GUIDELINES FOR EVALUATING PUBLIC E-SERVICES

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POLIITIKAUURINGUTE KESKUS
PRAXIS
CENTER FOR POLICY STUDIES

ESTONIAN DEVELOPMENT COOPERATION

This handbook is co-financed by the Estonian Ministry of Foreign Affairs funds for development and humanitarian aid.

AUTHORS: Riina Sikkut, Anne Jürgenson, Helena Rozeik

These guidelines are based on training materials prepared by the following experts of the Praxis Center for Policy Studies: Katrin Pihor, Anne Jürgenson, Riina Sikkut, Andres Võrk, Eneli Mikko, Kadri Kuusk, Annika Uudelepp and Kristina Mänd, with additional contributions from Hille Hinsberg, Helena Rozeik and Priit Kruus.

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Praxis Center for Policy Studies
Tornimäe St 5
10145 Tallinn, Estonia
Ph +372 640 8000
www.praxis.ee
praxis@praxis.ee

ISBN 978-9949-507-57-3 (pdf)

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INTRODUCTION

Governments around the world are extensively implementing information and communication technology (ICT) in order to provide services and fulfil government functions. The adoption of ICT has outpaced the evaluation of such systems. There are four types of public e-services: government to government, government to citizen, government to business and government to employee. ICT can change the performance of all parties involved, but the actual impact depends to a large extent on several factors related to the implementation and use of the system. A systematic approach is needed to understand, describe and quantify the impact of public e-services in order to make better decisions regarding these issues.

This handbook offers an introduction to the concept of evaluation, guides you through the process of evaluation and provides an overview of a range of methods. Theoretical material is supported by examples of e-service evaluations conducted in in Estonia. This handbook is designed as a tool for analysts, public servants and other specialists planning to undertake an evaluation of public e-services as well as for people developing such services.

1. THE CONCEPT OF EVALUATION

1.1. WHAT IS EVALUATION?

Evaluation is often defined as a systematic and objective assessment of the design, implementation and results of a program/project/policy/service (henceforth the term service is used in the document) **compared to a set of explicit or implicit objectives, targets or standards**. Evaluation usually determines the attainment of objectives, service efficiency, effectiveness, impact, sustainability and relevance.[1]

Evaluations are frequently used to establish the impact of a service. Impact refers to the difference between the situation with the service and the situation without the service. And therein lies the fundamental evaluation problem - generally these two different situations cannot exist at once. Thus we need to construct one or the other using different methods. However, **the most important contribution of evaluations is not the precision of the calculations used to establish the impact, but the process of analysis itself** – questioning, describing, comparing the actual impact and exploring prerequisites for achieving desired impact in a systematic way.

Evaluation offers valuable insights in different phases of service provision:

- During **service development** evaluation can be used to monitor progress, and redefine activities and expectations. It can identify potential gaps or problems early, so steps can be taken to resolve them.
- For an already **functioning service** evaluation findings can be used to monitor service provision and provide feedback to managers. Evaluation can help demonstrate successes as well as areas for improvement. Outcomes can also be assessed for mature services when enough time has passed since implementation to manifest measurable results.
- After a longer period **of service provision** evaluation enables assessing the total impact of the service as well as document lessons learned for the future. In this phase, evaluation can help establish whether there have been any unexpected outcomes and whether the desired results have been sustained. What is more, you can also assess whether the intervention could be replicated in another setting and which factors stimulate this process.

In professional literature the term "evaluation" is mainly used for post-implementation (*ex post*) assessment, whereas pre-implementation or *ex ante* assessment is referred to as "impact assessment". There is also the term "monitoring", which refers to on-going activities during the provision of service that provide indication of the extent of progress and achievement of objectives using systematic collection of data on specified indicators.[2] Throughout this handbook, the term "evaluation" is used for all kinds of assessments and the distinction between pre- and post-implementation evaluations is made if upon necessity.

[1] Based on Queensland (2014) and OECD DAC Glossary
[2] OECD DAC Glossary

1.2. EVALUATION ABC

In the following subsections the main aspects regarding evaluation are outlined in order to provide a theoretical framework for understanding the evaluation of e-services.

Why?

In general, evaluations allow us to to:

- understand what works and why
- make better/more informed decisions
- increase the inclusiveness and transparency of the decision-making
- keep the costs under control
- avoid unnecessary intervention
- assess the results

In case of assesing an e-service that is already in use, the evaluation may be aimed at finding possibilities for improvement and providing information to other implementers. However, when the e-service is still in the planning phase, it can provide valuable information on whether and how to implement the service. What is more, evaluations are especially important *ex post* for the purposes of learning from past experiences in order to identify more effective interventions.[3] Evaluation objectives can also be based on the overall goal of implementing the service and estimating the success of implementation (the latter is the case of DeLone and McLean IS Success model introduced in subsection 2.1).

Thus, the reasons for conducting an evaluation can be:

- deciding whether to implement an e-service
- giving input for improving the e-service in development
- assessing if the implementation of e-service has produced desired outcomes
- evaluating the overall impact of the e-service

Who?

The answer to this question determines which perspective (e.g. societal, end-user, government) is taken in the evaluation process, because most e-services affect several stakeholders. The number of stakeholders can make the implementation complicated, produce more diverse possible outcomes and thus, render the evaluation more difficult. It is important to make the distinction between the context and the subjects under evaluation.

[3] Yusof et al 2008

Consider who is:

- using the service
- affected by the service
- involved in service provision
- intended recipient of evaluation findings

When?

During the evaluation the e-service can be in different phases of development. Evaluation can be carried out in four main phases of the classical system development life cycle (SDLC)[4]:

- pre-implementation (development)
- during implementation
- post-implementation
- during routine operation

What?

There are various aspects of an e-service that can be measured and evaluated. Evaluation can include technical, professional, organisational, economic, ethical and legal domains. Also, in many cases it is not easy to draw the line, for example, between the overall information management platform of a state institution and a specific e-service. Ideally the evaluation framework should seek to address such difficulties.

Types of evaluations:

- Impact evaluations focus on questions of causality and the overall results of the service provision.
- Performance monitoring provides information about how a service is operating and the extent to which specified objectives are being attained. Performance monitoring informs on whether the obejctives can be reached.
- Process evaluations answer questions about how the service operates and also documents the procedures and activities undertaken in service delivery. The focus is on how the service is provided to the user.
- Cost evaluations address how much the service provision costs in relation to alternative uses of the same resources.

[4] See more at http://en.wikipedia.org/wiki/Systems_development_life_cycle

Sometimes different types of evaluations are combined to achieve the the goals of service provider, or other parties who have commissioned the evaluation. Therefore, in order to select the appropriate type of evaluation, it is vital to define the objective of the evaluation very precisely.

How?

The evaluation may be supported by a broader framework and entail objectivist or subjectivist approaches. The former relies on the assumption that there is a possible common understanding, about what constitutes a good service: for example, randomized controlled trials (RCTs) are important in the objectivist approach (this is especially the case in health care settings). The latter on the other hand assumes that there are many stakeholders involved in a complex system, thus there is no uniform to say what is right for them. In subjectivist studies, research is conducted based on the judgements of expert evaluators or stakeholders in the natural environment of the subjects. The subjectivist studies are considered more efficient and holistic, while the objectivist approach is deemed more costly and sometimes difficult to produce.

Hence it is advisable to seek a balance between subjectivist and objectivist approaches, as well as qualitative and quantitative methods. Although integrating qualitative and quantitative research can be difficult[5], it could also be challenging to provide a comprehensive evaluation with just a few methods (whether qualitative or quantitative) in case of services with many users, dimensions, functions and development phases. Thus, several research approaches should be considered beforehand, while also taking into account the cost and suitability of different methods.

1.3. EVALUATION PROCESS

The evaluation process involves (Figure 1):

- The first stage focuses on getting getting a good understanding of the service, preparing for the evaluation and working out the intervention logic
- The evaluation planning stage focuses on the objectives and design (evaluation questions, indicators) of evaluation is focused on
- The implementaton stage includes data collection, data analyses, and reporting results

[5] Bryman 2007

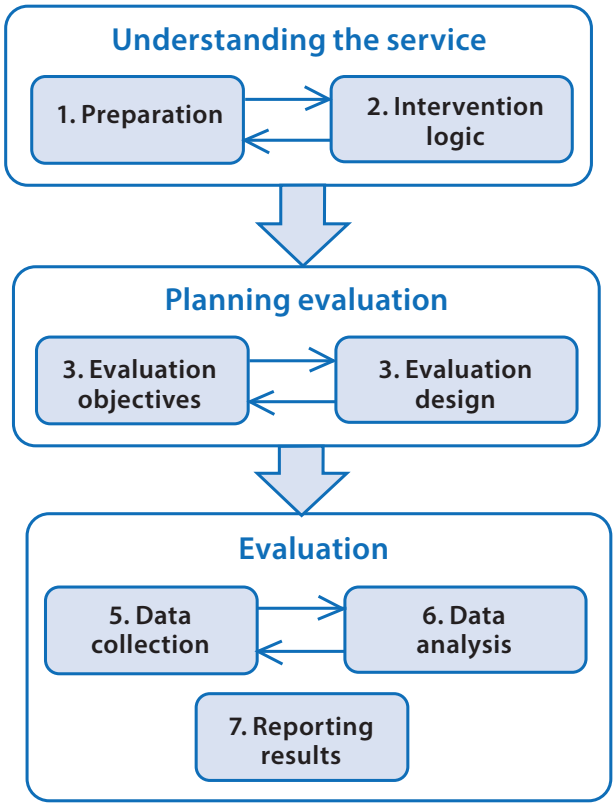

Figure 1. Phases of evaluation[6]

Preparation stage

The following aspects should be considered in the preparation stage:

1) Firstly, it is important to take into account the duration and timing of the assessment. In this regard there are two important issues to keep in mind: data collection is generally the most time-consuming phase of the process, and depending on the question under analysis, certain temporal distance must be allowed between the activities and their assessment in order for the results to manifest properly. The time spent on evaluation depends on the level of scrutiny, methodology, availability of data, variety and complexity of service etc.

2) Secondly, the cost of evaluation and the type of funding should be considered. The cost and duration of the assessment generally depend on the same factors (e.g. data collection is generally the most expensive and time-consuming phase of the assessment process). It is advisable to plan the evaluation and data collection in conjunction with planning of the service.

3) Thirdly, it is important to take into account the organisational capacity for carrying out the evaluation. If the organisation has plenty of people with analytical experience, and

[6] http://meera.snre.umich.edu/planning-and-implementing-ee-evaluation

enough time to take on the evaluation, then the organisation may conduct the evaluation in-house. If the organisation lacks the relevant expertise, but could provide support staff, then an external evaluator should be hired.

The time, cost and necessary analytical expertise depend on the complexity of the evaluation. Short-term evaluations of individual services are simpler, whereas long-term comprehensive evaluations of systems require more time, money and highly professional expertise.

Time and financial resources, as well as capacity, may set serious limitations on the evaluation. In case of serious constraints it should be considered whether it is reasonable to undertake the evaluation at all. **High quality evaluation with sound methodology provides the needed value, therefore it is advisable to conduct fewer but better evaluations**.

Intervention logic

Intervention logic is considered a precondition for evaluation. In oder to carry out an evaluation, one needs to gain a better understanding of the subject of evaluation (how the service enables to achieve the desired impact). **Constructing and analysing the intervention logic is the most valuable result of an (*ex ante*) evaluation**. Poorly designed intervention is not worth the complicated evaluation effort.

Intervention logic ties problems, objectives and actions together in order to describe how the expected results will be achieved. In short, the following issues must be clearly stated:

- Problem - what needs to be changed, and why?
- Objective - what is the desired outcome of the change?
- Action - what needs to be done in order to effect change?

There are numerous methods to construct the intervention logic (methods are described in Annex 1):

- Result chain
- Logical framework
- Theory of change
- Problem tree/objective tree

Without formulating a precise intervention logic, the strategic perspective remains unclear, the understanding of underlying problems is poor, planning is focused on activities, and the results are difficult to define. What is more, financial resources are scattered (not used in the most effective way to achieve the objective), the view is short-term, and there is a lack of common understanding of the issues.

