Cost Benefit Analysis Origin And Applicability Of Its Recent Advances: A Critical Review

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ABSTRACT
This study reviewed a number of empirical pieces of literature on CBA origin, advancements in its methods, and their applicability. This study applied a semi-systematic review by relying on previous publications (20 fully reviewed) in line with this study topic. The collected data was analyzed with the application of narrative synthesis. There are mixed ideas on the origin of CBA. This study concludes that CBA was first practiced in China in the 11th Century at the palace construction site. It then spread to the Bavarian Army. The French engineers embraced this technique in the execution of public works in 1708 before the American National Resource Committee incorporated it. Moreover, CBA was authoritatively documented in the US in the green book by a sub-committee on benefits and costs, where principles and procedures for determining costs and benefits were clarified for reference. Other countries hence embraced CBA after its documentation in the US. Advances in CBA include; willingness to pay, which exhibits the definite intention of clients in regard to how they value what they intend to purchase. That is, it expresses the degree the clients are ready to consume a particular product. On the other hand, conjoint analysis aids in determining willingness to pay, such that it offers a client an array of product characteristics, enabling the client to settle on the most preferred product feature. It is shown that designing a conjoint technique is complex. Conjoint is tested at the individual level. The model utilized in collecting data is uniformly applicable, assuming that all respondents have a similar modeled preference that does not match the real-life situation. Accordingly, information on product attributes could be obtained via a questionnaire or interview schedule in determining customers' preferences and not necessarily through conjoint. This review criticizes conjoint analysis as a CBA method on the basis of its complexity, and thus other data collection methods are offered, like questionnaires and interview schedules. The study also confirms that advances in CBA can be applied in all sectors of the economy since they have been empirically tested. It contributes to the comprehension of the origin of CBA, the advancement in cost-benefit methods, and a critique of the methods of CBA.

KEYWORDS: Cost Benefit Analysis, Willingness To Pay, Conjoint Analysis.

ABBREVIATIONS
CBA: Cost Benefit Analysis, US: United States, UK: United Kingdom.

1.0 INTRODUCTION

1.1 BACKGROUND

CBA is the process of counterweighing overheads against gains. It is where all relevant costs are formulated and summed up. Then all the benefits that accrue from executing a particular project are tabularized and summed up. The net-off occurs when the incentives from executing the project override the costs that will accrue from implementing the project. Jiang and Rainer [1] note that CBA is a tool that aids the organization in arriving at various decisions in regard to the apportionment of wealth.

Since its inception, CBA has been widely implemented by individuals, organizations, and even the government sector. Jiang and Rainer [1] suggest that up to 2020, this cost-and-benefit analysis tool had been researched in 54,445 publications and

implemented by 197 countries, with the frequent users in terms of the country being; the US, England, China, Canada, Australia, Germany, Italy, Netherlands, and France.

From a theoretical vantage point, normative theory propositions by Ijiri [2] hold that the subject advances from the speculated aspect toward the execution point. That is, the normative theory proposes what should be done in the process of implementation of the cost-benefit approach hence resulting in improvements in the method [3]. Thus CBA can be understood from its existing foundations to the current improvements, which include; the application of the balance sheet approach, willingness to pay, and conjoint analysis [4]. On the other hand, query theory [5] enables the formulation of preferred characteristics of a product, enabling the user to settle on a cost-effective product rate upon assessing the product features.

1.2 STUDY OBJECTIVES

i. To review the historical background of CBA.
ii. To critically evaluate recent advancements in CBA.

1.3 PROBLEM STATEMENT

Like any other discipline, CBA has undergone advances in its procedures. That is, there is development in the technique as regards the approaches it implements in aiding decision-making. Research suggests that implementation of the improvement in methods of CBA has been witnessed predominantly in the health sector [4]. However, the majority of the users of CBA do not have knowledge of the origin of this tool. Moreover, many users of the approach do not concentrate on the significance of the advancements. There is a universal accord to comprehend a particular substance, and it is essential to have its gist from the foundation, thus understanding the origin of CBA. Further, it is imperative to have clarity on the recent developments in CBA, their applicability in various sectors and a critical review of the advances in methods of CBA.

