BE LOGIC

DELIVERABLE

REPORT ON THE DESIGN AND DEVELOPMENT OF THE E-BENCHMARKING TOOL

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Report on the design and development of the e-benchmarking tool

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Executive Summary

The purpose of this document is to provide an overview on the structure of the e-benchmarking tool, which will be developed in the scope of WorkPackage 2, Task 2.5, for the implementation of the benchmarking methodologies developed in the scope of BE Logic project. Such tool will be implemented by means of a web-based application, made available to any potentially interested stakeholder through the internet, on a free of charge basis. The e-tool will be mainly targeted to small and medium enterprises (SMEs), accordingly with the general purposes of the project; however, it will be accessible by any potential user, also not belonging to the mentioned enterprise category.

This deliverable describes the general structure of the e-tool, the functionalities this software will offer to the potential users and, the modalities chosen to interact with the user and the optimal way to present the benchmarking results obtained; the potential problems and barriers for the accession to the tool are also taken into account, along with the definition of related solutions and countermeasures to be applied.
1 Introduction

1.1 Framework

Within BE LOGIC project the work package WP2 deals with the development of feasible and harmonized methodologies to be implemented into the different benchmarking processes developed in the scope of WP4, WP5 and WP6, under the point of view of policies, logistic chains and terminals. Furthermore, the benchmarking methodologies will be implemented into an online software tool developed by BE Logic project, namely the e-benchmarking tool, with the purpose of offering to potential users an instrument for the assessment of their performance in the field of logistics, and possible suggestions for improving such performance. The following sections of this document will provide the main indications on the foreseen structure of the e-tool and its development.

Work package 2 is split into 5 tasks, being:

- Task 2.1 – Overall benchmarking framework
- Task 2.2 - Indicators for macro comparison and policy benchmarking
- Task 2.3 - Indicators for transport chain benchmarking
- Task 2.4 - Indicators for inland terminal benchmarking
- Task 2.5 - Design and development of the e-benchmarking tool

The outputs of the other tasks, i.e. the benchmarking framework and the definition of methodologies and benchmarking indicators, will represent the basic input for the activities of Task 2.5

Figure 1 shown below indicates the position of task 2.5 within the BE LOGIC project.
Figure 1: Project structure

1.2 Objectives of Task 2.5

On the basis of the different performance and benchmark indicators identified in the previous tasks, an e-benchmarking self assessment tool will be designed and implemented. It will embed the methodology specified in tasks 2.2 – 2.4 and take into account the overall benchmark framework prepared in task 2.1. The self assessment tool will be usable via the internet, and it will be implemented by means of standard programming environment, either proprietary or open source. The ease of use will be guaranteed by means of suitable Graphical User Interfaces, defined accordingly with the main stakeholders. Language of the software interface will be English.

1.3 Purpose of the e-benchmarking tool

As indicated in the previous section, the purpose of Task 2.5 is the realization of a software web-based tool for the implementation of the benchmarking methodologies developed in the scope of the project.

1.3.1 Target users

The focus of BE Logic project is mainly concentrated on small and medium enterprises (SMEs), which represent more than 99% of enterprises in Europe and contribute for more than two third to European GDP, and represent the major potential from improvement in logistics sector.

Therefore, the e-benchmarking tool will be mainly targeted for the usage of SMEs; the design and development of the software tool will be organized in order to facilitate as
much as possible its usage by this typology of users. With this respect, the following aspects will be particularly taken into account:

- **Accessibility**: the e-tool will be designed to be easily accessible for users, avoiding as much as possible the necessity of installing dedicated software, and the use of particular hardware;
- **User friendliness**: the functionalities of the software shall be created in order to be immediately understood by any kind of users, regardless his personal competences on information technology. A manual for the usage of the tool will be made available; however, the software will include on-line help and explanations, in order to allow the user in proceeding through the different step minimizing the interruptions;
- **Time consumption**: the e-benchmarking tool will be designed in order to ensure that the time necessary for completing its usage and obtaining the desired results is reasonably limited;
- **Customizability**: e-tool users shall be able to decide whether to make use of the full functionalities offered by the tool, or to select just a subset of them which is considered more interesting. In addition, users will be given the possibility to customize the output generated by the tool;

However, it has to be clarified that even if the main target is represented by SMEs, the tool is intended to address a wider audience of potentially interested stakeholders; therefore the design of the software will not in any case limit the access to the e-tool for non-SME users.

### 1.4 Structure of the tool

The baseline for the development of the e-benchmarking tool is represented by the benchmarking methodologies identified in the scope of Task 2.2, Task 2.3 and Task 2.4; in particular, the tool will be based upon the list of benchmarking indicators related to transport chain, terminals and policy benchmarking defined by the mentioned tasks, on their mutual relations and the possibility of aggregating them for the definition of macro-indicators.

With this respect, generally speaking the e-benchmarking tool would be structured on the basis of a bottom-up tree, starting from the concrete values which will be measured from the field for the different benchmarking indicators to be selected, and aggregating them in order to define their influence on the overall performance of the system.

According to this general structure, it would be necessary that the outputs from the above mentioned Tasks include, along with the set of indicators mentioned in the Description of Work, also their hierarchical structure and their mutual influence ("weight") in determining the overall system performance.

The structure of the tool will be analyzed more in detail in the following sections of the document.
1.5 Functionalities

The e-benchmarking tool will offer the following general functionalities:

- Assessment of the performance related to the logistic case provided by the tool user;
- Comparison of the performance of given logistic system with similar real cases, analyzed in the scope of the project or input into the e-tool by former users;
- Analysis of possible improvements of the performance by assessing different alternatives (in terms of alternative routes or additional transport modes to be explored);
- Benchmarking on policy perspective.

In order to provide an effective and useful benchmarking performance, the e-tool shall include a proper data baseline, containing data related to known real cases, to be used for the comparison with the logistic case proposed by the user. Such data can be mainly obtained from two sources:

- at the initial stage, the database of the e-tool will be populated with the data related to the case studies analyzed in the scope of WP4, WP5 and WP6, with the cooperation of project Demonstrators;
- the information available for the e-tool will be further incremented by means of the data input into the systems by the users of the tool.

