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**COST-BENEFIT ANALYSIS METHODS IN THE
PUBLIC SECTOR**

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ABSTRACT FOR THESIS

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Abstract <p>Cost-benefit analysis is an economic analysis tool that can be used to support public decision making, when there are several mutually exclusive alternatives being considered. It compares the monetary value of the benefits resulting from a specific project or policy with the costs accrued by it. However, it would appear that it is currently used mainly for investment projects, and not for analyzing public services. This thesis is a literature study on the use of cost-benefit analysis in the public sector, with a focus on public service provision. The main objective of this study is to either verify or falsify the research gap regarding the initial assumption that there seems to be no existing research on how common the use of cost-benefit analysis is in public service provision. Other objectives include finding out how cost-benefit analysis can be used in evaluating the socio-economic impact of public decision making, and what kind of examples can be found on its applications in the public sector.</p> <p>The thesis presents the theoretical framework of cost-benefit analysis, including the basic steps in the typical cost-benefit analysis process, as well as its historical background and criticism regarding it. The alternative methods of cost-effectiveness analysis, cost-utility analysis and cost-minimization analysis are discussed briefly as well. Some of the leading institutions regarding the research and development of cost-benefit analysis methods are also presented. The Society for Benefit-Cost Analysis is one such institution. It publishes the Journal of Benefit-Cost Analysis, which is the only journal devoted exclusively to cost-benefit analysis. In addition, the European Commission's Guide to Cost-Benefit Analysis applies the international best practice on the use of cost-benefit analysis in investment-type projects.</p> <p>Some comments in various publications state that cost-benefit analysis is indeed underused and often even misused in public decision making, and that society would benefit if it was used to a greater extent. The literature study concludes with the analysis of two case studies. In the first study, a cost-benefit analysis was performed on the services of the Finnish Meteorological Institute, and it was found to produce approximately five times as much benefits to the society compared to its costs. The second study examined the use of cost-benefit analysis in Finnish place-making policies, and discovered that it was applied incorrectly by public officials in this case.</p> <p>The research gap is verified, as there does not seem to be any comprehensive research on how common the use of cost-benefit analysis is in public service provision as a whole. However, some publications do hint that it is underused in public decision making. Thus, there is a need for further research on its use in public service provision.</p>			
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TIIVISTELMÄ

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<p>Tiivistelmä</p> <p>Kustannus-hyötyanalyysi on taloustieteellinen työkalu, jota voidaan käyttää tukemaan julkista päätöksentekoa, kun arvioitavana on useita toisensa poissulkevia vaihtoehtoja. Siinä vertaillaan jonkin projektin tai politiikan seurauksena syntyviä rahassa mitattuja hyötyjä sen aiheuttamiin kustannuksiin nähden. Tällä hetkellä sitä tosin ilmeisesti käytetään lähinnä vain investointiprojekteihin, eikä julkisten palveluiden analysointiin. Tämä kandidaatintyö on kirjallisuuskatsaus kustannus-hyötyanalyysin käytöstä julkisella sektorilla, keskittyen julkisiin palveluihin. Tutkimuksen päätavoitteena on osoittaa joko todeksi tai vääräksi tutkimusaukko koskien sitä alkuolettamusta, että kustannus-hyötyanalyysin käytön yleisyydestä julkisen sektorin palvelutuotannossa ei vaikuta olevan olemassaolevaa tutkimusta. Muihin tavoitteisiin kuuluu selvittää, että miten kustannus-hyötyanalyysiä voidaan käyttää julkisen päätöksenteon sosioekonomisen vaikuttavaan arviointiin, ja että minkälaisia esimerkkejä sen käytöstä löytyy julkiseen sektoriin liittyen.</p> <p>Kandidaatintyössä esitetään kustannus-hyötyanalyysin teoreettinen viitekehys, sisältäen tyypillisen kustannus-hyötyanalyysiprosessin vaiheet, sekä sen historiallista taustaa ja kritiikkiä. Kustannus-hyötyanalyysin vaihtoehtoisista menetelmistä esitellään lyhyesti kustannus-vaikuttavuusanalyysi, kustannus-utiliteettianalyysi ja kustannusten minimointianalyysi. Työssä käsitellään myös joitakin johtavia instituutioita kustannus-hyötyanalyysin menetelmien tutkimukseen ja kehitykseen liittyen. Society for Benefit-Cost Analysis –järjestö on yksi tällainen instituutio. Se julkaisee Journal of Benefit-Cost Analysis –nimistä lehteä, joka on ainoa täysin kustannus-hyötyanalyysille omistettu lehti. Tämän lisäksi Euroopan komissio on julkaissut kustannus-hyötyanalyysiä koskevan oppaan, joka hyödyntää parhaita kansainvälisiä käytäntöjä kustannus-hyötyanalyysin soveltamisesta investointityyppisissä projekteissa.</p> <p>Erinäisissä julkaisuissa esitettyjen kommenttien mukaan kustannus-hyötyanalyysiä käytetään liian vähän julkisessa päätöksenteossa, ja joskus sitä on sovellettu siinä myös väärin. Näiden kommenttien mukaan yhteiskunta hyötyisi, jos sitä käytettäisiin laajemmin. Kirjallisuuskatsaus päätetään kahden case-tutkimuksen analyysillä. Ensimmäisessä tutkimuksessa oli suoritettu kustannus-hyötyanalyysi Ilmatieteen laitoksen palveluihin liittyen, ja niiden oli todettu tuovan yhteiskunnalle noin viisinkertaisen hyödyn niiden kustannuksiin nähden. Toinen tutkimus oli käsitellyt kustannus-hyötyanalyysin käyttöä Suomen alueellistamispolitiikassa, ja siinä oli selvinnyt, että virkamiehet olivat soveltaneet kustannus-hyötyanalyysiä väärin tässä tapauksessa.</p> <p>Tutkimusaukko on vahvistettu, sillä kustannus-hyötyanalyysin käytön yleisyydestä julkisessa palvelutuotannossa ei vaikuta olevan mitään kattavaa tutkimusta. Jotkin julkaisut kuitenkin vihjaavat, että se olisi alikäytetty julkisessa päätöksenteossa. Näin ollen on vielä tarvetta lisätutkimukselle sen käytöstä julkisessa palvelutuotannossa.</p>			
Muita tietoja			