2.0 METHODOLOGY

2.1 STUDY DESIGN

This critical review applied a semi-systematic or narrative review methodology. According to Wong *et al*. [6], a semi-systematic review is deliberate for areas that have been intellectualized in a different way and studied by several groups of researchers within varied disciplines, and that hamper a full systematic review procedure. Rereading every article that could be applicable to the topic is just but not likely, so a different tactic must be settled on. Besides, a semi-systematic review permitted observation of how this research topic has proceeded and developed across investigation civilizations.

2.2 SEARCH APPROACH

An in-depth internet search was conducted in the google search engine. Terms implying CBA origin, willingness to pay, and conjoint analysis applicability were used.

2.3 ELIGIBILITY CRITERIA

Of the publications extracted, 20 articles were included in the analysis and thus were fully reviewed. Repeated publications and articles with similar study topics were excluded. Besides, other articles were excluded based on the assessment of their quality and contribution to this study topic.

2.4 DATA ANALYSIS

The collected data was analyzed with the application of narrative synthesis [7]. That is, the narrative technique of analysis was preferred because of the different methodological approaches embraced in the previous studies gathered. Therefore, the narrative analysis helped gather outcomes from the myriad empirical studies assembled herein by describing them in minutiae before instituting a generalization as per the present research work.

3.0 DISCUSSION

3.1 HISTORICAL BACKGROUND OF CBA

Joseph [8] submits that CBA is exhibited in the works of French engineers whose draft cost-benefit reckonings date back before the French revolution, particularly in the nineteenth Century. He affirms that the major contributor to CBA is the French man Jules Dupuit a trained engineer and a self-taught economist.

Joseph [8] also traces CBA to have been embraced in the US, preceded by the French practice of the same, particularly in the US Army corps of Engineers.

Jiang and Rainer [1] contend that CBA was first evidenced in France in 1708 by French engineers in guiding the construction of public works. They mention Jules Dupuit as the dazzling individual among the French engineers who brought to light the concepts of costs and benefits with a lot of clarity. Porter [9] affirms the works of Jules Dupuit in 1844 in advancing CBA.

Jiang and Rainer [1] additionally depict the development of CBA in the US. They trace back this history regarding the American water resources development where the Gallatin report of 1808 partially recommend enhancements in the canal system and river and the justifications were based on monetary considerations. That is, accrued expenses were to be predetermined against the gains obtained upon execution.

This was displayed in the 1938 report of the American National Resource Committee, which presented the benefits and expenses that would be incurred.

They affirm that the main article which authoritatively brought into existence the CBA methods was the green book by a sub-committee on benefits and costs where they documented in book form the principles and procedures for determining costs and benefits.

Pearce [10] posits that CBA was coined in the US. Compared to the previous authors, he does not acknowledge the French contributions to the foundations of CBA. However, Pearce [10] and the previous researchers cite the source of the cost-benefit tool evidenced by the introduction of the green book of 1950 by the US Federal Inter-agency River Basin Committee.

The Chicago Chapter of the American Statistical Association [11] advances the history of CBA in regard to the US perspective. Just like Pearce [10], it speculates the origin in a discussion form but in regard to the Army corps of engineers in the US, which ends with a 1930 report.

Mishra [12] contributes his assessment of the history of CBA. He records that this technique can be traced back to the works of a self-taught economist, Jules Dupuit, in 1848. Dupuit's attestations on this economic approach of valuation of expenses and gains are depicted in the article written in 1848.

Contrary to the above-mentioned empirical authors, Mishra [12] proceeds to clarify that Alfred Marshal advanced the approach in 1890, British economist.

