Navigating Changes:
How Technology Can Help Empower Bangladeshi Youth in an Evolving Labour Market

SEPTEMBER 2023
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>i</td>
</tr>
<tr>
<td>List of Tables</td>
<td>iii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>iv</td>
</tr>
<tr>
<td>Foreword</td>
<td>vi</td>
</tr>
<tr>
<td>Authors</td>
<td>vii</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>viii</td>
</tr>
<tr>
<td>Acronyms</td>
<td>ix</td>
</tr>
<tr>
<td>Glossary</td>
<td>xii</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>xiv</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2. Methodology</td>
<td>4</td>
</tr>
<tr>
<td>3. Forecasting and Labour Market Information Systems</td>
<td>6</td>
</tr>
<tr>
<td>3.1. Introduction</td>
<td>7</td>
</tr>
<tr>
<td>3.2. LMIS &amp; Forecasting Analysis</td>
<td>7</td>
</tr>
<tr>
<td>3.2.1. Labour Market Forecasting Overview</td>
<td>7</td>
</tr>
<tr>
<td>3.2.2. Labour Market Information Systems (LMIS)</td>
<td>8</td>
</tr>
<tr>
<td>3.2.3. Interview Analysis</td>
<td>12</td>
</tr>
<tr>
<td>3.2.4. Key Findings</td>
<td>13</td>
</tr>
<tr>
<td>3.3. LMIS Forecasting Methodology - For a Bangladeshi Context</td>
<td>14</td>
</tr>
<tr>
<td>3.3.1. Setting the Direction</td>
<td>14</td>
</tr>
<tr>
<td>3.3.2. Data Sourcing</td>
<td>16</td>
</tr>
<tr>
<td>3.3.3. Methods and Analysis</td>
<td>16</td>
</tr>
<tr>
<td>3.3.3.1. Quantitative: Building a numerical jobs and skills forecast based on quantitative data and analysis</td>
<td>16</td>
</tr>
<tr>
<td>3.3.3.2. Qualitative: How qualitative data builds a horizon scan</td>
<td>22</td>
</tr>
<tr>
<td>3.3.3.3. Skills Taxonomy</td>
<td>28</td>
</tr>
<tr>
<td>3.4. Forecasting Module Guidelines</td>
<td>33</td>
</tr>
<tr>
<td>3.5. Limitations and Recommendations</td>
<td>33</td>
</tr>
<tr>
<td>3.5.1. Limitations</td>
<td>33</td>
</tr>
<tr>
<td>3.5.2. Future Recommendations</td>
<td>39</td>
</tr>
<tr>
<td>4. Self-Assessment and Career Guidance</td>
<td>40</td>
</tr>
<tr>
<td>4.1. Introduction</td>
<td>41</td>
</tr>
<tr>
<td>4.2. Interview Analysis</td>
<td>41</td>
</tr>
<tr>
<td>4.2.1. Interviews with Bangladesh-based Experts</td>
<td>41</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 3.1.</td>
<td>Comparison of countries selected for efficient forecasting systems</td>
<td>10</td>
</tr>
<tr>
<td>Table 3.2.</td>
<td>Forecasting Data Sources</td>
<td>17</td>
</tr>
<tr>
<td>Table 3.3.</td>
<td>Scoping Questions and Sample Answers</td>
<td>25</td>
</tr>
<tr>
<td>Table 3.4.</td>
<td>Skill Taxonomy Global Best Practices</td>
<td>30</td>
</tr>
<tr>
<td>Table 3.5.</td>
<td>Forecasting Module UI/UX Guidelines</td>
<td>34</td>
</tr>
<tr>
<td>Table 4.1.</td>
<td>Self-Assessment Module Guidelines</td>
<td>52</td>
</tr>
<tr>
<td>Table 4.2.</td>
<td>Career Guidance Module Guidelines</td>
<td>56</td>
</tr>
<tr>
<td>Table 5.1.</td>
<td>Short-term plan (2023-2025) Action, Purposes, and Metrics</td>
<td>67</td>
</tr>
<tr>
<td>Table 5.2.</td>
<td>Medium-term plan (2025-2029) Action, Purposes, and Metrics</td>
<td>69</td>
</tr>
<tr>
<td>Table 5.3.</td>
<td>Long-term plan (2029-2034) Action, Purposes, and Metrics</td>
<td>71</td>
</tr>
<tr>
<td>Table B.1.</td>
<td>Inclusion-Exclusion Criteria for Self-Assessment and Career Guidance Literature Review</td>
<td>89</td>
</tr>
<tr>
<td>Table C.1.</td>
<td>Inclusion-exclusion criteria for NISE Implementation Literature Review</td>
<td>95</td>
</tr>
<tr>
<td>Table E.1.</td>
<td>List of Forecasting Interviewees</td>
<td>101</td>
</tr>
<tr>
<td>Table G.1.</td>
<td>List of Self-Assessment and Career Guidance Interviewees</td>
<td>105</td>
</tr>
<tr>
<td>Table I.1.</td>
<td>Mapping search strategy</td>
<td>112</td>
</tr>
<tr>
<td>Table M.1.</td>
<td>Labour Market Information Systems by countries</td>
<td>122</td>
</tr>
<tr>
<td>Table N.1.</td>
<td>LMIS Users and Use Cases of Labour Market Information Systems</td>
<td>123</td>
</tr>
<tr>
<td>Table N.2.</td>
<td>Australia Nowcasting input and output</td>
<td>123</td>
</tr>
<tr>
<td>Table N.3.</td>
<td>Forecasting models covered by CEDEFOP/ETF/ILOM</td>
<td>126</td>
</tr>
<tr>
<td>Table P.1.</td>
<td>Inclusion-exclusion criteria of Horizon Scanning</td>
<td>129</td>
</tr>
<tr>
<td>Table Q.1.</td>
<td>Skill Taxonomy Global Best Practices</td>
<td>130</td>
</tr>
<tr>
<td>Table S.1.</td>
<td>Self-Assessment and Career Guidance Tools</td>
<td>138</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1.1</td>
<td>End-to-end Output of the Project</td>
<td>xiv</td>
</tr>
<tr>
<td>Figure 3.1</td>
<td>Forecasting Interview Coding Visualisation</td>
<td>12</td>
</tr>
<tr>
<td>Figure 3.2</td>
<td>Forecasting Methodology Structure</td>
<td>15</td>
</tr>
<tr>
<td>Figure 3.3</td>
<td>Advised methodology for conducting a Horizon Scan based on jobs and skills</td>
<td>23</td>
</tr>
<tr>
<td>Figure 3.4</td>
<td>Skill Taxonomy Methodology</td>
<td>29</td>
</tr>
<tr>
<td>Figure 3.5</td>
<td>Industry Overview Main Page Website Mock-Up</td>
<td>37</td>
</tr>
<tr>
<td>Figure 3.6</td>
<td>Industry/Sector Overview Example – Education Industry Website Mock-Up</td>
<td>37</td>
</tr>
<tr>
<td>Figure 3.7</td>
<td>Industry/Sector Overview Analysis Example</td>
<td>37</td>
</tr>
<tr>
<td>Figure 3.8</td>
<td>UK Unit for Future Skills Landing page</td>
<td>38</td>
</tr>
<tr>
<td>Figure 3.9</td>
<td>Nesta’s Skills Taxonomy</td>
<td>38</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Bangladesh Interview Coding Visualisation</td>
<td>42</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>UK Interview Coding Visualisation</td>
<td>45</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>UCL Pillars of Employability</td>
<td>46</td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>Demographic Survey Results</td>
<td>47</td>
</tr>
<tr>
<td>Figure 4.5</td>
<td>Career Guidance Survey Results</td>
<td>49</td>
</tr>
<tr>
<td>Figure 4.6</td>
<td>Labour Market Survey Results</td>
<td>50</td>
</tr>
<tr>
<td>Figure 4.7</td>
<td>Career Guidance page mock-up</td>
<td>51</td>
</tr>
<tr>
<td>Figure 4.8</td>
<td>Self-Assessment page mock-up</td>
<td>51</td>
</tr>
<tr>
<td>Figure 4.9</td>
<td>Occupational Profiler Test page mock-up</td>
<td>51</td>
</tr>
<tr>
<td>Figure 4.10</td>
<td>Virtual Work Experience Section - Forage Platform</td>
<td>51</td>
</tr>
<tr>
<td>Figure 4.11</td>
<td>Virtual Work Experience Steps - Forage Platform</td>
<td>61</td>
</tr>
<tr>
<td>Figure 4.12</td>
<td>Virtual Work Experience Benefits - Forage Platform</td>
<td>61</td>
</tr>
<tr>
<td>Figure 5.1</td>
<td>Project Management flow with key stakeholders</td>
<td>65</td>
</tr>
<tr>
<td>Figure 6.1</td>
<td>NISE Implementation in Universities: Building Blocks and Methodology</td>
<td>75</td>
</tr>
<tr>
<td>Figure A.1</td>
<td>General Global Mapping Framework</td>
<td>87</td>
</tr>
<tr>
<td>Figure A.2</td>
<td>Career Guidance Global Mapping Framework</td>
<td>88</td>
</tr>
<tr>
<td>Figure B.1</td>
<td>Factors influencing student career decisions</td>
<td>92</td>
</tr>
<tr>
<td>Figure C.1</td>
<td>Integration of Career Development Learning into the Curriculum</td>
<td>96</td>
</tr>
<tr>
<td>Figure C.2</td>
<td>Framework for University-Industry Cooperation</td>
<td>98</td>
</tr>
<tr>
<td>Figure I.1</td>
<td>Popular industries within each province in Bangladesh</td>
<td>110</td>
</tr>
<tr>
<td>Figure I.2</td>
<td>Number of respondents from each province in Bangladesh</td>
<td>111</td>
</tr>
<tr>
<td>Figure I.3</td>
<td>Education level of respondents</td>
<td>111</td>
</tr>
<tr>
<td>Figure I.4</td>
<td>Global Framework Mapping</td>
<td>113</td>
</tr>
<tr>
<td>Figure K.1</td>
<td>Draft self-assessment and career guidance module structure</td>
<td>119</td>
</tr>
<tr>
<td>Figure K.2</td>
<td>Draft self-assessment and career guidance user journey</td>
<td>119</td>
</tr>
<tr>
<td>Figure N.1</td>
<td>Jobs and Skills Australia’s Nowcasting Dashboard</td>
<td>124</td>
</tr>
<tr>
<td>Figure N.2</td>
<td>Future Skills Centre’s approaches to forecast skills in demand</td>
<td>125</td>
</tr>
</tbody>
</table>
Figure N.3. SkillsFuture Singapore priority skills bubble chart

Figure R.1. Mock-up of Self-Assessment and Career Guidance Module – Homepage

Figure R.2. Mock-up of Self-Assessment and Career Guidance Module – Labour Market Information Page

Figure R.3. Mock-up of Self-Assessment and Career Guidance Module – Skills Assessment Page
This report addresses one of the most urgent challenges facing the world – how to navigate potentially dramatic changes to jobs and skills in the decades ahead. It also offers solutions.