To achieve this objective, the e-tool shall include the additional functionality of recording as appropriate the information provided by the users, for future use. The confidentiality issues related to this functionality will be addressed in the following sections of the document.

1.6 Software

In order to guarantee the best accessibility, the e-benchmarking tool will be made available on the internet, through the BE Logic public webpage. The software will be formed by three parts: a web-based graphical user interface (GUI), the embedded logic based on the benchmarking methodology, and a database for the storage of the information necessary for benchmarking.

The selection of the programming environment and the database tool will be made at a later stage, according to the specifications defined for the software. The options will be extended both to proprietary and open source solutions.
2 E-tool structure

2.1 Implementation of benchmarking methodology

2.1.1 Transport chain and terminals

As already stated in the previous sections of this document, the link between the results of the activities undertaken in the scope of Tasks 2.2 – 2.4 is mainly represented by the set of key performance indicators (from now on referred to as “KPIs”) related to transport chains, terminals and policy benchmarking, defined by means of literature survey and interviews with relevant stakeholders (the so called project Demonstrators).

More in detail, the results achieved by the mentioned tasks include a long list of key performance indicators for each of the considered domains, grouped into different categories, such as for instance Efficiency, Safety, Costs……

The identified KPIs will be organized in different layers, according to their purpose and scope. The lowest level will include the indicators representing values which can be directly calculated from the field, also forming the set of inputs to be requested to the users of the e-benchmarking tool. Such low level indicators will be aggregated in an appropriate way to calculate the value of the KPIs included in the level above; such process will be iterated for all the expected levels, in order to achieve the assessment of the KPIs forming the highest level.

Figure 2: KPI trees
The layered structure of the indicators will allow the identification of a number of KPI trees, as shown in Figure 2 above. The structure of each KPI tree may vary from case to case, both in the number of layers forming the tree, and in the amount of KPIs included in each layer; in some cases the lowest and highest level may collide, as in the example of KPI2 shown in the picture above, this meaning that the value calculated from the field already represents a sufficient information for the evaluation of the indicator.

Both the number of layers and of KPIs will be determined case by case, in order to achieve the optimal balance between the complexity of input requested to the users of the e-tool and of the calculation necessary to determine the desired output, and the accuracy of the results provided.

The simple definition of the layered structure of KPIs is however not sufficient to perform the calculation of values related to top-level indicators; the structure of each KPI tree has to be completed taking into account also the relations linking the KPIs in one layer which are aggregated to calculate the value of an indicator in the level above; in other terms, it is necessary to identify the nature of the arrows represented in Figure 2.

With this respect, the considered relations will be generally represented by algebraic formulas, involving one or more indicators of the same layer and including appropriate parameters (“weights”) taking into account the importance given to each indicator and the different units of measure considered.

Therefore, according to the ideas detailed in this section, the benchmarking methodologies to be implemented in the e-tool shall be defined by the following aspects:

- Full list of KPIs;
- Layered structure of KPIs;
- Definition of (algebraic) relations linking the indicators.

2.1.2 Policy benchmarking

The benchmarking on policy perspective presents different characteristics with respect to the structure detailed in the previous sections, both in terms of structure of the Key Performance Indicators and of desired output. With this respect, the implementation of policy benchmarking into the e-tool need to be done accordingly with dedicated specifications.

At present, two possible solutions have been identified:

1. Include additional information concerning policy perspective to the output generated by the e-tool after the analysis of a transport chain or terminal case, in form of a textual report based on the geographical area and the use case selected;
2. Define separated functionalities referred only to the policy benchmarking, to be implemented in a dedicated section of the tool.

The decision on the optimal solution to be adopted will be taken by Task 2.2 and Task 2.5 Leaders, with the approval of the Project Coordinator.
2.2 Graphical user interface

2.2.1 Introduction

The graphical user interface (also referred to as “GUI”) represents the mean for interaction between the user of the software and the e-benchmarking tool. In order to guarantee the optimal accessibility for any kind of user, the GUI shall respect the following characteristics:

- User friendliness: the GUI shall avoid any possible incomprehension on the user side concerning the information requested, in terms of content, units of measure, place to be input, etc….Therefore, the GUI shall be designed also taking into account any potential misunderstanding which might arise around the usage of the e-tool, in order to provide precise indications at the right time and in the right place, by using any appropriate mean (descriptions embedded into the e-tool itself, on-line help, offline manual, helpdesk).

- Accessibility: being web-based software, the e-benchmarking tool shall be accessible by any system, regardless the operating system or the browser employed by the user. Therefore, the GUI will be designed in order to be independent from the platform under which the software is run.

- Easy usage: the main purpose of the GUI will be to guarantee that the user will be able to input the necessary data, and gather the desired input with the minimal time consumption possible. In order to reach this objective, graphical interactive elements will be used into the user interface in place of textual input wherever possible.

The GUI will be organized in different steps, in accordance with the structure foreseen for the software:

- Registration/Identification of the user
- Input of data
- Presentation of results
- Finalization

The above mentioned phases will be described in detail in the following sections of the document.
2.2.2 Registration or User identification

Purpose
The registration/user identification phase will represent the first step for the accession to the full functionalities of the e-benchmarking tool. Even if the usage of the software will be granted to any interested user on a free-of-charge basis, the request for a registration is considered unavoidable for a number of reasons, detailed in the following paragraphs.

Figure 3: User identification and registration

Identify the characteristics of the user
As indicated in the introductory paragraph of this deliverable, one of the most important characteristics of the e-benchmarking tool will be the represented by the customizability of the software on the basis of aspects on which the user will probably be interested; in other terms, the possibility of adapting the functionalities of the tool – in terms of input requested and possibilities for output generation – according to the main characteristics of a single user will surely represent one of the added values of the tool itself.