Carl and Niek [13] offer a diverse historical background of CBA. He contends that this approach was first recorded in the works of Benjamin Franklin in 1772. Benjamin prepared a column of merits and expenditures that were relevant. Benjamin Franklin was an American Polymath who was among the early scientists in the US.

Although not officially documented, cost-effectiveness was practiced in the Far East's early years [14]. It is recorded that in the 11th Century in China, under the governance of Sung and in the construction of the palace buildings which got burnt in Honan Province, the construction site chief engineer implemented CBA.

This is depicted when the construction site engineer, in order to reduce the expenses that would be incurred as a result of transporting materials to the construction site, devised a cost-effective method by digging a wide trench that allowed water to flow. As a result, the boats carrying construction materials could bring materials to the site.

Besides, the early cost-effective practice was portrayed among the Bavarian Army. Benjamin Thompson strived to improve and lower the cost of uniforms of the Bavarian Army.

Further, Quade [14] acknowledges that the US war department's third and probably official documentation of the CBA approach was in 1886.

3.1.1 TABULAR REPRESENTATION OF EMPIRICAL STUDIES ON CBA

Table 1: Summary of studies on the origins of CBA.

Author(s)	Discipline	Type of literature review	Contribution
Joseph [8]	Economics	Narrative review	Deepening the understanding of CBA as an economic approach used by Governments. Opines the source of CBA to be in the USA, preceded by France.
Jiang and Rainer [1]	Eco-environmental Sciences	Comparative analysis	They fill the gap on the neglect of the origin of CBA despite its wide usage globally. Evidence of the practice of CBA in France among the French engineers and then later on its spread to the US.
Pearce [10]	Political Economy	Narrative review	He explains the origin of CBA. Notes the source of CBA as USA.
The Chicago Chapter of the American Statistical Association [11]	Multi-disciplinary	Narrative review	Explanations of the origin of CBA-US perspective. Presents CBA origin as USA.
Mishra [12]	Economics	Narrative review	Understanding CBA, its uses, and history. Depicts the CBA origin as France, then the UK.
Carl and Niek [13]	Economics	Narrative review	Providing an up-to-date overview of the literature on CBA. Finds CBA origin as US. He dates his arguments back to before US independence.
Quade [14]	Multi-disciplinary	Narrative review	Advances History of CBA. He offers a broader view and appears actual. He recognizes the development of CBA in the 11th Century in a Construction site in China, followed by the implementation of CBA in the Bavarian Army and finally in the US army department, where the Americans began to take a keen interest in the method, thus ending up documenting it.

3.2 ADVANCEMENT IN CBA AND THEIR APPLICABILITY

3.2.1 THE BALANCE SHEET APPROACH (OPPORTUNITY COST)

This method is also referred to as a practical approach. The balance sheet approach is utilized to determine the profits and losses and who shoulders the latter, respectively [4]. In their study in health care, the latter authors further advance that the balance sheet technique allows formulation of expenses in one column and the proceeds in another to establish a net off.

3.2.2 WILLINGNESS TO PAY

The amount of money an individual is willing to sacrifice for a particular product, good, or commodity signals their level of contentment, thus referred to as willingness to pay [4] shows that if a patient has expressed the ability to offset a given amount of money in return for treatment, then they do so in totality taking into consideration the diverse characteristics of the product they intend to purchase. This recent advancement in cost-effectiveness has since been implemented in the health sector to establish the extent to which a patient is capable and, as such, signals that he or she can pay for the health product for as long as he or she will obtain maxim benefit.

As of 2011, 23 research studies had been in online print on willingness to pay, particularly in the health sector [15]. Besides, the study by the latter authors submits that contingent valuation literature has fully grown promptly; thus, several patients place substantial worth on diagnostic info. This was evidenced in their study after analysis to understand the level of applicability of the willingness to pay technique.

Haefeli *et al*. [16] advise that surgery is cost beneficial. That is, the latter authors applied willingness to pay in their study and, as a result, realized that if the client's willingness to pay is assessed by offering various categories (attributes) of surgery, then the final inference is that surgery is cost beneficial.

