F_1)_i\,, \tag{4}$$

$$A_2 = \sum_{i=1}^{m} (F_2)_i\,, \tag{5}$$

$$A_3 = A_1 - A_2\,, \tag{6}$$

$$E_s = A_4 - A_3\,, \tag{7}$$

$$B_1 = \sum_{k=1}^{n} (F_1)_k\,, \tag{8}$$

$$B_2 = \sum_{k=1}^{n} (F_2)_k\,, \tag{9}$$

$$B_4 = B_2 - B_1\,, \tag{10}$$

$$E_k = B_4 - B_3\,, \tag{11}$$

$$A_2 = B_3\,, \tag{12}$$

where:

m – number of calculation periods prior to the transaction $(i = 1, ..., m)$,

n – number of calculation periods after the transaction $(k = 1, ..., n)$,

$(F_1)_i$; $(F_1)_k$ – funds constituting expenditure in the calculation periods i and k,

$(F_1)_i$; $(F_1)_k$ – funds constituting revenue in the calculation periods i and k.

In Fig. 3 six settlement periods before and after the transaction are indicated ($m = 6$; $n = 6$), this should only be considered as an illustrative example.

Financial flows before a purchase and sale transaction can be determined based on the analysis of accounting records recording economic events (*A1, A2, A3*). These are past events and the accuracy of their determination depends mainly on the diligence of keeping accounting records. Whereas, financial flows after the execution of a transaction require anticipation of future events, which is often burdened with a high degree of uncertainty.

The reduction of uncertainty can be ensured using statistical analysis tools and attributed to expected future events with a probability of their occurrence. The idea of using statistical tools for building a stochastic model was taken from the PERT (*Program Evaluation and Review Technique*) method used for project management analysis of network models. Such an approach facilitates the creation of forecasts supporting the technology valuation task and making decisions in price negotiations concerning purchase and sale transactions (Biruk, 2015; Wirkus et al., 2014).

Stochastic model of technology valuation

In accordance with the proposed method of forecasting future financial flows treated as random variables, three options need to be estimated for each settlement period:

- minimum expenditure and revenue – $(F_1)_k^-$; $(F_2)_k^-$,
- maximum expenditure and revenue – $(F_1)_k^+$; $(F_2)_k^+$,
- most probable values of expenditure and revenue – $(F_1)_k^*$; $(F_2)_k^*$.

On the basis of these estimated values, assuming a statistical distribution β, the expected expenditure and revenue values are calculated $(F_1)_k^L$, $(F_2)_k^L$ and variances $(\sigma_1)_k^2$, $(\sigma_2)_k^2$ according to the following formulas:

$$(F_1)_k^L = \frac{(F_1)_k^- + 4(F_1)_k^* + (F_1)_k^+}{6}\,, \tag{13}$$

$$(\sigma_1)_k^2 = \left(\frac{(F_1)_k^+ - (F_1)_k^-}{6}\right)^2, \tag{14}$$

$$(F_2)_k^L = \frac{(F_2)_k^- + 4(F_2)_k^* + (F_2)_k^+}{6}\,, \tag{15}$$

$$(\sigma_2)_k^2 = \left(\frac{(F_2)_k^+ - (F_2)_k^-}{6}\right)^2. \tag{16}$$

It was then assumed that expenditure and revenue are random variables with a normal distribution as the sum of independent random variables corresponding to subsequent consecutive stages. The assumption of a normal distribution is valid for any distribution of probability of random variables (here a distribution β), in successive stages when their number is potentially infinite. In practice, this approximation is also used for a small number of stages. Hence, the expected values and variances are calculated as follows:

$$F_1^L = \sum_{k=1}^{n} (F_1)_k^L\,, \tag{17}$$

$$\sigma_1^2 = \sum_{k=1}^{n} (\sigma_1)_k^2\,, \tag{18}$$

$$F_2^L = \sum_{k=1}^{n} (F_2)_k^L\,, \tag{19}$$

$$\sigma_2^2 = \sum_{k=1}^{n} (\sigma_2)_k^2\,. \tag{20}$$

Two functions of the normal distribution probability density are thus defined for expenditure and revenue:

- $\Phi_1(F_1)$ of expected value F_1^L and variance σ_1^2
- $\Phi_2(F_2)$ of expected value F_2^L and variance σ_2^2

