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# **Prospects for Selecting and Using Indicators for Benchmarking Swedish Higher Education**

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## **Executive summary**

This report presents results of a feasibility study aimed at designing a system approach to the selection and use of indicators to benchmark Swedish higher education. Work has focused on the formulation of a conceptual framework for the eventual establishment of a relational database suitable for the task.

The feasibility study provided definitions and selection criteria for indicators, along with a discussion about various aspects of their use and misuse. It developed a conceptual framework useful for the organization of indicators in accordance with a select number of criteria; and identified a number of available indicators in the developed matrix to demonstrate the feasibility of such a project.

The three months of the project allowed to identify pros and cons in using indicators to benchmark Swedish higher education in an international context. In the conclusion, several short- and long-term options for future work are identified, depending on the targeted audience, decision-making/research goals of the project, and time/budgetary constraints.

## **1. Background**

### Statement of the problem

- 01 Many audiences have an interest in knowing more about the productivity, efficiency and quality of higher education in Sweden. Stakeholder groups include the general public, the main institutions of higher education, their teachers and students. Other groups include the government, Parliament, several national agencies and social partners. Each of these groups has a legitimate need to access relevant, accurate and timely information about various conditions of Swedish higher education.
- 02 Unfortunately, however, the available information is often limited in scope, highly fragmented and difficult to access and interpret. This is a problem because serious deficiencies in the knowledge base for higher education can lead to uncertainty, speculation, misunderstanding and bad policy-making. Ultimately information gaps can produce market failures and wrong investment decisions.
- 03 For some time now there has been, in certain quarters, a lively debate about different aspects of efficiency and quality in Swedish higher education. This debate is far from being settled. This is in part because the information base that is required for rational discussion is currently lacking. Opinions more often than facts fuel the public discourse. Sometimes various indicators are employed to lend support to statements that are inherently ideological. But in instances where such indicators are used out of context and in highly selective ways one faces the risk of bias in interpretation. Indicators can be useful tools for benchmarking and assessment but all too often their potential is not realized.

### The IIE-SISTER feasibility study

- 04 The Swedish Institute for Studies in Education and Research (SISTER) commissioned the Institute of International Education at Stockholm University to undertake a feasibility study of the possibilities to improve the coverage of and access to information about various aspects in Swedish higher education. The study was to be undertaken within 12 weeks. It was commissioned because of the perceived need for creating a platform that would allow for a more reasoned use of indicators. Such a platform would create more awareness of the nature, the possibilities and the limitations of selecting and using indicators of higher education for purposes of benchmarking, assessment and evaluation.
- 05 A reference group consisting of people from agencies and organizations interested in the topic for discussion was appointed by SISTER. The group has met three times mainly to discuss the frame of reference and the need for an indicator system.

## **2. Aims and objectives**

- 06 The overall objective of the feasibility study is to come up with a blueprint for the design of a more complete platform for a reasoned use of indicators in higher education. The specific aims are as follows: (1) to provide a theoretical perspective on the definition and selection of indicators, and to discuss various aspects of their use and misuse; (2) to develop a conceptual framework useful for the organization of indicators in accordance with a select number of criteria; and (3) to identify and allocate a number of available indicators to the organizing framework in order to demonstrate its feasibility and as a basis for offering suggestions for possible further work.

### 3. Definitions and selection criteria of indicators

- 07 Developing and measuring indicators are complex academic and statistical endeavors. But the task is certainly not limited to a mere academic exercise since indicators are defined first and foremost in a political or policy-analytical context. Their development and eventual use are oriented towards informing and facilitating the decision-making process on the basis of benchmarks and performance criteria for the education system. In this sense, they form an essential information base for policy making at all levels, from students, parents and the general public to educational institutions and administrators and political actors.
- 08 Educational indicators are best described as derived statistics with an added evaluative character to the informative nature of statistics in general. "An indicator is an individual or a composite statistic that relates to a basic construct in education and is useful in a policy context." (Shavelson et al., quoted in Bottani and Tuijnman, 1994:80) At the same time, however, an indicator: "... is not simply a numerical expression or a composite statistic. It is intended to tell something about the performance or behavior of an education system, and can be used to inform the stakeholders- decision-makers, teachers, students, parents and the general public. Most importantly, indicators also provide a basis for creating new visions and expectations." (Bottani and Tuijnman, 1994:26)
- 09 The political function of indicators is closely connected with the technical aspects of their design and the collection of the required underlying statistical data. The scientific considerations that underpin the definition and operation of indicators have direct implications for how they can be used for decision-making. At the same time, statistics can only be treated as indicators if they address important policy issues, for example if they serve as a measure of the quality of aspects of Swedish higher education.
- 10 The above definitions suggest a number of criteria to which indicators should comply:
- Indicators are quantitative but the quantitative comprehension of indicators includes an aggregation of qualitative, value- and policy-oriented attributes;
  - Indicators are mutually interdependent; they cannot stand on their own. No indicator can be treated as objectively reporting the state of the education system without a broader understanding of the range of possible indicators and the relationships that link them together. To be useful an indicator should form an integral part of an indicator system (Bottani and Tuijnman, 1994:80)
- 11 The above-enumerated considerations have critical implications for the utilization of indicators in policy-making. Principally, they deny the possibility to draw valid conclusions based only on one indicator, without examining its meaning in a broader context of relationships. Secondly, they point to the necessity of applying a logically consistent theoretical framework that makes the interrelationships among the indicators explicit. Thirdly, they suggest the need for a careful and comprehensive approach in collecting and aggregating statistical data as a prerequisite for covering all relevant aspects of the studied phenomena.
- 12 Information that describes the performance of the education system in achieving a certain goal offers an indication of the ability of the system to meet the social, political and economic goals pursued by politicians in a country. Such information would therefore fall under the definition of education indicators. The need to link input variables to the ability to achieve a certain outcome, or to link measures of system organization to this outcome, suggests that an indicator should not be used in