Research shows that CBA pursues sum up the significance of policy impacts. Besides, Aidan and David [17] note that the only way to attach the monetary aspect to the impacts of the policy is through a willingness to pay, which is an advancement in a CBA. A number of researchers have therefore applied conjoint analysis by indicating numerous preferences to help arrive at the willingness to pay among society members. This has resulted in an understanding of the actual benefits of the policies compared to the current policies.

According to the literature, information on the product features influences willingness to pay. Christoph *et al*. [18] support this, particularly in regard to marketing management. Thus the willingness to pay enables product pricing and the introduction of products to the market. Similarly, Balderjahn [19] supports that willingness to pay is applicable in determining the market product price.

3.2.3 CONJOINT ANALYSIS

Luce and Tukey [20] invented conjoint analysis in their practice of Mathematical Psychology. The same method was enhanced by the works of Green and Rao [21] in marketing research in enhancing comprehension and forecasting of the traits a customer would elicit. It is noted that since then, this method has been applied recently across various disciplines.

So as to elicit the willingness to pay, there comes the conjoint analysis. McIntosh *et al*. [4] show that conjoint analysis allows comprehension of various product features so that the economic aspect is captured as an attribute during conjoint analysis. In other words, specified amounts of money are specified as features, and this enables the client to settle on what he/she is capable and willing to pay.

Jan and Meyer [22], in their study of public sector organizations, utilized conjoint analysis to establish how governments boost employee morale. They applied various characteristics, which included education, year of appointment, wage, and contract terms, by taking a hypothetical situation of colleague comparisons. They concluded that the effect of personnel management practices varies across contexts. Adopting conjoint analysis was thus, to this extent, an empirical approach to the advancement in cost-effectiveness procedure.

Howlader [23] included the following qualities in their study during the implementation of conjoint analysis in healthcare in Bangladesh; determinants of premium, cost per doctor visit, physical examination, well-baby visit and immunization, among others. Their study demonstrated the aspect of conjoint analysis where the diverse product features offered to a client to settle on what fits him/her, thus eliciting willingness to pay and, in the long run aiding in establishing cost-effectiveness.

In instituting the applicability of the conjoint technique in ranking customer requirements, [24] concluded that the conjoint method aid in optimal pricing and product development decisions. Hence, it allows the company to comprehend what values it guarantees its clients with a lot of correctness and clarity. He further suggests that the same technique promotes the division of the market depending on the type of customer to enable smooth market operations.

Other studies suggest that conjoint analysis is a significant procedure in assessing patients' tastes. Basem *et al*. [25] affirm the same in their study, which embraced panel data using a sample of 16 full literature reviews.

The UK introduced a clause in its Health and Social care Act 2012 that all patients in the hospital should be part of their treatment pronouncements, and this was a mandate to the UK National Health Services Health and social care act [26]. Cunningham *et al*. [33] acknowledged that conjoint analysis was utilized in providing the patients the choice to settle on their perceptions and ideals for health actions.

A study in developed countries through secondary data reviewed showed that conjoint analysis preferably aids in understanding a patient's perception in regard to services offered; thus, the results can be used in developing favorable facility policies to accommodate clients Audrey *et al*. [27]**.**

Wittink and Cattin [28], in their research on the applicability of conjoint analysis among fifty-nine surveyed companies, revealed that thirty-eight percent of the 1062 observations conducted were in line with assessing prices of items. This is affirmed in a comparable research work by Wittink *et al*., Results and Critical Reflections [30], in the European market, where they realized that of the 956 observations, 46% were in regard to conjoint analysis.

The conjoint analysis enables a business enterprise to thrive in the competitive business environment by aiding the management team in methodically determining the relevant customers' likes and dislikes [29]. Products are therefore produced with the objective of satisfying customers' prerequisites**.**

3.2.4 TABULAR REPRESENTATION OF EMPIRICAL STUDIES ON ADVANCEMENTS IN CBA

Table 2: Summary of studies on advances in CBA and the applicability areas.

