# Cost Information, Management Control System and Experience: Experimental Testing on Cost Effectiveness of New Product Development

Dyah Ekaari Sekar Jatiningsih[1*], Nurbela Salsabila Herman[2]

{sekar@umy.ac.id[1], nurbelasalsabila18@gmail.com[2]}

Universitas Muhammadiyah Yogyakarta, Indonesia[1,2]

**Abstract.** The demand for product innovation currently pushes organizations to develop new products that may have optimum performance and may sustain in the business environment with its competitive advantage. This study tests the effect of three factors on new product cost-effectiveness, namely cost information, management control system, and experience. An experimental test is performed with 117 undergraduate student participants, adopting a 2x2x2 between-subject factorial design. Observing the cause-and-effect relationship, the result of the analysis reveals a three-way interaction effect of cost information, management control system, and designer's experience in cost-effective product design. The result of the analysis acknowledges the notion from contingency theory which states that there is no single effect from some aspects of the organization on a particular operation, system, or structure. In this study context, new product development experiences three factors that may affect performance, namely cost information, management control, and experience. This study contributes to the literature by providing empirical evidence of contingent factors affecting product design, in a three-way interaction effect. In addition to the confirmed effect of cost information acknowledged in the previous study, current research confirms the joint effect of cost information, management control, and experience.

**Keywords:** Cost-effective design, New product development, Cost information, Management control system, Experience.

## 1 Introduction

In the current era of globalization, competition between corporations is strengthening in tandem with the expanding flow of free trade, resulting in competition coming from all directions, both domestically, regionally, and globally. According to Barone and Jewell (2013), one of the most important parts of a company's sustainability is its attempts to produce new goods. In today's challenging business competition, a company's capacity to manage expenses is critical, especially when developing innovative products. [1].

Cost-effectiveness involves evaluating the costs and effectiveness of different interventions or services in comparison [2]. It encompasses not only cost considerations but also effectiveness. In essence, it's about finding the optimal balance between cost and desired

UHICEB 2023, December 18-19, Jakarta, Indonesia

DOI 10.4108/eai.18-12-2023.2350231

outcomes rather than solely opting for the cheapest option. In the context of new product development, the goal of cost-effectiveness is to efficiently manage costs, particularly during the early stages of product development, to ensure the company's competitiveness amidst fierce market competition [1].

According to research conducted by Nurjanah et al. (2023), specific cost details play a significant role in determining the cost of products during the creation of new products. [3]. This type of detailed cost information tends to have a relatively low average value, indicating optimal performance as it enables the development of new products at lower costs. Rahatulain et al. (2021) also emphasize the importance of essential information in the process of innovating new products. [4]. Cost-related data emerges as a crucial factor in this context, as it enables informed decision-making, a pivotal aspect of the new product development journey. Additionally, Khannan et al. (2021) echo these sentiments by highlighting the necessity for management to consider cost-effectiveness aspects to support environmentally friendly designs in new products, ensuring they remain affordable for consumers, thus aligning with the principles of eco-design [5].

Previous research by Booker et al. (2007) has shown that when designers are given more particular cost information, they are able to generate more cost-effective designs for both add-on goods and more radical products. [6]. There are no substantial compromises in terms of product features available to customers while developing a more cost-effective design. According to the findings of Jatiningsih and Sholihin (2015), detailed cost information has benefits that can help firms reduce production costs. [1].

Information regarding costs obtained from previous research has been confirmed as a factor that has a significant influence on Cost-Effectiveness in NPD. In the new product development process, there are special considerations that need to be taken into account. Therefore, to ensure that the products produced are effective, it is important to have strong control through a Management Control System (MCS) in the New Product Development (NPD) process. Management Control Systems can be an important part of companies ' competition in developing new products to meet customer needs. Researchers in the field of management accounting argue that companies can maintain resilience and achieve success in complex and uncertain environments by understanding how Management Control Systems (MSS) can help create competitive advantage.[7]

[8]Explains that the Management Control System is a process in which managers are responsible for the achievement and allocation of resources that must be carried out effectively and efficiently to achieve organizational goals [9]. According to[10]The Management Control System is a systematic method by the company to achieve the desired goals. According to[11], in implementing corporate strategy, diagnostic control systems act as a guide for the implementation of the next steps while interactive control systems can encourage the development of new ideas, initiatives, and directions originating from various levels in the organization, especially in the context of strategic uncertainty.

