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"DEVELOPING SKILLS FORESIGHTS, SCENARIOS AND FORECASTS”
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Executive summary

Background

This guide deals with two aspects of medium- to long-term skill demand forecasting: Qualitative Forecasting (Foresight) and Quantitative Forecasting (Forecasting). It is designed to aid the creation of a model to anticipate future demands for skills to avoid skills mismatches.

Skills impact positively into growth of economy, directly through increase of productivity or indirectly as innovations and technological changes. However, skill shortage or their mismatch act as limiting factors in growth.

Education and training play a central role in providing all individuals the opportunity to continuously develop skills in terms of lifelong learning that can adapt to the requirements and conditions of a rapidly changing labor market.

When people are making decisions on what type of education and training should be offered to the future work force, they will have to look at the future outlook, fill up any information gap and avoid later imbalances and mismatches. This requires identification of existing trends as well as current strategies and projection of any possible implications and probabilities that may arise from these trends and strategic moves.

The investments in education and training have long lead times. It should be noted that skill foresight and forecasting sound an alarm before skill gaps become evident and therefore enable taking action in advance. Thereby, it support informed decision on matters with a longer delivery period like educations, training programs, and long term labour market planning.

Document Structure

This guide consists of two parts: Part A – Skills foresight, and part B – skills forecasting.

Part A explains the idea of foresight and how it can be used in skills foresight. It presents several futures’ techniques and ways with which the foresight could be implemented to the state.

Part B deals with quantitative skills forecasting. The paper talks about skilled forecasting, choice of forecasting period and current situation in application of quantitative forecasting. Information on detailed components and operations of forecasting models is provided down here. These include demand and supply modeling,

dealing with technical changes, eligibility, imbalance indicators or regional forecasts. Lastly, a case-study on skill forecast is given.

The paper proposes developing a hybrid framework to enable combination of the two strategies of skills foresight and quantitative skills forecasting. Foresight benefits from quantitative inputs, while data missing in forecasting can be substituted with qualitative assumptions. It builds on international examples, stressing the need to tailor the approach to each country / region / locality. It intends to serve as a guidebook and box of tools providing various models that are applicable in particular situations.

PART A: Key Insights from the Foresight

Summary of What Foresight Is and Its Role in Skill Anticipation

Foresight is the medium to long term visioning process using anticipatory intelligence collected from various knowledge sources in a systematic way. It seeks to enhance forward looking thinking.

The objectives of foresight include supporting policy-making via informed input, creating stakeholder networks, boosting organizational foresight capacity and building and sharing a strategic vision. It is a part of continuous process (Foresight> Strategy> Implementation> Evaluation> Analysis> Foresight> Strategy…), not a one-shot activity, and results are reflected in strategies, which are assessed and analyzed, followed by improvements.

Initially targeted in technology forecasting, it now covers broad fields such as demographic change, social welfare, environmental and climatic changes, skills anticipation, and education. The purpose of skills anticipation is to provide policymakers with information of future skill needs and aid decision on education and training investments. A holistic approach of technological and economic trends will be preferred but a skills particular approach may work effectively for certain situations.

The evolution of foresight is a process involving five steps. Since third generation, it fits perfectly with the skills agenda owing to its wide engagement of stakeholders, inclusive approach to policy matters, and broad focus. In the beginning It was targeted at higher qualification and after expanding its application into social policy it covers any level and form of education.

Skills foresight is used because in today’s rapidly changing knowledge-based economy multiple stakeholders affect the production of skills. There is a moving away from such centralized supporting approach which had been in existence for many years toward an approach for various stakeholders to take the right decisions.

Foresight can produce tangible and non-tangible results. However, this is no silver bullet. Success lies in establishing goals, identifying, and engaging with key stakeholders and disseminating and promoting the use of outcomes. It is important to learn appropriate methods from international examples and adapt them to local requirements.

Overview of Foresight and Scenario Methods

There are three main types of foresight methods: exploratory, normative, and complementary. Exploratory methods for deriving future developments from current assumptions. Typical approaches include Delphi Method, Scenario Analysis among others, and even Cross Impact analysis. Normative methods refer to a set of tools that move backwards from the vision of the future and the desired objective to the appropriate measures within this moment.

The complementary ones include literature review, SWOT analysis and brainstorming.