The project was done by a multinational team based at UCL, working in partnership with a2i in the Prime Minister’s office of Bangladesh.

It provides a detailed diagnosis of far-reaching shifts in labour markets already underway and likely to accelerate in the years ahead – some prompted by artificial intelligence and automation – and then turns to how better to prepare young people to navigate this world.

It looks at emerging solutions around the world, from Australia and Singapore to Canada and Europe, and then shows how new tools can be developed to help young people make choices, whether in schools or universities, building on the impressive work Bangladesh has already done with its NISE platform.

By the end of the decade, every country will need an infrastructure not dissimilar to what is set out here: a capacity to map and forecast trends in jobs and skills demand, making the most of available data; a capacity to adjust the provision of courses and curriculums in response, so that young people are prepared for the world of the near future not the world of the past; and easy to use navigation tools to guide young people’s choices, allowing them to better understand their own capabilities and their options.

I hope the report stimulates and inspires others. I also hope that it will avert the fatalism which treats changes of this kind as only facts of nature to which we have to be passive observers.

PROFESSOR SIR GEOFF MULGAN
University College London
JULIO CRUZ ICABALZETA
From Nicaragua, Julio has recently completed his MPA at UCL, specializing in Development, Technology, and Innovation Policy. Holding a B.Eng in Electronics Engineering, his work in the Nicaraguan telecommunication industry and with an European Intellectual Property firm have fostered in him a commitment to assist developing countries in bridging their digital divide. His volunteering, professional and academic achievements have been recognised by a Chevening Scholarship award.

AARUSHI KUMAR
Aarushi is from Canada and has recently completed her MPA, concentrating on Digital Technologies and Policy, at UCL. She previously attained a Bachelor of Commerce from McGill University. She has worked in various roles including digital product management, marketing and technology within a multinational enterprise, instrumental in the inception of a start-up-style digital department in the company. Her career trajectory demonstrates a purposeful transition to designing appropriate digital services and policy for citizens.

ALMIRA LAVINA SAMBOWO
Almira is from Indonesia and has recently completed her MPA at UCL, where she's focusing on the intersection of Science, Engineering, and Public Policy. Her prior experience as a consultant, combined with a Bachelor's Degree in Industrial Engineering, has equipped her with a balanced perspective. Her academic journey is highlighted by her recognition as an Indonesia Endowment Fund for Education (LPDP) awardee.

SUNIYA SARWAR
Suniya from Pakistan has recently completed her MPA with a specialization in Development, Technology and Innovation Policy. Working in the Pakistani banking sector and holding a BSc in Psychology from the University of Sussex, she has developed a strong commitment to ESG principles, sustainable development, and the pursuit of global equity.

PRAKHAR SRIVASTAVA
Originally from India, Prakhar is now working in the international development sector, aiming to alleviate poverty. He completed an MPA at UCL, specializing in Development, Technology, and Innovation Policy. Prakhar has a background in projects that focus on improving child development in marginalized Indian communities, which has fueled his passion for international development driven by technology-driven societal progress.

MASHA ZEMTSOV
Masha is from London and has recently competed her MPA in Digital Technologies and Policy at UCL. She is currently working in the non-profit sector and has previously attained a BA in History and Politics of the Americas from UCL. Masha is particularly passionate about assessing the impact of AI-driven automation on the labour market in 4IR.
Nations worldwide are feeling the effects of changing dynamics in labour markets, from the nature of jobs required to the skills necessary to meet future demand. In these times of uncertainty, governments must look forward to address this situation. The authors of this report came together to use our research to solve a prevalent, disruptive and widespread problem, and leave a nation slightly more prepared to face this challenge than it was before. This became our guiding principle and has helped us achieve what we hope is a promising direction for Bangladesh and other nations to address these challenges and build a future for its citizens that is just, equitable and prosperous.

We would like to thank the Science, Technology, Engineering and Public Policy (STEaPP) department at UCL for the opportunity to contribute to a worthy and meaningful cause. Specifically, to Professor Sir Geoff Mulgan, we express our gratitude for your insight, direction and support throughout the last few months. It not only brought legitimacy to our work but galvanised our efforts to produce something of quality and purpose.

To our project partner, Aspire to Innovate (a2i), we are in admiration of the success you have achieved and the work you have undertaken to make a positive difference in the lives of your citizens. Thank you for your dedicated support and collaboration in bringing this project to life - we hope we delivered on your expectations and that our work will help progress you on your journey.

Finally, a thank you to the experts who contributed to our research and enabled us to prepare this report.

Sincerely,

Aarushi, Almira, Julio, Masha, Prakhar and Suniya
<table>
<thead>
<tr>
<th>ACRONYMS</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>4IR</td>
<td>Fourth Industrial Revolution</td>
</tr>
<tr>
<td>a2i</td>
<td>Aspire to Innovate</td>
</tr>
<tr>
<td>AI</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>API</td>
<td>Application Programming Interface</td>
</tr>
<tr>
<td>BBA</td>
<td>Bachelor of Business Administration</td>
</tr>
<tr>
<td>BSCO</td>
<td>Bangladesh Standard Classification of Occupations</td>
</tr>
<tr>
<td>BUP</td>
<td>Bangladesh University of Professionals</td>
</tr>
<tr>
<td>C4 IF</td>
<td>Connection, Communication, Consolidation, Collaboration</td>
</tr>
<tr>
<td></td>
<td>Interoperability Framework</td>
</tr>
<tr>
<td>CDL</td>
<td>Career Development Learning</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>DEI</td>
<td>Diversity, Equity, and Inclusion</td>
</tr>
<tr>
<td>ESCO</td>
<td>European Skills, Competences, Qualifications and Occupations</td>
</tr>
<tr>
<td>FAQ</td>
<td>Frequently Asked Questions</td>
</tr>
<tr>
<td>GPT</td>
<td>Generative Pre-Trained Transformer</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>ILO</td>
<td>International Labour Organization</td>
</tr>
<tr>
<td>ISCO</td>
<td>International Labour Organization</td>
</tr>
<tr>
<td>LMA</td>
<td>International Standard Classification of Occupations</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>LMI</td>
<td>Labour Market Information</td>
</tr>
<tr>
<td>LMI+</td>
<td>Labour Market Intelligence</td>
</tr>
<tr>
<td>LMIS</td>
<td>Labour Market Information System</td>
</tr>
<tr>
<td>MBTI</td>
<td>Myers-Briggs Type Indicator</td>
</tr>
<tr>
<td>ML</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>MPA</td>
<td>Major in Public Administration</td>
</tr>
<tr>
<td>NEET</td>
<td>Not in Education, Employment, or Training</td>
</tr>
<tr>
<td>NISE</td>
<td>National Intelligence for Skills, Education, Employment and Entrepreneurship</td>
</tr>
<tr>
<td>NLP</td>
<td>Natural Language Processing</td>
</tr>
<tr>
<td>OaSIS</td>
<td>Occupational and Skills Information System</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>O*NET</td>
<td>Occupational Information Network</td>
</tr>
<tr>
<td>PII</td>
<td>Personally Identifiable Information</td>
</tr>
<tr>
<td>REA</td>
<td>Rapid Evidence Assessment</td>
</tr>
<tr>
<td>SDGs</td>
<td>Sustainable Development Goals</td>
</tr>
<tr>
<td>SFG</td>
<td>Skills Framework for the Information Age</td>
</tr>
<tr>
<td>SFW</td>
<td>Singapore Skills Frameworks</td>
</tr>
<tr>
<td>SSP</td>
<td>Skills Service Provider</td>
</tr>
<tr>
<td>SST</td>
<td>Singapore Skills Taxonomy</td>
</tr>
<tr>
<td>STEM</td>
<td>Science, Technology, Engineering, and Mathematics</td>
</tr>
<tr>
<td>Acronym</td>
<td>Full Form</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
</tr>
<tr>
<td>STEEP</td>
<td>Social, Technological, Economic, Environmental and Political</td>
</tr>
<tr>
<td>STEaPP</td>
<td>Science, Technology, Engineering and Public Policy</td>
</tr>
<tr>
<td>TSP</td>
<td>Training Service Provider</td>
</tr>
<tr>
<td>UCL</td>
<td>University College London</td>
</tr>
<tr>
<td>UI</td>
<td>User Interface</td>
</tr>
<tr>
<td>UNDP</td>
<td>United National Development Programme</td>
</tr>
<tr>
<td>UX</td>
<td>User Experience</td>
</tr>
<tr>
<td>WIL</td>
<td>Work-Integrated Learning</td>
</tr>
</tbody>
</table>
## GLOSSARY