The thing that needs to be considered to achieve effective costs is of course to look at the experience that the designer has so that the product being designed can attract consumers to buy it. According to[12] Companies must ensure that the introduction of their innovations occurs in an orderly manner in terms of time, and achieving this consistency is influenced by the company's level of experience in carrying out innovations. Ensuring that innovations are introduced in an orderly and coordinated manner can play a crucial role in attracting consumer

interest. This shows that in addition to looking at the individual experience of designers, companies also need to have skills and experience in planning, managing, and implementing innovation effectively.

According to Gomes, (2013), we cannot change events in the past, but we have the opportunity to influence several aspects of the future by using the past as a reference. [13]. This can be interpreted as the importance of learning from past experiences to improve the innovation process in the future. By leveraging these learnings, companies can optimize their product designs and sustainably increase cost efficiency.

This research aims to investigate the impact of cost information, management control systems, and experience design on cost-effectiveness in the context of new product development. Interestingly, experience design was brought up as a research factor, illustrating the understanding that the way a product is developed and the development experience designed can have a significant impact on overall costs. Thus, this research can be considered a significant step in understanding the factors that influence cost-effectiveness in new product development, unearthing insights that can help companies manage resources more efficiently.

**Literature Review and Hypothesis**

**1. The Influence of Cost Information towards Cost Effectiveness in NPD**

Contingency theory states that the effectiveness of a company comes from aligning or adjusting company characteristics with contingencies that reflect the company's situation[14]. This theory says that to achieve effectiveness, a company must be able to adjust its characteristics according to the current situation. Rahatulain et al. (2021) emphasize the necessity of essential information for advancing new product innovation. They highlight that cost-related data holds significant relevance in the development of new products, as it empowers individuals to make informed decisions, which, in turn, plays a crucial role in the overall process of new product development. This research was supported byKhannan et al., (2021)To support Eco-Design, management needs to consider the Cost Effectiveness aspect which supports new products with environmentally friendly designs so that they can be sold at affordable prices. [5].

Rahatulain et al. (2021) discovered that providing specific cost information to designers rather than relative cost information improves the cost-effectiveness of new product designs, especially in cases where low-cost solutions are prioritized. Booker et al. (2007) discovered that particular cost information improves the cost-effectiveness of product design when compared to relative cost information, with incremental new product development innovation showing a more substantial rise than radical new product development. Similarly, Nurjanah et al. (2023) argue that thorough cost information influences the expenses of new product development, hence changing the development process. With the description above, this research is intended to obtain empirical evidence and test whether cost information influences cost-effectiveness in developing new products.

**H1: The cost-effectiveness of new products is higher when designers are facilitated with specific cost information rather than relative cost information.**

**2. The Influence of Cost Information towards Cost Effectiveness in NPD**

According toLathifah, (2014)Contingency theory is needed to evaluate conditional factors that cause management control systems to be more effective. By applying contingency theory, managers and leaders can identify control strategies that are better suited to an organization's unique conditions. This is supported by research conducted by[17]A management control system is defined as a system consisting of several interconnected sub-systems to help company management to achieve its goals through certain strategies as effectively and efficiently as possible[18]. Research conducted by[19] The use of a variety of Management Control Systems, both interactive and belief-based, and diagnostic and boundary-based, has a consistent, joint effect, pushing the organization in a particular direction.

Henri (2006) focuses on the diagnostic and interactive usage of one major part of Management Control Systems, Performance Measurement Strategy, as well as four capabilities that contribute to strategic decisions (market orientation, entrepreneurship, innovation, and organizational learning) [20]. The findings indicate that interactive use of Performance Measurement Strategies promotes the four capabilities by focusing organizational attention on strategic priorities, stimulating dialogue, and establishing boundaries to ensure order compliance, whereas diagnostic use of Performance Measurement Strategies hurts these capabilities.