2. PLANNING AN EVALUATION

2.1. EVALUATION FRAMEWORK

Without a systematic framework it is much more difficult to choose the questions to be asked and indicators to be measured in an evaluation. The evaluation framework should prvide a precise focus for the evaluation and utilize different methods, measures and study designs (both quantitative and qualitative). It should also address different dimensions, aspects and problems of the service under examination. A framework can be seen as a plan or a structure with relevant dimensions that the evaluation will subsequently focus on. A comprehensive framework can support different study designs, indicators and methods.

Different frameworks address different evaluation needs – some focus on specific development stages, some look at different process steps or distinguish dimensions, some take into account the cost and investment perspective of evaluation.

For example, the Total Cost of Ownership (TCO) method aims to quantify the short- and long-term (direct and indirect) costs of an ICT solution during the life-cycle of the solution. However, the TCO model does not usually assess how the intervention meets the needs of the user or fits with the organisation's strategic aims.

With regards to e-government, the DeLone and McLean (2003) framework has been used in order to capture the citizen's perspective of e-governance benefits, showing the interconnections of different dimensions of information system evaluation (Figure 2).

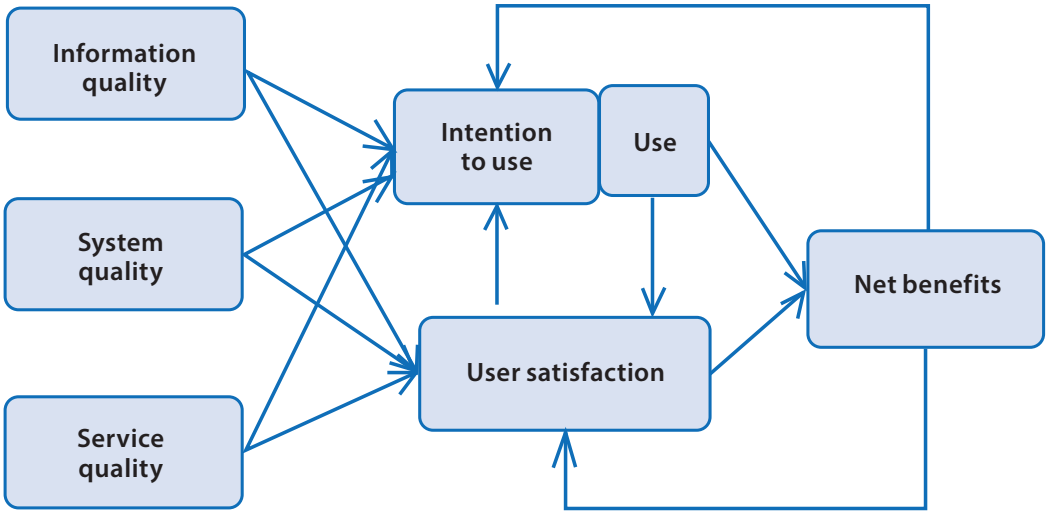

Figure 2. DeLone and McLean's updated IS success model

Esteves and Joseph (2008) focused on *ex post* evaluation of public e-services using a three-dimensional framework for evaluation (Figure 3). The three dimensions were maturity level, stakeholders, and assessment levels.

As the e-service matures, successive assessments may be necessary over the course of its evolution to determine if the desired objectives are being achieved.. The assessment framework contributes both to the improved accountability and the definition of public e-service strategies prior to, during, and after implementation. The evaluation of government e-services is a continuous process. However, evaluation will be beneficial if accompanied by clear guidelines for making improvements, and achieving results more efficiently.

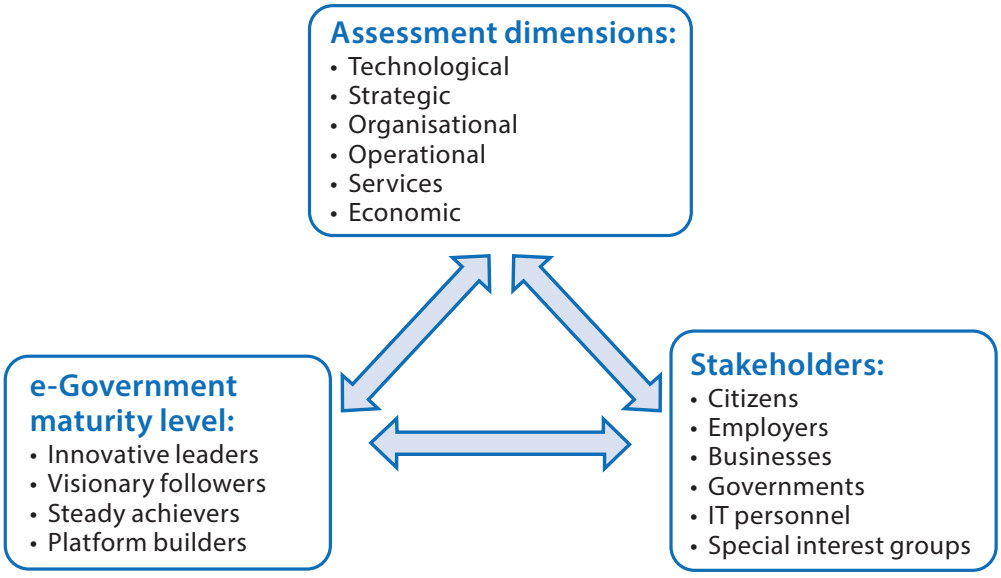

Figure 3. Esteves and Joseph e-Government evaluation framework

2.2. DETERMINING EVALUATION CRITERIA AND QUESTIONS

Evaluation criteria determine what aspects of the e-service are to be evaluated. Usually the criteria of relevance, effectiveness, efficiency and sustainability are used (EVALSED 2012):

- Relevance refers to the appropriateness of the specific objectives of the evaluation object in relation to the problems it aims to address. Usually, the questions of relevance are used in *ex ante* evaluations because the focus is on choosing the best strategy.
- Effectiveness concerns the achievement of formulated objectives, encountered successes and difficulties, suitablity of chosen approaches, and the effects of external factors. These aspects are important to take into consideration in intermediate and *ex post* evaluations.

- Efficiency is assessed by comparing the results achieved, and the resources utilized. Often the terms economy and cost minimisation are used instead of efficiency. Effectiveness and efficiency of services are the questions of intermediate and *ex post* evaluations.
- Sustainability refers to the extent to which the results of the intervention remain viable. Often evaluations consider the sustainability of institutional changes as well as socio-economic impacts.
- Utility is a very particular evaluation criterion which analyses the impacts in relation to broader societal and economic needs.
- Equity means looking at winners and losers, for example in case of changes to services or reducing inequality, whether income inequality, gender inequality or some other aspect has gained more prominence over the past years. It may even be set as a requirement by some sources of funding of evaluations or services.

The above is not a comprehensive list of possible evaluation criteria. Depending on necessity and context, such criteria as flexibility, institutional constraints, acceptance etc can also be used in evaluations. Table 1 below provides an overview of the typical evaluation questions related to the main criteria.

Defining evaluation questions is an essential part of planning any evaluation. There are different types of evaluation questions:

- descriptive questions intended to describe and measure changes (what happened?)
- causal questions strive to understand and assess relations of cause and effect (how and to what extent is something that occurred attributable to the intervention?)
- normative questions which apply agreed targets (are the results and impacts satisfactory in relation to targets, goals, etc?)
- predictive questions attempt to anticipate what will happen as a result of planned interventions (will the intervention create negative effects?)
- critical questions often support change from value perspective (how can e-services be made more acceptable to user groups?)

When formulating evaluation questions, the following aspects must be taken into consideration:

- The questions should correspond to an actual need for information, i.e. be an input into decision-making or public debate. These qustions should not be posed solely in the interest of gaining new knowledge as in scientific research.
- The questions should concern an impact, a result or a need i.e. elements outside the service (beneficiaries, economic environment etc.). Questions of internal management of resources and outputs, can be treated more efficiently in the course of monitoring or audit.

- The questions should concern only one evaluation criterion (e.g. efficiency). Without evaluation criteria clearly stated from the outset, it is difficult to provide meaningful conclusions. Evaluation questions that include evaluation criteria fall primarily into one of the following four categories: relevance, effectiveness, efficiency, and sustainability (Figure 4).

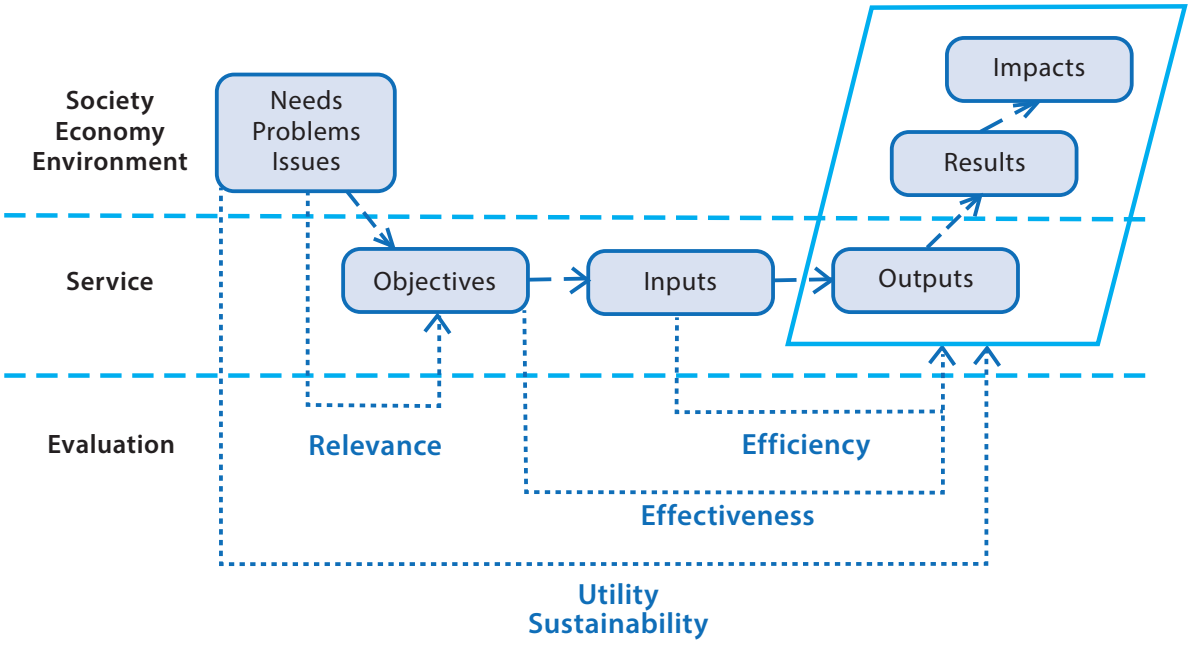

Figure 4. Prioritising evaluation questions (EVALSED 2012)

Table 1. Example evaluation questions related to the main evaluation criteria

EVALUATION CRITERIA	EXAMPLE QUESTIONS
Relevance	Are service objectives related to the needs? To what extent does the intervention help to solve the problem? Are there any other interventions that would be more relevant?
Effectiveness	To what extent have the objectives been achieved? Has the intervention produced the expected effects in the short term and in the long term? What helped/ hindered reaching the desired impact?
Efficiency	Is the intervention cost-effective? Would it have been possible to attain better outcomes at the same cost?
Sustainability	To what extent are the results viable? Can the results be maintained without public funding?
Utility	Were there any unintended effects? Are the expected or unexpected effects satisfactory from the perspective of direct or indirect beneficiaries?
Equity	Who are the winners and losers of the policy? Does the intervention alleviate inequality?
Flexibility	How easy it is to adjust to to the changed policy environment? Can the intervention produce results in a changed environment?
Institutional constraints	Does the policy option fit the current legal framework? Is there administrative support? Who is coordinating and monitoring the implementation?
Community acceptance	Does the community (people, entrepreneurs, government) accept the policy? Do they understand the policy and its effects?