<table>
<thead>
<tr>
<th><strong>Term</strong></th>
<th><strong>Definition</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Career Development Learning</td>
<td>A continuous process of authentic learning, helping individuals understand both the professional world and their own strengths and abilities</td>
</tr>
<tr>
<td>Career Guidance</td>
<td>Initiatives aimed at helping individuals progress in their professional career development via a mix of self-assessments guidance in terms of re-skilling and upskilling opportunities and the provision of LMI</td>
</tr>
<tr>
<td>Forecasting</td>
<td>A systematic analysis of current and historical data through statistical and predictive models to identify trends and patterns</td>
</tr>
<tr>
<td>Foresight</td>
<td>The utilization of mixed methods analysis to identify threats and opportunities to assist decision making from a medium to long term</td>
</tr>
<tr>
<td>Fourth Industrial Revolution</td>
<td>A technological shift merging the physical, digital, and biological worlds into one to transform how value is created, exchanged and distributed</td>
</tr>
<tr>
<td>Horizon Scan</td>
<td>Using qualitative methods to identify emerging trends, threats, scenario narratives and assessing the implications of emerging technologies, over a pre-defined number of years</td>
</tr>
<tr>
<td>Labour Market</td>
<td>A complex system made up of intertwined bodies of governments, industries, employers, educators and citizens whose coordination ensures the appropriate supply of jobs for workers to meet the demands of the country and its citizens</td>
</tr>
<tr>
<td>Labour Market Analysis</td>
<td>The use of labour market signals (e.g., wage, unemployment) to determine the underlying causes of supply-demand imbalance</td>
</tr>
<tr>
<td>Labour Market Information</td>
<td>Information concentrated on labour market trends, specifically employment opportunities and rates and fluctuations and changes</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Labour Market Intelligence</td>
<td>The processing of Labour Market Information for interpretation</td>
</tr>
<tr>
<td>Labour Market Information System</td>
<td>The network of stakeholders and functions that use Labour Market Intelligence to address policy concerns</td>
</tr>
<tr>
<td>Nowcasting</td>
<td>A novel technique pioneered by economists useful for extracting data on economy-wide indicators</td>
</tr>
<tr>
<td>Scenario Analysis</td>
<td>Assessment technique utilised to measure the potential impacts of what-if events</td>
</tr>
<tr>
<td>Self-Assessment</td>
<td>Process of exploring and evaluating oneself (e.g., skills, abilities, traits, personality, or performance)</td>
</tr>
<tr>
<td>Skills Taxonomy</td>
<td>A system designed to name, categorise, and group various skills, and abilities to outline the specific skill requirements for different occupations</td>
</tr>
<tr>
<td>Work-Integrated Learning</td>
<td>Concept designed to ensure educational initiatives are conducive to promoting job and skills awareness to improve employment outcomes</td>
</tr>
<tr>
<td>Quantitative Analysis</td>
<td>The application of models and statistics to understand patterns and trends from large pieces of data</td>
</tr>
</tbody>
</table>
Context and Objective

The complexity and speed of changes to the labour market have created a compelling need for governments around the world to adjust their national strategies and consider future realities. The need to reskill and upskill existing workers is of high priority. Yet, perhaps the more significant, forward-looking initiative is developing the youth of the nation to be malleable and prepared to face the challenges to come. This direction requires the alignment and coordination of the education sector, government and industry actors, and citizens to recognise the call for change and shift mindsets toward progress. In Bangladesh, the team at a2i is tasked with this responsibility.

This study aims to understand how nations should address this challenge and provide an initial set of guidelines to a2i on actions to be taken across government departments, the education sector, and its own platform - National Intelligence for Skills, Education, Employment & Entrepreneurship (NISE) - to enable Bangladesh to proactively confront the reality of changing labour markets.

The team approaches this study in three parts:
1. Looking at methodologies for forecasting jobs and skills that will be necessary for changing labour markets.
2. Evaluating and informing the guidance and assessment tools available for youth to make informed decisions about career pathways.
3. Proposing an integration plan to combine government and education initiatives to meet national goals.
<table>
<thead>
<tr>
<th>Module</th>
<th>Objectives</th>
<th>Proposed Output</th>
<th>Input</th>
<th>Process</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module 1</strong>&lt;br&gt;Forecasting and Labour Market Information System</td>
<td>To empower job seekers to explore a wide range of opportunities and increase their chances of finding a job.&lt;br&gt;Future Jobs&lt;br&gt;To guide career decisions and help youth to choose career paths that align with market demand and offer better growth prospects.&lt;br&gt;Skills Trends&lt;br&gt;To anticipate the future demand for specific skills, enabling job seekers to make informed decisions about skill acquisition and development.</td>
<td>Current Jobs</td>
<td>Available Jobs</td>
<td>Job Scraping</td>
<td>List of Available Jobs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Future Jobs</td>
<td>Past Trends; Horizon Scanning</td>
<td>Input-Output Models; Macroeconomic Hermin Model; Machine Learning Model</td>
<td>Industry Overview</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Past Trends; Scenario Analysis</td>
<td>Scraping method/analysis; Expert interviews extract</td>
<td>Job Trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lists of Skills</td>
<td>Methodology based on existing and best practices</td>
<td>Skill Taxonomy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skills Trends</td>
<td>Skill Taxonomy; List of Jobs Available</td>
<td>Link Skills and Jobs available using Natural Language Processing tool to update skills taxonomy</td>
<td>Linked Skills x Available Jobs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>List of Jobs; Job Trends; Skill Taxonomy</td>
<td>Forecast or Nowcast skill demands and supply based on available jobs</td>
<td>Skills Demand Nowcast/Forecast</td>
</tr>
<tr>
<td><strong>Module 2</strong>&lt;br&gt;Self-Assessment and Career Guidance</td>
<td>To assess personality-related strengths, existing skill sets, and career interest.</td>
<td>Self-Assessment</td>
<td>Personality (MBTI Test)</td>
<td>Job Scraping</td>
<td>Self-Assessment Report</td>
</tr>
<tr>
<td></td>
<td>To receive customized career guidance and reskilling and upskilling training</td>
<td>Self-Assessment</td>
<td>Occupational Interest (Holland Code)</td>
<td>Methodology based on existing and best practices</td>
<td>Training</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Skills Assessment (Career Ones Top Skills Test)</td>
<td>Linking Self-Assessment Report with Linked Skills x Available Jobs</td>
<td>Jobs Application</td>
</tr>
<tr>
<td><strong>NISE Implementation in Universities</strong></td>
<td>Encouraging tertiary education institutions to embrace LMIS</td>
<td>Short-term</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ensure that tertiary education institutions have the necessary capacities and are equipped with the required tools</td>
<td>Medium-term</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fully incorporate NISE to Uni Curricula</td>
<td>Long-term</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1.1. End-to-end Output of the Project**
Part 1: Forecasting and Labour Market Information Systems

Worldwide, governments are looking at ways to prepare their labour market for incoming changes. The methods chosen to analyse the current state and identify trends are based primarily on the social and economic context, the government (or organisation) priorities, and the availability of data. In order to build a forecast for Bangladesh, as requested by a2i, the team first explored the different approaches taken by governments and organizations and compared them against the knowledge they had of Bangladesh and its networks and systems. Simultaneously, they conducted interviews with local and international experts who explained when a forecast (and what kind) is most useful for governments or industry, what needs to be considered during its creation, and technical knowledge on its construction. The main findings underscored the importance of a comprehensive Labour Market Information System (LMIS) specifically for Bangladesh, a future-focused one that includes the capacity to use current data to build for the future.

This resulted in the following outputs to a2i within this section:

- A numerical jobs and skills forecast methodology based on a quantitative analysis of key national labour, demographic, and employment information to understand changes in demand of industries and occupations.
- A Horizon Scan methodology and example per industry based primarily on a qualitative analysis of expert knowledge, scenarios, and pathways along with the above quantitative analysis to understand the direction of an industry and the relative impacts on labour and employment.
- A skills taxonomy methodology per industry based primarily on qualitative analysis of taxonomy hierarchy and the linkage between market labour data and skill taxonomy upon which current and future skills demand can be tracked.

These three methodologies will enable a2i to create the outputs required for this LMIS and present key portions to youth and industries on the NISE platform.
Part 2: Self-Assessment and Career Guidance

The importance of providing youth with the right guidance and tools to build career pathways is a key goal of a2i and the Bangladeshi government. The unemployment rate for graduates from key national universities is up to 46%, emphasising the need for accessibility of career guidance to youths, as well as ways for them to proactively assess and build their careers. The team undertook the creation of a Self-Assessment and Career Guidance Module, requested by a2i, by first focusing on a review of the state and context around career guidance in Bangladesh, using those findings to guide interviews with local and international experts to determine what are the best practices in providing career guidance and conducting a survey with Bangladeshi university students to determine their engagement and requirements of career guidance.

The main findings displayed the lack of proper career guidance structures for the youth, an absence of university-based skills development initiatives necessary to align with the interests of the youth or meet the demands of the market, and a consistent social pressure to meet familial and societal expectations of a career. The team used these findings to inform the design of a Self-Assessment module focused on a personality assessment, interest assessment and a skills assessment for the youth.

The combined results of these assessments are used to inform the youths’ tailored career guidance both within university and in the second part of this NISE module.

The findings also indicated a need for Labour Market Information, virtual work opportunities and other application and interview tips that are included in the career guidance section of the module.

This section also provided insights into the importance and relevance of early and informed career guidance throughout the university. These findings contributed to the makeup of the third part of this report, linking education and employment.

Part 3: Putting it all together: Linking NISE and the market with universities

Integrating platforms such as NISE with university curricula can provide numerous benefits to university students to ensure that graduating students meet the demand for current and future jobs in the labour market. The team endeavoured to create an implementation plan for a2i to recommend how part 1 and 2 above can best be utilised by Bangladeshi university students throughout their university education.

This integration plan was centred around integrating ideas of career development learning, Work-Integrated Learning and collaboration with industries to create 3 short to long-term strategies:

- **Short-Term Strategy**: Focuses on encouraging tertiary education institutions to embrace Labour Market Information, self-assessment and career guidance mechanisms, and the evolution of domestic and international labour markets.
• **Medium-Term Strategy**: leverages the partnerships created in the short-term to ensure that tertiary education institutions have the necessary capacities and are equipped with the required tools to eventually integrate a NISE module into their curricula in the long-term.

• **Long-Term Strategy**: focuses on the formation of a compulsory NISE module integrated into the education department’s policy for the university curriculum of all tertiary education institutions.

By embracing these strategies, students will be better placed to enter the workforce with the necessary skills, knowledge, and real-world experiences to thrive in their careers.