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1 INTRODUCTION

1.1 Background

At the time of writing, the Finnish government is set to run a budget deficit for the eighth year in a row. Since the year 2008, the general government excessive deficit procedure (EDP) debt, including both central and local government debt as well as social security funds' debt, has pretty much doubled to a total of EUR 121.8 billion by the end of 2014 [Statistics Finland 2015a; Statistics Finland 2015b]. This amount of debt is 59.3 % relative to gross domestic product (GDP) [Statistics Finland 2015b]. At the same time, the Finnish general government spending as a percentage of GDP is one of the largest in the OECD countries, at 57.4 % relative to GDP in 2013. For comparison, in Sweden the ratio was 52.4 %, in Germany 44.1 % and in the USA 38.8 %. [OECD 2016]

A more comprehensive comparison of general government spending by country can be seen in Figure 1 below.

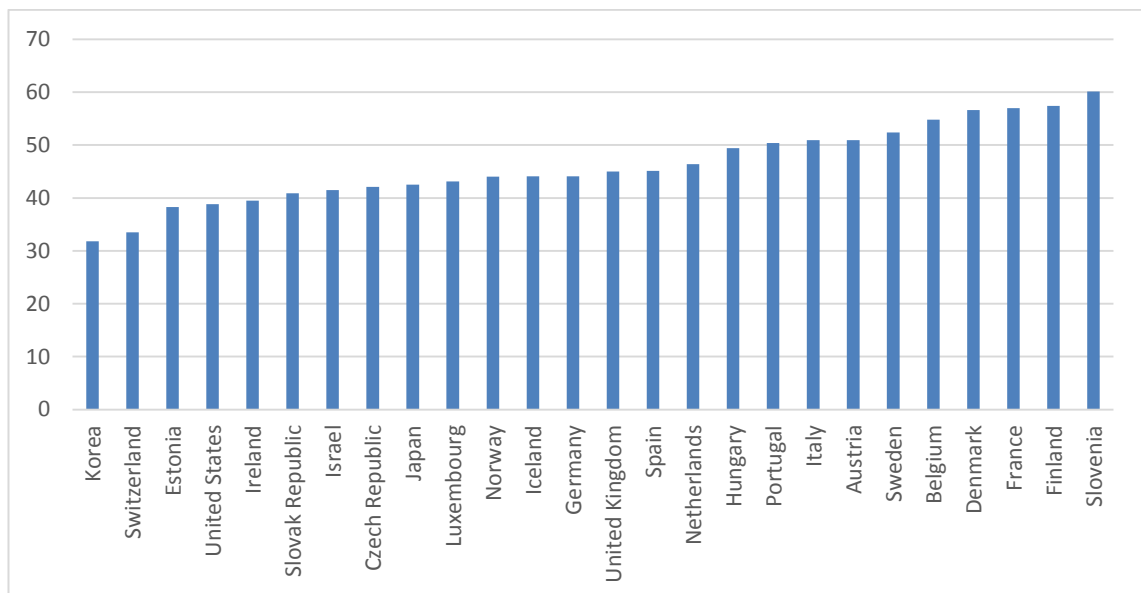


Figure 1. General government spending by country as a percentage of GDP in 2013. [OECD 2016]

The current Finnish government is under heavy pressure to cut spending and to eventually stop the debt level from increasing further. This leads to the inevitable conclusion that the Finnish public sector needs to be streamlined while still producing

services that provide as much benefit as possible with the scarce resources that are available to it. As many nations across the world are facing similar problems, this issue is relevant across the globe, not just in Finland.

Cost-benefit analysis (CBA), sometimes also called benefit-cost analysis (BCA), is one tool that can help government work more efficiently and effectively. In short, CBA is a tool for assessing the social impact of specific policies and projects. It weighs the benefits resulting from the policy against the costs accrued by it. The next subchapter provides a clearer picture on the objectives and scope of this thesis.

