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Executive summary
Introduction

The skill demands within the labor market undergo constant changes following rapid technological innovation and globalization within the last few years. These days, countries all over the world are looking to develop a suitable workforce that is equipped with these critical skills to navigate this fast-paced environment. It is therefore essential that all individuals continually improve their skills in lifelong learning, enabling them to adapt to the rapidly changing needs of the labor market.

The EU's New Skills and Employment Agenda seeks to foster life-long learning and develops a skilled workforce stocked with skills relevant to the labor market needs. A similar aim is held by the ILO which aims at matching skill supply demand, assisting workers and enterprises with adapting and building capability for labor market future needs. These goals position skill prediction and matching approaches as key elements of effective skill development systems.

Volume five focuses on "How to develop and conduct enterprise skills survey" which serves as a guideline on assessing the specific competencies required companies and formulating human resource development policies and strategies accordingly. ESS (Established Skills Survey) is an avenue of data collection which if appropriately designed, it serves important data required for prediction of present skills requirement and future expertise need. ESSs can be a means of addressing skills gaps in the labour market, enhancing individual employability, contributing towards increased firm competitiveness, and supporting economic expansion at government level for policy makers and firms.

Overview

The labor market is now changing faster than it had ever been in history; hence, worldwide emphasis is placed on the importance of human capital, particularly that of the available skilled workforce. Though forecasting the required skills and creating a proficiently trained workforce equipped with appropriate competencies for meeting up the demands of labour market is not easy.

However, this background requires quick and credible information on the skills' demand that responds to change. Furthermore, to design and execute good training programs, matching must be done between the demand and supply of the skills. However, it is important to note that traditional workforce data centric approaches will not be able to

adapt to changes as well as they would with the other methods of analysis discussed previously, and it must be stressed here as well that there still remain some shortfalls even when using those newer ways. ESS is a useful instrument that allows addressing the issue of the imbalance in skills between current and future labor force. the ESS is not only aimed at recognizing current and future skills required in the labour market as well as how the relationship between organizational characteristics and creating these skill needs could be studied. This may help in design of strategic plans on human resources management as well as designing appropriate vocational training.

Although useful, ESS is associated with numerous conceptual and practical challenges from survey design to data analysis. It is necessary to choose sampling methods appropriately and make correct decision at every stage of the design, however it needs deep expertise and involvement of external specialists. In addition, it is even more difficult to properly operate an ESS in developing countries with limited resources and capacity.

The aim of this guidebook shall focus on promoting good utilization of ESS through a simple understanding about ESS and guidelines. Thus, this Guidebook is meant for everyone concerned with the establishment and execution of the ESS. The Guidebook has already been used in Egypt, Tajikistan, and North Africa, and its usefulness as a government support tool and training material in the implementation of ESS has been confirmed. As they proceed in future, they plan cover some more countries and regions for this guideline book and apply it to a larger group of the population.

Context and Preparation of the ESS

Basic ESS Concepts: Definition and basic principles of ESS

ESS is a firm survey where they identify the type, level, and composition of skills that individuals must have to do a workplace job and establish the real skill demand and investments in human resources' development. Unlike conventional surveys targeting individuals (employees), the key feature of the ESS is that its primary information providers are employers (companies), who are in a position to drive technological innovation and business strategies. Hence, there can also be thorough data on what skills employers prefer or what character do they desire in a worker coupled with how the company characteristics influence their skill demands. Knowledge derived from the ESS can be used for each institution to adjust their strategy and policies pertaining to skills supply. Typical examples are listed below.

- A reference guide for policy makers to create educational and training policies.
- Education and training institutions can set up skill development programs, skill requirements and offer them where needed in alignment with skill needs.
- Companies can identify and address challenges and opportunities in their human resource development strategies.
- Future skills would inform individuals' career development.

As such, data collected from the ESS can be used by many actors in the labor market. It can help enhance the labour market through contributing to the development of skills and careers.

More countries and international organizations are carrying out ESS surveys and some developed countries with well-established LMIS use the ESS in providing information for better labour supply and demand adjustments within its policies. This information is used to develop strategies to strengthen the competitiveness of companies, such as reducing skill gaps and improving human resource development strategies. On the other hand, developing economies are seeking to build their labor market infrastructure by gathering ESS information on skills. For example, it is possible to mention Tunisia, Tajikistan, Egypt, where the initiation of ESS led several governmental departments to co-operate.

Besides data collecting ESS also includes several advantages such as formulating human resource development policies as well as refining labour market structure. These benefits can only be realized if the different processes are followed accordingly.

Background and Context in Which the ESS Is Needed

The labor market is transforming, with the advent of rapid technological innovation and economic globalization. Human capital is becoming increasingly important in making productivity improvements and fostering innovations. It is essential to forecast the demand of skill basing on updated and correct statistics as well as developing and securing a workforce that can meet the demand for skills.