Source: EVALSED 2012

Categorization is a helpful tool in the process of formulating questions. For example, depending on the objective of the evaluation, one can formulate questions from three different aspects. Those aspects are monitoring, process and impact. Moreover, it is also important to take into consideration the three different levels, i.e. individual, subject area, and society. Additionally, two more levels might be included – the funding/supporting body and the organisation itself. Based on these aspects and levels one could devise a matrix presenting the content of the evaluation, i.e. the objects of the evaluation.

Other questions can be related to the implementation or to the process itself: What activities or characteristics of the intervention contributed to the impact? Who were affected by the intervention, and how? Did the intervention affect all planned target groups? If not, then why? How did the impact manifest itself? What where the channels of these effects? Did the implementation of the policy vary between the target groups?

2.3. SELECTING EVALUATION INDICATORS

When the evaluation questions are formulated, you can move on to the process of selecting the indicators. **An indicator is a targeted metric that measures the course of a process or phenomenon**. An indicator indicates, but does not explain. Impact can be measured only in relation to something – a baseline is needed. Indicators can be quantitative (not more objective than qualitative indicators). What is more, the choice of indicator may affect the outcome - you'll get what you measure!

An indicator consists of an indicator base level, target level and the time period that is needed to reach the target level. If there is no information about the base level, the change can still be assessed for example, by asking service users if the service quality has improved during the past x years.

Types of indicators (EC Impact Assessment Guidelines 2009):

- **Resource indicators**: provide information about the financial, human, material, organisational or regulatory means needed for the implementation of the intervention. (What was used?)
- **Output indicators:** relate to the deliverables that the intervention is expected to produce. It is generally quite easy to distinguish, because output is by definition easily measurable, i.e. whether the planned activities were carried out in targeted volume (What was done?)
- **Result indicators:** represent the immediate effects of the intervention on the direct recipients. Result indicators are somewhat harder to determine, because they must reflect things that are frequently of qualitative nature. (What has changed?)
- **Impact indicators:** represent the consequences of the intervention beyond its direct and immediate interaction with the recipients (including unintended effects). Impact indicators are the most complex, because they must also take into account the causality between the objective and the results.

When choosing indicators, it is important to identify them throughout the result chain and not just at the level of outcomes, so that it would be possible to track the causal logic behind any results that are observed. Even in case of impact evaluation, it is still important to track implementation indicators, so that it would be possible to determine whether interventions have been carried out as planned and on time, and whether they have reached their intended beneficiaries. When evaluating public e-services, it is useful to include service providers in the process of selecting evaluation indicators, to ensure that the ones selected provide adequate measures of service performance.

Finding good indicators is not an easy task. A good indicator:

- is measureable
- measures what is relevant as opposed to not what is easy to measure
- is specific in terms of:
  - quality (what?)
  - quantity (how much?)
  - target group (who?)
  - time (when?)
- is valid and reliable
- measures only changes caused by the service

In order to select good indicators, the following questions should be answered:

- what do I want to change?
- what data sources will provide a good representation of this change?
- what are the baseline values?
- what direction and how much movement from the baseline do I want to achieve? (What is the target?)

Examples of indicators: 100% of population to have free access to internet in local library by 2015; 65% of population have used internet at home or work to visit public service websites by 2015; 15% of staff have agreements to work from home when appropriate by 2015; 40% staff time released by use of internet service delivery by 2016; 5 million EUR overall staff costs saved by move to e-service delivery by 2008.

If it is not possible to construct a good indicator due to data related constraints (no data, too expensive to collect etc), then we recommend using a proxy instead.

3. CONDUCTING AN EVALUATION

3.1. CHOOSING EVALUATION METHODS

Once it is clear what will be assessed and what kinds of evaluation questions need answering, one can start to consider how to conduct the evaluation. The methodology selected for evaluation will dictate the reliability of the results, the type of data that needs to be collected, duration of the evaluation, etc. Evaluation methods can be divided into quantitative and qualitative.

Quantitative methods:

- Use statistical and econometrical methods to (1) establish the extent of impact and its financial value by constructing an alternative situation (e.g. without implementation of the e-service) in *ex post* evaluations, or (2) estimating the expected impact (constructing the situation when e-service is implemented) in *ex ante* evaluations
- Employ previous research, models and additional data collection, large samples
- Unable to explain why and how the impact occurs
- Do not take into account detailed background information, standardise situations

Qualitative methods:

- Use information from interviews, focus groups, expert opinions, observations, case studies etc., small samples, difficult to generalise
- Describe results, processes and explain the way intervention achieves impact, able to use detailed and unstandardised information and take the context into account
- Unable to estimate the numerical value of impact
- Reliability of conclusions depends on the strength and consistency of arguments

Due to the limitations of both types of methods, often a combination of qualitative and quantitative methods is used. For example, qualitative analysis is employed in conjunction with quantitative methods in the following situations:

- performing scenario analysis before the quantitative assessment of scenarios
- quality of survey data depends largely on the questionnaire, to avoid missing valuable aspects and sift out ambiguous questions context is examined using interviews or focus groups
- qualitative methods are used for small societal groups that are hard to include with quantitative methods
- qualitative data helps to interpret the results of quantitative analysis

In addition to combining methods as described above, we also recommend using triangulation (answering the same questions with different methods/data/analysts) to increase the reliability of conclusions. Types of triangulation[7]:

- data triangulation uses different samples (e.g. samples from different time periods or areas) for answering the same questions
- investigator triangulation means two analysts using the same data
- multiple triangulation uses different methods, theories, data and analysts
- methodological triangulation: (a) using quantitative and qualitative methods in parallel, or (b) using different data collection methods, but data are analysed with the same method

Things to consider when choosing the evaluation methodology:

a) Evaluation objective and questions. Do you need to make projections or conduct a thorough analysis of the cost and benefits of the service? Is the focus on the extent of impact or the means of achieving it? Is the focus on a population or a small group of subjects?

b) Temporal distance. Depending on the subject field, there must be some time left between the time the activities took place and their evaluation in order to allow for the results to manifest. However, bear in mind that after some time has passed, people might not remember everything clearly. Therefore, it should be taken into account when designing questionnaires or deciding whether to use interviews for data collection. In such cases, quantitative methods might be preferable.

c) Available data. If for example extensive databases exist in the subject field (e.g. health care), then you should seriously consider using quantitative methods.

d) Evaluation time-table. Collecting data is usually the most time-consuming phase of evaluation, depending on the methods used. In addition, other aspects also affect the duration of the evaluation, e.g. level of detail, availability of existing data, variety of activities, complexity etc.

e) Financial resources. Data collection is usually the most expensive phase, especially in case of certain qualitative methods.

f) Analytical capacity. Complex methodologies require specific knowledge base and long-term experience.

Below is a list of possible evaluation questions and methods (assuming you have the necessary data, or the time and financial resources to collect it; there is econometric modelling expertise etc.):

- What is the nature and extent of the problem? *Quantitative and qualitative studies, monitoring indicators*

[7] Gray 2009

- Why is the intervention needed? *Logical models, economic theory, political criteria*
- What are the possible actions? Which is the best option? *Ex ante evaluation: previous studies, experiences, expert opinions, additional studies*
- How is the policy implemented? Does it reach target groups? Are planned services offered? *Monitoring and indicators*
- Has the intervention reached planned objectives? *Ex post evaluation: statistical methods, qualitative methods*
- Was the intervention cost-effective? *Ex post evaluation: financial methods*

Figures 5 and 6 illustrate the methods for *ex ante* and *ex post* evaluations. More information about the methods in Annex 2.

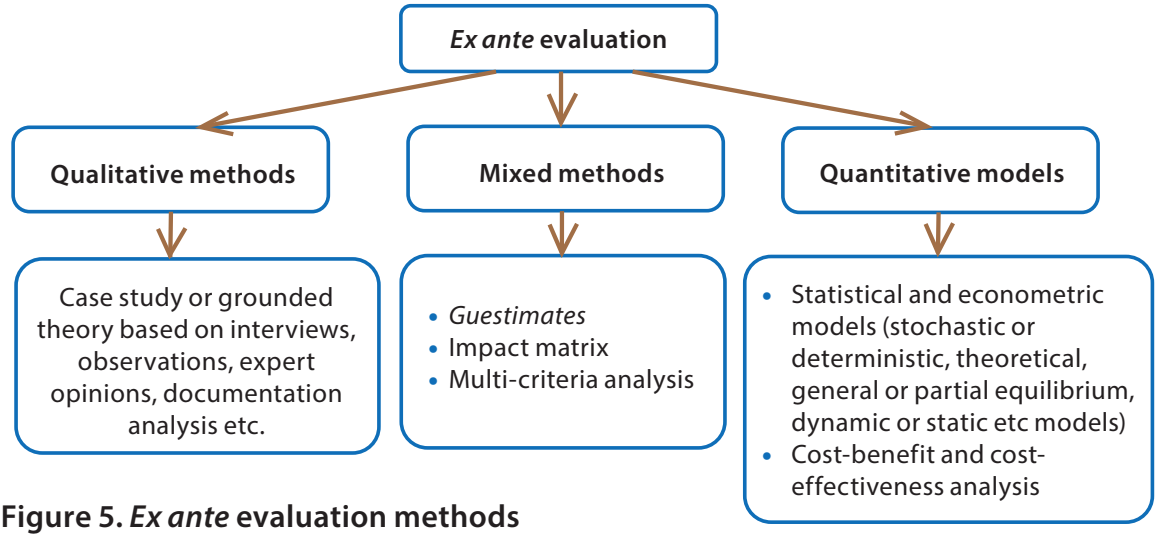

Figure 5. *Ex ante* evaluation methods

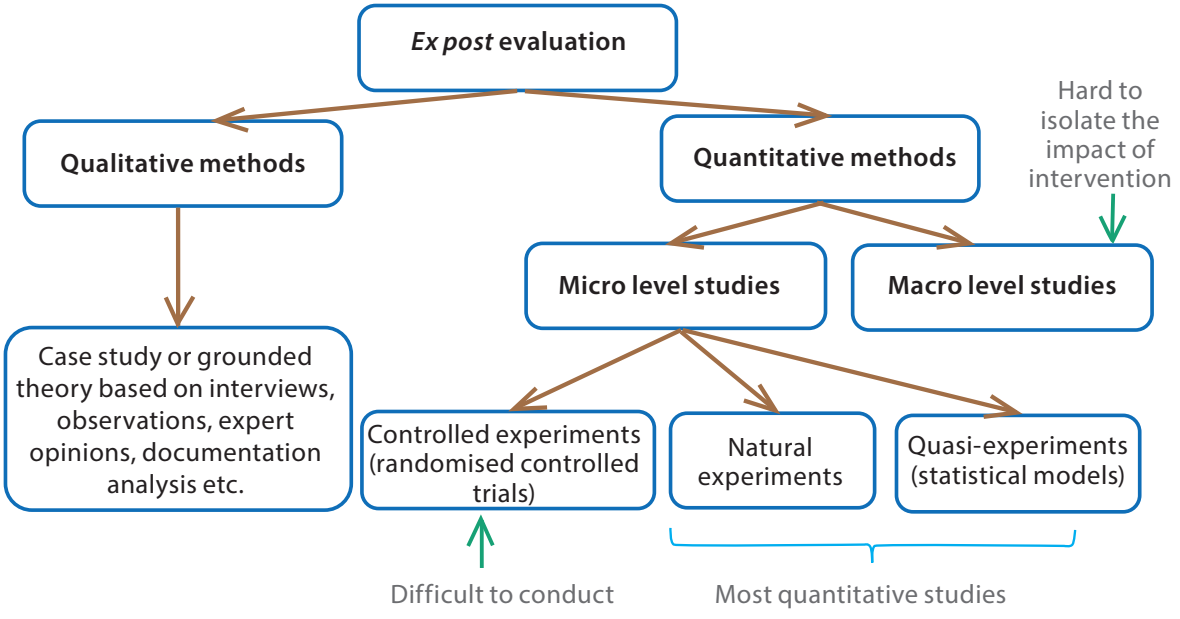

Figure 6. *Ex post* evaluation methods

3.2. DATA COLLECTION

What kind of data is needed?