1.2 Objectives and scope

This thesis is a literature study on cost-benefit analysis and its applications within the public sector, focusing on public service provision. There is a shortage of decision-making support tools that could be used to determine if public services are producing enough benefits for the society in order to justify their cost. Systems for recognizing and validating the right choices in service delivery and evaluation have not been comprehensively established. The nature of CBA enables it to be used in many applications in the public sector, but it would appear that it is currently used mainly for investment projects. If this is true, there seems to be a research gap in the cost-benefit analysis of public services. The research problem and main scope of this thesis is to either verify or falsify this research gap. The research questions for this thesis are:

RQ1: How can CBA be used in evaluating the socio-economic impact of public decision making?

RQ2: What kind of examples can be found in literature about the use of CBA in the public sector?

The structure of the thesis is as follows. Chapter 2 provides a brief summary of the theory behind CBA, the historical background and criticism regarding it, as well as alternative methods closely related to CBA. The next chapter studies some of the leading institutions in CBA research, and the use of CBA within the public sector, including case examples of CBA applications in the public sector. Chapter 4 includes

discussion on the researcher's own observations and views on the findings of the study. Finally, Chapter 5 provides a summary of the research.

The results will support a wider research entity related to the socio-economic impact of public agencies, led by one of the instructors of this study.

2 COST-BENEFIT ANALYSIS

2.1 Definition

According to Boardman et al. (2006), “CBA is a policy assessment method that quantifies in monetary terms the value of all consequences of a policy to all members of society.” The purpose of CBA is to assist in social decision making by providing a tool for allocating society’s resources in an efficient manner. In other words, it is used to weigh the benefits and costs associated with a policy in order to determine its net social benefits and thus the desirability of the policy. Net social benefits are used to measure the value of a policy and it is defined in equation (1) below:

$$\text{NSB} = \text{B} - \text{C}, \quad (1)$$

in which NSB is the net social benefits,
 B is the social benefits, and
 C is the social costs.

There are two major types of CBA: *ex ante* and *ex post*. *Ex ante* CBA is the standard form of CBA and it is used to assess policies while they are still under consideration and not yet implemented. *Ex post* CBA, on the other hand, examines projects after they have already been completed. *Ex ante* CBA helps policy makers in deciding whether to launch a specific project or not, while *ex post* CBA is useful as a learning tool for similar projects in the future. Since it is extremely difficult to estimate the actual impacts of a project before launching it, *ex post* analyses tend to be more accurate compared to *ex ante* analyses. (Boardman et al. 2006)

Another form of CBA is *in medias res*, which examines projects while they are in progress, but not yet finished. It can be used to determine whether a specific project should be continued or not, and to provide useful information for predicting costs and benefits in future *ex ante* analyses. However, it is far more common for service-orientated programs to get cancelled as a result of *in medias res* analysis compared to physical investment projects, such as bridges. The fourth class of CBA is the *ex ante / ex post* or *ex ante / in medias res* comparison, which compares *ex ante* CBA with either

ex post CBA or *in medias res* CBA of the same project. It is useful for learning about the efficacy of CBA as decision-making and evaluative tool. (Boardman et al. 2006)

2.2 Description of the cost-benefit analysis process

According to Boardman et al. (2006), the basic steps of cost-benefit analysis are:

1. Specify the set of alternative projects
2. Decide whose benefits and costs count
3. Catalogue the impacts and select measurement indicators
4. Predict the impacts quantitatively over the life of the project
5. Monetize all impacts
6. Discount benefits and costs to obtain present values
7. Compute the net present value of each alternative
8. Perform sensitivity analysis
9. Make a recommendation

The first step involves specifying the set of alternative projects to be considered in the analysis, for example a highway with tolls and one without. This step can prove difficult, since there are often a huge number of potential alternatives. A highway could vary on many dimensions, such as road surface, number of lanes, and wild animal friendliness. In practice, however, individuals can only handle four to seven alternatives at most. Typically less than six alternatives are analyzed due to resource and cognitive constraints. Usually the status quo is also considered as one of the alternatives. In the case of the highway example, the status quo is the same as the highway not being built. Sometimes the status quo is not a viable alternative, though. If the project displaces a specific alternative rather than a hypothetical one, the project should be compared to this specific displaced project instead of the status quo. This could be relevant if the government had already committed resources to do either a highway or a railway project. In this instance, it is not possible to maintain the status quo, so the highway project must be compared to the railway project. (Boardman et al. 2006)

In the next step, the analyst must decide whose benefits and costs should be counted. This means the individuals who have standing with respect to the project. This can be done from a global, national, provincial, or local perspective. For instance, the

provincial perspective takes into account the costs and benefits of the residents of a particular state, possibly including the state government as well. The global perspective considers the costs and benefits affecting everyone, regardless of where they live. Usually governments only take the national or local perspective into account, even though environmental issues can often have global effects. (Boardman et al. 2006)

In task 3, the physical impacts of the alternatives are listed as costs or benefits (e.g. time saved, accidents avoided). Only impacts that have value to human beings are counted. When identifying and cataloguing potentially important impact categories, the measurement indicators also need to be specified for these categories. Some examples of measurement indicators are the number of lives saved per year, the number of person-hours of travel time saved, and the dollar value of gasoline saved. The choice of the indicator depends on data availability and ease of monetization. (Boardman et al. 2006)