Author(s)	Applicability sector	Type of literature review	Contribution
McIntosh *et al*. [4]	Health care	Narrative review	Discusses the balance sheet approach, willingness to pay, and conjoint analysis. Concluding that nearly all economic valuations exhibit CBA. Empirical literature review.
Jan and Meyer [22]	Public Sector	A systematic review of the meta-analysis	Explains the use of the conjoint approach in establishing how government enhances employee morale. Evidence from the field.
Howlader [23]	Healthcare	Systematic review	Portrays how conjoint analysis application resulted in cost-effectiveness among hospital patients.
Kotri [24]	Marketing	Systematic review	Confirms the applicability of conjoint analysis in ranking customer preferences based on the features of a product. Evidence from the field.
Lin *et al*. [31]	Health care	Systematic review	Empirical literature review of the applicability of willingness to pay.
Haefeli *et al*. [16]	Health care	Quantitative study	Provides quantitative evidence on the applicability of willingness to pay.
Aidan and David [32]	Public Policy	Narrative review	Measures the extent to which willingness to pay is applied in understanding respondents' preference as regards policy features.
Basem *et al*. [24]	Health Care	Systematic review	Reports the use of conjoint analysis in predicting clients' taste in healthcare.
Cunningham *et al*. [33]	Health care	Narrative review	Discussion on the use of contingent analysis among patients.
Audrey *et al*. [33]	Health care	Systematic review	Literature Review on identifying patients' preferences using conjoint analysis.
Christoph *et al*. [18]	Marketing	Quantitative study	Applicability of conjoint and willingness to pay.
Wittink and Cattin [27]	Marketing	Quantitative study	Applicability of conjoint in product pricing.
Simona and Gyula [28]	Marketing	Quantitative study	Applicability of conjoint in determining customer's perceptions.

3.3 CRITICAL REVIEW

Research holds that the balance sheet approach is one of the advances in CBA [4], so the balance sheet approach is where costs are tabulated on one side while the gains are tabulated on another. However, this is a simplistic approach to redefining the meaning of cost-effectiveness. The balance sheet is a financial report which majorly performs the duty of portraying a company's equity and liabilities at a glance. Thus modeling it to imply a tradeoff between expenses and profits could be over-ambitious and may not form any strong foundation as an advancement of a CBA method. Therefore, portraying that a balance

sheet approach is a method of CBA is just but a mere language that may mean the act of offsetting costs and benefits in a balanced manner. Thus not a method to be considered.

Conjoint analysis, founded by Luce and Tukey [20] and advanced by Green and Rao [21], was intended to obtain as much relevant information from the clients as possible so that the method allows an indication of the product's limited attributes in a given combination where the customers are offered an opportunity to designate their preferences. The results are then run through a regression to arrive at the final utilities or the utility score. Though conjoint analysis has been widely accepted and tested empirically, it is a complex approach that every person may not apply. That is, the conjoint analysis presents the client with product features with a combination of the product level. For instance, a hypothetical situation of conjoint is presented here.

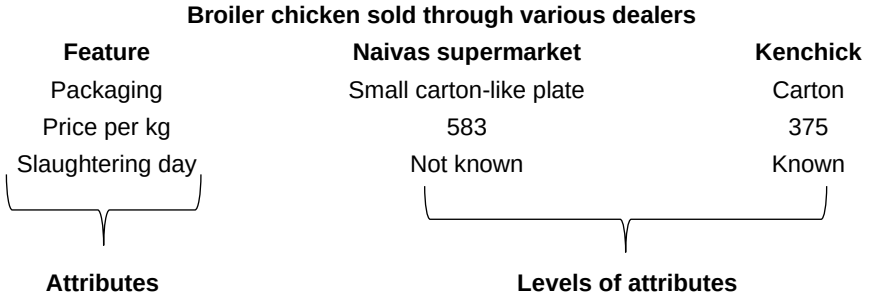

Figure 1: Conjoint hypothesized.