Once the evaluation objective, focus and questions have been established together with the indicators, it will be clear what type of data is needed. Indicators form the basis of subsequent actions, and it is important to collect all available data which will help determine base values and attainment levels of the various indicators. It should also be considered whether it is needed, for example, to quantify assessments, explain causes, describe process or collect user feedback.

What kind of data already exists?

A lot of data already exists and can be used for evaluations. The data corresponding to output indicators (e.g. number of service users, number of transactions in the process of service delivery of service etc.) is probably collected by the service provider itself in the course of monitoring its activities. If indicators reflect the data that is collected by research companies or the state in the course of regular surveys or can be found in various registries, then that type of data is also available. Finally, research, previous evaluations and the work of other evaluators might also be worth looking into.

The data itself can be divided into primary and secondary data. **Primary data** is collected directly from the data sources for a specific reason, tailored to the data collector´s interest (e.g. interview with e-service user to get feedback on the user interface). **Secondary data** is the kind that is readily available and, therefore, less expensive to obtain. Secondary data can be information from census, company's records or other statistical information, that has usually been collected over a longer period of time. When using existing data in an evaluation, the data will inevitably be secondary, because it has been collected and to some extent processed by others and for other purposes. Therefore, one needs to have a good understanding of how, when, why and exactly what kind of data has been collected.

What kind of data needs to be collected?

After the existing data has been mapped out, it will be clear what kind of information is still missing and what must be collected additionally in order to provide answers to evaluation questions. If additional data is needed then it is important to:

- Investigate synergies with other projects to combine data collection efforts
- Develop a data strategy for the evaluation:

  - The timing for data collection (to estimate change or impact data from at least two different time periods is necessary)
  - The variables needed
  - The sample (including sample size)
- Understand how to integrate the data from other sources (e.g service monitoring data)

Data can be quantitative or qualitative. **Quantitative data helps determine whether there is an impact as well as estimate the size of the impact**. It enables answering the following questions - how big? how much? The advantages of using quantitative data are as follows: it can be generalised, helps finding causality, is objective and precise. However, bear in mind that many important aspects cannot be quantified, because quantitative data does not explain why a change has occurred and thus expert opinions or insights are a valuable addition to quantitative data.

Quantitative data can be collected through:

- Censuses – collecting data from the whole population. Usually conducted by the government and used in an evaluation as existing data and not a method for collecting additional data.
- Registers – various databases of population data that are regularly updated. Registers are established by the government, large organisations etc. Data from registers is used in an evaluation as existing data and not a method for collecting additional data.
- Surveys – using a sample to draw conclusions about the population. Often used to collect data for evaluations.

Qualitative data helps understand how and why the change has occurred by opening the "black box" between inputs, results and impact. But qualitative data collection is more subjective and the data needs interpretation. Therefore, the quality and reliability of the data depends on the researcher's skills.

Most widespread qualitative data collection methods are:

- interviews
- focus groups
- observations
- documentation analyses
- case studies
- less common are Delphi method and estimations/projections (sometimes categorised as mixed methods)

The Table 2 provides an overview of the advantages and disadvantages of different data collection methods.

Table 2. The advantages and disadvantages of data collection methods used in the evaluation process

METHOD	ADVANTAGES	DISADVANTAGES
Interviews: One or more people are interviewed, i.e. asked questions. Interviews can be structured, semi-structured or unstructured, i.e. the questions are either standardised or allow adapting to actual circumstances. Interviews can be conducted face-to-face or by phone, comprise of open-ended or closed questions.	■ People being interviewed share their own or their institution´s experiences „in their own words" ■ The interviewer may ask additional questions and gain an in depth understanding of the topic ■ Useful in situations where there might be language problems (eg. filling out a form in order to avoid mistakes) ■ More suitable for getting input and insight form people in management positions ■ Suitable for studying behaviour and processes, helps explain why things happen in a certain way	■ Time-consuming (especially when factoring in transcribing) and expensive ■ If different perspectives are presented with regard to one topic or process, then the analyst has a hard time deciding, what actually occurred or if these differences are mutually exclusive or complementary (this risk can be mitigated with focus groups) ■ Difficult to make generalisations
Focus groups: Before asking structured questions, focused discussions are carried out with parties that have had frequent experiences with the issue under observation.	■ Same strengths as for interviews ■ Knowledge is formed via group interaction, i.e. participants may change their opinions to some extent in the course of the group discussion, and together the group may reach shared conclusions or recommendations. ■ As a result, the assessment is grounded in a strong social context	■ May prove expensive and time-consuming ■ Assembling the focus group may prove difficult, because it´s hard to find a time and a place that is suitable for all busy participants. ■ Results do not allow for generalisations ■ Requires an experienced moderator ■ Suitable for combining with other methods, e.g. provides input for devising questionnaires
Observation: Observing and recording situations. Includes the person under observation, what happens, when, where and how the event takes place. Observations may be direct (the observer just watches what happens) or participatory (i.e. the observer takes part in the scene).	■ Provides descriptive information about the context and observed changes that occurred.	■ The quality and usefulness of the data depends largely on the writing and observations skills of the observer ■ The results are prone to multiple interpretations

Documentation analysis: Systematic sifting of various documents.	■ May provide a context for the evaluation. ■ May point out topics needing further study. ■ Cost effective, but depends on the volume of the material and how familiar the analyst is with the topic at hand.	■ May prove to be time-consuming ■ The result depends on the quality of the documents (e.g. previous studies may have methodological problems etc).
Case studies[8]: Pooling information into a comprehensive narrative that can be either descriptive or explanatory and describing the how and why.	■ Comprises a large amount of evidence from documents, interviews, and surveys. ■ Provides an overview and understanding of broader and more complex cases. ■ Samples of several cases allows for comparative analysis.	■ Difficulty of delivering good quality case studies ■ Requires research and writing skills ■ Results do not allow for generalisations ■ Time-consuming and expensive ■ Difficult to verify results ■ This type of in-depth analysis usually leads to decrease in the number of objects under review
Surveys: Surveys can be conducted online (results can be instantly saved) or on paper.	■ Simultaneous study of a multitude of subjects ■ Allows respondents time to think before answering ■ May be conducted anonymously ■ Guarantees uniform answers ■ Data formation and comparison is easier ■ Allows for generalisations (provided that the sample is representative)	■ The quality of the answers depends largely on the clarity of the questions ■ Sometimes it is difficult to persuade the respondents to take the survey ■ In case of multiple choice answers the respondents may be forced to choose from pre-determined answers that may not reflect their true opinion

Which data collection method to choose depends on:

- Type and purpose of the evaluation (Is it necessary to quantify the impact? Or are detailed user experiences needed to improve the service?)
- Users of the evaluation (Will the method allow you to gather information that can be analysed and presented in a way that will be seen as credible and beneficial by your intended users?)
- Respondents from whom you need to collect the data (What is appropriate for the age, literacy level, and socio-economic back-ground of the respondents? Are they likely to respond to a mail survey or prefer to answer questions face-to-face?)

[8] Case studies can also be regarded as a research method for which data is collected via various methods e.g. interviews, observations, focus groups, content analysis etc.

- Resources available for collecting data (e.g. time and money that can be used for carrying out polls, working with datasets etc)
- Type of necessary information (Standardized or diverse? Are generalisations about the population needed?)

Quality criteria for data:

- Validity: refers to the extent to which a measure actually represents what we intend to measure
- Reliability: data should reflect stable and consistent data collection processes and analysis methods over time
- Precision: relative size of the measurement error may have an important impact on measurement
- Integrity: focuses on whether there is improper manipulation of data
- Timeliness: data should be accessible and up to date to meet evaluation needs

3.3. PRESENTING THE RESULTS

Evaluation results are usually presented as a report with an executive summary or section of conclusions to highlight the main results. The report is usually a comprehensive, often technical and theoretical text. In order to ensure that the evaluation results are understood, taken into account in decision-making and implemented, we recommend:

- using graphs, figures and tables to illustrate and present the most important data and conclusions. In addition, animation, infographics and video can be used to visualise important relationships, simplify large amounts of data and present evaluation results.
- ensuring that target audiences know about and can easily access the evaluation report (e-mail notification, press release, article, blog post, report available online, etc.)
- producing separate short forms in addition to the evaluation report (summary, memo, policy brief, infographic, video interview) while always keeping your reader in mind (incl. terminology, language)
- tailoring your presentation to the target audience to effectively communicate your messages. When presenting to multiple groups of users, present the results in ways that are usable for each of them (incl. oral presentation).

4. A CASE STUDY: EVALUATION FRAMEWORK FOR ESTONIAN E-SERVICES

The Estonian public e-services were evaluated pursuant to the concept developed by the OECD and the World Bank. According to this framework, e-services are a part of national e-governance solutions. **The aim of the evalution conducted by Praxis was to determine the efficiency and impact of the e-services, i.e. to carry out the *ex post* evaluation of e-services**.

The underlying question in grouping the e-services was: who is the target of impact? Consequently, the impact evaluation of the e-services was carried out with regard to three target groups:

1. users of e-services (government to business; government to citizens)
2. providers of e-services
3. developers of e-services (private professionals involved in developing the e-services through public procurements)

In evaluating the effectiveness of e-services we analyzed the position of the state as a service provider on one side, and citizens and businesses as service users on the other side. The impact of e-services was measured using three criteria: efficiency, effectiveness and democracy (Table 3). The efficiency was measured as the time it takes different stakeholders to complete a task and the cost of switching to an e-service. The effectiveness of the e-services was measured through the improvements in the quality of the e-service that were brought about by this transition. The time, cost and quality were evaluated from the perspective of the providers, and the users. The wider impact of the e-services, including on democracy and public participation, were measured indirectly. In evaluating the impact of e-services on the developers, we analyzed the export possibilities of IT solutions. The evaluation focused on the comparison of e-service and traditional paper-based, non-digital service.

Table 3. The framework used in the evaluation of Estonian e-services

TARGET OF IMPACT / CATEGORY OF IMPACT		EFFICIENCY	EFFECTIVENESS	DEMOCRACY AND ENGAGEMENT*
User benefits	**Citizen**	Cost reduction Saving time	User/customer-friendly service Customer satisfaction	Accountability: control over service process Relevance of information More channels for participation Access to service Awareness Reliability
	Business	Cost reduction in using state services	Enhanced productivity Better profit margins Flexibility Innovation, creating new products and services Motivation to interact with government	
Provider benefits	**Government/ institution**	Cost reduction Reduction of administrative burden	Staff motivation Expanding the user base Saving time	New user groups

Notes: *indirect impact. *Source:* Kalvet et al. 2013

In our evaluation of the public e-services offered in Estonia, we concentrated on 13 indicators. The main starting point for evaluating the **impact of an e-service to the users** were the time and the cost saving aspects related to the use of the e-services. For example, users were asked to compare how much time they spent on using the service as an e-service as compared to the paper-based service. However, often when the e-service has been in use for a long period of time such a comparison cannot be made. In such cases case, there is the possibility to compare the latest, most mature vestion with an earlier version of the e-service.

The financial impact of the use of the e-services consists of reduced costs, e.g. transport costs. We calculated the financial savings (achieved through the time saved) by multiplying the average time saved from the use of the e-services with the average wage.

In addition to saving time and money, the improvement of the quality of public goods is also important. The impact of e-services on the improvement of the quality of public goods was measured by four indicators: availability of public goods; their simplicity, and convenience; transparency and reduction of errors in procedural processes; and the enhancement of Estonia´s image. For all the indicators mentioned above **the data was collected through a user survey. The wording of questions was modified to achieve better relevance for each service**.

The evaluation of financial benefit (or loss) arising from the development and adoption of e-services was based on the total cost of ownership method (TCO). TCO, when incorporated into any financial benefit analysis, provides a cost basis for determining the total economic value of an investment. In evaluating the **impact of e-services on the provider**, we analyzed the data on the planning, development, adoption and annual operating costs of e-services. The costs related to the development and adoption of e-solutions were distinguished from the costs related to the general IT-infrastructure. Similarly, the time spent on and the operating cost of an e-action were compared to the similar activities in case of paper-based solutions. Based on the time and financial cost per each action and the change in the number of transactions over the years, it is possible to calculate the total revenue from adoption of an e-service for each year. In principle, **the cost-benefit analysis was carried out for evaluating the financial impact** of e-services for the service provider.