However, it is very hard to estimate current skill demand and forecast future needs. Skills' demand forecasting based upon the labor force as the mainstream technique to date possesses limitations in terms of its inability to respond to changes and the accuracy of its results. The use of ESSs as an alternative for addressing challenge that would adequately capture issues regarding skill demands in the firm's policy on human resources development, has become gaining attention as a new approach.

Through this ESS, companies can identify both current job skills and future skill shifts as business operations change. Moreover, through an investigation on how company characteristics affect skills requirement, ESS may also furnish basic data useful for setting up data-based human resource development policies.

Survey Planning and Implementation Considerations

Project management in ESS has certain conceptual and technical difficulties.

It is essential to see ESS as the sequence of processes from determining a problem, data collecting, policy planning, and implementation since this is what makes the proper planning and realization of the ESS possibility. It should correctly interpret the purpose of the data, accurately analyze the obtained information and to be able to reflect their results (knowledge) in effective strategies and policies.

The ESS is very costly and complex, with significant resources and technical capacity essential at each stage of the investigation. if resources and capacity are not available,

it would be wise to consider other options like phase approach or hiring an out organization to help do survey.

Such data is the type of information that has meaning only upon analysis. Therefore, institutional capacity to analyze the data and use it for policy purposes is essential. Country-specific factors that affect the ESS program's implementation should also be considered as well.

For a successful ESS, multiple actors in the public and private sector must cooperate. They should plan on their respective roles and responsibilities and communicate effectively. Above all, strong leadership, both administrative and technical, is essential. Leaders have two roles: a political role in recognizing the importance of cooperation and ensuring that processes are established and a technical role as an element which ensures continued fulfillment of the technical aspect by all parties involved. They also play an important part in scrutinizing reports and designing policy reforms, which must involve the involvement and control of political authorities. Political leaders also can influence their agencies into pursuing policy reforms.

The success of a survey depends heavily on the employer. However, employers might not want to get involved in such surveys because of limited time and confidentiality reasons, which is only possible to surpass using the below approaches.

1. customized partnerships with employers
2. make the questionnaire brief and precise
3. develop a questionnaire that mirrors the views of an employer.
4. design outputs that provide tangible benefits to the employer
5. make the employer feel like he owns the data
6. share the results of the analysis with the employer

Training providers and research institutions are also critical to the project. They are important strategic partners in leveraging data and incorporating it into effective proposals and policies.

Design and Implementation

Formulation of Objectives and Research Questions

The objectives of the ESS and the nature of the survey must be closely linked to the needs of the client and the desired results. Identify information gaps and create questions that provide new insights, considering what has been learned from existing surveys. It needs to ensure that findings of your survey are linked to policies and strategies, as well as customized for your intended end-users. The goal of the survey is to incorporate a balance of long- and short-term goals, considering the country, regional, and industry context. It is recommended that goals be set achievable and that the limitations of the survey be understood.

Features of ESS

ESS is characterized by the fact that the starting point is to envision a clear scenario in which the results will be used for policy making and decision making by the parties involved. First, the statement of the ESS's relevance to education and training and the

employment policies should be clear and stakeholder usefulness should be guaranteed. Due to time and resource constraints, prioritization of questions when looking at achieving multiple objectives is important. However, there should first be deliberation on how urgent policy formulation is and to what extent the multiple objectives are inter-dependent before deciding to make specific prioritizations explicit.

To achieve the objectives of the ESS, the following list of specific goals has been developed:

* **Identify the skill levels and usage of current and prospective employees:** The survey determines whether new employees the skills required by the employer, whether existing staff have the necessary proficiency for the job and evaluates the employer's training efficiency. It is also characterized by determination of the growth patterns and characteristics of different job categories inside a company and analyzing trends in occupational change. When conducting this analysis, it is crucial to group employee skills by similar skills to evaluate the skill shortages and requirements.

* **Understanding the drivers of skill needs:** Identifying the skill gaps companies are facing as well as providing suitable training and workforce development initiatives starts with understanding the factors impacting the skill needs. These encompass the development of new products and services, a change in labour practices, introduction of new technology and machinery, increase in competitive environment and changing regulations. The above could involve classifying firms into groups based on the said factors and comparing this with skill intensity could forecast for possible reasons why such companies would demand high level skills and which scenario might be met with skills shortages among countries and companies in the near future.

* **monitoring and evaluating the results of labor market and education and training policies:** Assess the implementation This includes evaluating "outputs" through questions about the skills and preparedness of employees hired directly from the institution, as well as "direct" methods that introduce explicit questions about specific policies. The purpose of this process is to achieve a good comprehension of the clarity of perception about the policy, its actual usage and the reasons why it is not being used or is unsatisfactory.