These three parts will be presented to our project partners, a2i, hereafter referred to as a2i (it) or the team at a2i (them). As the primary objective is for a2i to present these tools to the youth, Parts 1 and 2 also include the translation of our research and output into design and layout recommendations for the NISE platform. These UX/UI-focused considerations prepared by this group of researchers, hereafter referred to as the team (they), will be provided to a2i for its use when developing these modules on the website.
INTRODUCTION
Imminent and significant labour market transformations are being predicted by experts worldwide under the umbrella of the Fourth Industrial Revolution (4IR).\textsuperscript{1,2,3} Such forecasts are increasingly accompanied by the gradual acceptance that non-routine and cognitive tasks may be as susceptible to automation as the routine, repetitive, and manual jobs that have been traditionally associated with AI-driven displacement.\textsuperscript{4} For instance, the Organisation for Economic Co-operation and Development (OECD) noted that the “AI revolution puts skilled jobs at highest risk”.\textsuperscript{5} The reality of this has been compounded by the increasingly rapid evolution of artificial intelligence (AI) tools in the last decade, with technological advances spearheaded by tech companies such as OpenAI particularly picking up speed in the past year.\textsuperscript{6,7} For example, a 2023 OpenAI paper focused solely on the expected impact of Generative Pre-trained Transformer (GPT) models on the US labour market predicted that “approximately 80% of the US workforce could have at least 10% of their work tasks affected by the introduction of GPTs, while around 19% of workers may see at least 50% of their tasks impacted”.\textsuperscript{8}

Whilst this is undoubtedly a global issue, designing interventions to mitigate considerable consequences for workers in developing countries - where jobs vulnerable to rapid automation are more prevalent and re-skilling resources and opportunities may be minimal - is a particularly important task. For instance, Bangladesh has big garment production and agriculture industries, which are highly susceptible to automation and can lead to mass displacement of workers.\textsuperscript{9,10} As per a2i’s 2022 Future Skills report, approximately 40% of all jobs rooted in the readymade garment and textile, agro-food, furniture, tourism and hospitality, and leather and footwear industries are at “high risk of automation in the next couple of decades”.\textsuperscript{11}

Moreover, developing forward-looking strategies in countries like Bangladesh allows the country to set a precedent, for developing and developed countries alike, of ensuring just transitions for populations in times of significant transformations. This is particularly crucial given that labour market structures - rooted in different cultures, traditions, and educational norms - and capacities to address automation-related displacement (whether in terms of pivoting to alternate industries or designing adequate safety nets) vary from country-to-country.

Although automation-driven labour market transformations are undoubtedly challenging to address, the Government of Bangladesh’s Aspire to Innovate (a2i) agency - our partner organisation - has developed and recently launched their National Intelligence for Skills, Education, Employment and Entrepreneurship (NISE) platform.\textsuperscript{12} The platform aims to tackle the potential ramifications of labour market changes by forecasting emerging job roles and connecting young adults to new employment opportunities according to their specific skill sets.

Broadly speaking, the NISE platform aims to act as a matchmaking service between various industry actors and interested youths, defined by a2i as those aged 18-to-35. Whilst NISE itself is in the early stages, its influence can already be evidenced by both the replication of the platform in Somalia and Jordan and the interest expressed by the United National Development Programme (UNDP) in broadening the project to other countries.
Solidifying Bangladesh as a pioneer in labour market transformation and safety net strategies, a2i began conceiving the Future of Work framework underlying NISE in March 2020. The intention was to create a “one-stop solution hub for youth” that can support data-driven decision making [and] matchmaking among youth, skills providers, and industries; forecast future occupations; and enable the achievement of Sustainable Development Goals (SDGs) 4 & 8. This multi-stakeholder platform - encompassing government actors, skills service providers (SSPs) and training service providers (TSPs), youth, and employers - currently offers re-skilling and re-training courses, basic projections of future employment opportunities (both domestically and internationally), and live job postings. These components have now attracted thousands of users, between the ages of 18 and 35, from throughout Bangladesh.

To further examine the state and effects of labour market transformations in Bangladesh and consequently broaden the features available to the various types of users, our team worked on a three-pronged proposal, consisting of:

• Designing a forecasting module that utilises labour market data to predict emerging and in-demand skill sets and employment opportunities.
• Designing a self-assessment and career guidance module that provides users with the opportunity to assess their skill sets, personality traits, and interests with the aim of generating personalised career guidance reports; directing users to re-skilling, up-skilling, and training opportunities; and teaching users employment best practices.
• Creating an implementation plan for integrating NISE findings into university curricula to ensure that youths are regularly exposed to accurate labour market information (LMI) and career guidance opportunities throughout their university careers.

Alongside broadening the NISE platform, these three outputs address the 2041 Smart Bangladesh Vision, which aims to lead Bangladesh towards the attainment of developed country status by 2041 and partially revolves around the necessity of guaranteeing sustainable employment opportunities for youth.
METHODOLOGY
The methodological approach covered the three parts of the proposal - the forecasting module, the self-assessment and career guidance module, and NISE implementation into universities - and was subdivided into four distinct parts:

1. Assessing the global landscape, both with respect to existing forecasting methodologies, self-assessment best practices, and career guidance initiatives (Appendix A). This was critical in informing the development of the proposed modules, and the proposal for their integration into university curricula, due to the prevalence and diversity of initiatives aimed at strengthening youth access to the labour market.

2. Comprehending the Bangladeshi context, through secondary research efforts involving the production of two comprehensive literature reviews (Appendices B & C). This was crucial to ensure that the outputs were aligned with the context and capacities of Bangladesh, especially due to the nation’s status as a developing country.

3. Conducting interviews with experts in the forecasting and career guidance fields to examine the prevalence of such initiatives in Bangladesh; review the best practices underlying the technical builds of such modules; and discern the feasibility of proposing such builds to a2i. Interviews were conducted with global forecasting experts, technical experts, industry-specific experts (such as Bangladeshi economics and labour market specialists) (Appendices D & E); and both Bangladeshi- and UK-based career guidance counsellors and experts (Appendices F & G). 18 individuals were ultimately interviewed.
   a. Due to the interview period slightly clashing with a university break associated with the Eid al-Adha religious holiday, experts from beyond Bangladesh were also interviewed to supplement the findings.

4. Disseminating a survey (Appendix H) to National University Bangladesh students to unearth gaps and strengths of existing career guidance structures; pinpoint concerns youths may have with respect to the availability or the quality of career guidance; understand the prevalence of mismatches between skills taught in universities and in-demand labour market skills; and ascertain the current awareness of the NISE platform. 132 responses were ultimately received.

This approach resulted in the initial development of a flow diagram of a potential forecasting methodology (Figure 3.2) and of a self-assessment and career guidance module structure and proposed user journey (Tables 4.1 and 4.2). The findings were consolidated to develop recommendations for the two modules, and the gathered data was leveraged to ensure that the proposal for the integration of NISE into university curricula was considerate of the Bangladeshi context and the capacity of a2i to advance the recommendation and was informed by the designs of the existing international initiatives. The full methodologies for each part can be found in Appendices I-L.
3.1. Introduction
The effects of the 4IR pose significant impacts and changes to labour markets, including the potential of disrupting existing jobs. As a result, the demand for skills associated with new labour markets has shifted. At the forefront of this policy debate, are questions residing over which industries, jobs and skills are forecasted to grow in the upcoming years - with countries striving to identify a viable solution, calling for new tools that integrate existing labour market instruments with those that inculcate big data and AI.

An emerging solution to the problem is gathering intelligence on current and future skills’ needs, burgeoning industries and economic outputs to create ‘Labour Market Information Systems’ (LMIS). Consolidating information on the needs of future markets is on the policy agenda for many countries, particularly focused on ensuring that youth graduates from universities have the skills required to meet future labour demands. The International Labour Organization (ILO), a key resource in this space, is assisting many countries in developing these initiatives targeting three main objectives:

- Matching supply to current demands for skills
- Helping workers and enterprises adjust to change
- Building and sustaining competencies for future labour market needs

Creating such systems is a complex process; it requires mass stakeholder coordination, comprehensive and up-to-date data collection and expert knowledge of the direction of country-specific industries. With no universal roadmap existing for approaches to creating a detailed LMIS, each country is currently implementing its own methodologies. For developing and transitioning countries, creating a tool of such a nature is becoming more complex, given socio-economic conditions, institutional capacity, government systems and limited data sharing and investment capabilities.

Whilst it is important to acknowledge that a faultless, completely accurate forecasting and LMIS do not – and perhaps cannot – exist, broad forecasts informed by context-specific data are nevertheless useful. Moreover, as such systems are increasingly developed internationally, they gradually gain the capacity to become more precise.

The purpose of this research is to provide a2i with an overview for how it can create its own LMIS on the NISE platform. The team has explored methodologies of ‘Forecasting,’ particularly, international approaches for collecting and processing data and how this information is used to identify skills supply and demand in the present and future. The key considerations are:

- How can a2i leverage global research and best practices to create its own LMIS to identify emerging industries, jobs and skills for youth?
- What is the most feasible methodology a2i can adopt to create its own system?

3.2. LMIS & Forecasting Analysis
3.2.1. Labour Market Forecasting Overview
The labour market is a complex system of governments, industries, employers, educators, and citizens. It relies on the coordination of these groups to solve a ‘simple’ equation - ensuring the appropriate supply of jobs for workers to meet the demands of the country and its citizens. The successful operation of a labour market is fundamental to the growth
of a country’s economy. The drastic shifts and speed of changing factors in the global environment increase the need for a robust and self-sufficient national strategy.