It has to be clarified that in this specific case for “characteristics” of the user it is meant mainly the category he belongs to, being its area of business (or interest) on the point of view of logistics services provided offered; example of possible characteristics foreseen would be:

- Transport chain manager;
- Terminal operator;
- Shipper;
- Carrier;
- Hauler;
- Freight forwarders;
• Policy maker;
• ....

The bullet list mentioned above represents only an example of possible categories which might be taken into account for the identification of user characteristics. The registration phase of the e-benchmarking tool will rather include a list of macro-groups defined on the basis of the full list of categories to be taken into account; the detailed definition of such macro-groups of user categories will be finalized along with the leaders of the other Tasks and the WP Leader, in order to identify the optimal balance between an accurate identification of user categories, and the necessity of limiting the number of possible options to be presented to the user. In addition, in order to avoid any misunderstanding on the meaning attributed to each possible choice, a textual description will be provided once a single category is selected, allowing the user to identify the option suiting its own characteristics.

![Category Selection](image)

The definition of the category to which the user belongs to will allow the identification of the key performance indicators being more relevant for the user itself; this step will guarantee that the data requested during the input phase will be limited to the information being of real interest for the user itself, thus limiting the time necessary for completing the input phase, and the effort requested to the user for obtaining the requested information.

**User interest**

As already said, the usage of the tool will be in principle open to any interested stakeholder. However, as indicated in the introductory part of this document (see section 1.5 for reference) and further detailed in the following sections, the full deployment of the
functionalities which will be implemented into the software includes the possibility that the data provided by one user are stored into the software database, and used for benchmarking the new logistic cases which will be presented by other users which will make use of the e-benchmarking tool afterwards. With this respect, it is of paramount importance to ensure that the e-tool is accessed and used only by stakeholders having a real interest on its usage, and a sufficient knowledge of the logistic domain and of the key performance indicators handled by the tool itself; and to avoid the risk that an eventual user not fully aware of the scope of the software tool and its purposes includes into the system some data whose reliability is non sufficient to ensure a proper benchmarking.

With this respect, the request for registration will provide a soft barrier for the access to the e-benchmarking tool, which will prevent contacts from users not having a real interest in the usage of the software, but who would try it anyway making profit of the free access. However, it has to be underlined that the reliability of data stored is a major issue to be taken into account for the development of the tool, which will not be solved simply with the adoption of a registration process; the topic will be then re-addressed more in detailed in the following sections of this document.

**Project promotion and dissemination**

The companies and physical persons approaching the e-benchmarking tool will represent a group of stakeholders potentially interested in receiving information about the activities undertaken in the scope of BE Logic project and the results achieved, as well as concerning eventual updates and improvement of the e-benchmarking tool itself.

As shown in Figure 3, during the registration process users will be requested to provide, among other information, also their email address. This information might be stored to be included in the extended network of BE Logic contacts, which will be regularly updated on project developments by means of the dissemination activities and tool which will be set up during the project lifetime, as detailed in the Project Dissemination Program (Deliverable D8.1); in particular, the members of such extended network will receive the project brochure and the periodic newsletter; furthermore, they will be invited to attend the BE Logic final event, which will be organized at the end of the project to present the final results achieved.

The registration of user data into the software database will be done accordingly with the current European laws concerning privacy and data protection; moreover, the registered email addresses will be added to the extended network of contacts only if the user agrees on it. To this purpose, the user will be granted the possibility of giving or denying its consent before completing the registration process, and will have the right of requesting the removal of his address from BE Logic contacts at any time, by addressing a written request via email to the project coordinator or the dissemination leader.

**Identification and registration process**

When a user chooses to connect to the e-benchmarking tool through the BE Logic public webpage, a request for login into the system will be visualized, as shown in Figure 3 above; the identification of the user will be possible through the insertion of a user name and a password.
In case a user connects to the software for the first time, and therefore has not obtained yet a username and a password for connecting to the system, he will then be addressed to the registration phase, shown in Figure 4.

The registration phase requires only a few basic details of the user:
- Name and surname;
- Company;
- Email address;
- Category.

The name and surname are not considered as mandatory information, as the user characteristics are linked to the company using rather than to a single person; therefore, this information is considered as not mandatory, and the registration could be completed also if those two fields are left blank. On the other hand, the indication of the company and email address, as well as the category selection, will be set as mandatory fields.

To complete the registration procedure, the user shall click on the “Register” button shown in Figure 4. By doing so, the software will automatically generate a username and a password, which will be communicated to the email address indicated by the user. This procedure will not include any identification process: once the registration is complete, the user will be automatically redirected to the next step of e-tool functionalities; it will not be necessary for the user to check the automatic email received to validate the registration. The purpose of the username and password generated by the software will only be to allow the user to be recognized by the system in case he decides to use the e-benchmarking tool several times; however, if the system detects that the email address indicated is not correct (i.e. if the automatic email cannot be delivered to such address), a warning to the user will be generated, inviting him to check and correct the information.

As already indicated in the previous paragraphs, before completing the registration process the user will be requested to indicate if he agrees in receiving more information about the project in general, and the e-tool in particular; if the user provides its consent, the email address will be communicated to the responsible for dissemination activities, who will include it in the extended network of stakeholders informed about BE Logic activities. Finally, a dedicated disclaimer will clarify that the information provided during the registration process will be stored in the e-tool database only for the purpose of the usage of the software, and will not be communicated to any external third party not involved in the project, nor used by BE Logic consortium for any purpose different than the functionalities of the e-benchmarking tool, and the dissemination of project activities and results.

2.2.3 User support

The correct comprehension of the information requested by the software and of the different steps forming the procedure to follow for the correct usage of the e-benchmarking tool is of high importance for ensuring the correctness of the output generated, and the soundness of the indications provided by the e-benchmarking tool. For
this reason, a number of tools for supporting the user in inputting the correct data into the system, and interpret correctly the results presented by the software, will be set-up. The tools presented for support to the e-tool users will be the following:

- On-line help;
- FAQs;
- Software user manual;
- Helpdesk service.

A brief explanation of each of the mentioned tools is provided in the following sections of the document.

