BUDGET PLANNING FOR PRODUCT INNOVATION PROJECTS BY SMALL AND MEDIUM-SIZED ENTERPRISES

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Objective: This work aimed to establish the relationships between individual types of costs related to the planned budget of an innovative project and their impact on the values of future net cash flows and budget amounts.

Design/methodology/approach: Based on literature research, the following hypotheses were formulated: The product innovation budget depends on the amount of equity; The planned amounts of cost types are interrelated and dependent on the total value of future net cash flows from the product innovation. They were then verified using the Pearson correlation matrix, where lateral data were supplemented by SMEs.

Findings: Based on the study, NPV was found to be significantly positively correlated with the planned costs associated with "Intangible assets". Technically and technologically advanced projects force incurring higher costs, which translates into higher net cash flows in the future. Meanwhile, there was no relationship between the planned budget and equity of SMEs.

Research limitations/implications: The limitation of the relatively small research group was noted, which does not allow generalizing the results. However, it gives inspiration to expand the research.

Practical implications: Our findings allow for matching the financial needs of the project with the economic sustainability and security of the entity planning the product innovation.

Social implications: Innovation projects ensure the economic and financial stability of SMEs, which directly translates into employment and social efficiency in regions.

Originality/value: The article presents the relationships between the individual types of costs associated with the product innovation project and their impact on the NPV indicator.

Keywords: budget planning, product innovation, SMEs

Category of the paper: research paper.

1. Introduction

Innovations have been widely discussed in the literature, but are still of interest to many researchers. Their development and the impact on the economy of the country where they originate, as well as to which they are transferred, pose a challenge to modern researchers. Hence

the notion of innovation economics as a field where openness, creativity, entrepreneurship combine to form the innovation system of countries and regions. Basic research of business entities and public institutions involved in innovation processes, studying and describing their characteristics, changes and resulting barriers, require systematic observations. The triple helix model: universities, companies and governments as the main players in the innovation system (Leydesdorff, Fritsch, 2006; Zhuang et al., 2021), with their knowledge and expertise, it is extended and supplemented by social resources and economic structures that support the creation of new industries and markets for economic growth (Cooke, 2005; Kauffeld-Monz, Fritsch, 2013).

For this purpose, ontological papers are necessary that identify the main actors and their typical behavior, decisions made both in the tangible and the intangible sphere. The object of observation becomes not only the processes, but the impacts of economic policy instruments under the conditions formed within the framework of different types of regional innovation systems (Re Lee et al., 2022; Kim, Lee, 2022; Reshid et al., 2024) and their importance for the competitiveness of the economy (McKenzie, 2024), the formation of new structures of relations within the system of countries and regions themselves (Bai et al., 2024; Yoon et al., 2015). At this point, it is important to emphasize the special role of small and medium-sized enterprises (SMEs) in creating and strengthening the region's innovation system. Lee et al. (2022) notes that "from the government's perspective, it is necessary to change the direction of the system in a form that can form various start-ups by expanding the range of support for start-up support, away from the public relations method of nurturing start-ups that fit the theme set by the government".

Given that the government is one of the key actors in the innovation ecosystem (Tripathi et al., 2019; Ziakis et al., 2022), it should understand the mechanisms for the creation and dissemination of innovations, and the participation of SMEs in their creation and absorption to strengthen the economy of the country in which they operate.

The economic importance and peculiarities of SMEs, associated with different organizational requirements and the dynamic interaction of formal and informal systems, make these organizations an ideal context for exploring fundamental issues in measuring the relationship between different types of costs in the planned budget of a product innovation project. This study, therefore, seeks to understand how SMEs plan costs to successfully incorporate product innovation into the production and sales system of their existing business.

2. Literature review

Based on data from the Central Statistical Office of Poland (GUS, 2024), there were 2,307,100 non-financial enterprises in Poland in 2023. Most of them were SMEs. The most numerous group (97.1% i.e. 2.3m) in the structure of Polish enterprises are microenterprises,

the share of small companies is 2.1% (48.200), and medium-sized companies – 0.6% (14.300), and large companies are only 0.2% (3.800).