Therefore, governments must adopt approaches to monitor and predict labour market trends to prepare accordingly; forecasting is one such widely-used approach. Forecasting tends to be popular for labour markets as it uses historical data to analyse patterns (e.g., trends) and predict a future value as accurately as possible.18,19,20

Over the years, labour markets have increased in complexity, and multiple methods to analyse a labour market have emerged. Some of the more widely used methods are defined below:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forecasting:</strong></td>
<td>A systematic analysis of current and historical data through statistical and predictive models to identify trends and patterns; typically, quantitative but can be qualitative (especially when combined with other methods); duration of forecasts are determined by the requestor.16,19</td>
</tr>
<tr>
<td><strong>Foresighting:</strong></td>
<td>“Systematic, future intelligence-gathering and medium to long-term vision-building process aimed at identifying opportunities and areas of vulnerability to assist present-day decision-making”; typically, qualitative and action-oriented.</td>
</tr>
<tr>
<td><strong>Nowcasting:</strong></td>
<td>“An emerging technique in the field of economics used mainly to derive data on economy-wide indicators such as GDP and unemployment”; focuses on understanding the now to produce more frequent reports and enable responsive decision-making; typically, quantitative.</td>
</tr>
<tr>
<td><strong>Scenario-Analysis:</strong></td>
<td>An assessment technique that is utilized to measure the potential impacts of certain events. Unlike their quantitative counterparts, they provide a “what if” to enable government leaders and policy makers to prepare for the future.22</td>
</tr>
</tbody>
</table>

The combination of various practices and techniques of these methodologies to inform a larger, holistic view of a labour market is often called a Labour Market Information Systems (LMIS). It synthesises information from different industries and economic outputs to determine current and future skills' needs and enables stronger decision-making for a country’s stakeholders.23,24

### 3.2.2. Labour Market Information Systems (LMIS)

Labour Market Information (LMI) is any type of data (e.g., statistical, qualitative, quantitative) that provides insights into the labour market and enables the production of Labour Market Intelligence (LMI+). The network of stakeholders and functions that use the intelligence to address policy concerns make up the LMIS.

Several versions of countries’ LMIS were researched as part of this study as seen in Appendix M. Four particular countries and organisations were selected for a detailed evaluation of their methodologies and data sources; it informed the appropriate
methodology for Bangladesh (Table 3.1). Whilst no one methodology is flawless due to the complexity of forecasting, these were selected based on the diversity of approaches to predict the labour market behaviour, similarity in the objectives of the methodology and the recency and relevancy to the global environment. Further details of each of the primary case studies can be found in Appendix N. The selected components of the methodologies used in the recommendation to a2i are discussed throughout this section.
<table>
<thead>
<tr>
<th>Country/Organization</th>
<th>Method</th>
<th>Institution</th>
<th>Output</th>
<th>Data Input</th>
<th>Methodology</th>
</tr>
</thead>
</table>
| Australia            | Nowcasting   | National Skills Commission                                                   | Monthly updates of employment by region and occupation                | • Total employment [Region]  
• Occupational employment [Region, National]  
• Online job advertisements [Region, Occupation]  
• Weekly payroll jobs [Industry, Region]  
• Visa holders [Occupation, State]  
• Gross domestic product | • Forecast employment by occupations and map the forecasted occupations to skills through a taxonomy linking both.  
• Extract skills from job posts’ description  
• Modelling expert opinions about future trajectories of skills to make broad predictions about the skills that will be in demand |
| Future Skills Centre [Canada] | Forecasting |                                                                                  | Emerging skills in demand                                              | • Classification of Occupations Framework (e.g., Canada’s National Occupation Classification NOC)  
• Skills Taxonomy  
• Online Job Postings |                                                                                                                                                   |
| CEDEFOP/ETF/ILO       | Forecasting   | • European Centre for the Development of Vocational Training  
• European Training Foundation  
• International Labour Organization  
• European Training Foundation  
• International Labour Organization | Country skills and job demand                                               | • National Accounts time series on output by sector and factor, inputs on capital and labour  
• Historical data on employment by education, occupation, education and industry  
• Historical data on employment by occupation in age-gender groups  
• Employment by occupation and qualification  
• Data on population development  
• Employment by occupation and qualification  
• Data on population development | (Differs by each country)                                                                                                                          |
<table>
<thead>
<tr>
<th>Singapore</th>
<th>Forecast &amp; Foresight (e.g., Horizon Scanning, Roadmapping)</th>
<th>SkillsFuture Singapore</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Priority skills</td>
<td>Industry Transformation Maps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skill-based pathways</td>
<td>Quantitative data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Expert Opinions</td>
</tr>
</tbody>
</table>

- Identify emerging trends (3-step process)
  - Identify growth opportunities and skills needed
  - Quantitative analysis to group skills needed into specific sectors
  - Validate with experts
  - Measure demand growth and transferability of a skill to determine priority skills

**NOTES:**
- The O*NET framework links 35 overarching skills to more than 923 occupations.¹⁷
- Natural Language Processing techniques can be performed to categorise the job postings’ information with a skill taxonomy.
3.2.3. Interview Analysis

The team conducted several expert interviews to complement the evidence review. The main objective of these interviews was to determine the relevance and accuracy of forecasts in countries and organisations, the process undertaken to develop them, and the difficulties faced while doing so. The team interviewed local Bangladeshi experts who were trying to solve issues of youth employment, international experts who were working on future skills projects in their respective countries and technical experts who were working with data and forecasts, e.g., Canada and the UK (Appendix E). Interview questions were also based on this theme (Appendix D).

The findings of the interviews can be summarised in the following four themes (visualised in Figure 3.1):  

1. **Mismatch of supply and demand of required jobs and skills**

   Four of our interviewees have worked in Bangladesh as either professors, researchers or senior economists, and cited the lack of well-paying and skilled jobs in the country - referring to the larger economic and social struggles of Bangladesh. For those that were able to find employment, the interviewees described a lack of preparedness for job skills and adequate university training as a significant issue impacting the youth employees.

   They recommended movements towards vocational training to address some of the mismatch of jobs and skills. There was also a desire to educate the youth on entrepreneurial activity, to self-create jobs for themselves and other whilst boosting the economy. Overall, there was a strong call for coordination and organisation between various school, government and industry stakeholders to properly skill, reskill and upskill the citizens of Bangladesh.

2. **Data collection**

   The central foundation in developing a forecast centred around data availability and collection. One of the interviewees worked in a unit whose main responsibility was to consolidate and organise regional and national data sources upon which strategic and predictive analysis could be conducted.
Additionally, an honest and intermediary “data broker”, whose role it would be to ensure accuracy and legitimacy of the data used in such analysis. Interviewees underscored the importance of using data as intelligence for governments, and translating that value into impactful planning and operating. They also recommended building models of forecasts or initial futures strategies based on the existing available data in the country, and progressing from there, specifically for countries who were new to the practice.

3. Creating regional and sectoral forecasts
In relation to forecasts, interviewees warned of the difficulty in creating those that would remain accurate and relevant. They explained the various degrees of shifting dynamics in a country and the number of factors affecting labour markets as a key concern and limitation of the practice. The speed of change and unpredictability, especially in present day economics, makes traditional forecasts obsolete. A much more holistic approach (trying to include many factors), but at the same time narrower in scope to region and sector level, can increase the accuracy of the forecast. In terms of producing labour forecasts, the trend has always been towards numerical forecasts based on overall employment and economic figures.

4. Need for shifts in domestic views of labour and economics
Overall, building a forecast to prepare for the future is only one part of the puzzle for countries. Interviewees explained a need for governments to identify and build for the emerging sectors and industry. As previously stated, there was strong importance placed in understanding the insights coming from the data and influencing the direction of the market through decisions based on that intelligence. The pace of change in the global market is more difficult to manage in countries like Bangladesh, where economic and social conditions remain a key national concern. To tackle this while preparing for the future, Bangladesh and other countries in its position need to build with local context and conditions in mind. In Bangladesh, the informal sector plays a large role in the country’s economics, as mentioned by our local experts, and could be formalised and factored into building a robust future market. Similarly, interviewees called for a cultural shift between the stereotypes of university versus more vocational training, - often looked at negatively in social structures - suggesting that providing vocational training for some of the country’s youth would in fact be more productive for them and the growth of the nation.

3.2.4. Key Findings
‘Forecasts’ is a loosely-used term to identify and anticipate trends of a specific question and theme, and are composed of different quantitative, qualitative and predictive approaches to modelling the desired information. They are best evaluated not only on predictive power, but on the usefulness of the information in guiding decision-makers; especially when combined with additional labour analysis outputs. These outputs could be dynamic series of the economics of a current labour market, foresight documents to anticipate the demand of future skills, or quantitative skills forecasts for a more detailed picture of future demand of occupations, qualifications or skills growth regionally and sectorally. The combination of these outputs fit within an LMIS, building the most comprehensive view of the state of labour in a nation, and enabling the government to be better prepared for changes to the market.
For Bangladesh and the purposes of this study, the team designed a Futures LMIS methodology that touches on both quantitative and qualitative models and practices. This enables the Bangladeshi government to maintain a forward-looking view of the market and its sectors, upon which policy makers can base strategic decisions, and youth can build career pathways. The rationale and methodology of this process is detailed in the next section.

3.3. LMIS Forecasting Methodology - For a Bangladeshi Context
Based on our findings, the creation of a Futures LMIS and, therefore the main outputs to a2i are:

- A numerical jobs and skills forecast methodology based on a quantitative analysis of key national labour, demographic and employment information to understand changes in demand of industries and occupations.
- A Horizon Scan methodology and industry example based primarily on a qualitative analysis of expert knowledge, scenarios and pathways along with the above quantitative analysis to understand the direction of an industry and the relative impacts to labour and employment.
- A skills taxonomy methodology based on a mixed-method analysis of occupation, industry and skills information upon which current and future skills demand can be tracked.

The below section details the proposed process and methods described by Figure 3.2 to be undertaken by a2i to create a Bangladeshi-specific Futures LMIS.

3.3.1. Setting the Direction
If we look at the Bangladeshi local context, it is particularly useful to begin by reviewing data collected in Dhaka due to the comparative reliability of the capital’s data collection efforts; utilising industry data will make data collection easier to undertake. A forecast is only as useful as its potential accuracy. Accuracy is improved by reducing the number of variables and factors of change within a particular context. Setting a direction for the forecast helps establish that context. Based on our interview findings, there are two primary ways to set direction, regionally or by sector.

