

An Economic Instrument to Improve Communities

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Abstract

A general strive exists for achieving the wanted results with as limited resources as possible. There is a need for ever more cost-effective organisations, making this paper required to improve the policy efficiency and raise the technological standard in various communities. The launched economic instrument also improves the ecological footprint of the organisations in question. The Naturally Optimised Revenue Demand in Communities (NORDIC) model is introduced to improve the flow of physical and immaterial utilities through entities of different kinds, such as producing companies and nations. The basis for the work is the existing Efficient Use of Resources for Optimal Production Economy (EUROPE) model, which is developed to become more powerful. Constructed shadow costs are added to the bookkeeping systems of organisations to give economic incentives to improve the economy, technology and environment. The method provides a single key indicator to improve performance. A manual for the practical use of the NORDIC model is presented. The case study shows how to induce an economic incentive to reduce the costs and increase the efficiency for the health care, education and social services in the nation of Sweden. The model shows utility for various entities, such as public sectors, within nations. Citizens get a better life, and improved health, due to a better economy when the results in this paper are implemented.

Keywords

Nordic Model, Efficiency, Utilities, Flows

1. Introduction

The background for this work is the common strive for achieving the wanted results with as limited resources as possible. This general motivation points at

the importance of the subject. The need for ever more cost-effective organisations justifies taking up the study. This paper is required to improve communities. The Naturally Optimised Revenue Demand in Communities (NORDIC) model is introduced. The objective is to improve the flow of physical and immaterial utilities through entities of different kinds, such as producing companies and nations. The Efficient Use of Resources for Optimal Production Economy (EUROPE) model [1] [2] [3] [4] [5] is developed to become more powerful. The practical use of the EUROPE model [6] is improved. Shadow costs [7] are the basis.

2. Literature Review

The purpose for the literature review was to explore the previous findings, which may contribute to the model-development of this study. The literature review resulted in the authors' discovery of some scientific theories and models, showing a certain resemblance with the previously introduced EUROPE model and the new NORDIC model, which is based on the EUROPE model. For example, the following approaches can be mentioned.

The review of the earlier findings, mainly within the fields of economy, models and optimisation theory, resulted in information about, for example, Sekerka and Stimel [8] having studied how and why firms move to engage in sustainable enterprise. Ooi studied [9] the transition and evolutionary models of urban environmental development. Blake [10] used a regression model to measure political attitudes and environmental knowledge, which include effects of individual action related to environmental causes. Huang, Liu, Ma and Su have presented [11] a new data envelopment analysis-based model for quantifying vulnerability to natural hazards in China. Hills [12] found that a conventional command-and-control model focusing on pollution control drives environmental policy making in Hong Kong. Phyllis *et al.* applied [13] a model that uses fuzzy logic, called SAFE, to measure the sustainability of a country, based on a multitude of basic indicators. Gavazov *et al.* [14] coupled experimental and modelling approaches to assess the impact of climate change with a spatially explicit model. Jepson proposed [15] the incremental integration of the expansionist and ecological views, using a decision model that incorporates project and context information to identify appropriate method and role.

More recently [16], Dror has stated that the interest in the study and improvement of policymaking has been on the increase since around 2002, but no breakthroughs have occurred. A few, useful concepts have been developed, but no major advances in policymaking theory have taken place. No shift for the better in overall policymaking has occurred. In 2011, Vedung [17] suggested that we should concentrate on the generic tools of government action, public programs and says that the alternative tools of public action are the real "missing link" in the theory and practice of public management. These findings point at the approach presented in this paper being in line with the current movements of public management theory. Thus, the NORDIC model contributes to solving

the general problem of how to improve the overall policy efficiency for government action and public programs.

Regarding the use of shadow costs as a model component, Matsumura and Tomaru [18] introduced 2015 shadow costs of public funding as “the excess burden of taxation” and found that in a mixed duopoly, the level of product differentiation is too low for social welfare, in sharp contrast to the private oligopoly, where the level of product differentiation is too high. They showed that when the shadow cost is high, privatizing the public enterprise improves the welfare. However, according to Pentland [19] market thinking can easily go wrong. This work exhibits low amounts of shadow costs as the tool for improving enterprise efficiency. Thus, public enterprises are less likely to be privatized due to the application of the findings about economic modelling in the present paper.