Next, the impacts are predicted quantitatively over the life of the project. All impacts for each alternative in each time period (e.g. each year) must be quantified. Making predictions is often difficult, since people tend to respond to the project in unexpected ways. Another point is that the project might also affect the behavior of third parties, thus changing the estimated costs and benefits of the project. A third concern is that prediction may require scientific knowledge that is uncertain, such as the magnitude of the temperature increases caused by global warming. (Boardman et al. 2006)

A monetary value must then be attached on each of the impacts. These estimates should ideally be specific to the region in question. In practice, previous research is often used as a basis for these values. CBA analysts can also try to determine the appropriate values themselves, but this can be very time-consuming. Many important impacts are difficult to value, however. Environmental impacts are an example of this. Usually values are measured in terms of willingness-to-pay. If no one is willing to pay for a specific impact, then that impact has zero value. (Boardman et al. 2006)

In task 6, future benefits and costs are discounted in relation to present benefits and costs in order to obtain their present values. This is done because most people usually prefer to consume now rather than later. In addition, there is an opportunity cost when resources are spent in order to consume in the present. Even though discounting doesn't really have anything to do with inflation, inflation must still be taken into account.

However, the choice of an appropriate social discount rate is debatable, though government analysts must usually use a rate mandated by a government agency with the proper authority (e.g. the ministry of finance). A social discount rate of 3,5 % is recommended if the impacts of the project do not extend beyond 50 years. The present value of the benefits is defined in equation (2):

$$PV(B) = \sum_{t=0}^n \frac{B_t}{(1+s)^t} \quad (2)$$

in which $PV(B)$ is the present value of the benefits,
 B_t is the benefits that occur in year t ,
 n is the life of the project in years, and
 s is the social discount rate. (Boardman et al. 2006)

Similarly, equation (3) defines the present value of the costs:

$$PV(C) = \sum_{t=0}^n \frac{C_t}{(1+s)^t} \quad (3)$$

in which $PV(C)$ is the present value of the costs, and
 C_t is the costs that occur in year t . (Boardman et al. 2006)

Step 7 involves computing the net present value of each alternative. In short, a project should be adopted if its net present value is positive. If there is more than one alternative to the status quo, the alternative with the highest net present value should be adopted (assuming that at least one alternative has a positive net present value). If none of the alternatives has a positive net present value, then the status quo should remain in place. It should also be noted that the net social benefits of a project are equal to the present value of its net social benefits. The internal rate of return and the benefit-cost ratio have been proposed as alternative decision rules, but these sometimes give incorrect answers, while the net present value rule does not. Thus, the net present value rule is the appropriate method to use. The net present value of a project is defined in equation (4):

$$NPV = PV(B) - PV(C), \quad (4)$$

in which NPV is the net present value of the project. (Boardman et al. 2006)

A sensitivity analysis needs to be performed before making a final recommendation, since there can be substantial uncertainty regarding the predicted impacts and the monetary valuations for them. Some points of uncertainty could be the predicted number of lives saved and the valuation of a life. The analyst might also be uncertain about the social discount rate or the level of standing used in the analysis. Sensitivity analysis attempts to deal with these uncertainties. As an example, a sensitivity analysis on the standing issue could be performed by calculating the net present values from both the global and the provincial perspectives. As the assumptions can be varied in a vast number of ways (some even infinitely), the analyst needs to use good judgment and focus on the potentially most important assumptions. There is a danger that the analysis becomes vulnerable to the biases of the analyst, so carefully thought-out scenarios should be used instead of mindlessly varying the assumptions. (Boardman et al. 2006)

Finally, the analyst makes a recommendation on the best alternative based on the largest net present value and the sensitivity analysis. The sensitivity analysis might have revealed that the alternative with the highest net present value is not necessarily the best course of action under all circumstances. It is important to note that CBA analysts make recommendations, not decisions. CBA is normative, meaning that it gives information on how resources should be allocated, but not on how resource allocation decisions are actually made. CBA does not always succeed, and it is merely one input in the public decision-making process. Often politicians also tend to give the cold shoulder to economic arguments. (Boardman et al. 2006)

2.3 Historical background

The two underlying concepts behind CBA are called consumer surplus and externality. Jules Dupuit first came up with the concept of consumer surplus in 1844, stating that the benefits to the users of roads and bridges in France exceeded the cost of the tolls they had to pay in order to use them. Then in the 1920s, Arthur Cecil Pigou introduced the concept of externality by claiming that there is a difference between private economic production and public economic product. (Mishan & Quah 2007)

The next step for CBA was the enactment of the US Flood Control Act in 1936, which stated that any flood control project should be considered desirable if the benefits to the people affected by it are greater than the estimated costs. This led to the assessment of projects based on their social impact, and not only on financials. However, there was a lack of specific and concrete guidelines, resulting in inconsistent practices at the related agencies. Thus, in 1946, an interagency group called the US Federal Inter-Agency River Basin Committee's Subcommittee on Benefits and Costs was formed to come up with consistent standards and guidelines for the agencies. The group's work resulted in a document called Proposed Practices for Economic Analyses of River Basin Projects, also known as the Green Book, released in 1950 and revised in 1958. Another important publication was the Budget Circular A-47 by the Bureau of Budget in 1952. (Mishan & Quah 2007)