For the purposes of this methodology, we are proposing an industry-led direction. This is because:

- Bangladeshi local context makes collecting industry data easier than regional data. Except for Dhaka, the main economic hub, regional numbers will be inaccurate and incomplete.
- The regional study also requires sufficient local resources and coordination, which may not be feasible for Bangladesh in a short-term context; Industry leaders will provide additional support.
- Industry-based design enables prioritisation of policy; governments may invest in industries that are appealing to youth and will benefit from their employment.

When setting a direction, it is also important to determine the time-period of the forecast. This will influence the length of historical data required; it is also a primary input consideration when applying a predictive model.
Figure 3.2. Forecasting Methodology Structure
3.3.2. Data Sourcing

As per our findings, the biggest challenge to building an LMIS is obtaining and accessing complete and accurate data; all interviewees cited this as the biggest limitation and gap in the process. Reviewing global models helped the team identify variations of data sources that could be used to create a comprehensive forecast. Table 3.2 lists the sources and their purpose.

When developing the model, our technical experts discussed the role data, and its availability should play in the final design. According to these interviews, the initial steps to building future knowledge is identifying and consolidating data that is available. While data and reports can be commissioned, it is a time-consuming process and often requires an initial understanding of what is available and what it describes. Therefore, as this methodology was built, the team considered what data sources would be easier to accumulate or what was known to be available through discussions with a2i, and what could be commissioned at a later date - this is discussed in Column 4 of Table 3.2. A recommendation for data handling and management is provided to a2i based on this evaluation. The suggested analysis and modelling methodology for the LMIS is also built with the ease of availability of data sources in mind.

In addition to national reports, qualitative data sources in the form of expert advice, surveys and whitepapers are significant inputs to LMIS - they provide the empirical view that confirms or rejects the theories behind the topic, in this case, the future direction of industries. They also ensure a more user-centric designed solution to the problem. 29

Expert interviews, whitepapers and surveys can be collected or commissioned with a specific question in mind, or with the purpose of gaining a general understanding around the concept or industry.

3.3.3. Methods and Analysis

3.3.3.1. Quantitative: Building a numerical jobs and skills forecast based on quantitative data and analysis

Quantitative methods of analysis are the application of models and statistics to better understand patterns and trends from large pieces of data. This process is essential for the creation of numerical forecasts where previous years’ inputs are aggregated and organised to describe the current state. This analysis can then be used in conjunction with economic and labour models to understand the long-term picture.

The sections below describe the data handling process to maximise accuracy in the analysis; by ensuring data is cleaned, validated and organised, then extrapolated for trends and insights and finally applied within models for predictions. In this case, the team will be providing suggestions for tools and models that can be applied to the data to build a numerical jobs and skills forecast.

1. Data cleaning, validation and organisation

1.1. Create a data repository which stores the various files and reports received from government ministries, national surveys and industry documents. The structure of
<table>
<thead>
<tr>
<th>Data Sources</th>
<th>Importance - Purpose</th>
<th>Ministry</th>
<th>Availability/ Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total employment by region and demographics - current</td>
<td>High - Provides the view of the labour market and key employment information on which current and future trends can be built</td>
<td>Labour</td>
<td>This is available to the Bangladeshi government every five years.</td>
</tr>
<tr>
<td>2. Occupational employment by industry and region and demographics (can this include informal sector) - current</td>
<td>High - Provides the view of industries and key employment information on which current and future trends can be built</td>
<td>Labour</td>
<td>This is available to the Bangladeshi government every five years. However, the government would benefit from including the informal economy.</td>
</tr>
<tr>
<td>3. Payroll Jobs by industry and region and demographics (formal economy) - current</td>
<td>High - Provides a list of current jobs by industry and region on which current and future trends can be built</td>
<td>Labour</td>
<td>This could be provided by industry if not already existing, but can also be achieved through occupation titles in the national census.</td>
</tr>
<tr>
<td>4. Job advertisements by region and occupation - current</td>
<td>High - Shows labour demand in regions and roles.</td>
<td></td>
<td>This is already provided to a2i on the NISE platform. Effort should be placed to ensure it is complete.</td>
</tr>
<tr>
<td>5. Job placements by region and occupation - current</td>
<td>Medium - Indicates number of labour force in temporary work</td>
<td></td>
<td>This could be provided by industry if not already existing, but can also be achieved through occupation titles in the national census.</td>
</tr>
<tr>
<td>6. Visa holders/Migrant jobs by occupation and region - current</td>
<td>Medium - Indicates the labour demand that needs to be sourced from outside of Bangladesh</td>
<td>Foreign Affairs</td>
<td>This data should be available through one of the government mediums as visas would have been issued.</td>
</tr>
<tr>
<td>7. National Accounts time series (describing economic activity and GDP) on output by industry and factor inputs on capital and labour - past 10 years. More detail can be added by sector, employment and labour market participation by age, gender, price and wage</td>
<td>High - Provides a view of economic outputs, GDP, growth and other factors of influence in and on labour markets over a period of time</td>
<td>Industries, Labour, Finance, Commerce</td>
<td>This is available to the Bangladeshi government every 5 years. Effort should be placed to ensure it covers all desired inputs.</td>
</tr>
<tr>
<td></td>
<td>Historic data on employment by education, occupation, education and industry - the above data sources but for the past 10 years</td>
<td>High - Provides a historical view of the labour market and key employment information on which current and future trends can be built</td>
<td>General Labour</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>9.</td>
<td>Historic data on employment by occupation in age-gender groups for estimation of replacement demands</td>
<td>Medium - Provides a view on previous gender-based labour demand on which diversity standards can be built</td>
<td>Women Social affairs Labour</td>
</tr>
<tr>
<td>10.</td>
<td>Employment by occupation and qualification</td>
<td>Medium - Enables an understanding of skills’ supply and demand.</td>
<td>Education and Labour</td>
</tr>
<tr>
<td>11.</td>
<td>Data on population development - perhaps a national census?</td>
<td>High - Provides population figures over time and demographics of Bangladeshi nationals</td>
<td>General</td>
</tr>
<tr>
<td>12.</td>
<td>Education vs. employment after graduation</td>
<td>Medium - Nationals data linking education history with employment, identifying the relationship for future programs</td>
<td>Education</td>
</tr>
<tr>
<td>13.</td>
<td>Retirement information</td>
<td>Medium - Identifying subset of workers exiting the labour force creating a demand for those jobs and skills</td>
<td>Labour</td>
</tr>
</tbody>
</table>
the repository should be focused on easy integration of data from different sources, allowing interoperability from all Ministries.30

1.2. Standardisation of files and quality control - set up the following file handling process: convert files to user-friendly formats; clean and eliminate missing data or sensitive (PII) data; maintain backups of all files.30

1.3. Create a standardised naming technique to keep track of topic, dates and source. Use that to create an index of reports.

1.4. Create tables based on best practices of database management; with standardised primary and secondary keys to facilitate clear linkages in data points.

1.5. Add a business intelligence tool to the database e.g., Metabase that uses SQL queries to combine and create new reports for analysis.

1.6. Create workflows with Ministries and other departments to receive and update files on a timely basis. This will help identify if additional reports need to be commissioned for more comprehensive intelligence.

2. Statistical Analysis

2.1. A clean and organised dataset enables proper methods of statistical analysis - the collecting and analysing of data to identify and predict trends in the information.31 Different statistical methods should be applied to generate the numerical forecast and for its use in the qualitative analysis of the LMIS.

2.2. To understand the key elements of the current (or historical) labour and market information, descriptive statistics should be applied to the various data sources. This analysis will provide a contextual basis for each industry in the overall LMIS for a2i and the government, and for the youth who may be interested in the industry. It will also provide a benchmark for future comparisons of the data. The results from this analysis should be presented in the industry overview section of the module (see Forecasting Module Design Guidelines in pg. 34).

2.2.1. Statistics here could be key averages including growth of industry or jobs in industry, percent of total employment, number of roles/skills in the industry, etc.

2.3. To produce the numerical forecast, predictive analysis models need to be applied to data. Predictive analytics evaluates current and historical data to identify trends and patterns that predict the future value of the variable being analysed. It uses techniques and models from data mining and Machine Learning (ML) to make predictions. The method is chosen based on the nature and amount of data.32

2.4. Data extrapolation is a primary method of predictive analysis.17 Simple methods of this analysis are useful when only a few data points per indicator exist over a period of time (as may be the case when initially building the LMIS in Bangladesh).

2.4.1. Extrapolation methods include simple linear models but can also be conducted through more complicated geometric curve formulas.

2.5. Where data points over a longer horizon are available, more sophisticated extrapolation methods and analysis can be applied. These are often referred to as time-series analysis and are combined with other data mining or ML tools for increased accuracy. They are more commonly used to generate complex forecasts, as discussed in the next section.
3. Applying predictive models and analysis for forecasting

3.1. The extrapolation methods mentioned above are often focused on one variable at a time, and do not accurately factor in changes in other variables that may impact forecasts. If the appropriate data is available, predictive models and techniques that combine advanced statistical techniques with ML tools are more effective and accurate in predicting future outcomes. Models for this type of forecasting are input-output analysis, macroeconomic models and machine-learning modelling; these are described below in order of current relevance for Bangladesh.

3.2. **Input-Output models**: Input output models are used to determine impacts of changes of demand in sectors or in employment. They demonstrate the resulting impacts of a scenario change in demand, such as an increase in spending in clean energy. This indicates a rise in jobs and skills required in the sector, along with changes in education and training to support it. Input-output models are less data intensive, and good for developing countries looking to understand the implications of a policy initiative or a trend in the market.

3.2.1. The core of the model shows what a sector has produced in previous years, how much of that is used in other sectors, and what is the final demand of the production (Data source No.7 from Table 3.2). This, when overlaid with a labour report by sector and occupation, can determine future employment.

3.2.2. More advanced time-series data produces stronger input-output models, as they can account for greater variability in the data. The flexibility of the model makes it popular in developing and developed countries. Canada, Vietnam and Philippines have all used versions of input-output models to determine employment trends.