This literature review shows that few scholars have developed models to obtain economic instruments that use shadow prices, or shadow costs, to optimize the performance of activities related to welfare-issues. Most studies only describe the technical aspects. Few studies have examined how to monitor, measure and evaluate, in monetary terms, the performance of activities, using a single, key factor. This work hence presents a promising approach to analysis of various enterprises to improve the welfare of communities and nations.

3. Research Methods

The basis for the work is the existing EUROPE model. This concept is further developed into an even more versatile expression. The components of the EUROPE model are studied and reduced to improve the model’s generality, tested on the Swedish, public sector in a case study that employs real-world facts and figures.

The main hypothesis in this paper is that the flow of physical and immaterial utilities through entities of different kinds can be improved by applying the NORDIC model. The main goal is to facilitate the daily use of the NORDIC model by managers and practical operators. The nation of Sweden was chosen as the object of a case study for two, main reasons: first, there are good, statistical data available on nations, and second; Sweden offers an extensive public sector for the case study. More broadly, we hope that this study will contribute to improving the economic, environmental and technological standards for organisations, which also improve the living conditions for related communities. The research gap that this study aims to fill is the need to develop new economic instruments to manage communities. The case study concerns the application of the NORDIC model to public sector activities. The research questions that we address are: 1) How can we use the NORDIC model to improve the economic efficiency of communities, such as the health care, education and social services? 2) How can a versatile economic tool be developed for this purpose? 3) For whom is this tool important? and 4) Who are the other potential end users

(apart from governments)? Based on the results from the case study, we explore how the NORDIC model can be applied in practice to promote economic, environmental and technological improvements, and who would benefit from the endeavour. The answers to these questions will guide the relevant civil servants and financiers.

The research contributions of this paper are that it provides a better understanding of how community management can be facilitated by the application of economic instruments, and the development of a practical manual to help managers and operators who employ the NORDIC model. This paper introduces a novel method for improving the flow of physical and immaterial utilities through entities, such as producing companies and nations. Managers are provided with a single, key factor to simultaneously monitor, manage and evaluate their projects.

The NORDIC model is a tool to monitor, manage and evaluate how the economic, technological and environmental performance of a firm or a community changes over time. The method involves adding so-called shadow costs to economic systems. A shadow cost, or a shadow price, is commonly referred to as a monetary value assigned to currently unknowable or difficult-to-calculate costs [7]. These shadow costs are inserted into the budgets and accounting systems of the entity using the NORDIC tool. The changes that occur over time in the shadow costs provide a versatile tool that enables organisations to reduce the inefficiencies of the flows that these shadow costs are allocated to, one by one, in order of importance, or lowering the costs of the flows in question. In both cases, it is considered that the versatile NORDIC model can be applied to produce robust results, given the inherent logic of the mathematical theories underlying the model, and its good application in the case study.

Mainly, the problem has been analysed from a public perspective. The research approach aims at creating modification of models and theories. Rather few parameters are used to move the research frontier ahead. The study's intention is also to present certain applications of economic model theory about the welfare sector. Thereby, the tool is case study technique.

The research problem is centred around accomplishing a change, while the choice of method is centred on stakeholders through case studies. The results are increased knowledge.

Mainly, an analytical approach is applied to develop theories and models. The elaborated hypotheses are analysed and verified. Consequences are explained and causes found. Information was obtained through public Internet sources and personal E-mail contacts. The obtained results are generalised to enable a continued accumulation of knowledge. Empirical facts are observed to induce theories and deduce predictions to obtain and verify new facts.

When modifying the present economic models, an analytical, economic-logic approach is mainly applied. A descriptive systems theory is used for the model's context. A non-personal approach is chosen that is more positivistic than, for

example, humanistic.

An attempt is made to describe and establish as a part of the results, and to predict and guide as a part of the discussion. The prediction is tested to induce discussed theories. Concrete actions to take are suggested to improve the problem situation. Recommendations for the relevant actors are given, based on the statements about the findings presented by the authors.