In addition to the financial impact, we evaluated the impact of e-services on the work processes of public service. Two indicators were used: **the acceleration of the work, and the improvement in the work process and service quality**. For example, the smoother the exchange of information or the more modern and accurate working arrangements are, the less time is spent on preparations, prolonged periods of inactivity or transport, etc. The improvement of the service quality was measured by the transparency of the service process and decreased number of errors. For both indicators, the **data was collected through a service provider survey**.

The last two indicators used for evaluating the impact of e-services on service providers were

theimprovements in **organizational management, and feedback to policy planning and assessment**. In order to collect this data we carried out, a survey among the senior employees in the organisation which provided the e-service. The survey analysed the impact of current e-services, but also addressed what was preventing the achievement of greater impact. For the latter, we gathered the data through interviews with service providers, and a survey carried out among the officials and senior employees.

In order to evaluate the **impact of e-services on the service developer**, we measured the impact on the export possibilities of the e-service. The experience of different countries indicates that public procurements (including outsourced IT development) help shape the business environment, including the promotion of introduction of new products, services or processes at the company level. Table 4 provides an overview of the indicators used in the evaluation of e-services in Estonia.

Table 4. Indicators used in the impact evaluation of Estonian e-services

	SUBFIELD	TARGET GROUP	INDICATOR
1.	Financial impact	Provider	E-service cost and benefit analysis (Δ€)
2.	Time saving	User	Time saved from the use of an e-service (Δ)
3.	Time saving	User	Total time saved from the use of an e-service (Δ)
4.	Financial impact	User	Financial impact of the use of an e-service (e.g. transport costs) (Δ€)
5.	Public service quality	Provider	Acceleration of work
6.	Public service quality	Provider	Improvement in the work processes and service quality
7.	Public service quality	Provider	Improved organization management
8.	Better administrative policy	Provider	Feedback to policy planning and assessment
9.	Public service quality	User	Availability of public service
10.	Public service quality	User	Simplicity and convenience of public service
11.	Public service quality	User	Reduced number of errors in proceedings
12.	Public service quality	User	Improvement of a country´s image
13.	Impact on export	Developer	Public procurement impact on e-service IT-solutions export

Source: Kalvet et al 2013

4.1. DATA COLLECTION METHODS

Praxis´ analysts used the following data collection methods for measuring and interpreting the results of the introduction of e-services:

- **Desk research and statistical analysis of the available data**. Information was gathered from service providers, e.g. statistics related to e-service, previous evaluations and surveys, etc.
- **Structured interviews** with the persons responsible for developing the e-service. The interviews included questions about the size of the funds used for the development, administrative costs of the development, the changes in the number of employees and organisational structure. In addition, the interviews provided an opportunity to specify and check the information gathered about the e-service through other sources. Based on this data, the estimation of administrative costs and financial gains of adopting from the e-service was drawn up.
- **E-service user survey**. The users of e-services were asked to fill in a questionnaire before or after the use of the e-service. If it was not possible (because the e-service was not used actively during the survey), the invitation to fill in the questionnaire was sent through the service provider's website.
- **E-service provider survey** was carried out for measuring the impact of the e-service on the organisation.
- **Interviews with the e-service provider**. The aim of the interviews was to check the data collected through other sources and to identify the effects of the e-services.

The applied approach enabled to identify the technological, legal and organisational prerequisites for the successful implementation of an e-service and the main obstacles that have hindered benefiting from the use of an e-service.

4.2. PRECONDITIONS FOR THE EVALUATION

The starting point was to carry out an evaluation of effectiveness and efficiency on the following conditions (Terms of reference by the procuring agency - Ministry of Economic Affairs and Communications):

- From the position of a neutral bystander, independent from either the owner's perspective or the technical developer's interests. For the evaluation, it meant that we analysed the

benefits from the perspective of the provider and the user groups. NB! There may be various user profiles for one service, and they have different user behaviours which should be identified.

Example: *in the case of the school information system, parents (not students!) were identified as users of the system for the purposes of communicating with the school. There are no central providers of the service (it is an environment created by a digitalisation agency), but administrative users were identified in two groups – school management and teachers.*

- *Ex post* evaluation or looking back to evaluate the e-services in their present stage of life cycle. Some services were in their maturity, some had just been reorganised (redesigned and upgraded); some were at the end stage, i.e. a decision had been made to discontinue the current format for e-service.
- To establish the main dimensions from economic and social aspects and to choose relevant indicators to measure the „success" of providing digital access to public services
- To create and use a methodology that would be universally applicable to e-services, regardless of the intensity level of digitalisation; the policy area, and what user groups are targeted (individuals and corporate users alike)

4.3. PROCESS OF EVALUATION

The general preparation phase for evaluation includes:

- researching internationally used evaluation practices and methods
- creating a framework for measuring efficiency and effectiveness, selecting dimensions for measuring the impact (saving time, avoiding errors, increasing quality, providing access, etc.)
- making a list of evaluation criteria and indicators, based on the selected evaluation dimensions
- creating a format/case description as a base for collecting information on an e-service, according to evaluation dimensions and indicators
- applying evaluation methodology

4.4. EVALUATION OF INDIVIDUAL SERVICES

An example of a service evaluation is presented in Annex 3.

Adapting the case description format to the nature of the specific service. What were the aims for developing this e-service?

Lesson learned: it is important to establish what objectives were identified during the design phase when the digital development was started or commissioned (suitable documents to give this information may be e.g. Terms of Reference for the technical development, or funding application). If there are no clear objectives, then you should strive to define and discuss them with the owner of the service.

NB! If the aim was stated simply as "making the service digital", an evaluator cannot accept that. In order to define the objective more precicely one must, look at the general objectives in that specific policy area, e.g. what are the aims of granting public health services by the government?

Example: *in the case of e-voting, the main goal was not saving people time or even cost savings, but creating better access for democracy and engaging new voter groups.*

Modifying the list of indicators: are they relevant for this service? The evaluator must understand, what are the relevant dimensions and indicators to be measured. For example, are better administrative procedures a goal for the service provider? Or is the main aim to create transparency (regardless of the high costs of a complicated procedure)? The evaluation must focus on the relevant dimensions.

Lesson learned: Indicators are not universal, i.e. all indicators are not relevant for every service!

Contacting the owner/provider of the service, in order to discuss the objectives of the evaluation (what do we want to know?), identify user groups of the service, specify the timeframe necessary for carrying out the evaluation with the selected methods. Also asking for cooperation in collecting data and informing relevant persons in the organisation who are responsible for the service.

- Offline and online procedures were compared in order to measure time savings (and based on that, cost savings). In the case of some services, the process had been changed, e.g. not all components were digitalized. This should be borne in mind, because it is not possible to make direct calculations or comparisons if the service used for comparison has been significantly changed.
- The question of what is the added value of digitalization remains. Better access for users? Better quality, i.e. less mistakes by administration and also by users?

Example: *Statistics Estonia conducted a thorough audit of its processes and subsequently set the aim of achieving administrative efficiency. It resulted in creating pre-filled forms, re-using information already provided by businesses, etc.*

Research methodology needs to be sound and well-suited for the assignment.

- The aim was to assess the effectiveness and impact, not focus on cost-effectiveness, i.e. the question whether the same results could have been achieved with less money, was not addressed.
- No comparative conclusions were reached. Lesson learned: in order to compare the success of e-services, the selected services should have the same maturity level and development phase!

If there is no need to compare e-services, then the case description should be used flexibly (if comparative analysis is not required, then the questionnaire can be adapted for a particular service), indicators can be omitted and cost savings need not be calculated if they are irrelevant.

- In case of quantifiable, objective indicators (such as time and cost savings) do not give sufficient information on the value and effectiveness of the service, you should consider applying other indicators, before making conclusions regarding the impact.
- If the numerical data is unreliable, do not use it! Instead provide qualitative estimates.
- If possible, propose one or a couple indicators that could be universally used as an indicator for e-services (e.g. granting access to new users).
- For collecting reliable data on time savings, it is best to use observations and real-time testing (and not asking users for subjective estimates).
- Different user profiles should be tested separately.

4.5. LESSONS LEARNED IN THE EVALUATION PROCESS

You must define very clearly what IS, and what is NOT the object of evaluation. Defining the nature of the service and its objectives (what it is expected to achieve) is the key.

- Most of the evaluated services were platforms offering a range of different services for various user profiles. The evaluator selected one specific service and user profile (e.g. various a particular tax declaration) to define stakeholders, intervention logic etc.
- The choice of service and user profile from the platform was made with preference to services about which the most data had been already collected by the service owners/ providers. Remember, that it is advisable to select indicators that can be backed by data.
- It was difficult to define the costs involved in developing and operating a particular service. Usually, the initial investment was made on the whole platform/web environment, which was then out-sourced (procured from an IT development agency), but the subsequent upgrades and maintenance were done in-house. In-house operations were often not accounted for or calculated.
- It must be clear, what is the exact offline counterpart of the e-service. Only then can the comparison be made between the time and cost of using offline vs digital service. Even though it is difficult, we advise to measure cost-efficiency for the service provider, as it is a vital indicator.
- It is advisable to plan several periodically recurring interviews for each case/service. At first you get some initial information, and then you need to go back to ask for clarifications, based on the collected information, or results of user interviews, quantitative data, etc. Thus, you need to establish a point of contact in the organisation that can assist with getting the answers. Consider conducting a group interview with the key personnel from the development and operation departments of the service.

5. SUMMARY

Governments around the world are extensively implementing information and communication technology in order to provide services and fulfil government functions. A systematic approach is needed to understand, describe and quantify the impact of e-services in order to make better decisions regarding these issues.

Evaluation is a systematic and objective assessment of the design, implementation and results of a service compared to its objectives. Evaluation often determines the relevance, impact, efficiency, effectiveness and sustainability of an e-service.

Evaluations can be conducted before, during or after the implementation of an e-service and, therefore, the reasons for conducting an evaluation may be:

- To decide whether to implement an e-service
- To give input for improving the e-service in development
- To assess if the implementation of an e-service has produced the desired outcomes
- To evaluate the overall impact of an e-service

Types of evaluations:

- Impact evaluations focus on questions of causality and the overall results of the service provision.
- Performance monitoring provides information on how a service is operating and the extent to which specified objectives are being attained. Performance monitoring informs on whether the set objectives can be reached.
- Process evaluations answer questions about how the service operates, documents the procedures and activities undertaken in service delivery. The focus is on how the service is provided to the user.
- Cost evaluations address how much the service provision costs as compared to to alternative uses of the same resources.

The evaluation process involves:

- **Preparing for the evaluation.** The time, cost and necessary analytical expertise depend on the complexity of the evaluation and may set serious limitations to the evaluation. High quality evaluation with sound methodology provides the needed value, therefore it is advisable to conduct fewer but better evaluations.
- **Determining the intervention logic**. Intervention logic ties problems, objectives and actions together in order to describe how the expected results will be achieved. Construct-

ing and analysing the intervention logic is a valuable outcome of an evaluation. Poorly designed intervention is not worth the complicated evaluation effort. We recommend establishing close with the e-service provider to understand the e-service is recommended.