3.2.3. The steps of the model as described by ILO can be found in Appendix O.

3.3. **Macroeconomic models - Hermin**: Such models take a more economic approach and analysis on historical data to determine trends. These models include key interactions that decision makers believe will impact the market. The Hermin model is used mostly by smaller economies, or by nations with less data. It is grouped within a smaller subset of sectors (combining certain industries), and evaluates the effects of strategic frameworks within those sectors. The demand side of the sectors, as a result of the initiatives in the sector, creates long-term forecasts.

3.3.1. The Hermin model for Bangladesh should be trained with historical labour data and the structural changes of key industries. The simulation results will give situational insights to decision-makers.

3.3.2. Such models have been used in EU countries and within regions.

3.4. **Machine-learning models**: There are several machine-learning based modelling that can be used to generate predictions of employment by occupation and region. The following were used by Australia to produce the kind of information Bangladesh would be looking for from a numerical forecast. In all approaches, the model will have to be trained and validated. This can be done by splitting the datasets between training and validation data and testing data. For example, Australia used historicals from 2015-2020 excluding 2016 as its training set, and 2016 as its testing set - checking for accuracy.
3.4.1. Random-forest is a type of ML technique that uses randomised vector tests to generate independent “trees” with different values, accounting for different potential errors in the model. The final result is an average of all these values.35

3.4.2. Gradient boosting also generates “trees” of values, but unlike the random-forest, it builds upon the previous tree to better account for uncertainty in the data. This iterative approach continues until the model cannot generate a “tree” that improves the residuals.36

3.4.3. Elastic net regression is a common predictive linear regression model that utilises an enhanced regularisation and variable-selection method. The “elastic-net” means strongly-correlated variables are grouped together, whether in or out of the model. It is most useful when there are several dependent variables or predictors as compared to the number of data points.37

3.4.4. There are different variations and sub-processes of each of these models that are chosen based on the nature of the data available and the variable being forecasted. Oftentimes, as in Australia’s case, these models are stacked together to create one estimate. Each estimate becomes an input to a consolidated linear regression model. The stacking increases accuracy and robustness of the predicted values.21

3.4.5. It is important to note that while ML techniques are most accurate and advanced for forecasting, they are time and labour intensive and require large amounts of qualified data. While these approaches should be the forecasting ambition for a2i, our team recommends the previous approaches for the first few iterations of the numerical forecast. a2i can then use the learnings of those outputs, and the additional data collected, to generate predictions through ML models.

The above approach to building a numerical forecast details some best practices in conducting this process, especially given the Bangladeshi context and resource availability. However, there are some limitations to consider:

• Data availability is a significant gap across all country and organisational models. The availability of reports in desired formats are a deciding factor in determining the appropriate quantitative model of analyses. Proper scoping of the available data sources in Bangladesh, or sources that can be commissioned, should be conducted and then evaluated against the techniques recommended in this model.

• There are many predictive and economic models that can be applied to labour and employment data to produce forecasts. While the team has attempted to list the widely-used global methods that are also relevant for Bangladesh, a more specific and comprehensive exploration of models can be conducted to ensure the output meets forecasting goals of accuracy and robustness.

• Although ML techniques have been used in forecasting for decades, they have not necessarily been updated with the latest improvements in AI technology. Some of the more manual aspects of this flow, and some of the tools suggested could look simpler and easier to implement in the near future. This further supports our team’s recommendation to apply more straightforward predictive models for the first few iterations of the forecast, and apply enhancements at a later date.
3.3.3.2. Qualitative: How qualitative data builds a horizon scan

Qualitative approaches to forecasting utilise three key analyses that enable thinking about future jobs and skills requirements; stakeholder mapping, literature reviews and interview and survey results. By bringing together quantitative and qualitative methods, an LMIS with a holistic approach is created, where systems interact and informing future research.\textsuperscript{16}

**Stakeholder mapping**

A stakeholder mapping is a preliminary step to analysis and ensures the involvement of all actors with a significant influence and interest in the development, direction and dissemination of the results. Stakeholders for a2i would include:

- Education: ministries and partnering universities
- Industry Associations
- Employers
- Other relevant government ministries

The mapping of the above will facilitate data gathering from relevant authorities, tailor solutions and use cases of the forecast for each stakeholder and aid in clear policy formulation.

**Literature Reviews, Interviews, and survey results**

Results gained from literature reviews, interviews and survey results are multi-purpose. They can be coded to provide thematic analysis, giving insight over emerging trends and themes that will affect the labour market. They also provide:

- A broad overview of the topic.
- Global best practices to compare methodologies.
- A direction for emerging industries.
- Insights to automation, technology and future trends.
- Sentiments and opinions on the shifting labour market and job trends.

**Conducting a Horizon Scan**

A Horizon Scan, particularly one that is used for prediction and direction, must be comprehensive in its approach. It ‘scans’ the labour market over a predefined number of years in the future and identifies key emerging trends to create scenarios.\textsuperscript{38} These scenarios assess broad implications for jobs, skills and qualifications.

The UK Department for Education conducted a horizon scan for the labour market and skills in 6 specific sectors to understand:\textsuperscript{38}

- The global drivers and key trends for the labour market, particularly those that define the future of jobs and skills.
- Sector-specific information; how global and local trends interact with the UK market.
- Qualitative scenarios; what possible scenarios may emerge over the next 20 years.
- Implications of the scenarios; how might the needs for these jobs, skills and qualifications change over the short term (0-5 years), medium term (5 - 15 years) and long term (15 - 20 years).

As the UK is considered a best practice for horizon scanning, the suggestions for a2i’s horizon scan are centred around the methodology conducted by RAND Europe’s Centre.
for Futures and Foresight Studies in collaboration with the Institute for Employment Research commissioned by the Department of Education (DfE), with further additions from other methodologies as seen in Figure 3.3.38

Figure 3.3. Advised methodology for conducting a Horizon Scan based on jobs and skills

Advised Methodology

Scoping
Horizon scans require a clear and concise direction to assist the scanning team. A comprehensive scope aims to answer the following questions:39

• What is the guiding question that defines what you want to know?
• How broadly or narrowly defined is the field of interest?
• What are the key drivers of change and activities in the field? It is common to organise thinking around a STEEP (Social, Technological, Economic, Environmental and Political factors) framework.
• What is the spatial scope? Are you seeking issues with global or more localised impact?
• How far into the future are scanners projecting?
• Who should be involved?
• Who are the end users?

Evidence Review
To identify the types of global and local drivers of change expected in the next 15-20 years, how the drivers are likely to be important to the labour market and what is the demand for skills during a foresight period, a commissioning of an evidence review is suggested. This evidence should consist of multiple sources such as:

• Literature: Conducting an evidence review from multiple sources including academic journals and grey literature. The UK’s horizon scan consisted of 130 sources focusing on 6 sectors of interest (Energy - specifically renewables, Higher Education, Construction, Wholesale & Retail, Transport & Logistics and health & social care) and the direction for which each industry was expected to go in, in the predefined number of years.
• Data Sources: Looking at online repositories depicting past to current trends depicting changes in industries and skills (World Bank, IMF, ILO, etc.).
• **Internet Scraping**: Scraping the internet is a process that involves extracting certain types of information from websites to inform analysis. Scraping the internet can provide identification of emerging trends through the following methods:
  - Monitoring job listings through job posting platforms
  - Analysing job descriptions to identify emerging skill sets
  - Sentiment analysis on social media to inform researchers on attitudes towards specific job sectors

**Expert Interviews**
To validate, explore and refine findings from the evidence review, semi-structured interviews are required. In the UK’s case, they spoke to 21 interviewees grouped into: experts in labour market, skills and sectoral, academics and researchers and representatives of international organisations and bodies. The results from the evidence review and expert interviews require a synthesis thematically generated to list key trends and drivers likely to impact the future types of jobs and skills. This could be done through several mixed-method approaches.40

**Qualitative Scenario Development**
Creating scenarios is an increasingly popular qualitative method for projecting future outcomes. Like forecasting, they are based on trends and drivers but represent multiple future projections without indicating how likely they are to occur. In the UK’s case, a structured methodology was used to examine key drivers in the labour market with wider STEEP factors and any uncertainties that existed within these factors. These scenarios were built from the information and synthesis conducted from the evidence review and expert interviews.

**Scenario Workshop**
As the last step, the UK conducted a workshop with a two-pronged purpose to 1) receive feedback on the scenarios (were they plausible or did they contain inconsistencies?) and 2) consider the implications of each scenario (on skills, productivity and growth, quality of work, policies and interventions). The online workshop consisted of 10 experts representing academics and researchers, international organisations, national committees and industry bodies and representatives of government departments. In this workshop, experts were asked to qualitatively score the relationship between pairs of factors (from the STEEP framework) with a strong impact to no impact Likert scale.

Exercises, like the workshop above, ensure policymakers and governments are aware of the potential implications of scenarios on a variety of different factors which in turn, enables leaders to plan for these futures accordingly.

**Sustainability & Ensuring Longevity**
As horizon scans are qualitative, it is important for them to be long-term and sustainable through consistently communicating findings with stakeholders. These stakeholders may be an expert panel made up of members from Section 1.5, or an advisory board specifically created for this purpose. Information may be communicated through newsletters, regular conferences or workshops, which then must be validated and updated on a predetermined time frame.39
A Bangladesh Specific Example: Mini Horizon Scan on the Education sector and Youth

The following section of this report aims to provide an example of the Horizon Scanning process for Bangladesh, aimed at the Higher Education Sector and youth skill mismatches. This section is written as a sample with the assumption that a2i and researchers will conduct an in-depth evidence review and expert interviews, on the automation of several industries, not just Higher Education.

The sample is structured as the following:

• Section 1 offers the scoping method for this mini-horizon scan
• Section 2 draws upon a Literature Review (Appendix P), a survey conducted with National University students (Appendix H) and expert interviews (Appendix E) to provide key trends and drivers affecting the youth labour market.
• Section 3 offers examples of scenarios of labour market and skills demands in this sector, building from the above sources.
• Section 4 outlines suggested policies for the above with future recommendations.