isolation to assess a single dimension. Rather, there is a need of an indicator system that offers pointers to policy areas based on preset goals for education.

- 13 Criteria for selection are therefore essential for the adequate analysis of a problem with the use of indicators. They can differ according to the political values and because of the particular political context of examination, the characteristics of an education system or of the specific part being scrutinized. Given the task at hand, indicators should comply to the following criteria:
- They should be subject to a political process of selection, based around a consensus with political support;
  - preserving the balance between the diagnostic and suggestive nature of indicators used;
  - offering an implicit description of the theoretical model behind the selection;
  - diversity of analytical approaches must be enforced as reflecting the complexity of the existing relationships within the model adopted;
  - complying to the straightforward association between the research problem and the selection of the appropriate tools to assess it, and
  - measuring enduring features of the educational process, and allowing cross-country and time-series comparisons.
- 14 To summarize, the definition of indicators as quantitative pointers serving a political agenda emphasizes the necessity of explicitly formulating the system they are part of. Such logic also leads to the conclusion of the appropriate selection process, based on a theoretical framework adopted for the study.

#### **4. Application areas and reservations**

- 15 According to the definitions given above, the potential areas for using education indicators are closely linked to both political and research agendas. In general, their domain of utilization is either focused on the adequate reporting of the current state of the system or an aspect of that system, or geared towards the analysis of present or future trends affecting the education system. In both scenarios, however, the information value must offer a basis for making decisions to improve system performance and its outcomes according to defined social, political or economic goals. Hence the application of indicators for system diagnosis and analysis presupposes that goals, ambitions and a sense of direction have been explicitly formulated. The use of indicators for assessing the performance of the education system in accordance with national goals and against criteria such as equity or efficiency serves an additional, policy-relevant requirement, namely the need for more accountability in higher education. At the same time as indicators can provide important prerequisites for decision-making, their utilization is constrained by the limitations that are inherent in the theoretical framework that is applied.
- 16 Furthermore, the inter-dependency of indicators as being part of a system prohibits the possibilities for drawing conclusions based on a selection of one “convenient” index, merely restricting it to illustration functions. This happens because of the impossibility to interpret the data separate from the influences, political actions and factors having led to the present system state that the indicator portrays. Taken outside of the context, used without any explicitly defined theoretical framework that would depict the overall system organization and its development possibilities and peculiarities, educational indicators fail to fulfill their original goal, and are therefore detrimental to the description of the problem. The distortion of the value-judgment

character of indicators, depriving them of the evaluative character leads to the possible misinterpretation of information they carry.

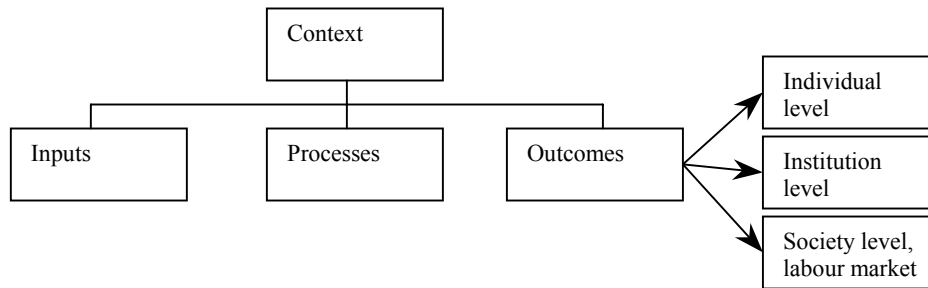
- 17 The use of educational indicators can therefore only be considered valid if done within the framework of the understanding of the indicators, meaning as well as its relationship to other parts of the system, and the possible “side-effects” of modifying this relationship. Adding to that, there is a necessity of an adequate understanding of the causality in the processes that the indicators report, as a necessary prerequisite for drawing appropriate policy inferences. (Darling-Hammond 1994: 361)

## Conclusions

- 18 On the basis of the above-said, it is apparent that the utilization of indicators for research and decision-making purposes requires a profound understanding of the specific features of their nature and rationale. The latter stresses the necessity of their utilization in a broader context of relationships to other pointers, as part of the system, and comparability criteria.
- 19 Indicators are best examined as to their suitability for the specific research problem. The political agenda should be explicitly present in the interpretation of educational indicators. The argumentation they provide is therefore only valid in as much as there is an explicit link to the utilization context, while the political agenda provides a meaning for the indicators by putting them in a framework for interpretation. The same reservations have a detrimental character when excessively using indicators as the sole base for the recommendations and actions taken.
- 20 The large number of factors that are necessary for the investigation require a system approach, treating indicators within the framework of their associations. Indicators necessitate an interpretation approach, examining them in the context of a system. A relational structure with an interface to select and examine indicators within a structured organization permits to meet these requirements. For research purposes, this construction would allow a wide coverage of variables selected through queries, while emphasizing the relationship between data elements, and providing an excessive number of pointers.