* **forecasting future demand for skills:** The ESS aims at forecasting the required skills in the future. This is accomplished by depicting changes in labor demand through a variety of scenarios, including changes in occupational structure, educational level requirements, and the impact of technological innovation. With combined external data, ESS offers more specific skills needs projections and insights that assist companies to prepare for the future market demands.

As previously discussed, ESS offers a practical foundation for companies and policy makers to arrive at more strategic decisions by utilizing skills-related data. It helps them

address skills gap problems, generate new training possibilities, and form strategies for changes in the labor market.

Time Scope and Questionnaire Design

∗ **Defining the time scope of the survey**

Determining a time range is one of the key issues in implementing an ESS. There are considerations about the frequency and methods of conducting the survey, as well as related cost-effective aspects of the survey.

1. The time scope and repetition of the survey:
   - The budget and survey design determine whether or not a survey is conducted regularly. This in turn influences the policy being formulated.
   - The use of Cross-sectional snapshot surveys that give data from a single point in time are useful for understanding current conditions. However, the information may quickly become obsolete.
   - Questions about the past and future should be limited to basic quantitative questions to reduce respondent stress, as well as measurement error.

2. Benefits and costs of repeated surveys:
   - One method of detecting changes over time is through annual surveys which enable quick developing of policy measures.
   - Repetitive survey can be viewed as a very costly, yet potent instrument of tracking and forecasting skill requirements.
   - Cost cutting measures include lengthening the survey period, narrowing questionnaires, shortening version of the survey, and downsizing the sample size.

3. Selection of longitudinal data and panel data:
   - Panel surveys tend to be rather costly and difficult to ensure continuous representativeness when carried out as repetitive surveys over some period of time.
   - In a longitudinal approach, surveys are typically repeated at different establishments and are more flexible than panel surveys.

4. Employer-employee surveys as an alternative survey approach:
   - The survey addresses a wide range of workplace issues by taking a sample from different establishments and surveying employers as well as employees.
   - Some examples of good quality data sets on employer employee relations include the WERS survey in the UK and the WES survey in Canada.

∗ **Questionnaire Design**

Questionnaire design involves turning the survey objectives into clear information categories and specific questions. An efficient questionnaire should gather required information in a brief period of time and exclude questions that do not deal with the purposes. From the start of producing an ESS questionnaire, some particularity should be noted. These are listed below.

1. Skills questionnaire strategy
   - There should be developed a system for effectively measuring workers' skills.

- While they give clear data on the skill levels and contents of the workforce, standardized test is expensive and time-consuming (in terms of design and running).
- A much easier-to-observe alternative is to use indicators such as occupation, education level, and type of training.

2. Selection of the optimal approach
   - Occupation-based approach: aiming to obtain a detailed map of an organization's occupational structure. Occupations are usually well understood, but the diversity of occupations complicates the approach. Changes in the skill content of occupations over time as well as accurate and consistent coding also constitute concerns.
   - Vacancy-based approach: ask for employers' opinions on current vacancies and the reasons for them. Questions on the cause of the vacancies can help establish whether the vacancy is related to a lack of skills or competencies of the job applicant. This helps in providing timeously, information on employers' skill requirements as well as its directly assesses a business's needs. However, it is susceptible to economic bias fluctuations and the difficulty of predicting future needs.
   - Training-based approach: Provides details regarding a company's training as well as information on present and prospective skills requirements. However, it is difficult to establish a link between training content and skills.
   - Task-based approach: Focusing on skills required to perform a task. However, the complexity of setting up and preparing the survey is a challenge due to the diversity of tasks and the need to make comparisons across companies. The other point is also on whether employers have information to respond appropriately to questions concerning the employee's duties.
   - Skills-based approach: Directly asking questions concerning the use of a certain set of skill lists and rate them according to significance or frequency of use. There is concern that a generic skills list may exclude investigation of job-specific skills.

   As discussed above, there are several methods to questionnaire design. Each technique is complementary to the other as it provides a different perspective and type of information. As such, instead of using only one approach, several recommended be combined depending on what the study is meant to achieve.

3. Determination of information sources
   - The entity providing information on skills needs to be determined.
   - Preferably, information should come from employee data across the establishment. Although it involves complex survey design and implementation that would be challenging within large firms and different professions.
   - The process needs to be simplified by categorizing workers into groups and obtaining information about groups rather than individual workers.

4. Clustering of workers
   - In the case of the cluster of workers, the questionnaire design is about how specific it defines the occupation. The occupations are classified hierarchically into classes using a system like the ISCO, comprising of the highest category that includes more than 100 different occupations downwards up to specific single occupations. Specifically, by using an intricate classification, the research collects data that is highly accurate with regards to occupational or technical skills as well as more homogeneous groups. However, this approach has the disadvantage of increased cost and complexity.
   - In contrast, using coarse occupational classifications will offer simpler and quicker data collection procedures but lower granularity of the information acquired. Therefore, the selection of an appropriate level of occupation classification for the purpose and resources is a vital element in questionnaire design.
   - In most situations, it may only involve some of the occupational groups and not all workers since time frames are limited. Occupational groups are normally chosen according to statistics, management strategy, or at their own discretion by the employer.