As portrayed in Figure 1, the product attributes are presented to the customer in combination with the product attribute levels. This then offers a client an in-depth set of combinations to choose from.

Based on the preceding, designing a conjoint technique is a real complication, particularly if the product has more features. Besides, respondents are already confined to choices; thus, their further perceptions are not applicable. That is, conjoint is tested at the individual level, and the model utilized in collecting data (see Figure 1) is such that it is uniformly applied across the study participants hence assuming that all the respondents have the same modeled preference. This does not match the real-life situation since individuals vary in their product feature preferences. Consequently, the same product attributes being tested via the use of conjoint could still be articulated in a questionnaire format or interview schedule to help collect data on customers' preferences. This is in line with Alpert [32], who reported that several alternate means exist for identifying the attributes relevant to consumers in forming their preferences. Kelly [33] confirms that focus group discussions or judgments of product managers, retailers and others knowledgeable about the product/service and its uses can be used for this purpose. Thus conjoint analysis should not be the finality in collecting customers' preferences due to its complexity.

4.0 RESULTS AND CONCLUSIONS

4.1 RESULTS ON THE HISTORICAL BACKGROUND OF CBA

Results from the historical backgrounds of CBA show mixed ideas on the origin of CBA. Part of the literature contends that the practice of CBA was commenced in France among French engineers in public works construction. Additionally, other studies show that CBA originated in the US in the 1938 American National Resource Committee report. On the hand, there is part of the literature that postulates that CBA originated in China in the 11th Century, then was evidenced among the Bavarian Army before the technique was officially documented in the US.

In view of the previous, this review documents the origin of CBA. CBA was first practiced in China in the 11th Century on the palace construction site. This then spread to the Bavarian Army, which also implemented the same technique. The French engineers embraced this technique in the execution of public works before the American National Resource Committee incorporated it. Additionally, it is true to conclude that CBA was authoritatively documented in the US in the green book by a sub-committee on benefits and costs where principles and procedures for determining costs and benefits were clarified for reference. Therefore, CBA was embraced by other countries upon its documentation by the US.

The finding of this systematic review is, therefore, unique in its way by clearly and chronologically putting forward the origin and development of CBA compared to other studies that partially discussed the origins of cost-effectiveness arguments.

4.2 RESULTS ON ADVANCEMENT IN METHODS OF CBA

Results show various advances in cost analysis methods, thus, balance sheet approach, willingness to pay, and conjoint analysis. The balance sheet approach determines profits and losses and apportions the proceeds to the respective persons/units. However, modeling a balance sheet to imply tradeoffs between expenses and profits could simply be over ambitious and may not form any strong foundation for advancement as a CBA method. Therefore, portraying that a balance sheet approach is a method of CBA is just but a mere language that may mean the act of offsetting costs and benefits in a balanced manner. Thus not a method to be considered.

Willingness to pay has been evidenced as a CBA method that is utilized in exhibiting the actual intention of clients in regard to how they value what they intend to purchase. So that the level of willingness they express to pay for a product feature expresses the degree to which they are ready to consume a particular product. Though in determining willingness to pay, conjoint analysis is utilized. That is, conjoint analysis is a CBA method that offers a client an array of characteristics of a product. Therefore, the individual can settle on the product's preferred features, which then advises the service provider or the manufacturer on the client's preference.

This study shows that designing a conjoint technique is complex. The target group in a study is already confined to the set of constructed attributes in conjoint schedules. Conjoint is tested at the individual level, and the model utilized in collecting data is uniformly applicable across the study participants with the assumption that all the respondents have the same modeled preference, which does not match the real-life situation since individuals vary in their product feature preference. Accordingly, information on product attributes could be provided via a questionnaire or interview schedule to determine customers' preferences.