Diagnostic usage, in particular, restricts the role of Performance Measurement Strategy to measurement tools, whereas interactive use broadens its scope to include strategic management tools. According to Simons, the diagnostic and interactive usage of Management Control Systems serves as a balancing force to alleviate inherent organizational tensions. According to De Haas and Kleingeld (1999), the employment of diagnostic Performance Measurement Strategies is not an aim in itself, but rather an essential method of initiating strategic discourse and interactive performance measurement strategies.

With the description above, this research is intended to obtain empirical evidence and test whether the Management Control System influences Cost Effectiveness in developing new products.

**H2: The cost-effectiveness of new products is higher when designers are facilitated with an Interactive Management Control System rather than a Diagnostic Management Control System.**

## 3. The Influence of Design Experience on Cost-Effectiveness in New Product Development

Experiential learning theory (Kolb, 1984) defines experiential learning as the process through which knowledge is generated by transforming experiences. The significance of work experience in the corporate realm is acknowledged as pivotal for the success of small enterprises [21]. Research by Abd Hadi et al. (2013) indicates that businesses led by entrepreneurs with prior work experience tend to achieve greater success compared to those led by inexperienced entrepreneurs [22]. This assertion is further supported by Hussain Naqvi (2011), who emphasizes the substantial positive correlation between an entrepreneur's previous experience and the success of both the entrepreneur and their business [23]. Turner et al. (2013) also assert that companies need to ensure a systematic introduction of their innovations over time, a task influenced by the company's level of experience in innovation implementation.

In the context of understanding previous work experience, the study by[24]Highlighting the importance of its influence on the performance of an organization. A wealth of work experience can form the foundation of knowledge and skills necessary to effectively design and develop new products. Therefore, it can be concluded that work experience, both at the individual and organizational level, has a significant impact on the success of business and new product development design.

With the description above, this research is intended to obtain empirical evidence and test whether the Management Control System influences Cost Effectiveness in developing new products.

**H3: The cost-effectiveness of new products is higher when designers have experience than designers who do not have design experience.**

**Methodology**

This research is a study where the research object is Muhammadiyah University of Yogyakarta. Participants in this research used Accounting Study Program students who had taken Cost Accounting and Management Accounting courses as substitutes for professional designers in new product development. There is criticism made towards students who are used as subjects,[25]Providing an opinion regarding the suitability and relevance of the usage must be considered carefully.

Elliott et al. (2007) propose that choosing students as participants can be a valid methodological approach when they are seen as proxies for real-world product designers in industry. [26]. However, researchers must ensure that the complexity of the tasks assigned aligns appropriately with the student's level of proficiency. In this study, professional experience is not a prerequisite since the tasks assigned are not overly complex, making students suitable substitutes for designers in this research context.

**1. Experimental Design**

This research uses a 2x2x2 experimental design with experimental research methods. The design used in this research is a factorial design because there is an interaction between two variables and can provide a difference due to the interaction between the 2 variables. This approach can potentially test several hypotheses simultaneously. Analysis of variance is used as a basic statistical technique in hypothesis testing.

**Table 1**

**Experimental Design**

| | **Management Control System** | | | |
|---|---|---|---|---|
| | Diagnostic | | Interactive | |
| | Specific | Relative | Specific | Relative |
| **There is Design Experience** | Cell 1 | Cell 2 | Cell 3 | Cell 4 |
| **No Design Experience** | Cell 5 | Cell 6 | Cell 7 | Cell 8 |

Based on this matrix, participants will be included in one of the experimental groups (cell), whether specific or relative information, diagnostic or interactive control, and having design experience or not.

**2. Experimental Task**

Participants will be divided into 8 groups, namely participants with design experience and no design experience who use diagnostic management control systems and interactive control systems, and receive information about relative and specific costs. The data on the case instruments that the respondents will complete will later become the data source for this experimental research.