5. Core employability skills and job-specific (technical) skills
   - Finally, another crucial issue in designing the questionnaire is on what kinds of skills should it focus? When clustering workers based on their occupations there is a risk of mixing skills among different workers in broad occupational categories. As a result, it becomes challenging to do an in-depth appraisal on specific job-specific skills.
   - Core employability skills are basic skills that are required regardless of the type of occupation, are related to general employability, and are useful throughout a worker's career. They are important as workers adapt to changes in the labor market and move between different occupations. Occupation-specific skills, on the other hand, refer to skills and expertise specific to a particular occupation.
   - The survey designers should appropriately combine these fundamental and occupation-specific skills to carry out thorough examinations and analyses in line with labour market needs.

* **Questionnaire Design**
The questionnaire should be divided into different modules that reflect the specific areas of interest of the survey. Some of these modules are employee information, recruitment, workforce competency, workforce development, demand for workforce, and business planning. While these are the core information that you should aim to capture in the ESS, you do not necessarily need to include all modules. They are selected based on a scope balancing approach that combines cost, data, and technical aspects as well as quality and quantity of information. Shorter surveys are geared towards accessing a large sample in a short time period and at lower costs.

Other modules can be included as per specific interests, these however are dependent on purpose of the survey.

Respondents need to stay motivated when each section of the survey is being administered. More specific questions recommended to be placed later in the survey to maximize response rates and quality of responses.

1. Module 0 - management information
   - The first administrative section which contain the offices' name and address of the office, details of respondent, interview details and interviewee information.
   - Confidential information which shall be destroyed after the authenticity and reliability of the questionnaire have been established.
   - Respondents are notified that the information will be treated as confidential and used for quality control purposes only.

2. Module 1 - basic information and occupational structure of the labor force
   - The objective is to collect basic information on establishments (enterprise statistics) and to determine the occupational composition of employees and the characteristics of employees in each occupation.
   - Firm statistics will include industry affiliation and background characteristics (ownership structure, size, and length of operation).
   - Ensure that occupational classification decisions are reflected in the categorical information sought in the questionnaire.
   - Concise and clear questions are needed to confirm and enhance the reliability of the information given.
   - Collect information on the average education of workers to identify employers requiring advanced skills.
   - Gathering information on worker gender ratios and changes in the workforce would be beneficial.

3. Module 2 - recruitment
   - Examine the hiring experiences of the institution during given time span and investigate whether there are problems in recruiting appropriately skilled personnel.
   - Investigate the number of vacancies, reasons for vacancies that are difficult to fill, and issues related to skill shortages.
   - Expanding on questions about the skill levels of recruits and education completers will explore employers' perceptions of the job readiness and skills of recruits.

4. Module 3 - skills used by the current workforce
   - The survey will determine the existing skills in a workforce; any skills gap present among employees, their implications on business activities, and how a company is handling this situation.
   - It can further include some questions relating to the mid-term skill requirements.

5. Module 4 - workforce development

- Explain quantitative and qualitative aspects of training programs applied by employers for their staff training practices.
- These questions may be about policies on education and training.

6. Module 5 - workforce participation
   - Find out about the establishment's planned expansion of the future workforce or reduction.
   - It is important to concentrate particular numbers, time period or occupational groups to get valid information.
   - However, one must understand that this information is just an indication of future developments.

7. Module 6 - business strategy and structure
   - Collect data on current and existing skill demand to classify firms into skills intensive and less skilled firms.
   - Key factors such as the type of products and services, work organization, and process technology relevant to the management strategies employed by the firms will be explored.
   - A list of questions should be developed to balance survey time and information volume.

∗ **Sampling in ESS**
   Purpose and importance of the sampling strategy: ESS's sampling entails defining the target population and coming up with a suitable sample frame for selection of the establishments or firms to be surveyed.
   1. Definition of Population
      - The survey population is a group that includes all the subjects who can provide the information we want.
      - In setting up the survey population, the challenge is to find an accurate definition of the target population and to comprehensively list all the subjects and select an appropriate sample frame.
      - (a) Identification of establishments: The focus for ESS analysis is generally on "establishment" level.
      - (b) Identification of family businesses: Since family businesses differ from typical commercial corporations, they recommend be excluded in the survey. However, since the establishment or enterprise is perfectly legal, it is difficult to separate them from regular enterprises.
      - (c) Identification of the informal economy: The informal economy is a place of business that is invisible to administrative control. Statistical techniques are difficult to design and apply when working with them. Nevertheless, failing to acknowledge the existence of the informal economy gives rise to certain difficulties on an attempt to comprehend the current status of the sector. Its significance should be appreciated, and an understanding of such issues as efforts/benefits required for its inclusion in the survey is required.