The sources of information for the study have included relevant literature and articles and database search, the Internet and personal E-mail contacts. This data is processed. Thus, trustworthy, secondary data is used, because primary data is new and unprocessed.

The quantitative research methodology is prevailing since the scientists are detached observers, more than parts of the study themselves. The passing from theory to empiric encompasses an operationalisation by employment of the defined concepts for certain exemplified units. The processing of ideally neutral data takes place mainly in the detached case study.

Traditional economic modelling constitutes the validity of the methods developed in this study. The use of relevant literature and the relevant case study grants the reliability.

The instruments that are developed in this work are based on financial incentives. They are hence economic instruments (EIs) which strengthens the dialogue between different actors.

The concepts presented here contribute to reducing the misuse of resources in society. The external environment will improve by time to enhance the citizens' quality of life.

The design of the scientific work emphasises a logical-historical disposition. Mainly, it follows the research process that contains, for example, the background, presentation of the problem and theory used, description of the data collection and processing, the analysis of the results and the final conclusions and recommendations. Explanative investigations are featured to investigate the causal relationship between the variables in the proposed model. The investigation is also explorative, since the study seeks new knowledge to present in the written form.

In practice, the research methods of this paper are designed as follows. First in the manuscript, a descriptive Introduction gives the background for this work and points at the importance of the subject. The need for taking up the study is clarified and why this paper is required. The acronym NORDIC is explained and how it is related to the acronym EUROPE, whose scientific basis is given in the references [1]-[6] by the authors. The literature review that follows displays the outcome of the authors' search for relevant, scientific references mainly within economy, models and optimisation theory. After this Research methods section, the mathematical basis for the new NORDIC model is given in two logical equations that are easy to apply on the study objects in question. The Analysis that follows gives the general principle for how the NORDIC model improves the

situation in organisations and tells managers how to act when the shadow cost S changes, and why they should do it. Next, a practical manual is given to show how the NORDIC model should be applied step by step. Thereafter, the practical usefulness of the NORDIC model is tested with real-world data in a case study on the health care, education and social services in the nation of Sweden. Then, the results are discussed and at the end of the Conclusions section, the most important conclusions are listed, the main theory-limitation is given, and the future research suggested. Finally, the benefits of using the model and recommendations for application of the NORDIC model are provided.

Study

The NORDIC model is expressed by Equations (1) and (2).

$$\text{The shadow cost: } S = (X/Y) * Z * W \quad (1)$$

$$\text{The entity to be optimized: } X = V - C \quad (2)$$

where

S is the shadow cost; X is the entity to be optimised, or at least improved, if optimisation is not feasible; V is the value of X ; C is the cost of X ; Y is the sum of the entities to be optimised, or improved; Z is the value of the activities connected to X , and; W is the weight factor (without sort, it is a decimal value) for the impact on society by X , per period for a certain, administrative unit that is studied. Sort: currency, kilogram, litre or Joule.

Analysis

The constructed shadow cost S is inserted into the profit and loss account of the organisation in question to accomplish monitoring, management and evaluation of the development of X . The addition of S gives economic incentives to improve the current situation, if S is considered as a real phenomenon to be applied.

If S increases, this means that the organisation in question has improved, as regards optimising, or improving, X . When S decreases over time, this calls for corrective actions to be taken to avoid inefficiencies.

Manual for the practical application of the NORDIC model

Constructed shadow costs are added to the values of economic significance, to improve the efficiency in the targeted organisations. This procedure increases the shadow costs, if X is useful and yields revenues. The cost development is studied overtime to make the product in question more cost-effective. The manual, guiding the practical application of the NORDIC model, involves the following key steps.

- 1) Determine which losses to pinpoint, step by step, by estimating the values of X .
- 2) Calculate S by estimating Y , V and C using the organisation's bookkeeping system.
- 3) Determine the suitable Z and/or the total breakdown cost from the organisation's ledgers.
- 4) Determine the weight factor W , without sort, for the organisation's impact on society.

- 5) Insert the constructed S into the accounting system and budgets of the current entity.
- 6) Determine S for any additional X entity that are of commercial or public interest.
- 7) Study the development of S to monitor, manage and evaluate the performance of X .
- 8) Take actions to make the studied system more efficient if S decreases over time.