Recent research (McGuinness, 2018) has provided evidence demonstrating (e. g. Beck et al. 2008) that SMEs act as a major driving force in increasing the country's growth. SMEs create employment opportunities, open markets and stabilize the economy by developing trade liberalization, among others. Due to the financial and economic crisis, many SMEs are facing various challenges that do not necessarily affect their financial and economic prowess. Several studies (e.g. Bas et al., 2018; Okpara, 2011), have revealed that SMEs are particularly vulnerable to bankruptcy during any type of crisis. According to the latest research conducted by the Central Statistical Office of Poland (GUS, 2023) into the innovative activity of enterprises (excluding construction), in 2020-2022 (the research period includes almost 3 years of the Covid-19 pandemic and the first year of the war in Ukraine), the total value of SMEs operating in Poland that introduced product innovations is: 35.6% (industrial SMEs) and 20.1% (service-providing SMEs).

It was also noted that the level of knowledge of SMEs is low, susceptible to economic fluctuations, less independent of the domains in which they operate, etc. In addition, several studies (McGuinness, 2018) have noted that SMEs are facing a number of challenges associated with their liabilities, i.e. repaying credits to financial institutions, identifying shortfalls in inventory and operating capital. Although SMEs have developed their own methods and ways to survive, the results achieved are diverse, both in positive and negative ways.

The literature strongly confirms that companies with higher levels of innovation are more resistant to crises (Fagerberg et al., 2010) and increasing their economic efficiency (e.g. Dooley et al., 2017), they grow faster than non-innovative ones. Innovation is associated with an increase in the competitiveness of the company, provides it with the ability to secure and imitate activities by other entities (Slater et al., 2014), optimizes inputs to increase the results, makes costs dependent on quality and quantity, strengthens creativity and control as a market leader (Pešalj et al., 2018; Rosösig et al., 2024).

However, one important aspect of management has not received sufficient attention in the relevant academic literature. For example, we currently lack a thorough understanding of how budget adjustments and planning will strengthen the financial needs of innovative ventures and the security of the entire company with potential consequences later in the project implementation. This shortcoming is significant because management research does not consider the financial risk approach of project managers.

Typically, business owners worry about investing in innovation, among others through budgetary activities, especially those related to financial disruption, which directly affects the balance and security of the planned overall initiative, while maintaining balance in the existing business. Hence the conclusion that

H1. The product innovation budget depends on the amount of equity.

The dynamic nature of the business environment requires a strategic approach to investment planning that goes beyond traditional financial management. Business leaders are tasked with promoting initiatives that not only yield immediate returns, but also contribute to creation of long-term value for SMEs. This includes a delicate balance between launching innovative products, expanding into new markets, increasing channel sales and intensifying efforts on existing offerings to maintain market leadership and prioritize speed in marketing new products (Mittal, 2024).

Collaboration in the process of planning financial resources is becoming a key factor, uniting stakeholders in a joint effort to identify and prioritize initiatives that promise the most favorable results in terms of return on investment, profit margins and alignment with the company's future vision. The process promotes a culture of strategic alignment, ensuring that financial allocations are meticulously aligned with strategic goals and support a shared commitment to achieving those goals. Budget planning and management should be focused on achieving strategic goals in the long term, so the comprehensive costs of the project should be taken into account.

According to the Certified Institute of Management Accountants (CIMA, 2005), a budget is "a quantitative expression of a plan for a specific period of time. It can include planned sales volumes and revenues, resource quantities, costs and expenses, assets, liabilities and cash flows". Therefore, in order to call a plan a budget, it must include quantities of economic resources to be allocated and used, it must be made for a specific period of time, it must be expressed in monetary terms, and managers must act in a way that shows the intention to implement the plan. Budgeting is the process of expressing quantitative resource requirements (amount of capital, amount of materials, number of people) in targets and milestones, divided into stages (Budget, 2015, p.3).