These documents also sparked academic interest, and a firm theoretical framework for CBA was established in 1958 based on publications by the economists Otto Eckstein, John Krutilla and Ronald McKean. In the 1960s, research on CBA was accelerating, and CBA was becoming more widespread as governments in the US, Canada and the UK started to require it for some policies and projects. Even some international organizations, such as the OECD, the UN and the World Bank, adopted CBA in 1969, 1972 and 1975, respectively. (Mishan & Quah 2007)

In 1981, US President Ronald Reagan issued Executive Order 12291, which essentially mandated the use of CBA in the form of Regulatory Impact Analyses for regulations that have an impact of at least \$100 million on the economy. In 1993, it was replaced with Executive Order 12866 by President Bill Clinton. The new order is similar to the old one and continues the commitment to CBA. (Mishan & Quah 2007; Boardman et al. 2006)

2.4 Criticism

Critics argue that it is immoral to place a monetary value on human life (Ackermann & Heinzerling 2002; Frank 2000). Some also say that CBA is too rooted in utilitarianism (Frank 2000; Kelman 1981). However, since this is a world of scarcity and there is only so much money for public officials to spend, it is important to use that money efficiently by choosing the alternatives that prevent the most deaths and injuries. Sometimes hard

choices have to be made, and cost-benefit analysis can help in finding the best decision in these situations. (Frank 2000)

Another criticism has to do with incommensurability. It relates to the fact that in CBA the pros and cons of an action have to be placed on a common footing by giving them a monetary value, even for things that are not normally considered in terms of money (Frank 2000; Kelman 1981). The argument is that, for example, if a power plant pollutes the air, the gains from the cheap power can't be compared in monetary terms to the loss of a pristine landscape. Supporters of cost-benefit analysis admit that comparing disparate categories is immensely difficult in practice, but critics insist that such comparisons are impossible even in principle. But scarcity is all about difficult trade-offs. In order to gain something, we usually have to give up something else. If the power plant would cut the price of energy in half, and its only negative effect was that it degraded the view for just one 15-second interval each decade, then the project would clearly be hard to resist. Any technology that is better than the status quo should be regarded as an improvement. (Frank 2000)

The practice of using prevailing interest rates in discounting future amounts for costs and benefits and converting them to present value is also seen as problematic. For example, in environmental protection the benefits are often realized much later than the costs. The costs today and the benefits tomorrow can affect different generations when dealing with large time spans. A low discount rate increases the relative importance of the future compared to the present, and vice versa. Climate damages, radioactive waste and other environmental problems are practically invisible at high discount rates, but have a high impact at low rates. (Ackermann 2008)

In addition, distributional issues have been a favorite target for critics of cost-benefit analysis. The objection is that since willingness to pay is based on income, cost-benefit analysis assigns inexcusably large decision weight to high-income individuals. This position implies that everyone should have the same amount of say in policy decisions, regardless of income. But it is not clear that poor people themselves would want policy decisions to be made on any other basis besides willingness to pay. However, critics are correct that the un-weighted willingness-to-pay measures used in cost-benefit analysis tend to result in a mix of public programs that are slanted in favor of the preferences of the rich. But instead of abandoning cost-benefit analysis altogether, one possible

solution to this problem is to use the welfare and tax system to compensate low-income people ex-ante for any resulting harm. (Frank 2000)

2.5 Alternatives to cost-benefit analysis

Cost-benefit analysis is not the only analysis method used to support public decision making. Some of its closely related alternatives are briefly discussed below.

2.5.1 Cost-effectiveness analysis

Cost-effectiveness analysis (CEA) relates the costs of a program to its key outcomes or benefits. It places a monetary value on the costs, but not on the benefits, so it differs from CBA in that aspect. The program's cost-effectiveness ratio is obtained by dividing the costs with specific measures of program effectiveness called units of effectiveness. Units of effectiveness are a measure of any quantifiable outcome key to the objectives of the program. For example, in a high school dropout prevention program, the number of dropouts prevented would be considered the unit of effectiveness. The cost-effectiveness ratio would then be interpreted as money spent per each prevented dropout. (Cellini & Kee 2010)

2.5.2 Cost-utility analysis

Cost-utility analysis (CUA) can be used in the healthcare industry for making decisions about allocating health resources. In CUA, the outcomes of alternative programs are expressed as a utility-based unit of measurement. In this case, utility refers to a person's subjective level of well-being that they experience in different states of health. Quality-adjusted life-year (QALY) is a widely used unit of measurement in CUA. The QALYs resulting from a program are calculated by combining the number of gained additional life years with a measure of the quality of life in each of these years to obtain a composite index of outcome. The alternative programs can then be compared based on the cost per QALY gained. However, critics argue that CUA discriminates against elderly people, and that it makes illegitimate interpersonal comparisons. (Robinson 1993)

2.5.3 Cost-minimization analysis

Cost-minimization analysis (CMA) measures and compares the input costs of different alternatives, and assumes outcomes to be equivalent. The optimal choice is the one with the lowest cost. However, since the outcomes must be equivalent, the types of programs that can be evaluated with CMA are limited. One example of CMA is comparing generic alternatives of the same drug entity. If the alternatives have the same chemical components, dose, and pharmaceutical properties, then their outcomes should be the same and only the cost of the medication needs to be compared. Another application of CMA could be measuring the costs of receiving the same medication in different settings. For example, it can be used to compare the costs of receiving intravenous antibiotics in a hospital versus receiving the same antibiotics at home via a home health care service. (Rascati 2013)