(d) Identifying the size of establishments: inclusion of microenterprises (typically 1-5 employees) will increase the cost of sampling and data collection.

2. Determining the sample frame and sampling method

Determining the sampling frame and sampling method is a core part of ensuring accurate data in ESS.

(a) Limitations of probabilistic sampling: sample implies that a particular group of establishments are to interview while sample frame is a comprehensive list of such establishments. Without a complete list, proper probabilistic sampling becomes difficult, and the quality of the sample frame must be checked. The major concerns should include incomplete lists (undercoverage), incorrectly included establishments (overcoverage), duplication, lack of accessibility, and misinformation, and to take steps to minimize these.

(b) If no sample frame is available: In the case where there isn't a suitable sample frame, or the deficiencies are too serious, other methods besides probability sampling should be used. Other techniques include list building, redefining a survey population, and using other Census survey data. Nevertheless, these approaches can result in improper statistical inferences. In this context, one must construct the most representative sample frame reasonably possible or reshape or use whatever available data with precision so as to make valid statistical statements.

(c) Defining sampling weights: accurate weighting of all sampling units is essential for aggregate results to accurately reflect the population. Incorrect weighting can lead to misinterpretation. Unbalanced sampling is used to ensure the inclusion of specific groups of establishments with uncommon characteristics.

(d) Sample size: Factors include sampling method, precision result, degree of subdivision, budget, and the anticipated non-response rates. Sample size is directly related to the accuracy of the desired results. With inappropriate sizes, it may not be possible to get correct and reliable results.

(e) How to proceed: this includes selecting an appropriate sampling technique, assessing the quality of the sample frame, and adjusting the final sample size to take into account the results of the pilot survey.

∗ **Data collection**
Purpose and Importance of Data Collection: The objective is to obtain the maximum number of complete questionnaires from the sample. Interview should be free from induction. The data collected should also be carefully systemized and properly supervised.

1. Risk management: The most important risks in the data collection phase involve budget overruns, high non-response rates, omissions within the survey, and lack of homogeneity of response.

2. Interviewer training: Interviewer training is critical, and pilot surveys will be used to test and guide their abilities. Proper training of such interpreters will help them explain the purpose of a question's accurately, recording of responses too.
3. Fieldwork logistics: they should also conduct fieldwork effectively within the set-out scope and ensure their budget limits encompass all necessary logistics. The main outline of the whole survey should be clearly specified in the plan.
4. Conducting data collection: Mostly, such interviews are done at the physical location of businesses either by the employer or somebody who is senior. Such persons may be reluctant to disclose confidential information. For successful data collection, it is effective to gain trust and interest through direct engagement with employers.
5. Trial survey: This is done prior to commencement of the actual survey. Questions are checked for comprehension, response times, and consistency in their answers through informal internal checks and actual field pilots.
6. Data handling: The data handling process is critical to ensuring the accuracy and security of the data collected. Multiple steps in the process contribute significantly to data quality.
   (a) Computer-assisted interviewing: increases data precision and reduces time and cost. Security is also required for safe transport of information as well as privacy. Errors with respect to inconsistency, missing values and outliers should always be centrally checked.
   (b) Data storage: centralized management is recommended. It reduces technical complexity and the risk of errors during data transfer due to communication failures. Databases should be checked centrally to ensure data integrity and accuracy. Once data has been entered, stored, and checked, it must be anonymized to protect personal information.
   (c) Coding of open-ended questions: due to the issue of the difficulty of quantification and centralized coding, special attention is required in the data entry stage. Consistency in the interpretation of responses can be achieved by consultations between interviewers and establishment of the common coding strategy.

These measures are vital for guard against loss or modification of the data prior processing of the post-collected information. Data must maintain consistency, reliability, and security.

Data Use and Policy Implications

Adaptation of Foresight to Local Needs

Some case studies of foresight activities across different countries indicate that foresight should be approached as a country level considering national specifics and their opportunities and barriers. The size of a country influences the complexity and management costs involved in foresight activities. In smaller countries, dealing with

spatial skill mismatch is also a challenge. Foresight is not always facilitated its implementation by economic expansions. However, there is a relationship between each country's level of development and its experience in implementing foresight.

Where there is no political stability, fostering a culture of foresight becomes daunting and such an approach runs at high risks of not being implemented sustainably. The cultural context also matters in selection of methods, as there are known differences in preferred methods between the West and the East. It is essential to consider variations in labour market supervision as well.