Project management textbooks distinguish five basic methods of project cost planning (Institute, 2017):

- Zero-based budgeting, in which each item is set to zero at the beginning of the period before reallocation;
- Static budgeting or incremental budgeting, which uses historical data to add or subtract a percentage from the previous period to create a budget for the upcoming period;
- Performance-based budgeting, which emphasizes cash flow per unit of product or service
- Activity-based budgeting, which starts from the company's goals and allows to determine the cost already incurred for the purpose of achieving them
- Value proposition budgeting, which assumes that no budget item should be included unless it directly provides value to the organization.

According to the presented methods of budget planning related to investments in product innovations, SMEs should propose a solution that depends on future revenues from innovation. Hence the following hypothesis:

H2: The planned amounts of cost types are interrelated and dependent on the total value of future net cash flows from the product innovation.

The proposed hypothesis is consistent with the direction of research and the conducted analysis of the literature. Making the budget of an innovation project dependent on future revenues from innovation, should reduce the risk related to the uncertainty of the environment. Therefore, it seems justified to formally plan and standardize the procedures for monitoring and evaluating the entire project (Sihag and Rijsdijk, 2019).

3. Methodology

The analysis in this study was conducted through secondary literature and primary analysis. The research was compiled from analysis and review of secondary literature. The formulated hypotheses are tested using a structured questionnaire in which financial data for the planned budget of a product innovation project is entered. The lateral data includes: current assets, tangible assets, intangible assets, subcontracts, staff, indirect costs, civil works and lands, equity and project budget, and the net present value (NPV) reported by the respondents, at a discount rate of r = 4%. NPV allows to assess whether a single investment will bring the expected financial benefits for uniformity of cash flow assessment. The values for the year 2033 were requested. Twenty-six entrepreneurs participated in the survey, including small (21 entities) and medium-sized (5 enterprises), who were planning to introduce product innovations in 2024-2026. The total amount of planned budgets for all the surveyed entrepreneurs was PLN 411,260,000.

Data analysis consisted in estimating the correlations between lateral data.

A correlation matrix was analyzed, assuming a correlation significance level of p=0.1 as the cut-off, due to the exploratory nature of the study. A correlation coefficient was applied to lateral variables as a measure of the relationship between two variables. In order to test Pearson's linear correlation of two quantitative features X and Y for n values of these characteristics (x_t and y_t, t=1,2...n, respectively), the coefficient will be denoted as r(X, Y) and calculated according to the formula (Śleszyńska, 2020):

$$r(X,Y) = \frac{\sum_{t=1}^{n}(x_t - \bar{x})(y_t - \bar{y})}{\sqrt{\sum_{t=1}^{n}(x_t - \bar{x})^2 \sum_{t=1}^{n}(y_t - \bar{y})^2}} \tag{1}$$

where x and y – the arithmetic mean values of feature X and Y, respectively.

The linear correlation coefficient is symmetrical and takes values in the range of [-1, 1], its absolute value indicates the strength of the linear relationship, and the sign – the direction of the relationship. Correlation matrices were generated using the Statistica statistical software.

4. Results

Based on the lateral data provided by the respondents, Table 1 shows the correlation matrix between the entrepreneur's equity, NPV and planned budget of the product innovation project.

Table 1.
Correlation matrix – project budget

Variable	Correlations (Budget) Marked correlation coefficients are significant with $p < .10$ N=26 (Missing data were removed by case)				
	Mean (PLN)	Std deviation	Equity	NPV	Project budget
Equity	58704,8	191698	1,000000	0,018247	-0,081521
NPV	29582,4	54956	0,018247	1,000000	0,075552
Project budget	991359,0	2060892	-0,081521	0,075552	1,000000

Source: Own research using the Statistica software.

In view of all of the given variables, the significance condition was not met. The correlation coefficient shows no correlation between lateral data, indicating that there is no statistically significant relationship between equity and the planned amount of the project budget. Based on the data in Table 1, the following hypothesis should be rejected:

The product innovation budget depends on the amount of equity.

It is interesting to note that the lower the entrepreneur's equity was, the higher the project budget was planned. This may indicate that respondents are optimistic about the economic efficiency of launching a new innovative product on the market.

Table 2 shows the correlation between the amount of the types of costs budgeted for a product innovation project. Based on it, it is possible to analyze the relationship between the different types and their impact on NPV.