- **Setting evaluation objectives.** In order to maintain focus it is essential to specify very clearly why the evaluation is undertaken. The evaluation framework should support setting a focus for the evaluation, but also describe the relevant dimensions, aspects and problems of the service under examination. Continued cooperation with the e-service providers is advised.
- **Choosing the evaluation design.** Evaluation criteria determine what aspects of an e-service shall be evaluated. These criteria can be relevance, effectiveness, efficiency, sustainability, flexibility, institutional constraints, acceptance by users, etc. Then follows the formulation of evaluation questions and the process of selecting indicators. An indicator is a targeted metric that measures the course of a process or phenomenon. Indicators can be divided into four categories: resource, output, result and impact indicators. An indicator consists of the indicator base level, target level, and the time period that is needed to reach the target level.
- **Data collection.** After the existing data has been mapped out, it will be clear what kind of information is still missing and must be collected in order to provide answers to evaluation questions. Quantitative data indicates whether there has been and impact, and measures its extent. Qualitative data helps to understand how and why the change has occurred.
- **Conducting data analysis and getting the evaluation results.** The reliability of the results, necessary data, duration of evaluation, etc is dependent on the chosen evaluation methodology. In *ex post* evaluations the objective is to estimate the impact by constructing an alternative situation, i.e a situation without the implementation of the e-service , whereas in *ex ante* evaluations the aim is to estimate the situation if the e-service is implemented. If comparison between e-service and non-digital service is not possible, then you could compare an earlier version of the e-service with an upgraded e-service. Methods are divided into quantitative and qualitative. Due to the limitation of both types of methods, it is advisable to use a combination of qualitative and quantitative methods. In addition to combining methods, you could also use triangualtion (answering the same questions with different methods/data/analysts) to increase the reliability of conclusions.
- **Reporting results.** Use visualisation to highlight important relations, illustrate large amounts of data and present your evaluation results. Ensure that the target audiences know about the evaluation report and have easy accss to it. In addition, produce separate short forms and adapt the form of presentation to suit the the target audience in order to effectively communicate your findings.

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ANNEXES

Annex 1. Methods for describing the intervention logic

The result chain describes the service from inputs to impact as shown in Figure 7. This graphic depiction should provide a clear overview of how the impact is achieved, i.e. which inputs are transformed and which activities are used to attain the desired changes.

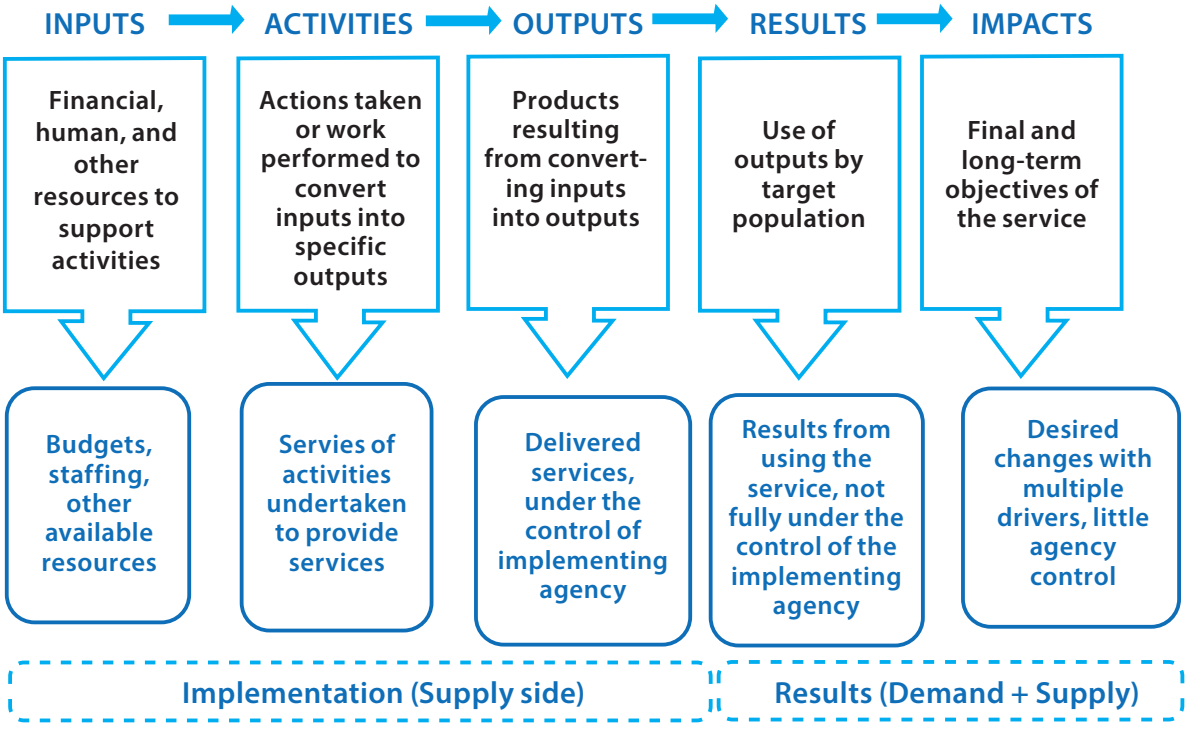

Figure 7. Result chain

Source: Gertler et al 2011

The logical framework (logframe) is a hierarchical framework that also illustrates gradual evolution towards the final goal using indicators as shown in Figure 8. It also demonstrates interdependence, i.e. outputs can be achieved only when actions are performed, the higher level depends on the lower one. In addition, the logframe provides an overview of prerequisites, i.e. what is needed or what conditions should be fulfilled in order to get the desired deliverables.

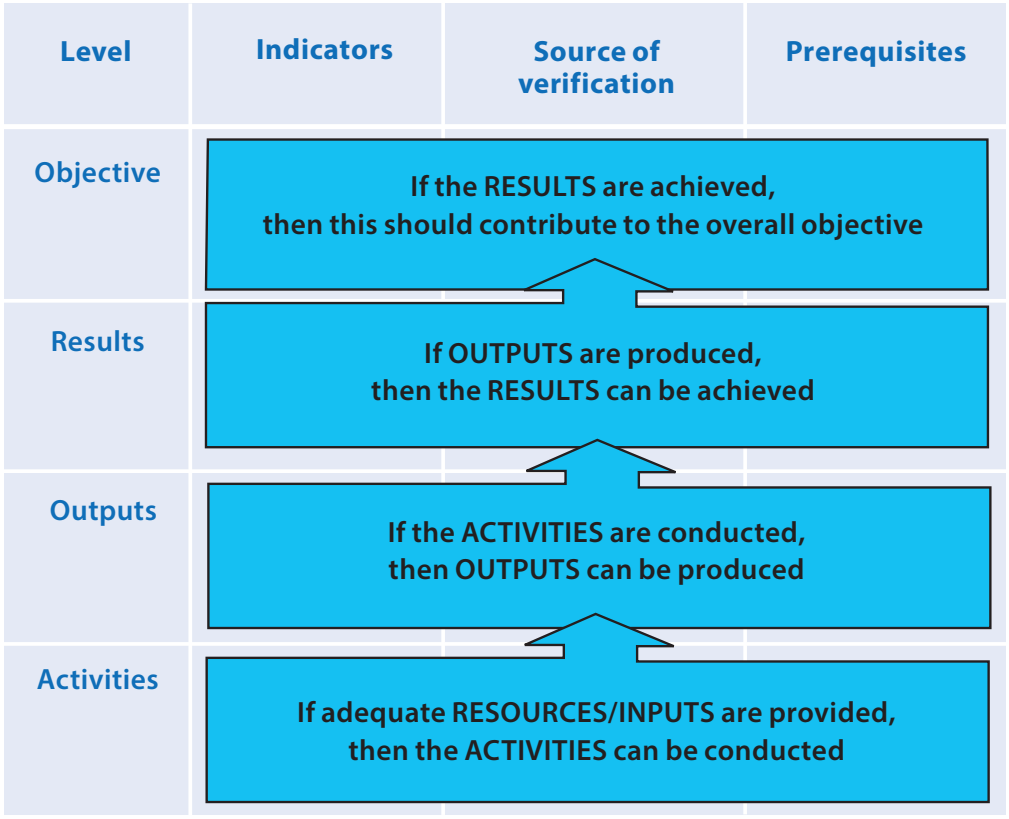

Figure 8. The Logical Framework

The theory of change is a description of a logical causal pathway, i.e. how an intervention is supposed to deliver the desired results. It gives an overview of short- and long-term changes needed to achieve long-term objectives, explores the conditions and prerequisites for the change, demonstrates explicit the causal logic behind the change and lists the interventions. The result is usually a descriptive text but can also be a graphical presentation of cause and effect relations, conditions and prerequisites needed for the change to happen.

The problem tree/objective tree is an analytical tool for displaying a hierarchy of problems and objectives (Figure 9). In order to build a problem tree you need to:

1. use brainstorming to identify problems, and formulate them as short sentences
2. choose a starting problem
3. create a cause and effect hierarchy – a problem tree
   - if the problem is the cause of another, move it down a level;
   - if the problem is the effect of another, move it up a level;
   - if it is neither the cause nor the effect , leave it on the same level.
4. choose the focal problem(s) and create a tree-like structure

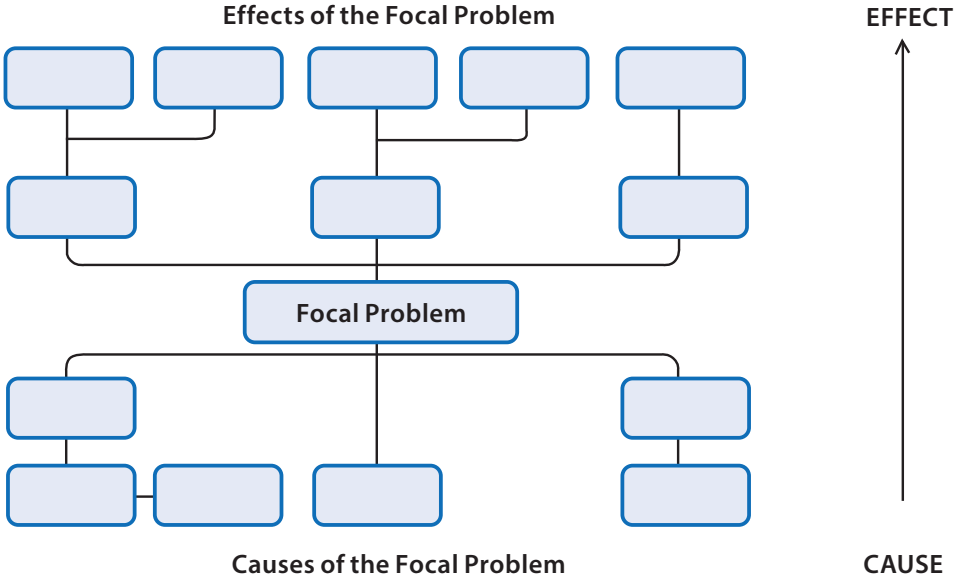

Figure 9. The Problem Tree

Then turn the problem tree into an objective tree by reformulating all the negative situations of the problem tree into positive situations that are desirable and realistically achievable:

- Ensure there is a causal relationship ("if this is done then this will be achieved"). Thus, the causes become the starting point for the objectives, and the effects become the results of fulfilling the objectives.
- If necessary:
  - Revise the statements
  - Add new objectives if they seem to be relevant and necessary to achieve the objective at the higher level
  - Delete objectives which do not seem suitable or necessary

Two recommendations to bear in mind:

- Problem definition needs to be sufficiently detailed (e.g. "management issues" is too general – what exactly is the problem?)
- The problems should not be defined as a missing solution (e.g. lack of trained staff, no money – but what happens because of it?)

Annex 2. Evaluation methods

Importance of baseline

Measuring change requires an understanding of the starting point based on which change is measured. The baseline is the situation prior to an intervention, against which progress can be measured or comparisons made. Baseline data is collected before a program or policy is implemented to assess the "before" state. Therefore, collecting baseline data should be kept in mind when planning an intervention and collecting data for evaluation.

Qualitative methods

Qualitative data is collected through interviews, observations, expert opinions, documentation analysis, etc. It is often analysed when compiling a case study or a grounded theory bin case of both *ex ante* and *ex post* evaluations. These methods explain the way an intervention achieves impact and enable the use of detailed and unstandardised information, taking the context into account. The description of logical causal pathways and the reliability of conclusions depend on the strength and consistency of arguments. Generally, these methods do not produce numerical estimates nor enable the generalisation of results.