**On-line help**
The on-line help consist of a set of information which the user will be able to consult during the usage of the software tool, not implying the need of interrupting the functionalities of the software to open new windows of the browser, or additional documents. The purpose of this support tool is to embed into the software itself a set of brief information which the user will be able to consult quickly for obtaining clarifications mainly on the meaning of data he has to provide as input. For instance, each of the KPI which the user will be requested to fill in with values will be accompanied by a brief description of the meaning of that specific indicator, along with an indicative range of values in which the information provided by the user should be contained; the user will be able to consult this help by simply clicking a button positioned next to the field to be filled in, which will open a small tip text easily readable. This procedure will help in avoiding any misunderstanding in the interpretation of key performance indicators considered by the system, ensuring that the data provided by the user are reliable and coherent with the information needed by the system.

**Frequently asked questions (FAQs) service**
The most common problems and doubts which might be experienced by the user will be identified, in order to define a list of the most frequent question for which the user might need to get clarifications in order to proceed with the usage of the tool. The list of FAQs will be available for consultation at any time during each step foreseen by the tool procedure; the questions will be mainly belonging to two different categories:

- Clarifications on procedures to follow (formulated as “How do I….”);
- Indication of possible solutions to most common problems.

**E-tool manual**
A manual for the usage of the e-benchmarking tool will be developed, and made available for download on the public part of BE Logic public website. A synthetic version of the manual will also be created, and made available for on-line consultation during the usage of the software.
Helpdesk

In case none of the support tools previously introduced is sufficient to clarify a doubt or solve a problem encountered by the user, it will be possible to report the issue via email to D’Appolonia as responsible for the development and maintenance of the e-benchmarking tool, which will take all the appropriate measures to allow the user in proceeding with benchmarking with the shortest delay possible. Once the doubt is clarified or the problem solved, it will be added to the list of frequently asked questions.
3 Input phase

When the registration or identification phase is completed, the user will be automatically directed to the following step, represented by the input phase of information necessary to the software for the application of the benchmarking methodologies. Such phase will be composed by four main steps:

- Identification of the characteristics of the logistic case which the user of the tool wants to be analyzed;
- Selection and ranking of the indicators which the user considers as more relevant for its particular case;
- Input into the system of the values requested by the software, on the basis of the choices made in the previous phases;
- Verification of the parameters embedded into the system.

Each of the mentioned steps will be described in detail in the following sections.

The graphical user interface described in the previous sections will provide the necessary support to the user during this phase, in order to facilitate the introduction of input data into the software and guarantee that the time necessary to complete the input phase is limited to a reasonable amount (i.e. less than one hour). The user support tool will guarantee the avoidance of any potential misunderstanding which might arise in the interpretation of the performance indicators considered by the e-benchmarking tool, and the solution of any issue which might prevent the user in completing the usage of the software.

3.1 Identification of the user case

The first fundamental step consists in the identification of the characteristics of the logistic case which the user wants to benchmark.

With this respect, the category selection made during the registration phase (see section 2.2.2 for reference) will play an important role, giving a first indication on the potential preferences of the user. However, it has to be underlined the information gathered from the registration will be used to favour the usage of the software, but it will not imply the exclusion of any option to be offered to the user. In other words, to make an example it is likely to happen that a user which registered as “Terminal operator” will be interested in assessing the performance of a terminal; however, it is not possible to exclude a priori that it might be interested in evaluating also the performance of a transport chain, or in gathering information from the policy benchmarking perspective.

As already introduced, the first indication to be provided by the user is the selection of the different perspective to be considered for the benchmarking process:

- Transport chain
- Terminal;
• Policy benchmarking.

Based on this selection, the following step will consist in the definition of the detailed characteristics of the benchmarking case to be considered; the information required will of course depend on the benchmarking perspective chosen, as indicated in the following. The identification of the characteristics of different benchmarking perspectives, listed in the paragraphs below, will be done in a visual and interactive way by means of the GUI, as further explained in the next sections.

Transport chain definition

For a complete definition of a transport chain case, the following information will be requested to the user:

• Starting point and ending point of the chain;
• Eventual intermediate point, identifying different sub-segments into the whole chain;
• Transport mode used in each sub-segment identified;
• Commodity transported;
• Transport units (containers, bulks…);
• Transport characteristics:
  o Door-to-door;
  o Terminal-to-door;
  o Door-to-terminal;
  o Terminal-to-terminal;
• Additional characteristics of the chain:
  o Geographical characteristics;
  o Traffic congestion;

The mentioned characteristics will have an impact both on the calculation of the values of the key performance indicators, and on the labelling of the considered transport chain; this second aspect, being one of the fundamental aspects to be taken into account for the realization of a proper benchmarking procedure, will be addressed more in detail in the following parts of the document.

Terminal definition

For a complete definition of a transport chain case, the following information will be requested to the user:

• Terminal position:
  o Deep sea terminal;
  o Short sea terminal;
  o Inland terminal;
• Number of modes served:
  o Monomodal;
  o Bimodal;
  o Trimodal;
- Characteristics of modes served;
- Surface covered by the terminal;
- Ownership:
  - Owned by a private company;
  - Owned by public company/organization;
- Terminal access:
  - Fully open to public;
  - Restricted to specific groups of users or goods

The mentioned characteristics will have an impact both on the calculation of the values of the key performance indicators, and on the labelling of the considered terminal; this second aspect, being one of the fundamental aspects to be taken into account for the realization of a proper benchmarking procedure, will be addressed more in detail in the following parts of the document.

Policy benchmarking definition
As already detailed in Section 1.5, the implementation of benchmarking under policy perspective into the e-tool has not been completely clarified at present. Therefore, the characteristics necessary for the definition of a policy benchmarking case will be selected at a later stage, in cooperation with the WP Leader (ISL) and the responsible for policy part (Task 2.2, HERRY).