Not all of the lateral data met the significance condition. Indirect costs did not significantly affect any of the examined expense values.

The amount of NPV is positively correlated with the cost of "Intangible assets". In their projects, respondents planned spending on intangible assets which significantly affects the NPV and the amount of planned spending on tangible assets. Such correlations are indicative of highly capital-intensive investments in product innovation. Both the tangible assets that respondents intend to purchase within the project and the intangible assets, generate high costs, as the project product itself should be innovative, and thus more technologically advanced equipment with software is needed, as entrepreneurs are aware.

Planned expenses related to "Subcontracting" are significantly, positively correlated with expenses for "Current Assets". Meanwhile, "Staff" costs were significantly coordinated by respondents to expenditures on civil works and lands. This cost projection demonstrates the direct relationship between the expansion of the company associated with the planned investment in an innovative product and the increase in employment, and is reasonable.

Table 2.
Correlation matrix – the relationship between the types of project costs with the value of future income

Variable	Correlations (Budget) Marked correlation coefficients are significant with p < .10 N=26 (Missing data were removed by case)									
	Mean (PLN)	Std deviation	Current assets	Tangible assets	Intangible assets	Subcontracts	Staff	Indirect costs	Civil works and lands	NPV
Current assets	778753	2026898	1,0000	-0,0629	-0,0578	0,5599	0,2382	0,2513	0,0315	0,0205
Tangible assets	202069	498054	-0,0629	1,0000	0,5256	-0,0694	0,0773	-0,0795	-0,1474	0,2297
Intangible assets	409	1412	-0,0578	0,5256	1,0000	0,0628	0,2520	0,1093	0,0205	0,6663
Subcontracts	1726	3216	0,5599	-0,0694	0,0628	1,0000	0,0685	0,1212	0,0574	-0,0483
Staff	3479	4956	0,2382	0,0773	0,2520	0,0685	1,0000	-0,0763	0,5492	-0,0064
Indirect costs	2469	5595	0,2513	-0,0795	0,1093	0,1212	-0,0763	1,0000	0,0521	0,0084
Civil works and lands	2451	7007	0,0315	-0,1474	0,0205	0,0574	0,5492	0,0521	1,0000	-0,1531
NPV	29582	54956	0,0205	0,2297	0,6663	-0,0483	-0,0064	0,0084	-0,1531	1,0000

Source: Own research using the Statistica software.

According to hypothesis 2, the values of individual investment costs are related to each other. Meanwhile, only expenses related to "Intangible assets" significantly affect the net present value.

5. Conclusion

The available literature on innovation is extensive. Many scholars study the systems, models, methods, regions, or causes and effects of how economic, financial or social actors manage innovations. Many researchers also highlight the dependencies and links between stakeholders and the economic and political ecosystems in which SMEs operate. However, a certain research gap has emerged when considering budgeting for innovation projects. SMEs have lower financial resources and are more vulnerable to risks associated with all kinds of social as well as economic crises. Meanwhile, innovative companies are better able to cope with a turbulent environment. The present article was designed to study the impact of types of costs on the budget of innovation projects, and to analyze the relationship between equity and the amount of budget planned by SMEs. This approach allows to better match the financial needs of a product innovation project with the economic balance of running an existing business.

Based on the study, NPV was found to be significantly positively correlated with the planned costs associated with "Intangible assets". Technically and technologically advanced projects force incurring higher costs, which translates into higher net cash flows in the future. This approach also proves that capital-intensive non-current assets will generate higher revenues, i.e. investment in a company's intellectual capital is more profitable.

At a significance level of $p=0.1$, there was no relationship between the planned budget and equity of SMEs. Hence the conclusion that the company's financial surplus does not affect the planned innovation project budget. Moreover, project budgets are negatively correlated with the entrepreneurs' equity (but there is no significance of correlation between that lateral data).

The present study is exploratory in nature and presents only a small part of the economic life of SMEs. The relatively small sample size does not allow us to generalize the results, but it does allow us to pay special attention to product innovation budget planning by the largest group of entrepreneurs in Poland, i.e. SMEs.