Case study: the health care, education and social services in the nation of Sweden

The Gross Domestic Product (GDP) in Sweden was worth 538.04 billion US dollars in 2017 [20] = Y . X is the Swedish health care, education and social services, Swedish: vård, skola, omsorg. During 2012 the Swedish municipalities' purchases of services amounted to 9.4 billion US dollars (SEK 85 billion), while corresponding figures for the county councils were 4.6 billion US dollars (SEK 41 billion) [21]. Sweden's GDP from public administration is 22.9 billion US dollars (205,775.00 SEK million) [20] = Z . W is the relative health-adjusted life expectancy in Sweden = 91 percent of the maximum rank globally for both sexes [22]. A conversion rate of US dollars 1 = SEK9 (January 2019) is used throughout. Equation (3) gives the shadow cost S for Sweden.

$$\begin{aligned}
 S_{\text{Sweden}} &= \frac{9.4 \text{ billion US dollars} + 4.6 \text{ billion US dollars}}{538 \text{ billion US dollars}} \\
 &\quad * 22.9 \text{ billion US dollars} * 0.91 \\
 &= 0.5 \text{ billion US dollars}
 \end{aligned}
 \tag{3}$$

S_{Sweden} is added to the public finances of Sweden to induce an economic incentive to reduce the costs, and increase the efficiency, for the Swedish health care, education and social services. The general principle is shown in **Table 1**.

Figure 1 shows how the shadow cost S varies with the entity X to optimise, in this case. The relationship is linear.

4. Discussion

The benefit of the NORDIC model is that the shadow cost provides management with an instant view of the performance of their business. The S conveys important aspects of how the community performs. Thus, a better possibility for CEOs to manage well is the major value of knowledge added by the paper. The previously developed EUROPE model provided an economic instrument, which was

Table 1. The public finances of Sweden [20].

| |
|--|
| Revenues |
| S_{Sweden} (500 million US dollars) |
| Expenditures |
| PSBR (–500 million US dollars) |

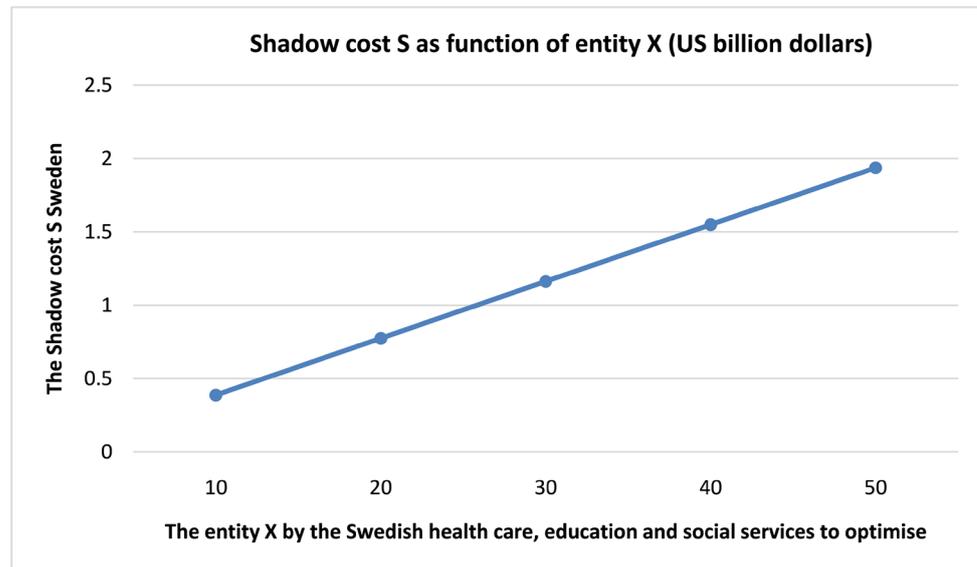


Figure 1. The shadow cost S , as a function of the entity X , in the case study.

more developed into the NORDIC model.