Implementation of use case characteristics
The system set up for the selection of the logistic case considered, and for the implementation of the characteristics detailed in the previous sections, shall allow the user to complete this phase minimizing the time requested, the risk of misunderstandings about the information requested, and the possibility that not all the necessary data are inputted into the system. For this reason, the graphical user interface will be based during this phase on a simple, user-friendly and interactive visual system, which will be based on the well-know software Google Heart, integrated as appropriate with dedicated modules for adapting it to the logistic domain representing the scope of the e-benchmarking tool.
At the beginning of the first step of the use case identification, the software will show a chart of Europe, as indicated in Figure 5 above. By means of such chart, based as said on Google Heart software, the e-tool user will be able to select by clicking on it the country in which the terminal to be examined is located, or which contains the starting point of the logistic chain to be assessed. Once the selection has been made, the software will zoom on the chosen country; by doing so, a dedicated plug in will show on the map the main logistic terminals located in that country; the example shown in Figure 6 takes into account an example in which the user has clicked on France to select and zoom it.
Figure 6: View at country level

From this view zoomed at country detail level, the user will be able to select one of the terminals indicated, by simply clicking on it. Once the terminal is selected, the user will be able to choose whether to make an assessment of the performance of this single terminal, or to start the definition of a logistic chain from this initial point, as shown in Figure 7.
If the user chooses the first option, i.e. wants to concentrate the benchmarking analysis on the terminal itself, then the geographical localization phase will be concluded, and the software will proceed with the request of information concerning the considered terminal, and then with the selection and prioritization of macro indicators, and the input of values for the relevant key performance indicators.

Otherwise, in case the definition of a logistic chain is decided, the GUI will go back to show the chart of Europe, allowing the user to choose another terminal which might represent both the final destination of the chain, or an intermediate point implying a change of transport mode; the process will be repeated until the user selects the ending point of the transport chain; after that, the software will proceed with the definition of the characteristics of each of the identified segments, as reported in Figure 8.

With this respect, it is clear that for the definition of a logistic chain it is not possible to limit the possible choices proposed to the user only to the list of terminals in Europe, as this will exclude the door-to-door, terminal-to-door or door-to-terminal options. However, it has to be said that the selection of terminals represents only the first draft functionality included so far in the GUI, which will be further refined in order to allow the user in creating any possible logistic path of his interest.
3.2 Selection of indicators

The analysis of a single logistic case, and its benchmarking with similar cases will be based on the evaluation of a set of macro indicators derived from the analysis of the full list of key performance indicators defined by the benchmarking methodologies developed by BE Logic project, as already introduced in Section 2.1. The definition of such macro indicators will depend on the choice made by the user concerning the logistic case: benchmarking on terminal, transport chain or policy perspective will require to take into account different groups of indicators.

3.2.1 Transport chain perspective

According to Deliverable D2.3 – Internal report on transport chains, the following macro-indicators will be taken into account for benchmarking on transport chain perspective:

1. Tender cost (quote);
2. Transport time;
3. Flexibility;
4. Punctuality;
5. Quality;
The detailed description of the macro indicators proposed, and their link with other performance indicators at sub-levels, will be further analyzed and defined in the scope of Task 2.3.

3.2.2 Terminal perspective

As defined in deliverable D2.4 – Internal report on terminals, based on the BE LOGIC performance criteria, i.e. efficiency, quality and environment, the following KPI’s per aspect are proposed:

1. **Efficiency**
   1.1. Throughput per FTE (total terminal throughput divided by number of staff in FTE);
   1.2. Throughput per crane (total terminal throughput divided by number of cranes);
   1.3. Throughput per square meter (total terminal throughput divided by surface area);
   1.4. Average time consumption per mode (for each mode: total ITUs handled divided by total interchange time);
   1.5. Share of mode per terminal (for each mode: volume of that mode divided by total throughput);
   1.6. Full in vs. out ratio (full in volumes divided by total throughput; full out volumes divided by total throughput);

2. **Quality**
   2.1. Quality label obtained
   2.2. Number of complaints per year

3. **Security**
   3.1. AEO status

4. **Environment**
   4.1. Electricity used per FTE (total electricity consumed per year divided by staff in FTE)
   4.2. Diesel used per TEU (total volume of diesel consumed per year divided by throughput)
   4.3. CO2 per TEU (total CO2 emitted per year divided by throughput (need for CO2 factor in background))

3.2.3 Ranking process

In order to give the user the chance to customize the calculation performed by the e-benchmarking tool and the definition of the output, the software will grant him/her the possibility of defining the ranking of macro indicators above listed, as well as a “weight” representing the relevance of each of such indicators according to user perspective.

To perform this step, the software will visualize a table containing the full set of macro indicators foreseen. Starting from this table, the user will be able to define:

- The priority ranking of indicators, by associating to each indicator a number (from 1 to 6 in case of transport chain benchmarking, or from 1 to 4 for terminal
benchmarking) indicating the importance given to that indicator (1=highest priority):

- The weight of each indicator, by associating to each of it a percentage representing the desired influence of a particular indicator in the calculation of the overall system performance. The weight will be represented by a percentage value; this meaning that the sum of weights indicated will be equal to 100%. This procedure will allow the user to exclude one or more indicators from the benchmarking process, in case it is considered as non relevant: for doing so, it will be sufficient to associate to it a weight equal to 0%.

The impact of the ranking and weighting procedure on the benchmarking evaluation will be further clarified in the following sections.

3.3 Input of values

After the conclusion of the parameters ranking procedure, the software will then proceed with the input phase of values related to the key performance indicators. The amount of input requested, and therefore the time necessary to complete this phase, will strongly depend on the choices made by the user in the previous steps (i.e. terminal or logistic chain benchmarking; number of segments forming the desired logistic chain taken into account in the use case; modes of transport considered); however, as already said, the input phase will be designed in order to limit its duration to no more than 1 hour.