## 5. The organization of indicators

- 21 There is an acute need for a model that would depict the inter-relationship of indicators as a system of associated pointers. Such a model would result in a visual interpretation of the causal relationships of the components, while allowing to concentrate on one indicator within a larger framework of its relationship.
- 22 The limitations of such an approach result from two major factors. The first one is the availability of indicators. The second one results from the organizational principles, and the social theories used in order to categorize these relationships. Despite the potential subjectivity, the work can present a valid picture providing that considerations of the flexibility and limited character of causal relationships are explicitly stated.
- 23 For the present study, the framework for analysis designed by OECD for the 1992 International Education indicators has been taken as the conceptual basis. The OECD model divides the general framework as the combination of the environment, resources, processes and effects, and for the present study have been redefined as shown in Figure 1:



**Figure 1 Framework for analysis**

- 24 In order to steer the discussion towards input-output analysis logic, the influence of the context over tertiary education has been modified to emphasize the dynamics of the process. Therefore, the “resources” and “effects” categories have been reformulated according to the Shavelson model of linking elements of the educational system (Figure 4.1 in Nutall, 1994:86), putting an emphasis on the input -> process -> outcomes logic. Three measures have been added as consistent with the research criteria behind the examination: productivity, efficiency and equity of tertiary education.
- 25 Three levels of outcomes are seen as covering the totality of possible results, ranging from the individual to the society. To be more developed at future project stages, for the purpose of the present paper they are not used as dividing factors for examining the use of indicators. On the contrary, the division is made in order to validate the inclusion of the maximum possible number of indicators within the chosen framework. Reference to every outcome level shall be included in the database as an additional positioning criterion. At the same time, these levels can not be treated as all-inclusive, and might be redefined to better fit to the requirements for the system.

## **6. Productivity, efficiency and equity**

### Productivity

- 26 Productivity as a term is used to stress the ability of a system to produce the desired result as a measuring criteria for the extent to which it meets the demands at different levels. Applied to the educational system, it therefore emphasizes the suitability of the schools and Universities to adequately respond to the requirements of the economy by providing needed knowledge and expertise, and of society at large by teaching skills and attitudes which are selected as necessary for a normal functioning of the individual within the given society. The apparent similarities in productivity criteria especially in countries having a comparable level of political and economic development can be interpreted as a sign depicting the analogy of requirements in terms of capacities to deliver a direct result.
- 27 Productivity refers primarily to the ability of the examined entity to produce. From this perspective, productivity as a meta-indicator is closely connected to the output/outcomes of the activities of the education system as measuring its results. As according to H. M. Levin, “the educational production function is a statistical relation between the inputs and outputs. (1995: 283)
- 28 Educational productivity concentrates on the creation of a final result, rather than examining this result in relation to the inputs. For instance, the ratio of students per teacher can be used as a productivity measure as it assesses the ability of the universities to produce a certain number of graduates without referring to measurement criteria which are related to efficiency factors.

## Efficiency

- 29 Efficiency is much more oriented towards a comparison of the final product to the costs involved. It therefore is primarily a criterion for measuring the ability of the system to satisfactorily function within a limited timeframe, budgetary constraints or logistical boundaries, with an accent put on internals of functioning.
- 30 “Efficiency entails judgment between price and some other objective or value. It is not an autonomous value and may be in conflict with such values as equity.” (Cordingley & Kogan 1993:47) It is therefore more a mean to achieve value for money rather than a good by itself, as, for example, viewed as aiming a better contribution of the universities to the national or local economic strength.
- 31 Used within a conceptual framework aiming to provide an overview of the educational indicators in a comparative perspective, the two terms cover rather distinct areas, while achieving a similar comparison goal. Taken together, they describe the national education systems at the selected level by assessing it from the point of view of its functioning and suitability for the purpose. At the same time, they provide different perspectives of the relationship between the Universities and the society focusing the different areas of how this relationship operates. In a way the connection between the two can be simplified as attempting to measure the supply and demand mechanism as applied to the educational system, although it reaches far beyond pure economic indicators, including social demand for knowledge and skills of political and socio-cultural nature.
- 32 “Efficiency is a term used to describe the relationship between input and output, but because this relationship can be analyzed from several perspectives, judgments about efficiency may have to take into account more than one aspect of the relationship.” (Psacharopoulos & Woodhall 1985:205) while external efficiency assesses the balance between social costs and social benefits, internal efficiency focuses on the relationship between the inputs and the outputs within the educational system. The definitions of efficiency are therefore clearly linked to the definitions of outcome, as well as to the adopted outcome measurements.
- 33 Further on, efficiency criteria can be broken down into technical and economic efficiency. While the first is concerned with the maximum output that can be achieved from a particular input of resources with a given level of technology, economic efficiency criteria focus on the achievement of a desired result with the minimum costs. (Psacharopoulos & Woodhall 1985: 206)