Mixed methods

Guesstimates are used in situations where data is not available or data collection is not possible due to time or budget constraints in *ex ante* evaluations. Guesstimates provide evaluators numerical values without using complicated quantitative methods and large-scale data collection by:

- using data from other countries or previous periods
- employing results from research and surveys with sound methodology
- using elasticities, relations between figures
- estimating lower or higher limits of an indicator if precise figures cannot be calculated
- using trends, growth rates, assuming convergence to some level
- collecting expert opinions to get an estimate

Multi-criteria analysis (MCA) is in many respects similar to cost-effectiveness analysis (CEA, introduced below), but it involves multiple indicators of effectiveness. It combines qualitative and quantitative information, and requires agreement on criteria and weights. MCA takes into account the multidimensionality of a problem, enables the use of different types of data in the same framework, while taking into account distributional issues. However, it entails some subjectivity, particularly in setting the weights, is unable to determine whether benefits exceed cost, and usually

does not incorporate a time dimension. MCA is mainly used in *ex ante* evaluations.

Undertaking a multi-criteria analysis involves the following steps:

- identifying the problem and objective
- selecting policy options
- selecting criteria (in practice max 8) that are clear, measurable, unique and linked to the objective
- attributing the criteria weights (can involve stakeholders or experts)
- Each option (alternative way of securing the objective) is then given a score
- weighing scores and aggregate results
- ranking options
- analyzing the effect of uncertainty to the decision

Quantitative methods

Statistical modelling is used in *ex ante* evaluations to estimate the expected impact, and in *ex post* evaluations to isolate the impact of intervention from other factors, constructing a hypothetical situation where the intervention was not implemented or to deconstruct the interaction of several interventions.

It is an empirical estimation of relations between parameters based on data of past periods, usually based on averages in the sample. For example, a micro simulation model, where based on individual data, a relation is estimated and a policy effect is simulated.

This method enables the calculation of numerical values of impact, the estimation of financial benefits and costs, the comparison of policy alternatives. However, modelling is also time-consuming, expensive, and entails high uncertainty, which is why the reliability of results should not be overestimated. Sensitivity analysis is used to understand the robustness of results and the influence of preliminary. The result must be: transparent, reproducible, and in accordance with other surveys and results. If model estimations contradict intuition or reality, then the model is probably wrong.

Cost-benefit analysis (CBA) seeks to quantify all the (expected) costs and benefits of an intervention in monetary terms and assesses whether benefits outweigh costs. For an intervention to qualify on cost-benefit grounds, its social benefits must exceed its social costs. "Society" is defined as the the sum of individuals. The context may be either *ex ante*, i.e. estimating whether something is worth implementing, or *ex post*, i.e. assessing the value of a past decision.

Undertaking a cost-benefit analysis involves the following steps:

- identifying the problem and alternative solutions (in *ex ante* evaluation)
- identifying the costs and benefits.
- determining the time period over which costs and benefits are estimated
- finding monetary values of costs and benefits
- weighing the values if needed (e.g. higher weights to benefits and costs accrued by disadvantaged or low income groups)
- selecting a discount rate (costs and benefits will accrue over time, not comparable without discounting since consumption in the future is usually valued less than consumption today)
- accounting for the relative price change (some benefits and costs attract a higher value over time relative to the general level of prices, e.g. environmental assets)
- conducting a sensitivity analysis (account for risks and uncertainties)
- taking into account non-monetary costs and benefits
- Finally, identifying the distributional incidence of costs and benefits

Monetary values can be found by using:

- market prices and labour cost
- opportunity cost: resources are priced at their value against their best alternative use, which may be above or below the actual cost of production
- willingness to pay (WTP) for a benefit and a willingness to accept compensation (WTA)
- value of statistical life (in health care, transport, environment) and valuing non-market impacts based on:
  - revealed preferences
  - stated preferences
  - human capital approach

Cost-effectiveness analysis (CEA) differs from cost-benefit analysis (CBA) in that benefits are expressed not in financial units but in physical units. Conducting a comprehensive CBA is complicated, especially when trying to find monetary values. CEA contrasts alternatives in terms of their relative contribution towards a specific objective. That is, a non-monetary criterion of effectiveness is predetermined and alternatives are compared in terms of either their cost per unit of effectiveness or units of effectiveness per dollar.

CBA or CEA? CBA is more useful when analysing a single program or policy to determine whether the program's total benefits to society exceed the costs or when comparing alternative pro-

grams to see which one achieves the greatest benefit to society. The major problem with CBA is that it is often difficult to place monetary values on all (or most) costs and benefits.

CEA is useful in cases where major outcomes are either intangible or otherwise difficult to monetize. The major difficulty with CEA is that it provides no value for the output, leaving that to the subjective judgment of the decision maker. CEA may provide a good starting point by requiring the evaluator to identify the most important outcome and relate the outcome to the money spent on the project.

Standard cost model deals with quantifying administrative burdens (does not include tariffs, taxes, investments, etc.) that constitute daily obstacles for enterprises. In order to fulfil obligations assigned by public authorities, enterprises have to allocate resources to administrative activities rather than invest them in more productive activities. Information obligations are the obligations arising from requirements to provide information and data to the public sector and/or third parties. For example, Denmark, the Netherlands and Norway have set a reduction target of 25% on the overall administrative burdens for businesses and the standard cost model is a useful tool in planning interventions and following progress toward these kinds of objectives. The international Standard Cost Model Manual is available at http://www.oecd.org/gov/regulatory-policy/34227698.pdf

Macro level ex post evaluations use statistical and econometric methods to determine the impact at the macro (e.g. country) level. This method requires reliable data and a sound theoretical base, but isolating the impact of an intervention is usually difficult on the macro level.

Micro level ex post evaluations or counterfactual impact evaluations. It is impossible to observe the same individual with and without an intervention (e.g. using a service/not using it) simultaneously. Thus we need to need to estimate the alternative situation or counterfactual, i.e. what would have happened without the intervention. The difference between the observed situation and the counterfactual is the estimated impact. However, participants differ in observed and non-observable ways (selection bias).

The counterfactual is devised using experimental design (controlled or natural experiments) or quasi-experimental design. Random assignment (controlled or naturally occurring) is used in experiments to form intervention and comparison groups. It requires a large population and not too wide variability. An experiment needs to be planned prior the programme. Quasi-experimental design allows for the comparison group to be constructed afterwards by statistical and econometrical methods. The aim is to create a situation where participation (e.g. e -service use) would be independent from all other factors.

A comparison group can be constructed using:

- **Randomisation.** Individuals are randomly assigned into participation and the counterfactual is the randomisedout group. It is often considered the "gold standard" because by design the selection bias is zero on average and the mean impact is revealed. Randomisation is also perceived as a fair process of allocation with limited resources. But ethical issues or political constraints appear in some areas and participants may not comply with the assignment (selective non-compliance). The estimation of entry effect is not possible and the question of generalizability arises – usually a controlled experiment is run on a small scale and it is difficult to extrapolate the results to a larger population.
- **Simple before and after comparison.** A counterfactual is the same group before intervention. Often used due to simplicity, but makes implicit assumptions that there is no selection bias and results are affected only by the intervention. In real life these assumptions rarely hold.
- **Matching.** Participants are matched with non-participants from a larger survey. Each program participant is paired with one or more non-participants who are similar based on observable characteristics. This assumes no selection bias based on unobservable heterogeneity. The method does not require randomization nor a baseline (pre-intervention data), but requires very good quality data to control for all factors that influence program placement and a significantly large sample size to generate the comparison group.
- **Difference in difference.** Both participants and non-participants are observed for changes over time and non-participants provide the counterfactual for participants. Therefore you need to collect baseline data on non-participants and (probable) participants before the intervention, compare it with data from after the intervention, and subtract the two differences or use a regression with a dummy variable for participation.
- **Instrumental variables.** Variables that affect participation, but not outcomes, are identified. However, it identifies the effect of the intervention only for the sub-population of those induced to participate by the instrument. The validity of the instrument can be questioned, but cannot be tested.
- **Regression discontinuity.** This method exploits the rule where participation depends on exceeding a given threshold, assuming that there is a discontinuity in participation, but not in counterfactual outcomes. The counterfactual is constructed by individuals just below the cut-off, who did not participate. The threshold needs to be applied in practice and individuals should not be able to manipulate their score to become eligible.

Annex 3. Registering a company in Estonia via the e-Business Register

Name of the e-service: registering a new company via the e-Business Register

Service provider: Ministry of Justice, Centre of Registers and Information Systems (RIK, Registrite ja Infosüsteemide Keskus), registry departments at county courts. Estonian Ministry of Justice is the responsible authority. The service was developed by RIK, which subsequently took over the administering duties for the e-Business Register. Petitions for entry are reviewed by courts.

Maturity level of e-service: in routine operation

Launched in: 2007

1. The objective and target group of the e-service

The Centre of Registers and Information Systems (RIK), responsible for developing and administering the e-service, is a government agency operating in the jurisdiction of the Ministry of Justice. According to the head of the court registers department at the RIK, the main objective for developing this e-service was, first, to simplify things for prospective entrepreneurs, and secondly, to foster entrepreneurship/the establishment of new companies. An additional impulse to deal with this issue came from the European Council which tasked the member states, in its conclusions adopted in June 2006, to ensure by the end of 2007 that establishing a company would not take longer than a week. These obligations led to legislative amendments, and pursuant to the current Estonian Commercial Code, a petition for entry into the commercial register must be reviewed by the registrar (registration departments of the county courts) within five working days (as opposed to 15 working days stipulated in the previous version) after receiving the petition. What is more, launching the Company Registration Portal also helped accelerate the registration proceedings, because registration by electronic means is considered an expedited procedure (within 24 hours). However, no specific numerical targets were set.

The service is aimed at both private persons looking to establish a company, and legal persons establishing new companies (except public limited companies).

The service has been used very actively. Actually, it is no longer possible to register a company using completely non-electronic channels. Even those, who do not register their companies via the e-service and use notary services instead, will have their petitions entered into the e-Business Register by the notaries. Thus, from the perspective of the RIK or person actually reviewing the petitions, there is no difference whether the petition was entered by the entrepreneur him/herself or by a notary.

During the first couple of years the number of e-service users increased by 20% per year, but starting from 2011 to 2012 the proportions have largely remained the same: approximately 80% of petitioners use the e-service, and the remaining 20% prefer other means. In 2011 85% of new companies (16,781) were registered by their founders via the Company Registration Portal, and 15% (2,859) as a notary service. Statistical data for the period from 2006 to 2012 is illustrated in Figure 10.