3.3.1 Transport chain benchmarking

Since a transport chain might be composed by several segments, each of them having different characteristic (in terms of transport mode, commodities transported, geographical characteristics); therefore, the performance indicators may be different depending on the transport segment considered, this meaning that the input procedure will be replicated for each considered segment.
Figure 9: Transport mode selection

The procedure shown in Figure 10 and Figure 10 represents a generic example of input phase referred to a generic segment of a transport chain. First of all, the user will be requested to indicate the transport mode characterizing the considered segment; after this choice is confirmed, the software will then be able to identify the key performance indicators depending on the options selected by the user.
3.3.2 Terminal benchmarking

The procedure for data input referred to terminal benchmarking will be similar to the one described above for transport chain benchmarking; however, considering that the terminal structure does not imply the necessity of considering any sub-segment or sub-set of information, it will not be necessary to replicate the general procedure shown in Figure 11 below.
In both cases each requested value will be accompanied by an on-line help icon (represented by a “?” button); by clicking on this icon, the user will obtain a description of the performance indicator considered, and an indication of the range minimum and maximum values that should contain the indicator itself (where available).

In addition, when the “Confirm” button is clicked, the system will automatically verified that the values provided by the user for each indicator are contained into the ranges considered more likely; in case one or more values are out of the corresponding range, a pop-up window will inform the user of such discrepancies, and invite him to verify the values provided, and confirm their correctness or make the appropriate corrections. A second click on the “Confirm” button will proceed to the following step, assuming that the values indicated are considered correct by the user.

Such procedure shall guarantee the accuracy of the values inputted into the system, so that they could be stored into the software database (previous consent from the user) and used for benchmarking purposes.

### 3.3.3 Missing or incomplete values

The list of performance indicators which the user will be requested to fill in are defined according to the benchmarking methodologies and the KPI trees developed in the scope of BE Logic, as already explained in Section 2.1; this means that the values which will be requested to the user have been identified and selected according to the experience and the suggestions provided by expert stakeholders in the considered field, by means of dedicated interviews.
With this respect, it is possible that a generic user of the e-benchmarking tool is not able to provide information related to one or more indicators considered by the software, because it is not possible for him to have access to that information in a reasonable time, or because the company or organization he works for does not consider that indicator as important, and therefore does not record any information about it.

Should this happen, the software shall in any case to proceed with the benchmarking analysis, and to provide reliable results to the user; in other words, the software has to be designed taking into account the possibility of missing values, implementing alternative solutions for solving this issue without affecting the continuation of benchmarking process.

With this respect, three possible solutions have been identified:

1. Define the calculation phase in an appropriate way: as detailed in Section 2.1, the top-level KPIs are defined on the basis of the input obtained from the user by means of algebraic relations, involving different layers. With this respect, when one of the low-level values is missing, the system will still be able to perform the calculation, but the result obtained might be affected by the lacking of one of the terms in the algebraic formula;

2. Skip completely the calculation of an indicator affected by the lack of one or more inputs, in order to avoid the introduction of errors into the system. However, this solution might imply the risk that, if the amount of input not completed by the user is too high, the system will not be able to proceed with the benchmarking analysis;

3. Complete the information not filled in by the user, by means of average values calculated on the basis of the information contained in the software database. The accuracy level of this procedure will increase depending on the content of the database: the higher will be the amount of data available into the database, the lower will be the error introduced with the use of an average value.

The third procedure proposed provides the best balance between the risk of affecting the correctness of the output proposed to the user, and the computational complexity necessary for its implementation. However, the adoption of the other two proposed solutions might suit better in particular cases to be identified; with this respect, each KPI tree will be evaluated in order to define the best solution, depending on the input which might be missing.
4 Outputs calculation

After the completion of the definition of the user case and the phase of data input, the software will proceed with the calculation of the values to be assigned to the macro indicators selected by the user, on the basis of the KPI trees defined by the benchmarking methodologies described in Section 2.1, and finally to the visual presentation of the results to the user by means of the graphical user interface.

4.1 Foreseen functionalities

According to the feedback received from the Demonstrators interviewed during the definition of benchmarking methodologies, the e-benchmarking tool should offer the following functionalities:

- Assessment of the performance of the logistic case introduced;
- Benchmarking with similar cases;
- Benchmarking with earlier inputs on the same logistic case;
- Comparison with other transport modes (related to the evaluation of a transport chain).

Of course the user will be given the possibility to select the functionalities he is really interested in, skipping those who do not represent a real added value on the user point of view. To this purpose, after the conclusion of the input phase the GUI will present the full list of the functionalities included by the tool, requesting the user to select those he wants to make use of. In order to avoid possible misunderstandings about the real content of the output which can be generated by the software, an explanation of each functionality will be also included, in the form of an on-line help which the user can consult without the necessity of exiting the software, by simply clicking on the “?” button positioned on the right of each option proposed.

In addition, after the presentation of the results the user will receive a further request to make use of the functionalities he originally did not select; this procedure will allow the user to improve and complete the information he received, if he considers it necessary, avoiding that he is forced to re-start the usage of the software from the initial phase.

4.1.1 Performance assessment

The assessment of the performance of the logistic system introduced by the user will be performed according to the macro indicators described in Section 3.2 above.

On the basis of the input values provided by the user for the lower level performance indicators, and making use of the KPI trees defined by the benchmarking methodologies applied (see Section 2.1 for reference), the software will perform the calculation of the value to be associated to each macro indicator related to the logistic case selected.
Such calculation will be based on the relations between the different indicators defined by the KPI trees, represented by algebraic formulas; the input provided by the user and the parameters embedded into the software will be used as input for the formulas representing the lower layers of KPIs, whose results will feed the formulas at the following level; the process will be iterated until the upper KPI level is reached, and with it the calculation of the desired macro indicators, accordingly with the proper units of measure defined in the scope of the benchmarking methodologies.

Along with the calculation of the values of indicators, the system will also calculate an indicative value of the overall performance of the logistic case introduced, taking into account the weight given by the user to each indicator (see Section 3.2 for reference).

This first step of benchmarking will also be used as a basis for the other functionalities; therefore the performance of the system will be in any case calculated by the software, also if not explicitly requested by the user.

### 4.1.2 Benchmarking with similar cases

The benchmarking with similar cases will consist in the comparison of the values calculated for the macro indicators in the logistic case inputted by the user, with the values associated to the same indicators in other cases, recorded into the e-tool database, which can be considered comparable.