**Manipulation**

Participants were assigned the task of creating or innovating new products and were randomly allocated to specific experimental conditions. Subsequently, they were informed beforehand that they would be acting as product designers. The study aims to investigate methods for reducing production costs. All participants received materials including blocks, manuals, and product specification data on worksheets to aid them in the design process. Prior to commencing their tasks, participants underwent brief training and completed a questionnaire detailing their background information to assess their level of creativity. Measures were taken to ensure that participants fully understood and comprehended the experimental treatments.

**Manipulation Check**

To verify participants' understanding of the provided information regarding specific or relative cost details and their comprehension of how different design choices would impact cost-effectiveness, a manipulation check was conducted through a series of questions.

**Experimental Procedures**

The researchers implemented the following procedures for the experiments:

1. Participants were situated in the laboratory, which had been arranged and set.
2. Questionnaires and experiment materials were distributed by the researchers.
3. Participants completed a questionnaire and proceeded with the experiment as instructed by the researchers.

**Findings and Discussion**

**Descriptive Statistic**

**Table 2**

**Descriptive Statistics**

**Dependent Variable: Cost Effectiveness**

| Cost Information Type | Management Control System | Experience | Mean | Std. Deviation | N |
|---|---|---|---|---|---|
| Specific | Diagnostic | There is experience | 3.6774 | 1.01282 | 31 |
| Relatively | Diagnostic | There is experience | 3.1538 | 1.06819 | 13 |
| Specific | Interactive | There is experience | 3.7059 | .68599 | 17 |
| Relatively | Interactive | There is experience | 3.6296 | .92604 | 27 |
| Specific | Diagnostic | No Experience | 3,3000 | 1.05935 | 10 |
| Relatively | Diagnostic | No Experience | 4,0000 | 1.00000 | 5 |
| Specific | Interactive | No Experience | 3,5000 | 1.29099 | 4 |
| Relatively | Interactive | No Experience | 2,9000 | .99443 | 10 |
| Total | | | 3.5214 | .97908 | 117 |

Source: SPSS output

Descriptive statistics for variables tested in the hypothesis can be seen from the table above. To observe the mean of cost-effectiveness, standard deviation, and the number of participants in each experimental group, the experimental results data are presented in the table above. The distribution of participants in each experimental group ranges from 4 to 31 participants.

**Table 3**

**ANOVA Result**

**Tests of Between-Subjects Effects**

Dependent Variable: CostEff

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 8.904a | 7 | 1,272 | 1,355 | ,232 |
| Intercept | 908.210 | 1 | 908.210 | 967,766 | ,000 |
| CostInfo | ,292 | 1 | ,292 | .311 | ,578 |
| Experience | ,255 | 1 | ,255 | ,272 | ,603 |
| MCS | ,183 | 1 | ,183 | ,195 | ,660 |
| Cost Info * Experience | ,573 | 1 | ,573 | ,610 | ,436 |
| Fee Info * MCS | ,850 | 1 | ,850 | ,906 | ,343 |
| Experience * MCS | 2,306 | 1 | 2,306 | 2,457 | ,120 |

| | | | | | |
|---|---|---|---|---|---|
| Cost Info * Experience * MCS | 3,571 | 1 | 3,571 | 3,805 | ,054 |
| Error | 102.292 | 109 | ,938 | | |
| Total | 1562,000 | 117 | | | |
| Corrected Total | 111,197 | 116 | | | |

a. R Squared = .080 (Adjusted R Squared = .021)

To test the hypothesis, an Analysis of Variance (ANOVA) is performed, as can be seen in the above result. Test of between-subjects effect indicates that the main effect of Cost Information, Management Control System, and Experience on NPD Cost Effectiveness is not significant. Meanwhile, a significant three-way interaction is revealed between cost information, MCS, and experience. With the statistically significant influence of the three-way interaction variable, it can be acknowledged that solely one factor cannot be considered to have an impact on the cost-effectiveness performance of a new product. The effect of cost information will depend on the control system adopted and the designer's experience in performing new product development.