References

1. Bai, C., Chu, H., Hassink, R. (2024). Regional Innovation Systems: Evolution, Transition, and Future Agenda. *GEIST – Geography of Innovation and Sustainability Transitions, 4.* Retrieved from: https://doi.org/10.13140/RG.2.2.14068.77445.
2. Beck, T., Demirgüç-Kunt, A., Maksimovic, V. (2008). Financing patterns around the world: Are small firms different? *Journal of Financial Economics, 89(3), 467-487.* Retrieved from: https://doi.org/10.1016/j.jfineco, 2007.10.005.

3. Budget and financial planning. (2015). *Global Innovative Leadership Module.* Retrieved from: https://ec.europa.eu/programmes/erasmus-plus/project-result-content/4d828916-38f-a-4fb8-83d0-28f27ccb71be/Budgeting_And_Financial_Planning_Booklet.pdf,13.11.2024.

4. CIMA official terminology (2005) Oxford: CIMA.

5. Cooke, P. (2005). Regionally asymmetric knowledge capabilities and open innovation: Exploring 'Globalisation 2'—A new model of industry organisation. *Research Policy, 34(8), 1128–1149.* Retrieved from: https://doi.org/10.1016/j.respol.2004.12.005.

6. Das, S., Kundu, A., Bhattacharya, A. (2020). Technology adaptation and survival of SMEs: a longitudinal study of developing countries. *Technology Innovation Management Review, 10(6), 64-72.* Retrieved from: https://doi.org/10.22215/timreview/1369.

7. Dooley, L., Kenny, B. and O'Sullivan, D. (2017). Innovation capability development: case studies of small enterprises in the LMT manufacturing sector. *Small Enterprise Research, 24(3), 1-24.* Retrieved from: https://doi.org/10.1080/13215906.2017.1396242.

8. Fagerberg, J., Srholec M., Verspagen, B. (2010). Innovation and Economic Development, In: Hall, B.H., Rosenberg N. (Eds.) *Handbook of the Economics of Innovation, 2, 833-872.* North-Holland. Retrieved from: https://doi.org/10.1016/S0169-7218(10)02004-6.

9. GUS (2023) *Działalność innowacyjna przedsiębiorstw w Polsce w latach 2020–2022*. Retrieved from: https://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/nauka-i-technika/dzialalnosc-innowacyjna-przedsiebiorstw-w-polsce-w-latach-2020-2022,14,10.html, 09.11.2024.

10. GUS (2024). Działalność przedsiębiorstw niefinansowych w 2023 roku. Retrieved from: https://stat.gov.pl/obszary-tematyczne/podmioty-gospodarcze-wyniki-finansowe/przedsiebiorstwa-niefinansowe/wyniki-finansowe-przedsiebiorstw-niefinansowych-w-2023-roku,-12,54.html, 9.11.2024.

11. Kauffeld-Monz, M., Fritsch, M. (2013). Who Are the Knowledge Brokers in Regional Systems of Innovation? A Multi-Actor Network Analysis. *Regional Studies, 47(5), 669–685.* Retrieved from: https://doi.org/10.1080/00343401003713365.

12. Kim, J., Lee, K. (2022). Local–global interface as a key factor in the catching up of regional innovation systems: Fast versus slow catching up among Taipei, Shenzhen, and Penang in Asia. *Technological Forecasting and Social Change, 174(4), 121271.* Retrieved from: https://doi.org/10.1016/j.techfore.2021.121271.

13. Leydesdorff, L., Fritsch, M. (2006). Measuring the knowledge base of regional innovation systems in Germany in terms of a Triple Helix dynamics. *Research Policy, 35(10), 1538–1553.* Retrieved from: https://doi.org/10.1016/j.respol.2006.09.027.

14. McGuinness G, Hogan T, Powell R. (2018) European trade credit use and SME survival. *Journal of Corporate Finance, 49, 81–103.* Retrieved from: https://doi.org/10.1016-/j.jcorpfin.2017.12.005.