* **Literature Statistical Review**
  Characteristics: Typically done in the initial stages of the foresight process. This first step of the foresight process involves collecting previous as well as existing knowledge, offering basic data. Accumulation of knowledge and converting raw data into information.
  Pros: Enhanced comprehension of existing knowledge, visualization of important trends, problems, and weak signals. Cost-effective because it is based on desk research.
  Cons: Requires time and research skills. These new insights still have limitations and need to be complemented by other methods. May miss signals.

* **SWOT Analysis**
  Characteristics: Not a foresight method and can however provide input into foresight activities. An analytical method that identifies important internal and external factors that influence strategies and possible futures. Complemented with other approaches not as a sole technique.
  Pros: It helps in viewing problem from different angles. Helpful in exploiting opportunities and correcting failings. Simple and flexible.
  Cons: Factors are not well defined. Generation of factors can be subjective and difficult to reconcile differences of opinion.

* **Brainstorming**
  Characteristics: It often utilizes at the initial phase of foresight activities, prior to scenario design and during SWOT analysis. Approach that will stimulate creative thinking among a team and generate ideas. As a fundamental principle, all opinions are treated equally without criticism or negative judgment, as many ideas as possible are generated and evaluated after discussion. The results of brainstorming are used as part of the evaluation process.
  Pros: Freethinking, criticism-free that facilitates novel ideas and suggestions. Problems can be clearly defined. Prevents conflict and facilitates consensus.
  Cons: Many ideas are not feasible. Criticism can stifle creativity.

* **Focus Groups**
  Characteristics: An approach to qualitative research where people generate ideas through sharing opinions in groups to improve, validate or enhance the existing ideas. There are no basic rules, and a more liberal exchange of any idea even in the form of criticism is encouraged. However, it must be well organized for effective discussion, with emphasis on defining objectives, establishing

timelines, identifying participants, formulating questions, and selecting facilitators. It calls for careful and systematic analysis of the discussion.
Pros: It is involved in generation of ideas as well as improvement and verification of existing ideas.
Cons: Just like in brainstorming there are problems of feasibility and critique.

* **Expert Panel**
Characteristics: Comprises of 10-20 experts with the objective being that knowledge and ideas are shared by experts. A panel is very important in sharing, coming up with future ideas, verifying data and prioritizing among action. The composition of the expert panel is of paramount significance since meaningful and balanced findings must be obtained. The composition should include diverse experts ranging from their various organizations with varied opinions as well as different roles in politics, values, fields of specialization and overall knowledge levels.
Pros: The use of multiple perspectives, fast feedback as well as high participant ownership.
Cons: Ignoring expert errors and weak signs. Challenging to deal with divergent opinions.

* **Delphi method**
Characteristics: Multi-round expert survey, using the results of the previous round as input for the next round. The communication process is a moderately rigid expert group, on an issue regarding imperfect knowledge. Through establishing what is important to the futuristic element, complex and implicit knowledge can be condensed into a sentence which provides direction in its decision-making ability. It is often complemented or assisted by brainstorming and scenario creation during the preparatory phase of defining key statements.
Pros: This offers anonymity and allows for candid views to be aggregated. Having various views from many experts is due to participation of many experts.
Cons: Process is time-consuming. Labor-intensive. Outcomes can be influenced by the expertise of participants and choice of leaders.

* **Horizon Scanning**
Characteristics: A structured evidence-gathering process, based on desk research and expert opinion, to identify early signs of future change. Includes experts at the forefront of their respective disciplines, thinking outside of typical time scales and settings as well as considering novel or unexpected issues. These, in turn, form a basis for decision making and for program development. Diverse group opinions are supported within that process.
Pros: Transcends time scales, information sources, identifying the future issues and trends, gains insights from pioneers in the field of expertise
Cons: Can only yield reasonable outcomes when conducted in conjunction with other techniques. It also takes time and research skills.

* **Scenario**
Characteristics: A qualitative vision that outlines other imagined futures in story format. One of the most cited methods of thinking about the future. Furthermore,

it is universally used in quantitative forecasting projects on analyzing and describing skill projection outcomes. To help the decision makers think of possible alternatives and select a preferred vision for future decisions. Three criteria are important for creative scenario development beyond the usual short-term perspective: validity, consistency, and decision usefulness. SWOT analysis and road mapping are used to support consistency and relevance.
Pros: Responsiveness to contingencies and decisions today can be improved.
Cons: Risks creating an unfeasible vision of the future, requires frequent updates, and is human resource intensive. May face cultural and cognitive myopia.