**Conclusion**

The experimental approach performed in this study to test the proposed hypothesis reveals an interesting result. Based on the analysis, it is found that the cost-effectiveness of a new product will be determined not only by one factor, but by a joint effect of three factors namely cost information, management control system, and experience. This is due to a significant interaction effect between three independent variables on dependent variables. This result is consistent with contingency theory which explains that there is no single factor affecting a particular process or system in the organization. In this study context, the particular system is a new product development, and the factors will be cost information which can be specific or relative, management control in the form of a diagnostic or interactive system, and whether the designer has sufficient experience or vice versa.

This study's result implies that in performing new product development management has to consider some factors to achieve a better performance. Presentation of cost information used in the design process, setting of the management control system, and experience of the designer will be crucial factors. Therefore, managerial setting and team composition have to be prepared according to this study's result. In addition, exploration of another factor will be important as well to enrich knowledge of the effect of such factors in the product design. This means that future research has to extend this study result by testing some aspects that may have an effect on new product development performance.

## References


[1] S. Jatiningsih and M. Sholihin, "Examining the Interaction Effect of Cost Information Types and Strategy on the Effectiveness of New Product Development: An Experimental Study," vol. 13, no. ue 2).

[2] C. Hulme, "Using Cost-Effectiveness Analysis; a Beginner's Guide," *Evid Based Libr Inf Pract*, vol. 1, no. 4, pp. 17–29, doi: 10.18438/b81s34.

[3] T. Nurjanah, D. Ekaari, and S. Jatiningsih, “Cost Information Types and Ego Depletion : The Role in New Product Development.”

[4] A. Rahatulain, T. N. Qureshi, A. Maffei, and M. Onori, “Relationship and dependencies between factors affecting new product development process: An industrial case study,” *Procedia CIRP*, vol. 100, pp. 367–372, doi: 10.1016/j.procir.2021.05.086.

[5] M. S. A. Khannan, A. E. Tontowi, M. K. Herliansyah, and A. Sudiarso, “New Product Development Method Trends and Future Research,” *Journal of Industrial Engineering*, vol. 23, no. 1, pp. 11–24, doi: 10.9744/jti.23.1.11-24.

[6] D. M. Booker, A. R. Drake, and D. L. Heitger, “New Product Development: How Cost Information Precision Affects Designer Focus and Behavior in a Multiple Objective Setting,” *Behavioral Research in Accounting*, vol. 19, no. 1, pp. 19–41, doi: 10.2308/bria.2007.19.1.19.

[7] S. K. Widener, “An Empirical Analysis of the Levers of Control Framework,” *SSRN Electronic Journal*, Dec. 2011, doi: 10.2139/ssrn.771994.

[8] U. Rahardja, “Implementation of Enterprise Resource Planning (ERP) in Indonesia to Increase the Significant Impact of Management Control Systems,” *APTISI Transactions on Management (ATM)*, vol. 7, no. 2, pp. 152–159, Aug. 2022, doi: 10.33050/atm.v7i2.1881.

[9] U. Rahardja, “Implementation of Enterprise Resource Planning (ERP) in Indonesia to Increase the Significant Impact of Management Control Systems,” *APTISI Transactions on Management (ATM*, vol. 7, no. 2, pp. 152–159, doi: 10.33050/atm.v7i2.1881.

[10] N. Anjarsari, S. Sistem, P. Manajemen, and F. Ekonomi, “ANALISIS SISTEM PENGENDALIAN MANAJEMEN DALAM MENINGKATKAN DAYA SAING PADA KEDAI KOPI LEDOKAN DI BINANGUN BLITAR,” 2021.

[11] J. F. Henri, “Management control systems and strategy: A resource-based perspective,” *Accounting, Organizations and Society*, vol. 31, no. 6, pp. 529–558, Aug. 2006, doi: 10.1016/j.aos.2005.07.001.

[12] S. F. Turner, W. Mitchell, and R. A. Bettis, “Strategic Momentum: How Experience Shapes Temporal Consistency of Ongoing Innovation,” *J Manage*, vol. 39, no. 7, pp. 1855–1890, Nov. 2013, doi: 10.1177/0149206312458704.

[13] S. Gomes, J. J. Ferreira, and J. M. Lopes, “Entrepreneurial conditions and economic growth in entrepreneurial ecosystems: Evidence from OECD countries,” *International Journal of Entrepreneurship and Innovation*, 2023, doi: 10.1177/14657503231156340.