In an undeveloped institutional context, it is more likely to be difficult to translate foreseen results into policies and strategies. Similar is the case of resource bottlenecks. Under these limitations, it is important to set goals carefully and not to expand the scope of activities too much.

The mixture of methods to be employed must also suit a given country's situation; it has to relate to specific goals for forecasting established and reflect the nature of the study's method. Reliance on a single methodology would be risky.

Point

- Relations between country size, organizational activity, and discrepancy in spatial skills.
- Lack of correlation between economic growth and ease of implementation of foresight.
- Foresight culture and sustainability are hindered by no policy stability.
- Identifying appropriate techniques of analysis that acknowledge cultural settings.
- Policy change is difficult when there is no institutional context.
- Importance of precise target setting and scope setting.
- The need to select and combine methods that are appropriate to the situation.

Success Factors in Implementing Foresight

Goal setting forms one of the common factors of success in foresight implementation. It is important to set reasonable goals and scope of activities and to position them realistically without being overly ambitious. The lack of adequate expertise and statistical data may cause failure towards the success of foresight activities; thus, the goals and scope should be set in such a manner as they balance available resources and projected results. This will ensure that progress can be made.

Second, the commitment and involvement of a wide range of experts as well as more general stakeholders, such as industry and labor unions, is essential. The reason is that stakeholders having a feeling of belongingness and possession, they are expected to implement the findings.

In addition, effective dissemination of results is also important. Considering the foresight objective of decision support, results must get to respective decision makers. To achieve this, the findings could be made public on a website or a report or through stakeholder workshops.

The above three points form the basic pillars of what is referred to as common success factors. Ensuring these will be key to the success or failure of foresight.

PART B: Key Insights from the Skills Forecast

Summary of What Skills Forecast

The objective of skills forecasting is to provide information to players in the labour market, as well as the education and training stakeholders, so that the market should work efficiently. It may be impossible to systematically predict the way in which skill needs change over time but both governments, employers, schools, and individuals should plan assuming a certain number of anticipations. The need for labor market information and analysis varies widely from subject to subject and forecast period lengths depend on specific objectives. Hence, one needs to determine who is doing it, when they are doing it, why they are doing it and to whom they are doing it.

Skills forecasting start with the Mediterranean regional project that took place in the 1960s, and analyses of skill demand and supply forecasts have been developed since the 1980s.

Skill forecasting usefulness is no longer in its predictive power, but in the informed ability which it provides to address future imbalances. It is essential to comprehend that quantitative models are not magical; therefore, we should understand what they can and cannot do.

Advantages of a Quantitative Approach

- Explicitly and transparently lays out assumptions about the future.
- Supports systematic and logical thinking.
- Acts as meeting point for intellectual discussion.
- Provides counterfactual information for judging policy implications.
- Provides detailed employment and skills information by sector, enabling the formulation of concrete policies.
- Analyses the performance of an entire economy both at a macro and a micro level.
- Enables to develop reasonable predictable futures with the use of historical and existing information.
- Capable of developing sound plans that are based on the realities or restrictions facing it; e.g., financial and labor constraints.
- Modeling the effect and interplay with external factors like technology change.

Disadvantages and Limitations

- The use of complex models entails high cost hence the need for substantial input of resources.
- Shifts in the labor market cannot be fully predicted.
- Cannot accurately indicate the need for education and training.
- Limited ability to predict the future as an extension of the past.
- The continuous accumulation of abundant and high-quality data.

- Need to manage the data.
- It is difficult to obtain sufficient data that is relevant to the purpose of the project, as it must rely on existing statistics.
- It is impossible to plan mechanical manpower.

Overall, however valuable quantitative methods may be as a basis for a comprehensive analysis of emerging skills requirements, they are also accompanied by data and model limitations. Thus, Qualitative methods should be brought together with these approaches. Quality of the data determines the quality of the result, and while quantitative approaches are resource-intensive, it takes less time and at affordable costs, if already existing models are used.

General Approach to Skill Prediction

There are four main general approaches to skills forecasting: employer questionnaires, quantitative modelling, industry specific surveys and qualitative investigations. The surveys directly asking employers for skill shortages and so on are near real but subjective. Though quantitative modeling is comprehensive and consistent it involves a lot of data, that is costly. While sector-specific surveys could be modified with respect to the peculiarities of separate industries, they might not go together with the general one. Qualitative methods are more likely to reflect the opinions of those directly involved but tend to be less systematic and subjective.

The quantitative model may involve range from simple trend extrapolation from historic data or a more complex method using time series analysis and behavioral theories. The process involves construction of simplified models of social phenomena presented as algebraic equations, which serve the purpose of predicting future scenarios.

Contrary to this, qualitative method encompasses; interview, case study, focus group, roundtable, and scenario building. Although these are highly subjective, they may provide innovative perspectives.