With this respect, the comparison will be made indicator by indicator, calculating the difference between the score obtained by the user case, and the score associated to an already known case, and indicating the percentage associated to such difference. By doing so, the user will be able to understand the aspects in which his logistic case is performing better or worse than the benchmarking cases, and the magnitude of such differences.

In order to take into account also the ranking and the weight given by the user to each indicator (see Section 3.2 for reference), an overall score for the comparison will be calculated, by multiplying the difference in percentage for each indicator by the corresponding weight, and summing the results. Such value will give a general indication to understand if the performance of the logistic system considered by the user is, in general, better or worse compared to a similar case, accordingly with the weight he gave to the considered indicators.

In case more logistic cases recorded into the database satisfy the similarity criteria compared to the case provided by the user, the software will provide several reports, one for each of the similar cases identified.

### 4.1.3 Benchmarking with earlier input

The benchmarking with an earlier input referred to the same logistic case will be particularly useful in case the user wants to assess the impact of the system performance of modifications implemented in the logistic case itself.
This procedure will be possible only if the user, after having inputted the data related to his system for the first time, agrees in registering them into the e-tool database, and to link such records to his login details (see Section 5.5 for reference). By doing so, the software will be able to recover the original information provided by the user, and make the comparison with an updated version of the data related to the same logistic system.

The benchmarking procedure will be the same applied to the benchmarking with similar cases, described in Section 4.1.3 above.

4.1.4 Comparison with other transport modes

This benchmarking category will assess the impact on the system performance of the use of different transport modes than the ones indicated by the user; with this respect, it will be applied only to the case of transport chain benchmarking.

If the user chooses to make use of this option, the software will present him a list of the segment forming the logistic chain inputted into the system, asking for which of them an alternative transport mode shall be assessed, and requesting the indication of the new transport mode to be considered. In a second step, the software will request the input of new KPIs for the modified segments, accordingly with the new transport modes selected. Once this new input phase will be completed, the system will proceed to calculate the new scores associated to the macro indicators, and to benchmark them with the results obtained by the previous investigation.

The user will be able to repeat the process at his best convenience, allowing him to select the possible combinations of his interest, and to

4.2 Definition of similarity criteria

The definition of similarity criteria plays an important role in the definition of the benchmarking methodologies. The comparison of two logistic cases in fact can be considered effective only if the are characterized by similar parameters, in terms of geographical localization, traffic congestion, costs…; otherwise, the results of applying the benchmarking methodology to different logistic cases could not be considered sufficiently reliable.

To this purpose, similarity labels will be identified both for the terminal perspective and for the transport chain case, as detailed in the following sections.

4.2.1 Similarity labels for transport chain

The similarity labels for the transport chain case will be based on the following criteria:

- Geographic localization (Western Europe, Eastern Europe);
- Number of countries touched by the chain;
- Number of segments;
- Total length of the chain;
• Commodity transported;
• Traffic congestion;
• Monomodality vs Multimodality;
• Mode(s) of transport involved;
• Characteristics (door-to-door, terminal-to-door; terminal-to-terminal).

4.2.2 Similarity labels for terminals

The similarity labels for the terminal benchmarking case will be based on the following criteria:

• Geographic localization (Western Europe, Eastern Europe);
• Characteristics (Deep sea, short sea, inland);
• Number of modes served;
• Surface covered;
• Modality of access to the terminal;
• Transport unit handled.

It is clear that the accuracy of the similarity identification will strongly depend from the number of labels considered: the higher this number will be, the more the benchmarking process could be considered accurate and effective. On the other hand, the implementation of too strict criteria might imply the risk that no similar logistic cases are found in the e-benchmarking tool database, especially when the software will be used for the first times and therefore the database will be populated by a limited amount of examples. Therefore, the definition of the benchmarking labels will be done in cooperation with other WP2 Leaders, in order to find the optimal balance between accuracy and benchmarking necessity.
5 Identification of potential barriers

As specified in the previous sections of the document, the usage of the e-benchmarking tool will be open to any interested stakeholder on a free of charge basis. However, unfortunately it will not be sufficient to guarantee the interest of potential users, and to ensure that they will approach the software and complete its usage until the generation of the desired results. Therefore, the design and implementation of the e-tool shall take into account the potential barriers which might prevent or limit a wide usage of the software, in order to mitigate or, where possible, eliminate their negative effects.

With this respect, the following potential barriers have been identified:
1. Lack of information concerning the added value provided by the usage of the e-tool;
2. Request for a registration;
3. Complexity of the input required;
4. Time requested to complete the input phase;
5. Request of recording the information provided by the user;
6. Language used.

The following section will describe more in detail the barriers foreseen and the countermeasures adopted during the design phase of the software.

5.1 Lack of information on added value

The main group of target users is represented by small and medium enterprises (SMEs) in Europe, as explained in Section 1.3.1. This typology of enterprises are usually characterized by a small number of employees strongly focused on the core business; the e-tool might be seen with this respect has an interesting “gadget” providing nice information without any concrete impact on the real world, and therefore not able to provide any kind of support to the user.

Therefore, it will be necessary to set up an extensive amount of information concerning the added value which the e-benchmarking tool is able to provide to its users, and in particular to SME; and to ensure that such information is communicated to any potential user approaching the e-tool.

In order to minimize the potential barrier above detailed, it will be necessary to set up a “marketing campaign” for the e-benchmarking tool, addressed in particular to SMEs. Such marketing effort will include:

- A clear description of the software functionalities and the added value - on business perspective – characterizing the e-tool, to be included in the public part of BE Logic website, followed by the link for accessing the software;
- The preparation of a brochure fully dedicated to the e-tool;
- The presentation of e-benchmarking tool at public events, focused on the added value provided, including live demonstrations of its functionalities;
- The publication of articles on specific publications on logistic domain.
5.2 Registration request

The access to the e-benchmarking tool will be granted through a registration process, in order to ensure that the software is used only by interested stakeholders, and to allow the identification of user characteristics and the gathering of useful information for dissemination (see Section 2.2.2 for reference). The registration process will be completed by indicating a very limited number of data, such as name of the company and email address, avoiding the request of providing confidential information; however, it is not possible to exclude a priori that such request for registration will be felt by the user as an unexpected and unacceptable burden, convincing him to renounce to use the software.