## Equity

- 34 The complimentary nature of efficiency and productivity would not be comprehensive without a meta-indicator assessing the distribution of the educational services and demand mechanism as to the possibilities for the different population groups and strata to participate. Taken in a broad perspective, that would include the institutionalized system of checks and balances working to insure that there is an adequate opportunity for different groups to either impose their demands, or to fully utilize the potential of higher education. The above-described system of supply and demand indicators therefore requires an equity indicator assessing the functioning of the system from the point of view of its position in a democratic society that protects the equilibrium of interests of different groups.
- 35 Equality in its weak version, offers a measure of opportunity equality, as emphasizing social justice in inputs rather than outcomes. In its “hard” version, equality would include a commitment to insure the equality of outputs through the allocation of resource and commitment to actions to redress disadvantage (Cordingley & Kogan 1993: 46). According to Psacharopoulos & Woodhall, equity is a measure of adequate

distribution of goods and services between different society groups (Psacharopoulos & Woodhall 1985: 14)

- 36 While the definition emphasizes the social group approach to equity as a measurement criterion, it can also be broken down to cover the individual level. In doing so it can either provide information about the individual as relating to the social group examined, or refer to the immediate implications for the individual based on non-socioeconomic measures (such as age, gender or disadvantaged group).
- 37 In contrast to equality, equity "... is the value of agreeing and abiding by rules and mechanisms through which governance and the distribution of resource takes place. It appeals to the morality in insuring that all will be subject to the even handed application of rules" (Cordingley & Kogan 1993: 47). As a concept, equity is best used in conditions when the regulation of the educational system is not subject to free market regulation, but instead relies on bureaucratic governance modes.
- 38 In order to broaden the scope of the equity-related indicators, they are purposefully defined in the broadest possible sense. Hence, it includes but is not limited to the gender equality issues, but also includes measure related to the possibilities for different social groups to participate in tertiary education, age and many other variables.
- 39 Equity is not always a result of deliberate policy, but is rather dictated by objective factors, such as history, opportunities, institutional and program development patterns. Diversification can be a positive factor, stimulating efficiency, choice and student initiative, diversifies the range and scope of the offered programs. For the political debate, structural equity is often referred to as centered (binary, multi-layered) versus unified system of tertiary education.

The matrix

- 40 Productivity, efficiency and equity are treated for the purpose of the adopted model as meta-indicators, with the understanding that they represent only generalized logical entities for the representation of the forces shaping the educational process. With this in mind, it is impossible to refer to the interplay of these meta-indicators as linear, but rather treat them as providing a whole array of influences. Combined together, they can be treated as overall quality measures, assessing the suitability of the national educational systems to accomplish the tasks they are entrusted with by society. "The quality of education and training is considered in all Member States to be a concern of the highest political priority. High levels of knowledge, competencies and skills are considered to be the very basic conditions for active citizenship, employment and social cohesion." (EC 2000,3) The resulting general framework can be summarized in the following matrix:

		The system dimension			
		Context	Inputs	Processes	Outcome
The criteria	Productivity				
	Efficiency				
	Equity				

- 41 The matrix is therefore a graphical layout of the web of variables, categorized according to their relationship to the criteria for evaluation, and the process of higher

education<sup>1</sup>. Further work has been done to sample the indicators according to their place in the designed framework.

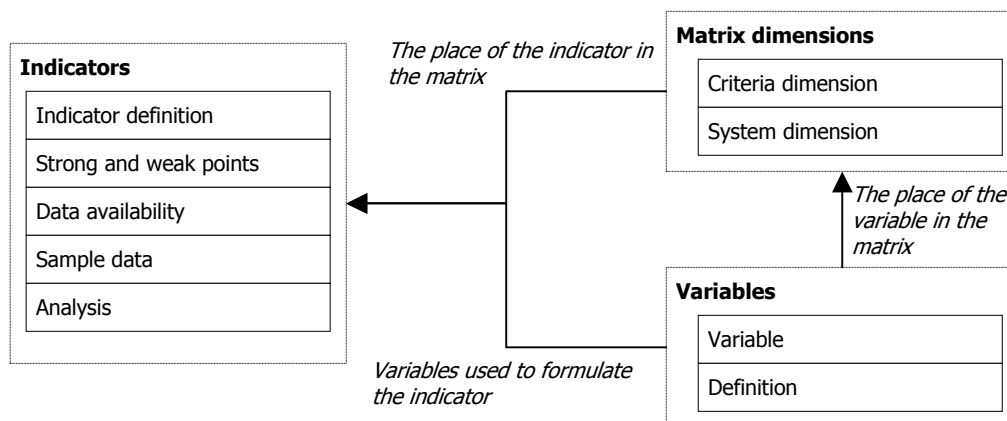
- 42 The following table depicts the categorization, which has been done. Without pretending to cover the totality of the possible pointers to assess the productivity, efficiency and equity as present in tertiary education, it concentrates on the key indicators commonly used.
- 43 The indicators presented in the table come from a number of different sources. At the present stage, they represent examples of what the matrix *can* contain rather than the predetermined list of what a future Swedish indicator system will contain. Some of them were chosen on the basis of the analysis of the OECD reports, Unesco and EURYDICE publication. Others express the need for measuring important aspects of the higher education system (in italics). The examples chosen are supposed to cover tertiary education at ISCED level 5-6 (see Appendix 2). During the selection process, work has been done to examine the variables used to calculate them in order to minimize the overlap between the indicators and dispose of secondary-level derivative measurements (see Appendix 3).