Quantitative and qualitative approaches should be adequately combined to profit by each method's strengths and provide a holistic solution for the problem. These will provide comprehensive quality skills forecasts which address the lag that exist between the actual demand changes and the policies formulation and implementation response.

Data collection and modeling approach

Data collection

The initial set of primary data required in predicting skills include: output and factor inputs by sector; employment by occupation, education/industry; demographics; and education information. These data usually collected for a particular period depend on the nature of data concerned as well as the purpose.

Statistical surveys, which include labour force surveys, census, employer surveys among others and administrative data are employed in collecting data. Administrative dataset could also help make quantitative projections at the level of occupation and education not covered by the statistical surveys. Detailed information about skills and qualifications are obtainable also through different skills surveys. Each of them has its

strengths and weaknesses and it's recommended to apply combination of several types of sources. Attention should equally be directed into the consistency of the time series data as well as classifying different data sources.

Modeling Approach

The different modelling approaches vary, ranging from pure extrapolation methods, those related with time series analysis and theoretical considerations. The better choice is a large-scale macroeconomic model showing modifications in macroeconomy. However, due to data and resources restrictions the more simplified models targeting employment changes could be used.

Macro models are an important component of quantitative future projections. Macro model has one advantage; important interactions may be included in the model. This helps in evaluating various economic cases and policy simulations.

- **E3ME** or economic and social model for Europe is a set of models used by the European commission in their Skills project. Each European country is treated as one of several regional economic areas that form Europe together.
- In the case of nations where statistics are lacking, a more streamlined structural model like that of **Hermin** is more applicable; Hermin presupposes an economy with a small trade and emphasizes on traded and intractable areas, pricing mechanisms, and influences from the labour market and public sector.
- Models based on input-output tables and social accounting matrices can be used for developing and developed countries, they require low amounts of data. They are well suited for modeling the impact of changes in final demand on production and employment. The **Lotus model** for Vietnam is a good example of an inter-industry macroeconomic model that forecasts employment by industry.

It is necessary to employ a blend of quantitative models with qualitative methods and expert judgment due to uncertainties that come along with forecasting. According to the circumstances in each country, they need to be combined differently, for example through interpretation of quantitative forecast results or by directly putting them into forecast model.

However, no matter what they are, they all carry out the same process of drawing a conclusion by making prediction based on some sort of models which use past and current data. The modeling methodology and data are intertwined, as good data is important for skill anticipation.

Components of Skills Forecasting

Supply

The stock flow model could be thought to be most suitable to analysis of variation and forecasting in number of formal qualification holders. Such an approach could consider qualified enrolments and economic activity rate movements over medium- and long-term, as well as retirement or related "outflows" from the active population. However, it cannot be easily constructed because it demands both data and information concerning behavioral selectivity determinants and is often limited to analyses focused on the stock of educational attainment. Research at the macroeconomic level suggests that factors

such as GDP growth, wages, and employment rates affect average education levels across countries.

Employment change

The overall employment level by industry is derived from a macroeconomic model and can be transformed into occupational and qualification demand. Transformation may occur through various ways such as fixed share or regression trend estimation; Cedefops use of econometric specification within expanded demand may be considered as demand sides-oriented approach because it is based on net employment changes over any given period.

Replacement needs

Replacement demand refers to job replacement demand resulting in permanent or semi-permanent job loss due to retirement, move, death, etc. Demographic, labor force participation rate, and outflow by occupation and education data are required for forecasting. Cohort component methods involves using outflow rate history of the past to forecast or predict the future replacement demand flow. Retirement demand and movement across occupations is influenced by the differences in age structure, and consequently has impact on the replacement demand.

Specific issues in skills modelling

Technological change

- There could occur changes in the economic structure brought about by technical innovation, among others. These changes would include modifications of sectors, occupations, and qualifications.
- The Dutch and UK studies used time-series econometric models to establish the main factors influencing shifts in required skills.
- It was revealed that high-skill occupations were complemented with new technology, and also medium skilled jobs with capital.

Skill mismatch

- One of the most significant issues aimed to solve by skills forecasting. It is a phenomenon that takes place through overeducation and undereducation.
- The trend toward higher education leads to a state of oversupply when the required skills are not rising proportionately to those qualified, punishing educated workers by penalizing their wage.
- Under-education implies that there is a low investment in human capital which results into lower productivity.
- There are "temporary mismatches' due to short-turned-out information and "long-term mismatches" due to structural gap resulting from demand-supply of skills.
- Temporarily occurring mismatches can be helped by information improvement, but long-term mismatches require strategic adjustment of the educational system.

Imbalances

- In theory as well as in practice, it is not possible to directly compare the anticipated supply with actual demand. They can only be directly comparable when carried out at the same time with the use of common data and methods.
- Canada defines imbalance as the quantitative difference between demand and supply by occupation and Australia by educational stage.
- The Dutch methodology excludes minor differences that can be automatically corrected and identified only major imbalances.
- Imbalance indicators only provide an extension of the status quo and are difficult to predict as a result of the complex labor market adjustment process.