15. McKenzie, D. (2024). Is there still a role for direct government support to firms in developing countries? *New Zealand Economic Papers, 1–6.* Retrieved from: https://doi.org/10.1080/00779954.2023.2290484.

16. Mittal, S. (2024) Innovative Costing Methodology for Strategic Financial Planning and Resource Allocation: Navigating Budgetary Constraints to Drive Sustainable Growth and Business Leadership. In: Proceedings of the International Conference on Applied Research in Management, *Economics and Accounting, 1(1), 1-11.* Retrieved from: https://doi.org/10.33422/iarmea.v1i1.284.

17. Okpara, J.O. (2011). Factors constraining the growth and survival of SMEs in Nigeria: Implications for poverty alleviation. *Management Research Review, 34(2), 156-171.* Retrieved from: https://doi.org/10.1108/01409171111102786.

18. Pešalj, B., Pavlov, A., Micheli, P. (2018). The use of management control and performance measurement systems in SMEs: A levers of control perspective. International *Journal of Operations & Production Management, 38(11), 2169-2191.* Retrieved from: https://doi.org/10.1108/IJOPM-09-2016-0565.

19. Project Management Institute. (2017). A guide to project management: Body of knowledge (PMBOK® Guide), 6th Edition. Newtown Square, Pennsylvania: Project Management Institute Re Lee, K., Hyun Kim, J., Jang, J., Yoon, J., Nan, D., Kim, Y., Kim, B. (2022). News big data analysis of international start-up innovation discourses through topic modelling and network analysis: comparing East Asia and North America. Asian *Journal of Technology Innovation, 31(3), 581–603.* Retrieved from: https://doi.org/10.1080/19761597.2022.2134154.

20. Reshid, A., Svensson, P., Steinbach, N. (2024). The long-term effects of R&D subsidies on firm performance: evidence from a regression discontinuity design. *Economics of Innovation and New Technology, 1-24.* Retrieved from: https://doi.org/10.1080/10438599.2024.2351136.

21. Rosösig, S.A., Schmidt, S. (2024). The road less travelled: An exploratory study of the association between top management team dissimilarity and innovation capability. *Journal of Management and Organization, 1-25.* Retrieved from: https://doi.org/10.1017/jmo.2024.53.

22. Slater, S.F., Mohr, J.J., Sengupta, S. (2014). Radical product innovation capability: literature review, synthesis, and illustrative research propositions. *Journal of Product Innovation Management, 31(3), 552–566.*

23. Sihag, V., Rijsdijk, S.A. (2019). Organizational Controls and Performance Outcomes: A Meta-Analytic Assessment and Extension. *Journal of Management Studies, 56(1), 91-133.* Retrieved from: 10.1111/joms.12342.

24. Śleszyński, Z. (2020). Wyznaczanie współczynników korelacji liniowej – podstawy. Wiadomości Statystyczne. *The Polish Statistician, 65(6), 69–87.* Retrieved from: https://doi.org/10.5604/01.3001.0014.2347.

25. Tripathi, N., Oivo, M., Liukkunen, K., Markkula, J. (2019). Startup ecosystem effect on minimum viable product development in software startups. *Information and Software Technology, 114, 77–91.* Retrieved from: https://doi.org/10.1016/j.infsof.2019.06.008.

26. Yoon, H., Yun, S., Lee, J., Phillips, F. (2015). Entrepreneurship in East Asian regional innovation systems: Role of social capital. *Technological Forecasting and Social Change*, *100, 83–95.* Retrieved from: https://doi.org/10.1016/j.techfore.2015.06.028.

27. Zhuang, T., Zhou, Z., Li, Q. (2021). University-industry-government triple helix relationship and regional innovation efficiency in China. *Growth and Change*, *52(1), 349–370.* Retrieved from: https://doi.org/10.1111/grow.12461.

28. Ziakis, C., Vlachopoulou, M., Petridis, K. (2022). Start-up ecosystem (StUpEco): A conceptual framework and empirical research. *Journal of Open Innovation: Technology, Market, and Complexity, 8(1), 35.* Retrieved from: https://doi.org/10.3390/joitmc8010035.