The present case study exhibits the practical usefulness for the NORDIC model, also on higher, administrative levels. A most reasonable shadow cost of 500 million US dollars is obtained, compared to the Swedish GDP of over 538 billion US dollars in 2017. Thus, the introduced NORDIC model can be used where ever a “black box” system is present. Ultimately, the gain from using the model is a better life for the citizens, in a global context, due to the strengthened economy. The model shows utility for various entities, such as nations. S hence constitutes a versatile tool. The reliability is good, since the outcome of the case study gives a realistic result.

The main strength of the model is its powerful generality. The disadvantages are the less good precision when employing the shadow costs, and the difficulties to get easy access to the necessary input data to apply the novel theory in practice. Further research can develop mathematical algorithms adapted to the public sectors of interest and add some relevant factors to the current model-design.

Examination of the S over time shows the changes in the organisational efficiency. S is a key indicator. If S decreases compared with the previous years, this calls for actions, such as the implementation of measures to improve the performance. The S is a warning signal. A substantially decreased S , compared with that of the previous year, indicates that major changes are required, whereas a small change may indicate that only small adjustments are required. Management can design its own rules regarding when and how to act, depending on the extent of the changes in S from time to time. Different degrees of changes in S give rise to different actions.

The shadow cost S increases proportionally with X . Thus, it is unproblematic to apply the launched model on different organisations to provide an improving instrument. The application of the new, economic instrument can easily be per-

formed, regardless of the X decreasing or increasing, compared to its original value, due to the linear relationship (**Figure 1**).

S in the NORDIC model does not directly show the value of the communities' equipment. Nor does the NORDIC model consider the size of the organisation's assets. Instead, S provides an indicator that indicates how efficiently the community uses its resources over time to produce utilities. In the present case study, the costs of the Swedish health care, education and social services are optimized, or at least reduced, over time by using the NORDIC model, and the constructed shadow cost S , to indicate the efficiency improvements.

It cannot be determined what specific actions that should be taken by studying the changes in the S . A decreased S indicates that actions should be carried out, but not exactly which ones. Determining the appropriate actions is a task for the civil servants in consultation with their CEO.

If the S decreases from one year to the next, the management understands that it must act. The NORDIC model alerts management that it must act but leaves the determination of the improvements to the employees and CEO of the current organisation. If the S increases from one year to the next, the NORDIC model tells management that the business has improved, in general terms.

The NORDIC model does not make it possible to determine in detail which solutions should be implemented. It indicates that when the S decreases, there is an issue with the system that requires action. The model does not indicate precisely which solution the CEO will choose. Instead, it provides managers with an overview that presents a general picture of the situation.

This is how economic instruments work in general. The development of the NORDIC model includes a stepwise manual that covers its practical application. This manual provides the very step-by-step instructions for application of the launched model. In this paper, the NORDIC model is based on currency as the dominant unit for the model calculations, rather than physical entities.

In the case study, the fraction X is a certain public sector. The step-by-step manual shows how CEOs should use the NORDIC model in practice. It is not possible to provide detailed suggestions about what actions to take, as part of the model, but CEOs should learn the principles for applying the NORDIC model in practice. When the NORDIC model indicates that measures are required to increase the efficiency of the organisation, the CEO will approach the managers to determine the solutions required.

The NORDIC model gives not the very solutions. It provides an economic instrument to monitor, manage and evaluate the performance. The employees design the innovative solutions required when the CEO determines the need to find creative solutions. In the short run, the NORDIC model will not result in zero loss goals being met. By applying the model and the manual instructions, over time the losses can decrease, focusing first on what are of greatest importance to achieve in terms of profitability and environmental impact.

This method will have a positive impact on the private behaviour in minimiz-

ing losses. The X in Equations ((1), (2)) increases over time when the organisation becomes more resource-effective. Thus, when management tries to increase its S , its actions will include encouragement and incentives for reducing losses, and improve the behaviour exhibited by the citizens being affected by the practical implementation of the NORDIC model.

The NORDIC model can assist in achieving an objective. The NORDIC model can guide in making a desired fraction more efficient, by lowering operational costs. Also, the model provides management with a better understanding of the cost-situation for the X factor.