[14] D. Yan Minarhadi, S. Trisnaningsih, A. Referli, F. Ekonomi dan Bisnis, U. Pembangunan Nasional Veteran Jawa Timur Jalan Rungkut Madya, and S. Jawa Timur, “PERSEPSI AUDITOR INTERNAL TERHADAP REMOTE AUDIT TERKAIT BIAYA AUDIT & KEPUASAN KERJA SETELAH PANDEMI,” *Jurnal Ilmu Manajemen dan Akuntansi*, vol. 11, no. 1, p. 2023, 2023.

[15] M. S. A. Khannan, A. E. Tontowi, M. K. Herliansyah, and A. Sudiarso, “New Product Development Method Trends and Future Research,” *Jurnal Teknik Industri*, vol. 23, no. 1, pp. 11–24, May 2021, doi: 10.9744/jti.23.1.11-24.

[16] I. Lathifah, “Sistem Pengendalian Manajamen dan Tujuan Perusahaan (Sebuah Tinjauan Teori Kontingensi),” *Jurnal Dinamika Akuntansi*, vol. 6, no. 1, pp. 40–53, 2014.

[17] Mahsina and Poniewatie A, “Pengaruh Sistem Pengendalian Manajemen dan Inovasi Produk Tehadap Efektifitas Perencanaan Laba,” *Jurnal Manajemen dan Penelitian Akuntansi* , vol. Vol. 14, No. 1, no. P-ISSN: 1693-3907 E-ISSN: 2746-7147, 2021.

[18] Mahsina and P. A, “The Influence of Management Control Systems and Product Innovation on the Effectiveness of Profit Planning,” *Journal of Management and Accounting Research*, vol. 14, no. 1(P-ISSN, pp. 1693–3907 – 2746–7147.

[19] R. S. Barros and A. M. D. S. da C. Ferreira, “Management control systems and innovation: a case study grounded in institutional theory,” *Journal of Management Control*, vol. 34, no. 1, pp. 109–133, Mar. 2023, doi: 10.1007/s00187-023-00351-4.

[20] J. F. Henri, “Management control systems and strategy: A resource-based perspective,” *Accounting, Organizations and Society*, vol. 31, no. 6, pp. 529–558, doi: 10.1016/j.aos.2005.07.001.

[21] M. Masrizal, M. Miftahurrahman, S. Herianingrum, and Y. Firmansah, “The Effect of Country Risk and Macroeconomic on Jakarta Islamic Index,” *Jurnal Ekonomi dan Bisnis Islam (Journal of Islamic Economics and Business)*, vol. 6, no. 1, p. 151, 2020, doi: 10.20473/jebis.v6i1.14707.

[22] G. Abdurrahman, H. Oktavianto, E. Y. Habibie, and A. W. Hadiyatullah, “Pelatihan Digital Marketing Pada UMKM Sebagai Penunjang Kegiatan Promosi Dan Pemasaran,” *Jurnal Pengabdian Masyarakat Manage*, vol. 1, no. 2, pp. 88–92, 2020, doi: 10.32528/jpmm.v1i2.3981.

[23] S. W. Hussain Naqvi, “Critical Success and Failure Factors of Entrepreneurial Organizations: Study of SMEs in Bahawalpur,” *Journal of Public Administration and Governance*, vol. 1, no. 2, p. 17, doi: 10.5296/jpag.v1i2.824.

[24] G. Dokko, S. L. Wilk, and N. P. Rothbard, “Unpacking prior experience: How career history affects Job Performance,” *Organization Science*, vol. 20, no. 1, pp. 51–68, Jan. 2009, doi: 10.1287/orsc.1080.0357.

[25] R. H. Ashton and S. S. Kramert, “Students as Surrogates in Behavioral Accounting Research: Some Evidence,” 1980.

[26] E. Duncan and G. Elliott, “Customer service quality and financial performance among Australian retail financial institutions,” *Journal of Financial Services Marketing*, vol. 7, no. 1, pp. 25–41, 2002, doi: 10.1057/palgrave.fsm.4770070.