* **Cross Impact Analysis**
Characteristics: It is a way of planning various scenarios for different potential outcomes caused by several events acting on each other. The first step involves defining several events to be analyzed and estimating their probability of occurrence. Lastly, the statistical software is used to analyze quantitatively the influence relationships among the events and in turn, several future scenarios are auto-generated. Interpretation of the generated scenarios needs to be done and matched with the authentic events.
Pros: Makes clear causal relationships among factors and structures knowledge. Knowledge of future developments can be clarified and increased.
Cons: The combination of factors and scenarios can become enormous and difficult to analyze. Consistency and validity of methodology would be difficult to interpret.

* **Backcasting**
Characteristics: The most popular standardized method. This means that it conceptualizes a desired picture of what the future should look like; moving backwards from that image to the present; and finally evaluating the necessary action plans, policies and programs that must be in place at present so as to link this present with that future. To have a vision of the desired long-term scenario, it will be necessary to include stakeholders at the initial level of the process. Alternative routes towards achieving the desired vision are then suggested. This leads to formulation of an action plan based on alternative pathways that are carefully considered and deliberated upon collectively by all stakeholders.
Pros: Can creatively formulate a desirable vision of the future, not just an extension of the status quo
Cons: Concerns about feasibility. Requires constant updating to adapt to changing conditions, resource intensive.

* **Morphological Element Analysis**
Characteristics: A method that starts from a future need or goal and then identifying the context, actions, skills etc., required to satisfy it. It arranges information in order to analyze an issue or create new thoughts. First, the problem is defined and formulated. Next, important parameters that may help in solving the problem are identified and analyzed, and then a multi-dimensional array of potential solutions is created. The results are evaluated based on feasibility and achievement of desired objectives.

Pros: Will be able to spot new relevance and systematically evaluate the future vision for the system
Cons: Too much structuring inhibits creativity. The number of possibilities could balloon. Critical judgment must prevent human error.

* **Road Mapping**
Characteristics: A method of graphically depicting future scenarios that provides a strategic perspective. It aims to look into the future of a selected sector and explore the most important drivers of change in that sector. Experts design the road mapping methodology. This makes possible to explore and map the evolving systems, which in turn, support the development and deployment of innovations and strategies at all levels.
Pros: Extremely adaptable and could be customized for any objectives or environment. It is used for depicting relationships and clearly presenting system components.
Cons: Few of participants and hard to determine a suitable style for a particular circumstance.

Some of these methods face challenges such as time and budgetary limits and subjective nature that may also result in creativity loss through simplification. However, it has been observed in international examples of Foresight that using just one method or framework is not the most efficient approach. For the Foresight goals to be realized, relevant methods should be chosen and used in synergy depending on the circumstance. There are selection criteria which require the researcher to be aware of fitness for purpose, available resources, participants, data demands, and methodological competence. One should also consider the cultural, economic, political, social, and institutional context of the field. The strengths and weaknesses of such methods should complement each other and must be tailor-made based on the particularities of a certain situation.

Key steps in the implementation of a foresight program

Foresight Program is a one which helps present day decision making in view of unclear future. In particular, the program is designed to increase understanding of future conditions and to examine strategies for achieving the desired future vision.

There is a stipulated process of operations which includes defining the domain, stating targets, design, implement, and assess outcome. Some key things to observe at every stage are as follows.

1. **Define foresight area to be considered**
The area definition specifies the focus and scope of the program. It builds consensus with key stakeholders and establishes appropriate intervention levels and related topics with specific problem solving in mind.
2. **Clarify the purpose of the foresight exercise**
The main consideration in setting of objectives includes the understanding of the view of the future and creation of the common vision. At outset, specific requirement of specialty is not a need.
3. **Clarify the key program design elements**

The design clarifies elements such as outcomes, timeline, participants, and methods. In particular, it is essential to identify and ensure the participation of key stakeholders.

4. **Clarify key questions and the way to find answers.**
   Management involves addressing organizational issues, time management and the participants.
5. **Manage the foresight exercise**
   Without proper results utilization, the significance of the program will be reduced by half. It is essential to incorporate the implementation, evaluation, and improvement of results into the plan and ensure that it is carried out.

It is important to note that one of the benefits of foreseeing program is that it helps understand the uncertain future and assist in strategic planning. It helps in addressing society's problems and building up desired future aspirations.

However, the magnitude of the operation makes it quite cumbersome to obtain optimum output outcome. Particularly, the stakeholders' commitments are normally inadequate.

Recommended practices include clear objective setting, effective operational management as well as accurate use of results. Ensuring these is the key to success.

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.