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<sup>1</sup> The described matrix can be easily adopted to allow alternative approaches depending upon the research topic. For instance, in order to study governance in its relationship to other resources (students, teachers, money, etc) and the system dimension, these variables can be used to replace the criteria dimension in the matrix. Indicators such as cost per graduate (productivity/money), selection mechanisms (students/process) or per capita public/private investments (input/money) therefore would be compliant with such a derived version.

		System				
		Context	Input	Process	Outcome	
Criteria	Productivity	Correlation between education and employment	Public subsidies to households	Average unit cost in GDP per capita	Correlation between education and earnings (tertiary level)	
			Public subsidies for educational services	Student to teacher ratio	Graduation rates in a longitudinal perspective	
			Educational expenditures as percentage of GDP	Organization of the educational process and study duration	Proportion of the age group with complete tertiary education	
		Population at the age of tertiary education as a percentage of the total population	Private tertiary education expenditures	<i>Fulfilment of student/teacher expectations</i>	Population distribution by the highest completed level of education	
			Organizational limitations for entry to tertiary education	Proportion of courses given as distance education	Graduates (first degree) in relation to the age group	
		Proportion of the population aged 25-64 with university-level qualifications	Percent of foreign students enrolment	Salary level of teachers	Literacy performance of recent graduates	
				<i>Proportion of programs subject to external evaluation</i>	Percentage of foreign students and students going abroad	
		Efficiency	Educational attainment of the adult population	Enrolment into tertiary education	Age range in tertiary education	Distribution of graduates by field of study
				Expenditure by educational institutions (tertiary level) by source of funds and level as a percentage of GDP	Teaching hours per student by type of institution	Earnings and educational attainment
	Participation in tertiary education as related to parental educational level		Public & private expenditures on tertiary education as percentage of total public expenditures	International student mobility	Pass rates (graduates in relation to intake X years earlier)	
			<i>Building and premises, including m<sup>2</sup> per student, equipment etc.</i>	Student activity and financing (full, part-time)	<i>Contribution to community /regional development</i>	
			<i>Teacher qualifications by type of institution</i>	<i>Communication and library services utilization</i>		
	Equity	Educational attainment of the adult population by gender, socio-economic status	Minimum requirements for entrance to tertiary education	Gender distribution by fields of study Proportion of women in the student population	Gender disparities in employment by educational attainment	
		Relative size of the youth population	Public expenditure by type of institution	Proportion of students in tertiary education as a percentage of all pupils and students	Chances of young graduates to enter the job market	
		Secondary school graduates qualification assessment	Net enrolments by age, gender, ethnic and geographical background by type of institution/program	Cost per student by type of institution, and by field of study	Graduates distribution by gender and/or field of study	

44 In addition to the development of the conceptual frame for the study, a relational database has been designed in order to serve as a container for the definitions and data. The main emphasis in design has been consistent with the requirements of the relative place of every indicator as depicting its relationship to the dimensions examined, and taking care of the expansion possibilities, with enough flexibility to add additional measures if necessary. The core design is centered around three fundamental datasets, tied to each other through relationships, as shown in the following figure:



45 Every field of the database is independently linked to others either through a “one-to-one” or “one-to-many” bonds, which allows a very flexible construction for further queries and sub-sets generation. For instance, the contents can be filtered to include only indicators related to GDP, therefore putting this measure in the center of the analysis. The proposed organization is also flexible enough to support complex queries providing only indicators which match certain criteria (see Appendix 1).

46 The organization of data in a database format is flexible enough to fit any option for further work. It can be either used for queries in order to present the results in a printed form, or it can be used interactively. It can be disseminated in a variety of formats (such as CD-ROM) or linked to an Internet server in order to allow selective exploration of data. In all the cases, it can be adapted depending upon the audience and the specific requirements for the system.

47 In order to reflect the difference in views and the diversity of questions of stakeholders, the structure and the choice of indicators has been explicitly left as broad as possible. Along with this, however, the database has specific limits due to selectiveness criteria. These are due to the necessity to restrict the number of countries, indicators, educational levels etc.

## 7. Conclusions

48 Several conclusions can be drawn from the previous discussion as a base for recommendations and options for further work. They are briefly summarized below:

49 Approaches to indicators use and selection should be based on the understanding of their system nature, and their utilization as dependent upon criteria of interdependency. Consequently they can not be used for policy-making purposes selectively, but have to be treated as part of the whole web of relationships accounting for the part of the system under scrutiny;

- 50 The results of the feasibility study suggest the necessity to develop further work as important for empowering the political debate with a scientific base for the interpretation of tertiary education indicators. Such a task should be carried out by the academic research community, providing interested organizations and agencies with information that can be used in the decision-making process and the discussions about the future of higher education.
- 51 A profound investigation of the indicators and intra-matrix relationships goes beyond the scope of a three-months project, with the necessity of a thorough description of the definitions, utilizing strong and weak points of every indicator. There is a need to further develop both the structure of the relational database as the technical container for the collection, but also the definitions and relationship descriptions of the variables used together with the selected indicators sample.
- 52 Further work on the matrix should concentrate on the following criteria:
- place of the indicator in the matrix, with a description of the relationship to the criteria and system dimensions;
  - a concept definition, outlining the validity and relevance of the chosen indicator, combined together with a depiction of its relationship with the other indicators in the same group;
  - a description of the variables used to calculate the indicator, including the possibilities to create derivative second-level indicators;
  - strong points and weaknesses of the indicator, framing the possibilities for its utilization; and
  - availability of data on three levels: no data available, data in Sweden and compatible data for all the examined countries.