3 APPLICATIONS OF COST-BENEFIT ANALYSIS IN THE PUBLIC SECTOR

3.1 Comments on the use of cost-benefit analysis in public decision making

Pursiainen (2015) suggests that the annual reports published by the Finnish government should be based on cost-benefit analysis. There was no sign of the use of CBA in the government's annual report for 2014, and the report only focuses on listing the actions taken by the government and their use of resources. There is no information on how these actions affect the society. However, cost-benefit analysis could be used to justify that the objectives and policies practiced by the government truly produce well-being for the citizens. This kind of information would be much more relevant to the public. The reporting should be more precise, and it should include clearly defined objectives, as well as a sound explanation on how the objectives can be achieved with the chosen courses of actions. The alleged success of a policy should be rationalized in a convincing manner. (Pursiainen 2015)

For example, the government's annual report for 2014 states what kind of activities, such as inspections, have been done and how much resources have been spent in fighting black market activities. But there is no information on what kind of economic benefit these actions have produced, or what was done to estimate the effectiveness of the actions. Another example from the report deals with controlling unemployment. The report merely lists some vague actions taken by the government, such as activating young people and investing in the quality of working life, and loosely connects these actions to statistics. The report does not say what kind of effect on employment the government hopes to achieve with these actions, or why the used methods would accomplish them. Also, there are no references to actual research data in the report. (Pursiainen 2015)

Wiberg (2004) also calls for the use of CBA in public decision making. Argumentation in public discussion often somewhat resembles cost-benefit analysis, but usually costs and benefits are not evaluated in a balanced manner. Instead, one is usually emphasized over the other in order to justify the person's own point of view based on preconceived notions. For example, supporters of nuclear power tend to highlight its good sides, such

as reliable power production, while critics only talk about the devastating effects of nuclear accidents. Supporters rarely list the negative effects, just like critics never mention the positive. However, when used correctly, CBA is a good tool for supporting public decision making. In proper CBA, the benefits and costs just need to be evaluated in a balanced and objective manner before coming to a conclusion on which course of action to take. The decision maker's pre-existing opinions must not impact the decision. (Wiberg 2004)

In general, public agencies have a tendency of calculating some of the costs and benefits, while ignoring others (Adler & Posner 1999). There is also an emphasis on effectiveness with relatively little examination of the related questions of efficiency and cost-effectiveness, and this partly reflects the infancy of CBA in the public sector (Davies et al. 2000).

Though not directly related to CBA, the productivity and effectiveness of public services is one of the main research themes of the Finnish VATT Institute for Economic Research (Valtion taloudellinen tutkimuskeskus VATT 2016; VATT Institute for Economic Research 2016). Some attention has also been paid to the quality of public services. For example, the European Union has developed a tool called the Common Assessment Framework (CAF), which is a total quality management tool designed specifically for public sector organizations (European Institute of Public Administration 2016). CAF is used in over 4000 organizations across Europe, and in 2014 it was also the most widely used quality framework in the Finnish public sector (Valtiokonttori 2016).

3.2 Research and development of cost-benefit analysis methodologies

This chapter presents some of the leading and most relevant institutions regarding CBA methodology development.

3.2.1 Society for Benefit-Cost Analysis

The Society for Benefit-Cost Analysis is an international association that works to improve the theory and practice of benefit-cost analysis as well as support evidence-based policy decisions. It was founded in 2007 by the Benefit-Cost Analysis Center at the Evans School of Public Policy and Governance at the University of Washington.

The society covers various policy areas, such as criminal justice, education, energy, environmental quality, homeland security, poverty, public health, transportation, etc. However, their methods are not limited to cost-benefit analysis alone. They also work with cost-effectiveness analysis, risk-benefit analysis, applied welfare economic analysis, and damage assessments. (Society for Benefit-Cost Analysis 2015)

The primary goals of the association include:

- *“Bringing together individuals from diverse disciplines and from different countries and providing them opportunities to foster collaboration and exchange information, ideas, and methodologies related to the practice and theory of benefit-cost analysis and applied welfare economics*
- *Encouraging applications of benefit-cost analysis and applied welfare economics, and promoting dialogue between practitioners and others who are interested in benefit-cost analysis*
- *Facilitating the development and dissemination of knowledge about benefit-cost and applied welfare analysis methods and applications*
- *Developing and updating standards of practice for benefit-cost analysis and applied welfare economics*
- *Fostering methods to improve communication and consideration of benefit-cost methods and results”* (Society for Benefit-Cost Analysis 2015)

The Society for Benefit-Cost Analysis also publishes the Journal of Benefit-Cost Analysis, which is the only journal devoted exclusively to benefit-cost analysis. The journal includes theory, empirical analyses, case studies, and techniques. Its mission is to expand the use of serious, state-of-the-art CBA. (Cambridge University Press 2016)

3.2.2 The European Commission’s Guide to Cost-Benefit Analysis

In December 2014, the European Commission released the updated Guide to Cost-Benefit Analysis of Investment Projects for Cohesion Policy 2014-2020. The guide was prepared with the help of consultants and an organization called JASPERS. The use of the guide is mandatory for all projects submitted to the European Structural and Investment Funds in 2014-2020. The updated guide builds on the original guide for the period 2007-2013, as well as the experience gained during the preparation and appraisal of major projects during that time. The guide aims to provide practical

recommendations and case studies for the authorities and consultants involved in major projects. It takes into account recent developments in international best practice. (European Commission 2014)

3.3 Case examples

The evaluation of road projects is one example of where CBA has been consistently applied in the Finnish public sector (Antikainen & Siivonen 2003; Laakso & Kostiainen 2009). In addition, the following case studies were found in the literature study to examine the use of CBA in some other areas of the public sector as well.