This allows to determine the probability value of costs (as low as possible) and revenue (as high as possible). Hence, the likelihood of costs no greater than $F_1^\wedge$ and revenue not less than $F_2^\wedge$ is as follows:

$$P_1\left(F_1 \le F_1^\wedge\right) = \Phi_1(F_1), \tag{21}$$

$$P_2\left(F_2 \ge F_2^\wedge\right) = 1 - \Phi_2(F_2). \tag{22}$$

Thus, the probability of obtaining a satisfactory income can be determined as a conjunction of two independent random events, namely:

$$P\left[P_1\left(F_1 \le F_1^\wedge\right) \cap P_2\left(F_2 \ge F_2^\wedge\right)\right] = \\ = P_1\left(F_1 \le F_1^\wedge\right) * P_2\left(F_2 \ge F_2^\wedge\right). \tag{23}$$

In practical activities, the probabilities are determined using distribution calculators that are part of professional statistical software as well as commonly used spreadsheets (e.g., MS Excel). It is also possible to convert random variables to a or the standard normal distribution. This is the distribution described by the density function $\Phi(X)$ with an expected value of 0 and a variance of 1. The standardized variables for expenditure (X_1) and revenue (X_2) are:

$$X_1^\wedge = \frac{F_1^\wedge - F_1^L}{\sigma_1}, \tag{24}$$

$$X_2^\wedge = \frac{F_2^\wedge - F_2^L}{\sigma_2}. \tag{25}$$

Hence, the respective probabilities for expenditure, revenue, and income are determined as follows:

$$P_1\left(X_1 \le X_1^\wedge\right) = \Phi(X_1), \tag{26}$$

$$P_1\left(X_2 \ge X_2^\wedge\right) = 1 - \Phi(X_2), \tag{27}$$

$$P\left[P_1\left(X_1 \le X_1^\wedge\right) \cap P_2\left(X_2 \ge X_2^\wedge\right)\right] = \\ P_1\left(X_1 \le X_1^\wedge\right) * P_2\left(X_2 \ge X_2^\wedge\right). \tag{28}$$

In this case, statistical tables can be used, which have been the basic tool supporting calculations for many years now.

Stochastic model of valuation in practice

The analysis was carried out for the data corresponding to the expenditure and revenue shown in Fig. 3. These correspond to the actual commercialization process in the initial period and are subsequently adopted as estimates. The values in absolute currency units were not provided, considering that this is not necessary for the presentation of the method based on the presented stochastic model of valuation.

Table 1 presents the revenue and expenditures in subsequent periods as well as the total revenues and expenditure before the sale and purchase transaction.

Table 1
Expenditure and revenue before the transaction

Period i	Expenditure	Revenue
	$(F_1)_i$	$(F_2)_i$
1	3.6	0
2	6.8	0
3	10.8	0
4	19.6	0
5	35.2	0
6	38	6.4
$\sum$	A_1	A_2
	114.0	**6.4**

Source: *Own elaboration*

According to the financial model (Fig. 2) and formulas (2), (3), (4) were determined:

- Seller's expenditure $A_1 = 114.0$.
- Seller's revenue $A_2 = 6.4$.
- Invested capital $A_3 = 107.6$ – this is the minimum transaction price $W_{\min}$.

Table 2 contains data related to finance after the sale and purchase transactions. These are predictions (forecasts) estimated with the participation of experts having extensive knowledge and experience. For each accounting period, the minimum, maximum, and most probable values of expenditure and revenue were determined. On their basis, the expected values and variances were calculated for each period (formulas (13)–(16)). The minimum, maximum, most probable, expected values, and expenditure and revenue variances were then calculated, covering all calculation periods jointly (formulas (17)–(20)).

Table 3 presents the results of the simulation using a stochastic model of valuation for four different cost and revenue values $F_1^\wedge$, $F_2^\wedge$. The table also includes standardized values for random variables.

Simulation 1. Expenditure and revenue were assumed to be equal to the most probable (according to the expert's estimates). With reference to the financial flow model, the following results were obtained:

Table 2
Finance after the sale and purchase transactions

Period k	Expenditure					Revenue				
	$(F_1)_k^-$	$(F_1)_k^*$	$(F_1)_k^+$	$(F_1)_k^L$	$(\sigma_1)_k^2$	$(F_2)_k^-$	$(F_2)_k^*$	$(F_2)_k^+$	$(F_2)_k^L$	$(\sigma_2)_k^2$
1	14.8	16.0	19.6	16.40	0.640	18.5	19.6	21.0	19.65	0.174
2	2.2	2.4	3.2	2.50	0.028	32.8	37.6	42.0	37.53	2.351
3	2.0	2.0	2.8	2.13	0.018	45.0	49.6	55.0	49.73	2.778
4	2.0	2.0	2.7	2.12	0.014	62.0	66.4	78.0	67.60	7.111
5	2.4	2.8	3.6	2.87	0.040	58.0	64.4	78.0	65.60	11.111
6	4.8	5.2	6.2	5.30	0.054	49.0	56.8	63.0	56.53	5.444
$\sum$	$(F_1)^-$	$(F_1)^*$	$(F_1)^+$	F_1^L	σ_1^2	$(F_2)^-$	$(F_2)^*$	$(F_2)^+$	F_2^L	σ_2^2
	28.2	**30.4**	**38.1**	**31.32**	**0.794**	**265.3**	**294.4**	**337.0**	**296.65**	**28.969**