Further, previous studies show that willingness to pay and conjoint analysis have been applied in various sectors of the economy (university setup, public sector, marketing, and health care). However, it is true to conclude that the majority of the studies applying willingness to pay and conjoint analysis have been in the marketing industry and profoundly in healthcare. Therefore, this study concludes that the advances in CBA can be applied in all sectors since they have been empirically tested. Besides, not all sectors apply for cost-benefit contemporary methods. The study recommends for application of CBA in totality alongside the implementation of other costing techniques.

AUTHOR CONTRIBUTIONS

RO participated in conceptualization, design, data collection, data analysis, interpretation, drafting article, critical revision of the article and, therefore, is the major contributor to writing this manuscript. JO is the supervisor who provided constant advice on the direction of the work and final examination as fit for academic research. Both authors read and approved the final manuscript.

CONFLICT OF INTEREST

None.

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REFERENCES

1. Jiang W, Rainer M, 2021. The origin of cost–benefit analysis: a comparative view of France and the US. Cost Effectiveness and Resource Allocation, 1-11. https://doi.org/10.1186/s12962-021-00330-3
2. Ijiri Y, 1975. Theory of Accounting Measurement. Studies in Accounting Research. https://lib.ugent.be/catalog/rug01:001210050
3. Kabir MH, 2005. Normative accounting theories. Dhaka University Journal of Business Studies, XXVI(1), 87-123. https://doi.org/10.2139/ssrn.765984
4. McIntosh E, Donaldson C, Ryan M, 1999. Recent Advances in the Methods of CBA in Healthcare. Pharmacoeconomics, 15(4), 357-367. https://doi.org/10.2165/00019053-199915040-00003
5. Johnson E, Haubl G, Keinan A, 2007. Aspect of endowment: a query theory of value construction. Journal of Experimental Psychology: Learning, Memory, and Cognition, 33, 461–474. https://doi.org/10.1037/0278-7393.33.3.461
6. Wong G, Greenhalgh T, Westhorp G, Buckingham J, Pawson R, 2013. RAMESES publication standards: Meta-narrative reviews. BMC Medicine, 11(20), 1741-7015. https://doi.org/10.1186/1741-7015-11-20
7. Laura M, 2022. Covidence. Retrieved from a Blog: The difference between a systematic review and a meta-analysis, https://www.covidence.org/blog/the-difference-between-a-systematic-review-and-a-meta-analysis/
8. Joseph P, 2001. Retrospectives CBA and the Classical Creed. Journal of Economic Perspectives, 15(4), 199-208.