The case study presented here shows the viability of the NORDIC model, when applied to Sweden's public finances, to improve the performance of the Swedish health care, education and social services. The case study results in the calculation of a reasonable shadow cost S of 500 million US dollars, which managers can utilize to guide decisions. S provides a comprehensive key indicator, which summarizes the performance of most organisations also in other sectors than the public, as in the case study.

S is a constructed entity that is added to the revenue of the organisations that use it. The addition of S to the revenue results in an incentive for management to start increasing the fraction X , or to decrease the total costs C connected to fraction X , if X is a useful fraction.

The manual associated with the NORDIC tool is also applicable to the schemes in industries. Therefore, practical application of the NORDIC model is useful for businesses in general. It may also be possible to apply the model to developing countries, subject to training.

The NORDIC model and its manual promotes the circular economy, a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing energy and material loops [23]. The introduced tool namely reduces various spillages at the source, by providing economic incentives to achieve that goal.

5. Conclusions

The main hypothesis in this paper is that the flow of physical and immaterial utilities through entities of different kinds can be improved by applying the NORDIC model. The hypothesis is verified, because the logics of the theory designed support this conclusion, and because the introduced theorems are mathematically correct. The results from the case study support the main goal of facilitating the daily use of the NORDIC model by civil servants and operators. As more communities adopt the NORDIC model, the goals of improving the economic, technological and environmental conditions in the organisations will be supported. The gap is filled in the existing research, regarding novel, economic instruments to manage communities and other organisations.

The results of the study, and the previous discussion, provide answers to the research questions posed, regarding how to use the NORDIC model to improve

the efficiency of economic units, such as nations and communities, and how an economic instrument can be designed and modified for this purpose. The research contribution involves the development of a versatile, economic tool that enables managers to better understand how their organisations can become more efficient in economic, environmental and technical terms. In this study, this tool has been shown to be useful for public finances, particularly the health care, education and social services, and to help them improve the well-being of communities and municipalities.

The work contributes to the literature by providing novel solutions to promote the optimization of the economic efficiency and to assist public managers, and managers in industries, to improve their companies' performance. This improved management situation in the public, as well as the private sector, is the major value of knowledge added by the paper.

The real finding of the present study is that the NORDIC model represents a versatile theory to improve the situation in various entities, such as nations. The evidence for this statement consists of the realistic results of the performed case study with real-world data. The novelty of the approach is the innovative usage of the shadow cost construct to create the economic incentives for improvement of the functionality of management systems. The introduction of a single key indicator to simultaneously monitor most aspects of interest for a management system is a highlight. The most interesting findings in this study are the method to facilitate managers' policy decisions and the positive impact on the economic development. The method aids managers and practical operators to reduce losses in economic systems and improve efficiency, based on the well-known concept of shadow costs. The most important conclusions based on our developed model and the case study are as follows.

- 1) The research is useful for managers to reduce losses in their organisations.
- 2) Managers obtain an economic instrument to monitor, manage and evaluate.
- 3) The constructed economic incentives improve the utilization of resources.
- 4) Cost-effectiveness and equity increase due to the reduced risk of spillages.
- 5) Managers can apply economic instruments to prevent people's discontent.

The main limitation of the introduced methodology is its less specified impact on the targeted communities. The employed shadow costs namely work on a general level, which mainly gives overall results for the current entities of interest. Therefore, additional algorithms should be developed, and integrated into the present NORDIC model, to enable a more specific impact on the sub-units that are intended to be improved.

In the future, studies could also be conducted to determine how the NORDIC model can be implemented to even larger units. There is potential to apply the model to the international context.

Benefits of using the model

The NORDIC model gives managers a management tool. The method provides a single key indicator that assists companies and communities to assess

and improve their performance. The model is applicable to the public sector and commercial activities. The method is robust and easy to grasp. The method is based on the well-known concept of shadow costs, or shadow prices.

Recommendations

Apply the NORDIC model to public and other organisations to improve their general performance; apply the NORDIC model based on the practical manual presented in this study.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

The Authors' Contribution to the Present Study

J Stenis—Concept idea, planning of the work, performance of the literature study, methodology design, EUROPE model design, NORDIC model development, all the research effort, all the writing of the paper.

W Hogland—Paid the journal's Article Process Charges.

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