Source: *Own elaboration*

Table 3
Results of the simulation

No.	$F_1^{\wedge}$	P_1	$F_2^{\wedge}$	P_2	P	X_1	X_2	Profit $E_s + E_k$
1	30.40	15.2%	294.40	66.2%	10.0%	−1.029	−0.418	156.60
2	31.92	75.1%	294.40	66.2%	49.7%	0.677	−0.418	155.08
3	31.92	75.1%	279.68	99.9%	75.0%	0.677	−3.153	140.36
4	33.44	99.1%	300.29	25.0%	24.7%	2.383	0.676	159.45

Source: *Own elaboration*

expenditure $B_1 = 30.40$; revenue $B_2 = 294.40$; income $B_4 = 264.00$, and this is also the maximum transaction price $W_{\max}$. The probability of maintaining costs at this level is low $P_1 = 15.2\%$, the probability of obtaining the indicated level of revenue is $P_2 = 66.2\%$. The total probability of obtaining a profit divided between the seller and the buyer $E_s + E_k = 156.60$ is $P = 10.0\%$. Figures 4–7 present the probabilities of expenditure and revenue after standardization.

Simulation 2. Expenditure was increased and revenue was maintained as in simulation 1, resulting in: expenditure $B_1 = 31.92$; revenue $B_2 = 294.40$; income $B_4 = 262.48$, and this is also the maximum transaction price $W_{\max}$. The probability of maintaining costs at this level is high $P_1 = 75.1\%$, the probability of obtaining the indicated level of revenue is $P_2 = 66.2\%$. The total probability of obtaining a profit divided between the seller and the buyer $E_s + E_k = 155.08$ is $P = 49.7\%$.

Simulation 3. Revenue was decreased and expenditure was maintained as in simulation 2, resulting in: expenditure $B_1 = 31.92$; revenue $B_2 = 279.68$; income $B_4 = 247.76$, and this is also the maximum transaction price $W_{\max}$. The probability of maintaining costs at this level is high $P_1 = 75.1\%$, the probability of obtaining the indicated level of revenue is $P_2 = 66.2\%$. The total probability of obtaining a profit divided between the seller and the buyer $E_s + E_k = 140.36$ is $P = 75.0\%$.

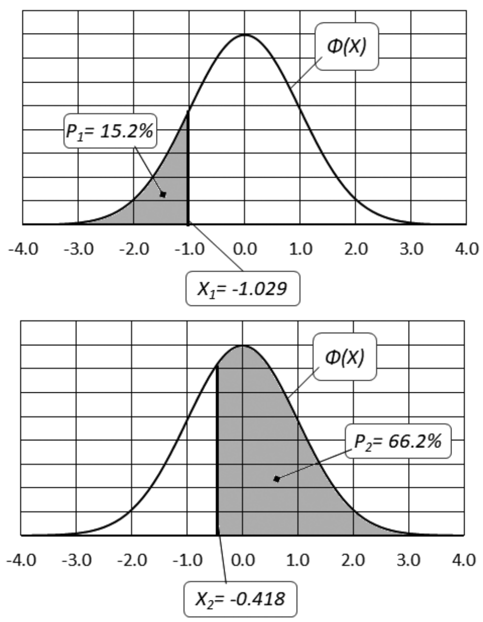

Fig. 4. Probabilities: expenditure and revenue – simulation 1. Source: *Own elaboration*

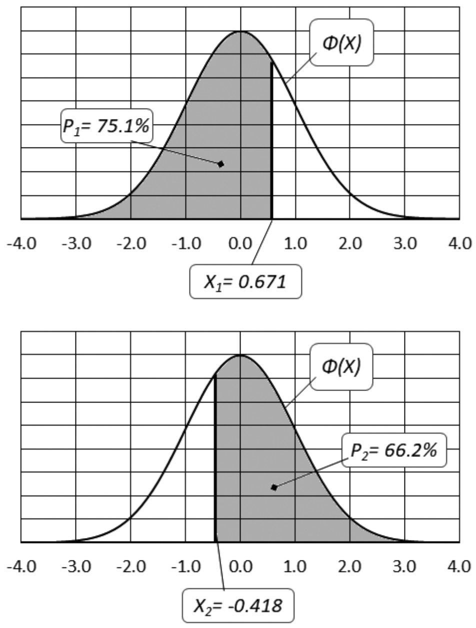

Fig. 5. Probabilities: expenditure and revenue – simulation 2. Source: *Own elaboration*