## **8. Short-term and long-term options for further work**

- 53 Consensus reached during the preliminary phase of the project has demonstrated that there exists a need for a systematic study of educational indicators. There is a potential demand for such a system, and the necessary academic and organizational capacity to build a system that can cater to the needs of the different audiences. In the short term, further work is necessary to determine the needs of the different stakeholders as a base for the design of the system, including an open debate about the uses and concepts of educational indicators.
- 54 Further work should first of all focus on developing the process of consultation with the different clients interested in benchmarking the Swedish tertiary education system. Based upon the needs of the different audiences and their requirements, work has to be done to steer an active discussion involving academics, politicians, universities administrators, media, unions and statistical agencies. Through a series of consultations, seminars and workshops, it is necessary to build up the legitimacy of the project while setting in motion a constructive discussion about the uses and misuses of educational indicators, the specific requirements of the various parties and defining the technical side of the project.
- 55 The immediate continuation of the project therefore shall concentrate on a political consensus of the expectations from the indicators system. That will comprise an active involvement of the different stakeholders and a consensus-building process. The compromise will also delimit the list of measurable indicators to be included in the database.

- 56 This work, coordinated by SISTER, would serve as the basis defining the shape that such a system would take. Outlined below, the described options refer to the long-term possibilities to set up a system able to provide timely and systematic information about the state of the Swedish tertiary education.

#### Option 1

- 57 The first option provides for the development of the interpretation and relational logic of the adopted conceptual framework. Work will be continued on the matrix of indicators, focusing primarily on the rational logic of the database. The development of the selected indicators will therefore concentrate on the definitions of the variables and indicators selected, their calculation and interpretations.
- 58 The results will be incorporated in the database, creating a research instrument that will be valuable for further research in this field. Deliverables will include a detailed theoretical framework with a developed database model.

#### Option 2

- 59 Option 2 is the developed version of the first scenario, expanding it with data from the OECD, Unesco, Skolverket and other publications. In this way the theoretical framework will be utilized as a basis for the integration and analysis of real data
- 60 The results will be disseminated as a report summarizing the data analysis, including a developed conceptual base and real data interpreted in accordance with the theoretical framework.

#### Option 3

- 61 Option 3 also emphasizes the work with real data on the basis of the database, targeting a widest possible audience for its utilization. This can either take the form of an interactive searchable database published on the Internet, or distributed on CD-ROM with a query-enabled interface.
- 62 The major difference between options 2 and 3 is therefore the dissemination character of the results. In the first case, the target audience is a restricted group of policy-makers and interested agencies. The third scenario aims at a wider active audience, allowing anyone interested to have access to the data, with possibilities to ask questions and get familiar with the structure, definitions and pros/limitations of every indicator, as well as get extensive information about data on tertiary education.

### **9 The future**

- 63 The results of the three-months feasibility study have shown that there exist all necessary prerequisites for a large-scale benchmarking system of educational indicators. During this period of time through several meetings with the reference group a consensus has been reached on the conceptual framework to be used. Additionally, a prototype relational database has been developed at IIE as the instrument for the storage and analysis of the selected educational indicators. Therefore both the theoretical aspects and the methodology to be used have been identified, proving the feasibility of the project.
- 64 With confidence about the feasibility of the project, a number of questions still remain, to be answered by the stakeholders and interested parties. What kind of a

system is needed to reflect the diverse needs of the possible users? What shape should the system take to better respond to the expectations? How ambitious should the project be? Answers to these questions will reflect the need for such a system and the directions of further work in this field.

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## Appendix 1: data organization

The organization of data as a relational structure presents several advantages, namely:

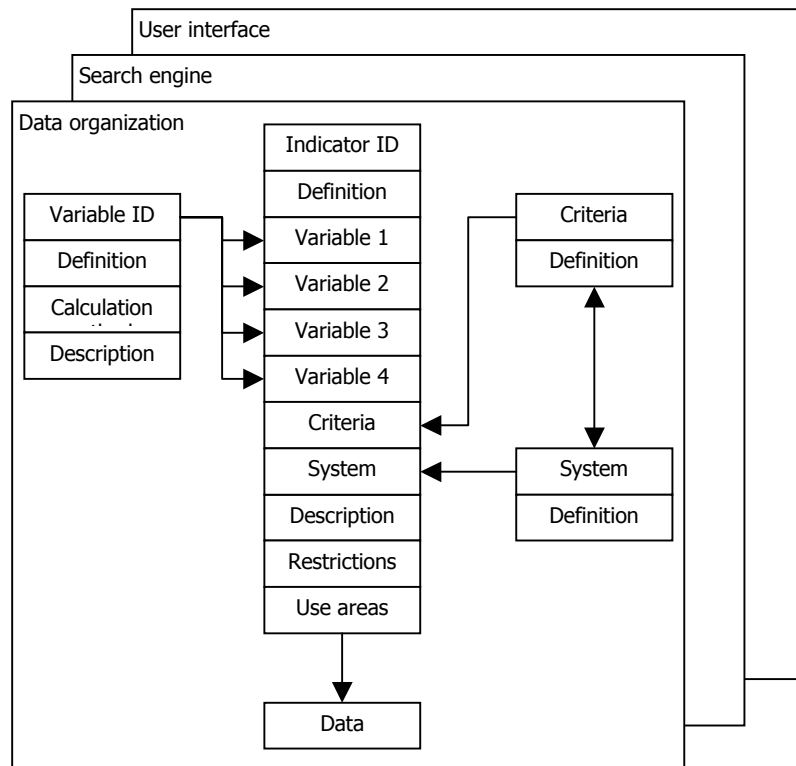
- an easy definition of relationships between the elements, including multiple relationships such as several indicators based on the same variables;
- expendability of the dataset, with the possibility to continue tuning up the structure without harm to the information content; and
- the ability to run complex queries.

The three major components of the database are:

- **the data organization framework** defining the internal structure of the tables in their relationship to each other;
- **the search engine** used to formulate queries and select data according to the predefined or free-form questions; and
- **the user interface** which can either rely on the HTML standards if the front-end is web-based, or a standalone software built upon MS Access.

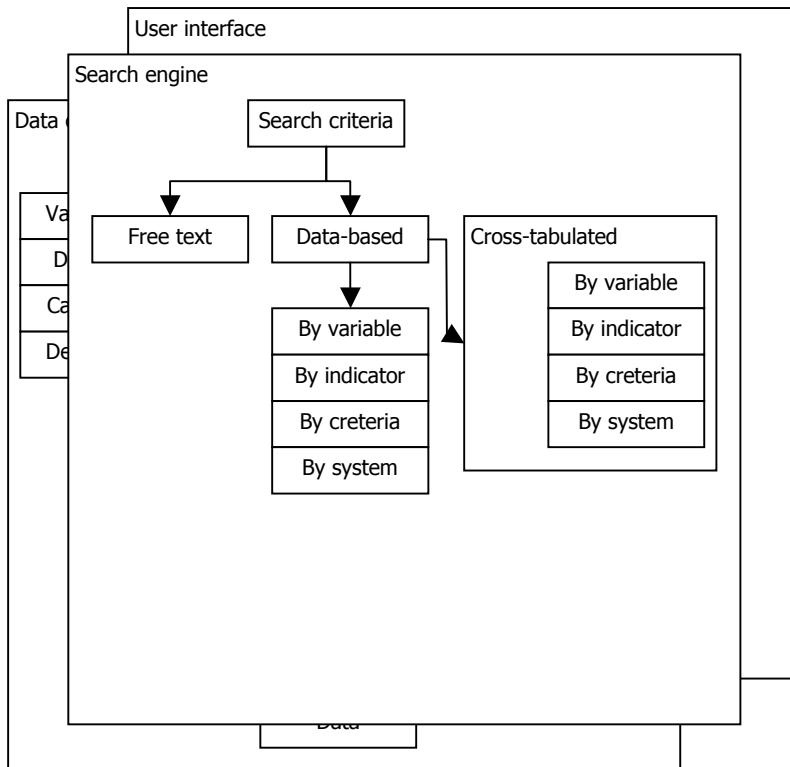
The following graphic schematically describes the data organization. *Criteria* and *system* tables together compose the matrix where the indicator fits best. On the other hand, the variables used to calculate every indicator are put into a separate table, with a many-to-many type of relationship to the indicators table. In this way, an

indicator is uniquely described as to its place relative to the criteria and system variables, with up to four variables used to calculate it. Within every table, further sub-divisions are made to provide as much information as possible about every measure. In this way, it is possible to add additional fields without disturbing the internal consistency.



The search engine is used to give the user step-by-step guided selection tools. The results are either a group of indicators that suit a specific criterion, or an indicator that most closely matches the query.

**Free-text** options can be used to parse through the tables for a keyword which can be present in the descriptions and any text field. It is most useful to gather information which is not quantifiable, such as keywords that can be present in the indicator limitation fields, or in the variable description. It returns either the indicator or variable information dialogs.