https://doi.org/10.1257/jep.15.4.199
9. Porter T, 1995. Trust in numbers. The pursuit of objectivity in science and public life. Princeton University Press, Princeton NJ, xiv + 310. https://www.academia.edu/3035482/T_M_Porter_Trust_in_Numbers_The_Pursuit_of_Objectivity_in_Science_and_Public_Life
10. Pearce D, 1983. The Origins of CBA. In: CBA. Studies in Economics. https://doi.org/10.1007/978-1-349-17196-5_2
11. The Chicago Chapter of the American Statistical Association, 2011. History of Cost Benefit Analysis. Retrieved from https://community.amstat.org/zthechicagochapterold/calendar/pastevents/20052006/may52006conference/downloadpresentationshistoryofcostbenefitanalysis
12. Mishra A, 2020. What is CBA, it's history and usability. https://medium.com/@authorabhishek1206/what-is-cost-benefit-analysis-its-history-and-usability-b5e52aeb70ce
13. Carl K, Niek M, 2020. CBA. https://doi.org/10.1016/bs.atpp.2020.07.005
14. Quade ES, 1971. A history of cost effective analysis. The Rand Corporation, P4557. https://www.rand.org/pubs/papers/P4557.html
15. Lin P, Michael J, Lee D, Peter J, 2013. Willingness to pay for diagnostic technologies: A review of contingent valuation literature. International Society for Pharmaco Economics and Outcomes Research. https://doi.org/10.1016/j.jval.2013.04.005
16. Haefeli M, Achim E, McIntosh E, Gray A, Atul S, 2008. A CBA Using Contingent Valuation Techniques: A Feasibility Study in Spinal Surgery. Value in Health, II(4). https://doi.org/10.1111/j.1524-4733.2007.00282.x
17. Christoph B, Michael H, Thomas R, 2006. A review of methods for measuring willingness to pay. Innovative Marketing, 2(4). https://www.semanticscholar.org/paper/OF-METHODS-FOR-MEASURINGWILLINGNESS-TO-PAY-BreidertHahsler/1b627445a4ba39bf78fbc6666722433297adfbdf
18. Balderjahn I, 2003. Preisbereitschaft // H. Diller, A. Hermann (Eds.), Handbuch. https://doi.org/10.1007/978-3-642-00754-5_9
19. Luce R, Tukey J, 1964. Simultaneous conjoint measurement: A new type of fundamental measurement. 1, 1-27. https://doi.org/10.1016/0022-2496(64)90015-X
20. Green P, Rao V, 1971. Conjoint Measurement for Quantifying Judgmental Data. Journal of Marketing Research, 8, 355. https://doi/10.2307/3149575
21. Jan H, Meyer S, 2020. Merit Recruitment, Tenure Protections And Public Service Motivation: Evidence From A Conjoint Experiment With 7,300 Public Servants In Latin America, Africa And Eastern Europe. Public Administration. https://doi.org/10.1111/padm.12708
22. Howlader M, 2013. A Comparative CBA of Micro-Health Insurance Programmes in Bangladesh: Conjoint Analysis. Available at SSRN: https://ssrn.com/abstract=2364048
23. Kotri A, 2006. Analyzing customer value using conjoint analysis: the example of a packaging company. Research Papers in Economics. https://doi.org/10.2139/ssrn.950497
24. Basem A, Peter M, Angela B, 2021. Systematic Review of Studies Using Conjoint Analysis Techniques to Investigate Patients' Preferences Regarding Osteoarthritis Treatment. National Library of Medicine, 197-211. https://doi.org/10.2147/PPA.S287322
25. Health and Social Care Act, 2012. (n.d.). Retrieved from: https://www.legislation.gov.uk/ukpga/2012/7/contents/enacted
26. Audrey HL, Sock WN, Xin RT, Su MO, Sheamini SK, 2022. Conjoint analyses of patients' preferences for primary care: a systematic review. BMC Primary Care, 23, 234. https://doi.org/10.1186/s12875-022-01822-8
27. Wittink D, Cattin P, 1989. Commercial Use of Conjoint Analysis: An Update. 3, 41-52. https://doi.org/10.1177/0022242989053003
28. Simona BA, Gyula FL, 2012. Conjoint Analysis in Marketing Research. Journal of Electrical and Electronics Engineering, 5(1). https://www.scribd.com/document/407173236/Conjoint-Analysis-in-Marketing-Research-pdf
29. Wittink D, Vries M, Burhenne W, 1994. Commercial Use of Conjoint Analysis in Europe. International Journal of Research in Marketing, 11(1), 41-52. https://doi.org/10.1016/0167-8116(94)90033-7
30. Aidan R, David L, 2015. Policy Analysis. In: International Encyclopedia of the Social and Behavioral Sciences (Second Edition). https://www.sciencedirect.com/topics/social-sciences/policy-analysis
31. Alpert M, 1971. Definition of determinant attributes: A comparison of methods. Journal of Marketing Research, 8, 91-184. https://doi.org/10.2307/3149759
32. Kelly G, 1955. The psychology of personal constructs. Vol. 1. A theory of personality. Vol. 2. Clinical diagnosis and psychotherapy. WW Norton. https://psycnet.apa.org/record/1956-04524-000
33. Cunningham C, Deal K, Rimas H, 2008. Using conjoint analysis to model the preferences of different patient segments for attributes of patient-centered care. Patient, 1(4), 317-330. https://doi.org/10.2165/1312067-200801040-00013