The first countermeasure to this issue is already contained in the structure of the registration process itself: in fact the low amount of generic information requested will guarantee that the time necessary to complete the registration step will not be time consuming at all; furthermore, even if a username a password will be sent to the email address indicated by the user, their usage will be requested only for the following connections to the e-tool, while the first usage will continue immediately after the registration process, avoiding that the user is forced to check is mailbox to confirm his identity, and the risk that the email message containing the login data is not correctly delivered.

Furthermore, a dedicated banner will be included in the registration page, specifying that the information provided by the user will be stored in the database of the e-tool only for authentication purposes, and that they will not be used by BE Logic consortium for commercial use, nor communicated to any third party external to the project.

Finally, it has to be taken into account the case that the user is not willing to provide personal data and complete the registration process, because he does not know exactly how the e-tool will work and which kind of information it can offer to him. With this respect, also as part of the marketing campaign described in the previous paragraph, prior to the request for registration the user will be allowed to access to a demo version of the e-tool, which will show him the main functionalities and output provided by the software, and allow him to try the interaction with the software in a very simple case. After the conclusion of such demo, the user will be requested if he wants to proceed with the full version of the software, specifying that in this case a registration will be necessary.

5.3 Complexity of input required

The user of the e-tool will be requested to provide values and or information concerning very specific indicators, this giving the floor to two potential issues to be taken into account. It is in fact possible that the user misunderstands the meaning of one of the indicators proposed, giving to it an interpretation different from the one taken into account by the benchmarking methodology; should this happen, the value inputted into the system therefore will not correspond to the use case considered, leading to an error in the application of the benchmarking procedure.

Two avoid such kind of misunderstanding, as detailed in Section 3.3; a brief description of each indicator will be implemented into the GUI as on-line help, including the indication
of the correct range of values to be considered. In addition, a more detailed indicators
description, including examples for their calculation, will be included in the manual of the
software, which will be available for download on the public website.
Furthermore, an automatic check on the input provided will be performed by the system,
detecting those values being out of a given range of correctness and asking the user to
confirm or correct them.

On the other hand, it is possible that the user does not know the value to be attributed to a
specific indicator, because he does not have the possibility to obtain it from his internal
information system, or because it is not considered relevant by his company, and therefore
not calculated. In this case the use will be allowed to leave the corresponding field blank;
the software will still be able to perform the necessary calculation for implementing the
relevant benchmarking methodology, as previously explained in Section 3.3.3.

5.4 Time consumption

The time necessary to complete each step of the e-benchmarking tool might represent a
severe barrier to its usage; if the user is requested to spend too much time for using the e-
tool, he might decide to abandon the process before the desired results are calculated and
presented. The most critical step with this respect is represented by the input phase, since
the user will be requested to provide a high amount of information, which he might not
have immediately available. To cope with this issue, the e-tool will be designed in order to
guarantee that the time necessary to complete the input phase will be limited to maximum
1 hour; to do so, it will performed a simulation of the case requiring the highest amount of
input from the user, estimating an average time to obtain the value of an indicator and
inputting it into the system. In case the time obtained with this simulation will exceed the
threshold indicated, then the relevant benchmarking methodology will be re-examined, in
order to identify potential means for reducing the time consumption.

Another possible critical step might be represented by the phase of calculation of results: it
is necessary that the time elapsing from the conclusion of the input phase to the
visualization of results is not too long, to avoid the risk of a lost of interest from the user
side. This time strongly depends on the computational capability of the hardware available
for the user, and the browser used for running the e-tool.
It is estimated that the current hardware and software configurations normally available to
enterprises should guarantee that the duration of the calculation phase should be limited to
a few minutes maximum; however, dedicated tests will be run to identify eventual sources
of delay.

5.5 User information recording

As detailed in Section 1.4, the e-benchmarking tool will be as much effective as many data
from previous verified cases will be available in its database, representing the information
baseline necessary for a proper benchmarking process; with this respect, it is extremely
important that e-tool users give their agreement in recording the information related to the
logistic case they inputted into the system. On the other hand, this procedure has to be
designed with great care, since the information provided might be in some cases confidential, and therefore users would probably be reluctant to allow its recording into an external database.

The following procedure will be applied: after the generation of the results, the software will visualize a pop-up window containing the explanation why it is important for improving the performance of the e-tool that the data inputted by the user are recorded into the system. The banner will also contain a disclaimer clarifying that the information will be recorded and used exclusively for the purposes of the e-benchmarking tool; it will be important to indicate that none of the information contained in the database will be made available to BE Logic consortium members, or other external parties, for any commercial or non-commercial purpose. Once the user has confirmed to have read the disclaimer, he will be requested to give or deny the permission for storing the data he provided.

In case the consent to the storage his given, it will be necessary to clarify whether the user prefers to record the data anonymously, or to link them to this login details. The second solution will allow the software to recover the user data when he logs into the system, and to offer the option of starting from the logistic case already analyzed allowing the benchmarking of the same situation on different moments.

5.6 Language

The e-benchmarking tool will be initially developed in English. However, considering that the software will be mainly targeted to SMEs, it has to be taken into account the possibility that the potential user is able to understand sufficiently only his mother language. Therefore the final version of the e-benchmarking tool will be translated in the most common European languages (German, French, Italian, Spanish, and Dutch).
6 Conclusions

This deliverable provides indication on the structure which will be implementing in the realization of the e-benchmarking tool, and about the status of its implementation at the present time.
A manual for the usage of the software will be created in parallel with the development of the software tool, which will both represent the final report on the realization of the e-benchmarking tool, and the main reference for the usage of the software itself.

The document still includes some open points needing to be clarified in the following steps of software development; close cooperation between WP2 participants, and in particular with leaders of Task 2.2, 2.3 and 2.4, will be continuously set up during the following phases of the e-tool implementation, in order to clarify all the open issues in due time.