Indicators
- Indicators transform forecasting outcomes into understandable form using either internal or external data of models.
- Indicators suggest possible imbalance in the future on indicating some demand pressures and oversupplying of certain jobs or qualification.

Regional forecasting
- Ideally, regional forecasts connected to country level, are best but not always available.
- Maximum use of regional information and consideration of country influence is ideal, but may be approximated by regional settings only

Conclusion and recommendations

Many countries are now setting up skills anticipation models. They are aimed at enhancing the matching of demand and supply of labour and giving directions to educational system and training. This is where, conventional, top-down workforce planning are departing and giving feedback, regarding the labor markets to all the parties involved. The case studies of skills anticipation in the surveyed countries demonstrate both positive results in different qualitative and quantitative methods, as well as common issues and conclusions.

- In the case of Brazil, SENAI's initiatives have succeeded in guiding vocational education. However, the issue of funding and capacity in developing countries remains a major hindrance. They are susceptible to the macro environment and must be prepared for the risk of changes in the assumptions of their foresight.
- Germany has been able to derive skill trend predictions while giving directions on research and development as well human resource management with the use of the BMBF foresight and ITA among others. On the other hand, there is an issue of technology assessment bias.
- The EU predicts many competences as necessary for more than twenty professions but there is not real link between it and the national education policy which determines curriculum for any European state. That is why, the EU tries to create the common skills framework for the region; however, in some features, the correlation with national circumstances remains problematic.
- The Russian instance becomes important for studying how to organize new technologies with the help of Industry-Academy-Government Panel, but is still a pilot work.

- In the cases of Japan, Korea, and the U.K., a common problem was found: Skill foresight does not fully incorporate its outcome into educational policy and practice. The sociocultural perspective in Japan and Korea needs to be applied to improve the methodological framework.
- Finland has quantitatively forecasted the demand for education 15 years from now, but its contribution to policy making is insufficient due to a lack of cooperation among related organizations.
- Australian case study emphasizes on need of flexibility in preparation for uncertainties. As such, it may be argued, the capacity for coping could be enhanced in terms of picturing several alternatives as opposed to a singular view of the future. However, it should be noted that there is a very strong reliance on specialists within predicting approaches.

Thus, policy makers need to appropriately match the outcome as projected on skills development with their policy on education and employment. Educators are also required to respond fast by including anticipated change in skill demand in their curriculum. Experts are expected to focus on improving methods and promoting the interpretation and use of results. The most critical component is the establishment of an interface linking skill anticipation with education policy. It also calls for greater diffusion of sociocultural-informed approaches, together with the development of a cross-national & cross-organizational information-sharing mechanism. In addition, such as in developing countries with insufficient resources and capacity, appropriate methods should be made available for obtaining maximum benefits out limited resources so that durable efforts may be realized.

With faster technological change comes speedy change in the labour market as well in the near future. Information availability and immediate policy interventions issues will be essential.

Possible use cases in Qatar

Qatar aspires to grow into a knowledge-based economy by 2030; however, this aspiration faces barriers posed by the small national population of the state. It is necessary to develop the present and emerging work force by way of education as well as vocational training, yet the policy formulation presently suffers from a lack of Information related to future skill demand.

Hence, there is a need for a mechanism which should integrate demand skill forecasting in policy making process and come up with education content and vocational training program responsive to technical advancement.

Responding to Technological Change

- Cross-impact analysis will be used to assess the multifaceted quantitative impact of technological change on different sectors and hence an expert panel comprising experts from industry, academia and government agencies will be established as a forum for this study. It will enhance understanding of and reaction to change.

- Industry and academic institutions will together embark on collaborative project activities relating towards to emerging technologies in future. Applied research fields which can be anticipated to correspond with those of the industry will be derived using road mapping methodology, thus promoting joint enterprises.

Measures to Address Skill Mismatch

- Prediction of future quantitative imbalances in industry, occupation, and skill aspects employing both demand and supply forecasting models.
- Organize an expert task for a cross industry and academic approach towards building consensus on education policy via the Delphi technique aimed for a bridge the skills supply-demand gap.

Addressing regional differences

- Perform local economic outlook forecasting based on administrative data including demographic, industrial, and operating job guarantee at municipality level.
- Offer regional vocational programs by conducting interview surveys in each municipality about available local education sources.

Application to education policy

- Share relevant information regularly with professional associations for understanding of HR needs and workplace level and establishing an inclusion mechanism in education policy making process.
- Quantitatively analyze the relationship between learning history and employmen options using cohort data from various education statistics and establish mid- to long-term trends in skills acquisition over time.