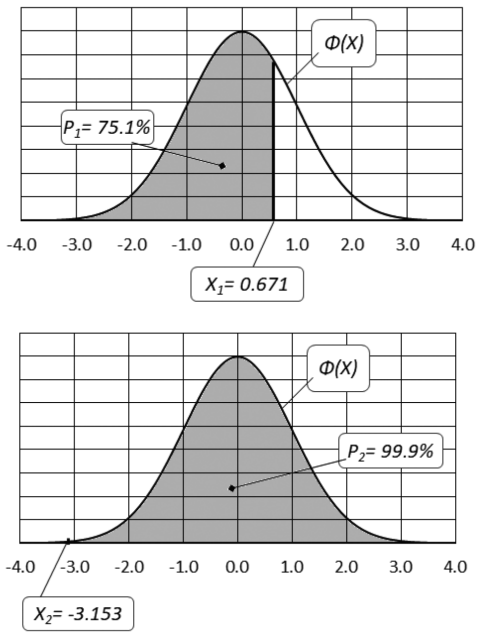

Fig. 6. Probabilities: expenditure and revenue – simulation 3. Source: *Own elaboration*

Simulation 4. Expenditure and revenue were increased compared to previous simulations, resulting in: expenditure $B_1 = 33.44$; revenue $B_2 = 300.29$; income $B_4 = 266.85$ and this is also the maximum transaction price $W_{\max}$. The probability of maintaining costs at this level is very high $P_1 = 99.1\%$, the probability of obtaining the indicated level of revenue is $P_2 = 25.0\%$. The total probability of obtaining a profit divided between the seller and the buyer $E_s + E_k = 159$ is $P = 24.7\%$.

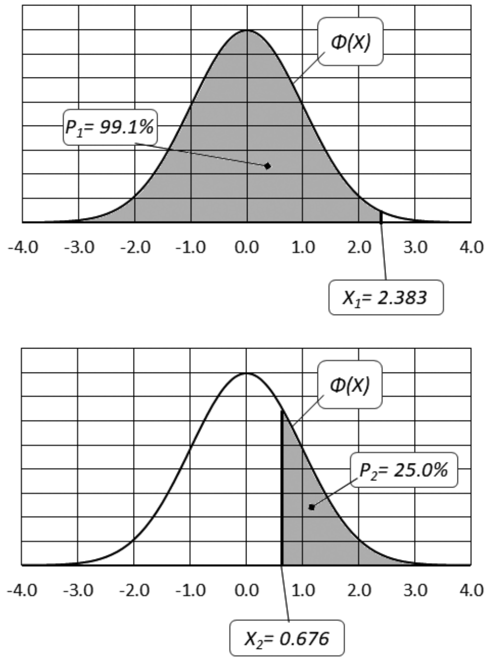

Fig. 7. Probabilities: expenditure and revenue – simulation 4. Source: *Own elaboration*

It is also possible (which has not been shown here) to make calculations in reverse, i.e., to determine expenditure and revenue from or using the assumed probability values. The sample analyses presented here covered only six settlement periods after a sale and purchase transaction. In the final phase, a moderate decrease in revenue occurs, which indicates that it may be significant in subsequent accounting periods. Taking into account these further periods may significantly affect the results of the analysis – the total profit of the seller and the buyer as well as the probability of obtaining the said profit. The presented example does not deal with the matter of distribution of profit between the parties involved in the transaction as a result of bilateral negotiations.

Conclusions

The presented stochastic model of technology valuation is another tool supporting decision-making process. Its effectiveness, as in other methods, depends on the accuracy of the forecasts provided by experts. The advantage of the model is the inclusion of the theory of probability, which helps to quantify the chances of success and the risk of failure in relation to sale and purchase transactions, and is due to the similarity to the PERT method. Furthermore, the presented method includes the possibility of technology valuation at each stage of the life cycle.

The paper does not discuss issues related to the work of experts and methods of estimating expenditure and revenue. An additional requirement is to provide estimates in three versions – the minimum, maximum, and most probable values. This is a different view of the issue of valuation requiring knowledge and skills acquired in practical activities. The next stage of research work will be the further verification of the method in the valuation of various types of projects.

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