3.3.1 The effectiveness of the Finnish Meteorological Institute's services

In this comprehensive study, a cost-benefit analysis was performed on the services of the Finnish Meteorological Institute. The meteorological services were examined with industry-specific evaluations on traffic, logistics, construction, real estate management, energy production, and agricultural production. The study started with a literature review on the effectiveness evaluations of meteorological services on traffic. About 100 such publications were reviewed, half of which were analyzed in more detail. The evaluations were supplemented with statistics and interviews. Although a lot of publications were found on the effects of meteorological information services on road traffic, literature had little significance with some other sectors, such as logistics and construction. These sectors relied more on interviews with professionals. (Hautala & Leviäkangas 2007)

The study itself identified many benefits for the society as a whole. More accurate weather forecasting reduces the need to salt roads in order to melt ice, thus resulting in environmental benefits. The services also increase safety in traffic, for example. Other significant benefits include time savings, as well as reduced maintenance, investment and quality costs. All in all, the benefits are largely based on better planning and anticipation for various activities and accidents, resulting in reduced damages and other harm. In order to determine the costs for the cost-benefit analysis, the authors used the actual costs of the Finnish Meteorological Institute for the year 2005. These costs consisted of weather services (6,43 M€), research and development (16,52 M€), customer service (12,45 M€), technical services (9,33 M€), and administration (9,62 M€), resulting in a total cost of 54,35 M€. The authors placed monetary values on the

benefits based mostly on estimates by professionals, though commonly established values were found for some of the benefits. The study used the Finnish Transport Agency's unit values for traffic accident costs and time savings. For example, a human life was valued at 1,752 M€. (Hautala & Leviäkangas 2007)

The total combined benefits of the Finnish Meteorological Institute's services were estimated to be 265-285 M€ per year for the industries examined. For example, cost-savings of over 100 M€ are attained by preventing slipping accidents from happening to pedestrians and bikers. However, it was not possible to value all of the benefits in monetary terms, and many industries and functions were left outside the study. Nevertheless, these total benefits are five times larger than the total costs of 54,32 M€. The results indicate that meteorological services are beneficial to society and that their development is worth investing in. This benefit-cost ratio is similar to ones calculated for national meteorological institutes in other studies. (Hautala & Leviäkangas 2007)

Perrels et al. (2013) also studied the socio-economic benefits of weather and climate services in various countries, and found out that the cost-benefit ratio of a national meteorological service is around 1:3 to 1:10.

The theoretical maximum for potential additional benefits was estimated to be 166-283 M€. Achieving these additional benefits would require significant improvements in the services and their delivery, as well as more investments. The study also gave several concrete improvement recommendations for the institute. The benefits of meteorological services depend on the utilization rate, accessibility and effectiveness of the services. TV, radio and the internet are good mass channels for providing weather information to the public, but personalized and tailor-made commercial weather applications can be used to produce even more benefits. In the future, the benefits of meteorological services will only increase if extreme weather phenomena get more common as a result of climate change. (Hautala & Leviäkangas 2007)

3.3.2 Evaluation of place-making policies in Finland

Place-making policies are one of the rare instances, in which CBA has been used in Finnish public decision making. The Ministry of Finance had a specific cost-benefit framework developed for this purpose. In this context, place-making means relocating public administration functions or agencies to areas outside the Helsinki capital region.

Direct cost savings as well as broader societal benefits are the objectives of place-making policies. (Pursiainen 2014)

The framework first considers the costs for the transitional period after a decision is made. These costs could be, for example, severance pay or the costs of relocating the staff. The next step is to calculate the costs and benefits after the transitional period. These costs and benefits are considered in terms of three aspects: the organization being relocated, the initial and the destination region, and the society as a whole. The net effect of the place-making actions is the sum of all these factors. (Pursiainen 2013)

However, this cost-benefit framework has been criticized as being invalid. In the framework, some effects that are not actually costs are listed as costs, and some effects that are not actually benefits are listed as benefits. The system emphasizes uncertain and elusive benefits instead of certain and direct benefits. Another error is that it exaggerates the positive effects in the target area of the relocation at the expense of the area the functions are moved from. CBA principles also require that the costs and benefits are allocated to individuals instead of regions or organizations in general, like the framework does. (Pursiainen 2013; Pursiainen 2014)

4 DISCUSSION

It would seem that there is no comprehensive research on how common the use of CBA is in public service appraisal as a whole, and thus the research gap was verified. There is clearly a need for further research on the use of CBA in public service provision, though some publications do already hint that CBA is underused in public decision making. Sometimes it is also applied incorrectly by public officials (Adler & Posner 1999; Pursiainen 2014). The scarcity of existing research on the use of CBA in public service provision made the author's work somewhat difficult, but on the other hand, the verification of the research gap is an important achievement in itself. Based on the findings of this study, the answers to the research questions are as follows.