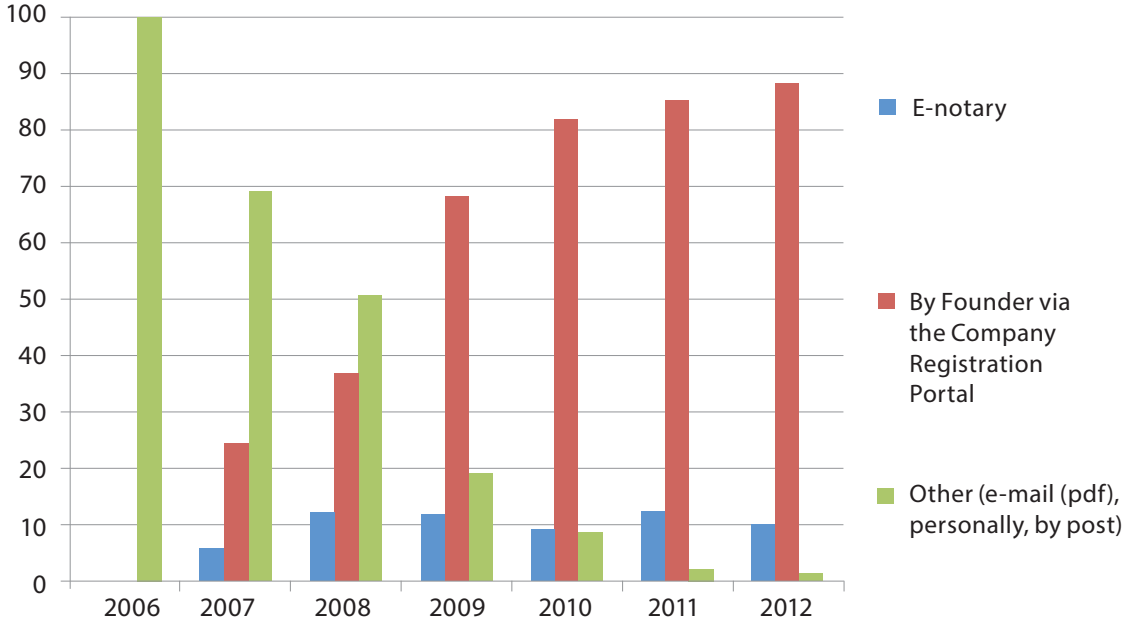

Figure 10. Company registration via different channels (%)

Source: RIK

2. Overview of the Content and Decision-Making Process of the e-Service

Currently the company registration procedure is fully electronic in Estonia. The founder(s) must have an ID-card or mobile-ID, and special computer software for digital signatures. In the e-Business Register the founder(s) must:

- Enter the necessary data regarding the founders, and the company under establishment
- Enter the business name (the system will automatically check whether the name is available). If the preferred business name is not available, then the founder must decide whether to pursue establishment of a company with an already existing name or not
- Make any necessary changes, and approve the standard statutes
- Pay the state fee (185.34 euros for a private limited company)
- Pay the nominal capital contribution – can be done later, i.e. one year after the start of business activities

Electronic registration without the help of a notary is treated as an expedited procedure. The petition for entry is reviewed within a couple of hours, and if there are no problems, the court shall approve the foundation resolution by sending a confirmation to the founder. In 2009 a world record was documented in Estonia – establishment of a company in 18 minutes (Kõmmus, 2009). According to the seven entrepreneurs who answered the questionnaire prepared in the framework of this study, the time for establishing a company ranged from 15 to 60 minutes, averaging at about 30 minutes, corresponding to the estimates made by experts.

The Company Registration Portal allows for the establishment of the following types of companies: private limited company, general partnership, limited partnership, and also sole proprietorship. It is not possible to register a commercial association or a public limited company via the e-Business Register. It is necessary to use the services of a notary if the company's capital contribution is non- monetary (i.e. a thing which is monetarily appraisable and transferable to the private limited company, or a proprietary right, e.g. equipment, software), or if the founders cannot sign association documents digitally (e.g. foreign citizens, who do not have a suitable ID-card). In such cases the following steps must be taken in order to establish a company:

- Pay the capital contribution, and the state fee (140.60 euros for a private limited company), plus notary fee
  Choose a notary and book an appointment
- Prepare the necessary documentation with the help of a notary, and submit the documents to the Business Register (incl. memorandum of association of the company, statutes, petition for entry, telecommunications numbers, proof of payment of the capital contribution, and state fees)

Registering a company through a notary will usually take about two or three days.[9]

Before 2007 the process of registering a company was relatively long, and entailed a considerable amount of paperwork. It included the following:[10]

- Familiarising oneself with the necessities (talking to someone knowledgeable, making phone calls or browsing the Internet) – at least 1 hour
- Setting up an appointment with a notary, and sending the necessary information. The appointment could be made by phone, but the information had to be relayed either by fax or personal delivery (this option was usually easier). At the notary's office one had to

[9] https://www.eesti.ee/est/teemad/ettevotja/ettevotte_loomine/ettevotte_asutamise_toimingud/ettevotte_registreerimine

[10] The time estimate is based on expert opinions

make photocopies etc. – 30 minutes spent on getting there[11], plus one hour at the notary's totalling at 1.5 hours

- Opening a bank account for the company, payment of state fees, and making the capital contribution – 30 minutes spent on getting to the bank, plus 30 more minutes at the bank (usually there is a small queue) totalling at 1 hour
- If the company was registered in a field of activity requiring a license, one had to visit the field of activities register – 30 minutes spent on getting there, plus 30 more minutes at the register totalling at 1 hour
- Return to the notary's office to fill out and sign the full documentation package, making photocopies (e.g. if the documents were faxed), payment of invoice – 30 minutes spent on getting there, plus one hour at the notary's totalling at 1.5 hours
- Delivering the documents to the registration department. Unfortunately there is no data regarding the proportion of people who delivered their documents personally vs those who sent theirs by post or courier. We assume that people were trying to save time, and sent their documents by post – 15 minutes to post the documents
- Once the company was registered the founders needed to acquire a confirmation letter, and take it to the bank in order to finalise the opening of the bank account. This confirmation was usually delivered by post, but if people were in a hurry they usually picked it up themselves. Assuming that the confirmation letter was delivered by post – 30 minutes spent on getting to the bank, plus 30 more minutes there totalling at 1 hour

In total the registration process used to take approximately 6.25 hours, plus waiting time due to queues at the notary´s office need to be factored in. All these procedures could not have been completed on the same day.

3. The main prerequisites for successfully launching an e-Service

The main prerequisites for launching the e-service were the following:

- Authentication with an ID-card (already available)
- The X-Road service allowing the pooling of necessary data from other registers
- e-Business Register allowing for the development of additional e-services. Initially the e-Business Register was used only for information queries. The registration of companies

[11] Hereafter the time spent on getting to the various offices is estimated at 30 minutes, which is a rough estimate, and should not be considered an objective average in any case. It should be taken into account that in a city environment it might take less time, whereas in the countryside it might take longer. Effective people will plan their errands accordingly, and therefore their trip to the city might not be related only to the registration procedure. For this reason we have not taken into account the time spent on returning home.

became the first state-provided e-service utilising digital signatures

- Public readiness to use state-provided e-services, fostered by the newly launched e-Tax Board
- Legal framework – several legislative acts had to be amended

The e-Business Register was launched quite quickly: it took about six months (in 2006) to make the necessary legislative amendments, and design the system. Legal questions were handled by the Ministry of Justice, and the programme was developed by RIK. Quick action was bolstered by a small and effective team, and the Justice Ministry´s commitment and support as the contracting agency

4. Time and investments spent on deploying the e-service

It took six months in 2006 to deploy the first phase of the e-service, and subsequently the e-service was launched. The second phase involved a further development which allowed from 2008 the citizens of four countries – Portugal, Finland, Belgium, and Lithuania – to register companies in Estonia using their respective ID-cards. Contrary to the first phase, the new legislative amendments were made under the leadership of RIK. Currently RIK is collaborating on new registration application procedure software.

The cost of launching the service was 193,728 euros, which comprises the cumulative investment made from 2006 to 2007 for the purposes of developing the current version (incl. investments in personnel and hardware). The life-span of the investment is estimated at 20 years, and annual operating costs are 1,021,925 euros. This includes the costs of court registration departments (50% of total cost), the Justice Ministry's personnel costs, and RIK's costs (30% of total costs related to the e-Business Register).

5. E-service Impact Assessment

No previous studies have been conducted to assess the impact of this e-service. An international study titled „Doing Business" does not accurately reflect the speed of registering a company in working hours, but takes into account all waiting periods. Thus, according to that study, in 2005 company registration in Estonia took 72 days in 2005, and during 2006-2007 it totalled 35 days (mainly due to long queues at the notary´s offices). Later they have estimated the process to take 5 days, which is also not an accurate estimate (each step described above has been designated one day, although each one takes only a few minutes to complete). However, it does indicate that the time period related to registering a company has decreased considerably.

Impact on the users of e-service

For persons wanting to go into business this e-service will mainly help save a considerable amount of time. Currently the registration process takes approximately half an hour (plus waiting for the confirmation), whereas it used to take about 6,25 hours, and therefore we can see that the immediate gain for users is 5,75 hours. Prior to the launch of the e-service company registration entailed several types of monetary costs (which are difficult to estimate in retrospect) - transport costs, postal service fees, notary fees, state fees, phone bills, and photocopying. Currently the user of the Company Registration Portal only has to pay the state fee.

In addition, entrepreneurs benefit indirectly from shorter waiting periods, i.e. they are able to start their business activities at least one month earlier than before. Since the registration process used to take so long, people preferred to buy so-called shelf companies. What is more, there was also a share capital contribution requirement (but when buying a shelf company, one did not need to pay the share capital contribution), which does not exist in that form anymore.

Access to the service has also improved considerably, which mainly affects entrepreneurs operating in the countryside. A recently published study indicates that the simplification of the registration procedure is one of the best state offered solutions for fostering entrepreneurship.

However, the new system is unfortunately a bit too complicated for smaller businesses that have limited computer skills, and must therefore turn to business consultants and courts for advice. Harju county court house has set up a computer station in its foyer for the purposes of accessing the service with the help of a secretary.

RIK has indicated that convenience, reduction of mistakes, and improved security should also be celebrated as positive developments, resulting in improved information confidentiality, integration, and access.

Impact on the provider of the e-service

There are actually several parties involved in service provision. Things have not really changed for assistant judges, whose task it is to review and approve petitions for entry, because reviewing documents and comparing them to the letter of the law still takes the same amount of time as before. Efficiency is achieved mainly in the form of:

- receipt of petitions for entry – reduced office staff
- simplified archiving – no need to expand archival rooms
- typing information into the computer – no need to do it anymore
- document circulation among officials – no need to circulate documents anymore

- Resolution notice – previously sent by post, now mainly via e-mail (even without the e-service notifications it could still be sent via e-mail)

In addition, there are fewer mistakes, because when information is entered electronically it can be automatically checked, which makes processing easier for the registrar. The system will be improved further with the upcoming launch of the new review software.

In conclusion, from the perspective of the service provider the working process has become more efficient, especially in terms of supporting activities, e.g. receipt of documentation, dispatch of resolutions, and archiving. However, the actual review process still takes practically the same amount of time, although it will become more convenient with the coming software upgrade.

Obstacles to increasing effectiveness

The main obstacles are as follows:

- The e-Business Register does not allow for registering public limited companies. Technically it could be possible, but this would entail major investments into system development, and these are not foreseen for the near future
- In certain fields of activity companies are required to apply for a license, which can be done electronically (via a separate service), and later they can add the relevant license to their file at the e-register. The license application system will soon be redesigned, and simplified
- Problems with authenticating foreign citizens upon company registration. 2008 saw a giant leap forward, and now citizens of some countries (namely Portugal, Finland, Belgium, and Lithuania) are able to register companies in Estonia using their respective ID-cards
- The review of petitions of entry at the courts is sporadically ineffective. This situation should improve with the transition to new software
- Some first-time entrepreneurs are not very experienced Internet users, and therefore the service might be a bit too complicated for them.

6. Potential for internationalisation and export

Initially the Estonian e-service was seen as extremely innovative in the EU context, but by now the same system has been deployed in several other countries as well. However, according to RIK the Estonian system is still the best in the EU with regard to accepting ID-cards of foreign citizens. The fact that the Estonian e-service has set an example for others is confirmed by numerous awards received at the EU level.

Thus far the RIK has shared its know-how with other countries free of charge, but in the future they plan to make it a payable service. The Company Registration Portal runs on the basis of the e-Business Register, and together they share great export potential – especially with regard to practical experience, but also in terms of exporting technical solutions.

The upcoming software upgrade, based on freeware and aimed at improving the work done by courts, also enjoys a certain export potential. The software could be exported as part of a package paired with training and consultation services. RIK is already organising for-profit trainings to other countries, offering consultation services, and is willing to continue on this path in the future. Their development partner is also very interested in export.

The copyrights related to the e-service belong to the Republic of Estonia, but it can be used with the European Union Public License.

7. Concluding impact evaluation

In conclusion, the e-service has managed to effectively fulfill the objective of simplifying life for entrepreneurs, although there remains a group of people whose poor computer skills do not allow them to take full advantage of this feature. However, they are free to employ the services of a notary if necessary.

The positive effect on start-ups is especially pronounced in rural areas. The e-service takes much less time, and there have been overall improvements in terms of accessibility, simplicity, convenience, and quality.

With regard to service users the work process has been made more efficient, but there is still room for improvement. The export potential lies mainly in the practical experiences related to the deployment/launch of the e-service, and the software paired with training, and consultation.