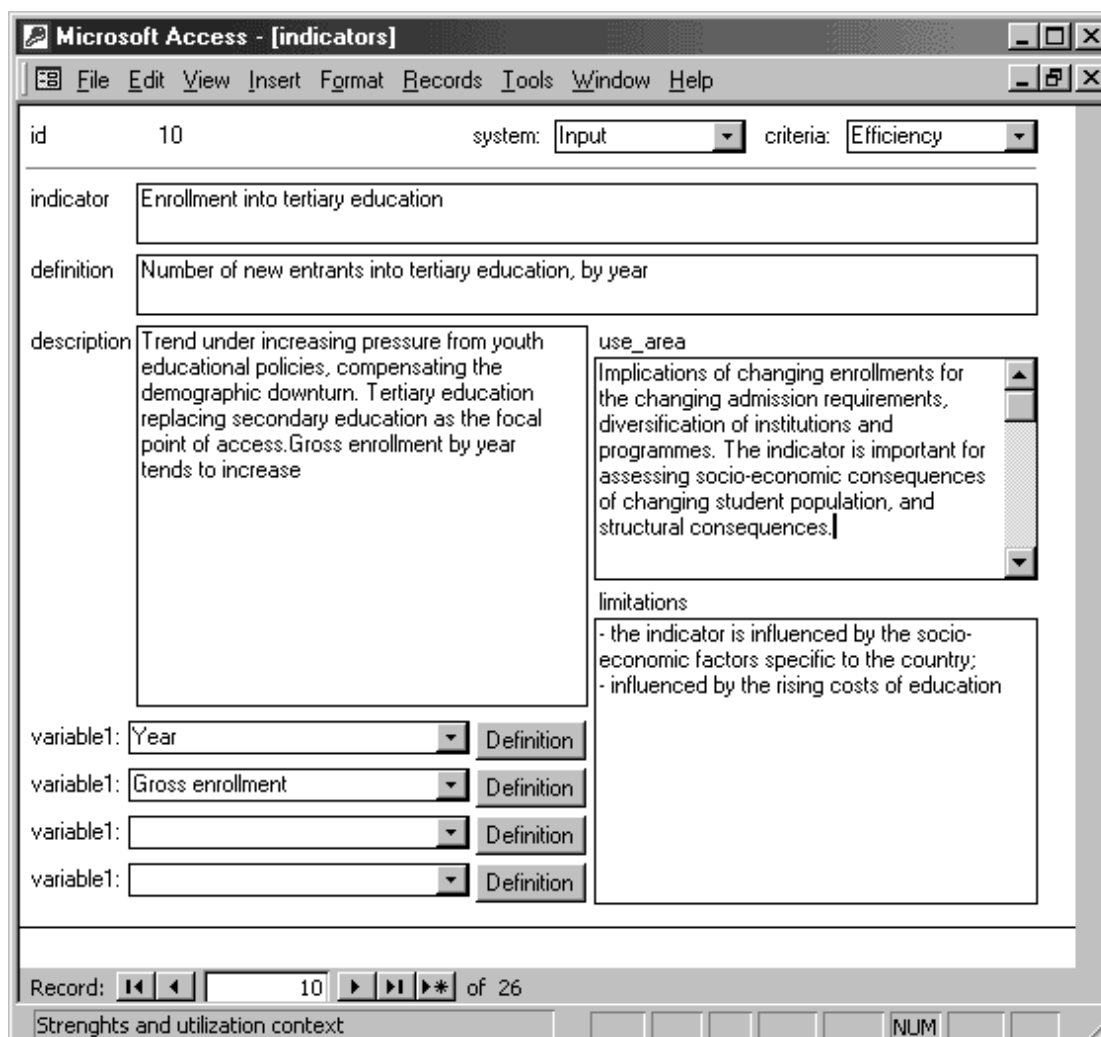


The **data-based** search forms can either return information based on the user selection from the dataset, or through a sub-list generated as a result of a cross-tabulation. The following example illustrates how this can be achieved in a cross-tab scenario, with the objective to find an indicator relating to the efficiency in inputs in terms of enrolment

Step 1: the user selects the appropriate matrix cell

The query returns a list of indicators which fit into this category, allowing the user to choose the one of interest

The selection leads to the main indicator description screen, gathering information from the database. From this point, the user can either get additional information on the variables which compose the indicator, get countries comparison data, or return to the selection screen.



## Appendix 2: ISCED-97 classification of tertiary education

For the project, the term of tertiary education has been defined as compliant to the ISCED-97 standards. ISCED-97 has introduced a multi-dimensional classification framework on the basis of multiple classification criteria (OECD 2000: 327). For tertiary education, this comprises two sub-categories of the Level 5 for the first stage of and the Level 6 for advanced research classifications.

Entry to these programmes normally requires the successful completion of ISCED level 3A/3B or similar qualifications at ISCED level 4A/4B.

ISCED 5 programmes have an educational content more advanced than those offered at levels 3 and 4.

- 5A. ISCED 5A programmes that are largely theoretically based and are intended to provide sufficient qualifications for gaining entry into advanced research programmes and professions with high skills requirements. The

minimum cumulative theoretical duration is of three years, followed by the completion of a research project or thesis.

- 5B. Generally more practical programmes offering a practical/theoretical/technical orientation. With a minimum of two years' full-time equivalent duration, they offer an additional occupational emphasis.

ISCED6 is reserved for tertiary programmes that lead to the award of an advanced research qualification. Devoted to advanced studies and original research, it requires the submission of a thesis of publishable quality which is a product of original research and represents a significant contribution to knowledge. The theoretical duration is of three years full-time, although the actual enrolment time is typically longer (OECD 2000: 329,372).

### Appendix 3

Example of the inter-dependency of selected indicators in relation to the variables.

The analysis was done based on the sample of indicators (in rounded boxes) form OECD "Education at a Glance" 2000 Edition in relation to the variables used to calculate them.