RQ1: CBA can be applied in order to make an economic evaluation of whether a specific public policy or service should be implemented or not. If there are several mutually exclusive alternatives, CBA can be used to make a recommendation on which alternative to select. The basic steps of the CBA process, according to Boardman et al. (2006), are listed below.

1. Specify the set of alternative projects
2. Decide whose benefits and costs count
3. Catalogue the impacts and select measurement indicators
4. Predict the impacts quantitatively over the life of the project
5. Monetize all impacts
6. Discount benefits and costs to obtain present values
7. Compute the net present value of each alternative
8. Perform sensitivity analysis
9. Make a recommendation

RQ2: It looks like CBA is currently used mostly for investment-type projects. For example, CBA has been typically applied in the evaluation of road projects in the Finnish public sector (Antikainen & Siivonen 2003; Laakso & Kostainen 2009). However, some CBA studies were also found in public service provision, but they were limited to individual service sectors, such as meteorological services. One case study determined that the Finnish Meteorological Institute produces 265-285 M€ of benefits annually to the society, while its costs are only 54,32 M€ per year (Hautala &

Leviäkangas 2007). Another study evaluated the meteorological institutes in various countries and indicated that they produce a cost-benefit ratio of between 1:3 and 1:10 (Perrels et. al 2013). A case study was also found about the use of CBA in Finnish place-making policies. This study pointed out major flaws in the CBA tool developed by the public officials, and stated that it was not based on proper CBA methodology (Pursiainen 2014).

According to the findings, society as a whole would benefit if CBA was used to a larger extent in public service provision in order to determine which services are truly beneficial to society, and thus worth the scarce resources spent on them. It should be noted that many of the CBA case studies were done by external researchers, and were thus merely studies of already completed projects or ongoing services. In order to be an effective tool in public policy making, CBA also needs to be used by the public officials responsible for decision making. However, qualified professionals should be hired to develop the CBA tools themselves, since it is important that correct economic principles are used in them (Pursiainen 2014). The tools do not provide accurate information for decision making, if they just slightly resemble CBA, and the fundamentals behind them are flawed.

Even though CBA itself does not seem to be widely used in public service provision or research related to it, the productivity and quality of public services are nonetheless common subjects of research. For example, the productivity and effectiveness of public services is one of the main research themes of the Finnish VATT Institute for Economic Research, and they have produced several publications on this topic (Valtion taloudellinen tutkimuskeskus VATT 2016; VATT Institute for Economic Research 2016). In addition, the European Union has developed a tool called the Common Assessment Framework (CAF), which is a widely used total quality management tool designed especially for public sector organizations.

It should also be noted that CBA has also been a target of frequent criticism. Some argue that it is immoral to place a monetary value on human life (Ackermann & Heinzerling 2002; Frank 2000), or that it is practically impossible to do so for things that are not normally thought of in monetary terms, such as beautiful landscapes. But as Frank (2000) states, this is a world of scarcity and sometimes difficult choices need to be made. CBA can help in making that decision. However, in some cases it might be

more practical to use alternative analysis methods instead of CBA. In cost-effectiveness analysis it is not required to place a monetary value on the benefits, thus avoiding some of these problems about placing monetary values on human life etc. Also, cost-utility analysis is perhaps a more suitable method to be used in some applications in the healthcare industry.

5 CONCLUSION

This thesis was a literature study on the use of cost-benefit analysis in public decision making, with a focus on public service provision. The main objective was to either verify or falsify the research gap regarding the initial assumption that there seems to be no existing research on how common the use of CBA is in public service provision.

The thesis presented the theoretical framework of CBA, including the basic steps in the typical CBA process, as well as its historical background and criticism regarding it. Some alternatives to CBA were also discussed briefly. In addition, the study discovered a few of the leading institutions in CBA methodology research and development. Some comments on the use of CBA in public decision making were found in literature. They hinted that CBA is underused and often misused in public decision making. The literature study concluded with the analysis of two case studies.

The research gap was verified, as there does not seem to be any research on how common the use of CBA is in public service provision as a whole, except for the hints that it is underused in public decision making. This lack of existing research and the apparent rarity of the use of CBA in public service provision imposed some constraints on the effectiveness of the literature study. There were also some publications that might have been useful to this study, but they were written in other languages and thus it was not possible to analyze them properly. Based on the findings, society as a whole would benefit if CBA was used to a larger extent in public service provision in order to determine which services are truly beneficial to society, and thus worth the scarce resources spent on them. Thus, there is a clear need for further research on the subject.

The purpose of this study was to support a wider research entity related to the socio-economic impact of public agencies, led by one of the instructors of this thesis. The verification of the research gap is an important piece of information in this regard, and the use of CBA in public service provision is now likely to be researched in more detail. Since literature on this subject seems to be rather scarce, it would probably be more beneficial to gather empirical evidence related to it, for example by interviewing decision makers in public agencies. These interviews should attempt to find out how the officials specifically evaluate the impact of their decisions and the public services they are in charge of.

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