1. Scoping Method

The scoping method is centred around the UK’s proposed questions as stated in Section 1.1. With the sample answer is provided below (see Table 3.3)

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer for sample horizon scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What are the existing gaps between secondary education and youth skills in Bangladesh? What are the potential future skills that can begin to bridge these gaps?</td>
</tr>
<tr>
<td>2</td>
<td>For this particular horizon scan, it will be broadly defined as it only serves as a sample.</td>
</tr>
<tr>
<td>3</td>
<td>These are outlined in Section 2.2</td>
</tr>
<tr>
<td>4</td>
<td>The spatial scope is local, Bangladesh specific.</td>
</tr>
<tr>
<td>5</td>
<td>This particular sample has no year range specified.</td>
</tr>
<tr>
<td>6</td>
<td>Government, academia &amp; industry</td>
</tr>
<tr>
<td>7</td>
<td>Government: Can gear NISE future strategies in accordance to the results found from the Scan to inform their ‘skilling’ section on the platform. Youth: Can learn from the insights of the scan and plan their career accordingly. Higher Education: Can gear future modules or courses towards skills gaps.</td>
</tr>
</tbody>
</table>

2. Key Trends and Drivers influencing youth

Key trends and drivers affecting the youth entering the labour market and meeting skills demand were summarised through the synthesis of an evidence review (Appendix P) and expert interview findings from this study. They are as follows:

1. **There are an inadequate number of jobs to support Bangladesh’s youth population**: Bangladesh has a young population with millions of youth entering the labour force every year. This has placed pressure on the economy to create an adequate number of jobs to employ youth in the labour market, which the country cannot sustain.
2. **Limited Graduate understanding on Labour Market requirements:** youth in Bangladesh face high unemployment, with industry leaders reporting that graduate skills do not match the requirements for jobs. Furthermore, graduates lack relevant knowledge about the general culture of work, and thus do not focus on acquiring needed skills or experience.43

3. **The role of the informal sector:** The informal sector which holds majority of labour in Bangladesh lacks employment benefits. With a young population, jobs in the informal sector are also viewed as undesirable by university graduates (via interviewees).

4. **Low uptake of STEM education:** Access and exposure to STEM education remains low with students, particularly females, thus resulting in a skills gap for the future when technologies emerge.

5. **A population geared towards migration:** Lack of suitable jobs and desired career paths has led a significant amount of youth pursuing jobs elsewhere, leading to a significant brain drain in Bangladesh.

3. **Scenario Narratives - the Bangladeshi Education Sector**

Scenario narratives are usually based on a structured-scenario development methodology, through interrelated systems which do not rely on one or two main drivers. However, for this study as we are only providing a sample for a2i of one sector, the scenarios below were created through the amalgamation of experts' interviews and an evidence review and are not reflective of all STEEP factors.

The following 3 scenarios are envisioned projections of the Bangladeshi Education sector future contexts. The purpose of these scenarios is to ensure that policymakers explore alternative futures to enhance decision-making within uncertainty. The takeaways of each scenario are actionable agendas for policymakers to plan according to each of the projected futures.

<table>
<thead>
<tr>
<th>Scenario 1: A skills mismatch persists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low levels of investment in higher education and research into skilling has led to a persisting skills mismatch between youth and available jobs, with attained skills from higher education not meeting job requirements. In this scenario, automation continues to advance, minimal jobs that once existed for Bangladeshi graduates are even harder to come by.</td>
</tr>
</tbody>
</table>

Consequently, unemployment and brain drain increases whilst GDP and development of the country decreases. In this time, there would be a more pressing need than ever for universities to adjust their curricula. However, there would be limited time to do so, thus leaving Bangladesh behind the curve, unable to compete with global markets.

**Takeaway**
The Government must swiftly work to update higher curriculum to upskill labour for the future of work.
Scenario 2: Entrepreneurship and gig economy increases in job market

A medium level of government spending has led to encouraging youth participation in the entrepreneurship and gig sector; characterised by an advance in startups. However, with lack of longevity in skills, such as increasing the uptake of STEM subjects, most startups provide services rather than innovative solutions, creating a volatile labour market. This labour market is subject to inequalities, job instability and poor working conditions for the youth.

Takeaway
The government must work on inequality, whilst also ensuring innovation in other arenas is maintained in the country, by providing new jobs and skills.

Scenario 3: Emphasis on skills for the future

After the creation of the NISE platform, adequate research and a high level of public spending on re-skilling and upskilling has led to a labour market that is not greatly impacted by the effects of automation. Scenario 3 is based around a labour market that has undergone a significant transformation, where routine tasks are being automated, but youth have acquired necessary skills that fit the roles required for the new industries such as climate, entrepreneurship, cyber security, agri tech etc. This leads to a boom in Bangladesh’s development and GDP, with a youth labour force that has revolutionised the informal sector.

Takeaway
Skills for the future will be highly demanded, especially in emerging sectors and technologies and the youth will be prepared to tackle these.
Limitations and Recommendations for Horizon Scanning
The above research shows numerous policy recommendations for integrating government programs such as NISE with higher education. These short-, medium- and long-term recommendations can be seen in Module 3: NISE Implementation in Universities (Tables 5.2, 5.3, and 5.4).

Limitations
• Although a vast amount of background research was conducted, the team’s contextual knowledge of STEEP factors specific to Bangladesh is limited.
• Horizon scans and scenarios require expert interviews, which can be biased based on interviewee beliefs.
• As horizon scans are qualitative, results and scenarios are ‘likely’ and therefore do require supplementary quantitative results to support them.
• Interviews were only limited to the ‘Higher Education’ and Skills mismatch due to time constraints, rather than the direction of other industries. Future horizon scanning should consider all industries.

Recommendations
• a2i begins to create a stakeholder map, identifying key experts within emerging industries; this would enable a quicker turnaround time when the horizon scanning process begins.
• a2i begins to create a horizon scan for the most important industries affecting youth based on the examples above.
• The outputs from the horizon scan will feed into the forecasting and vice versa to continuously verify sources.

3.3.3.3. Skills Taxonomy
Introduction
Shortages in skills are a global concern and arise not because there is a lack of skilled workers, but rather because there is a mismatch in skills supply and demand. According to the OECD, countries could boost productivity and lower costs if a skill mismatch is reduced.45

A skills taxonomy is a system designed to name, categorise, and group various skills, and abilities to outline the specific skill requirements for different occupations, which can be utilised to convert available data on industry and job trends (as taken from forecasting or horizon scanning) into insights related to skill trends.46 This approach provides a consistent way to measure the supply and demand of skills over time and subsequently, enables policymakers, youth and users to meet the need for required skills. They can also be valuable for developing curricula and training programs, providing insights into skills mismatches, and understanding historical trends in job requirements to predict future changes.46 When a forecast is supported by a skills taxonomy, it allows for a long-term planning that allows governments and organisations to proactively identify and prepare for the end-to-end needs of the future.
The objectives of creating a skills taxonomy for NISE
An ideal taxonomy for NISE’s main output would aim to achieve the following objectives:
- Provide a comprehensive overview of job requirements, which enables a more holistic understanding of skills.
- Establish connections between skills, qualifications, and labour market data. These insights are expected to create more focused guidance for users by:
  - Capturing the evolving skills requirements in existing occupations
  - Reflecting the skills requirements for emerging occupations
  - Showing the possible list of skills acquired through on-the-job training
  - Enabling users to monitor the changing significance of skills over time
  - Recommending skills through available courses online

Global Best Practices - Key Takeaways
A literature review based on global skills taxonomies was conducted. For the full review including limitations see Appendix Q.

Suggested Methodology for a2i
It is important to note that when conducting Skills Taxonomies, a one-size-fits-all approach is not feasible. As seen in Table 3.4, a vast number of methodologies exist when trying to create a skills taxonomy; countries need to explore a combination of several methodologies before developing an approach suitable for their context. Figure 3.4 shows a suggested methodology for a2i to begin to create pathways for skills.

Figure 3.4. Skill Taxonomy Methodology

Laying the groundwork:
1. Setting out goals and objectives for the skills taxonomy should be the first step undertaken by the government. As suggested in the quantitative and qualitative methods section, policy makers may choose specific industries which are most likely to see an influx of youth entry and engagement (for example; NESTA narrowed these down to two areas).

2. Classifying Occupation Levels to enable a comprehensive understanding of roles: a2i has utilised ILO’s ISCO definitions of predefined four occupation/skill levels to create their own; BSCO. By further classifying these occupation levels into youth-centric versions, it will be easier to create subsequent skills and align interconnected processes. For example, tagging specific skills to online learning programs on NISE.
The International Standard Classification of Occupations (ISCO) is a system used to classify and group data related to occupations. This information is collected through statistical censuses, surveys, and administrative records. The process of determining a person’s skill level for a particular job is based on their ability to perform the tasks and duties required. Skill level is determined by the complexity and variety of tasks and duties involved in a particular occupation. To gather information on job level and skill, classification codes are assigned to survey responses.

The hierarchy of the taxonomy is based on skills and then narrowed down to industry and jobs. Can be used internationally regardless of the economic status of a country. Available documents by ILO on the step to step process of using ISCO.

O*NET is a valuable resource that provides comprehensive information about skills, abilities, work activities, training, and job characteristics for each occupation in the US system. It is the primary source of occupational competency information in the USA and covers the entire labour market. The taxonomy is regularly updated, easily accessible, and provides robust descriptors of job requirements. It has been compiled over two decades, making it a reliable source of information that is widely used by academics, decision-makers, and society. The Organisation for Economic Co-operation and Development (OECD) also uses it. The significant investment required to produce and update the taxonomy, along with its established usage, contributes substantially to its credibility.

O*NET is created by gathering data from workers’ self-reported assessments and professional evaluations by job analysts. The data is collected through standardised questionnaires to measure job requirements in 177 elements, across approximately 1,000 occupations.

Provides detail for most occupations and measures attributes that capture a broad range of job requirements. Provides summary for each job title that includes: What the job does, what is the usual workload, knowledge, skills, abilities, personality, education, technology, job outlook (avg. salary), and link to similar jobs in one page. One of the most objective and robust measures of the taxonomy reflects considerable input as it is populated by experts. An open source and easy to use for practical application. Great Level of granularity.

Source: Review of Skills Taxonomies, UFS UK (2020)
The European Skills, Competences, Qualifications and Occupations (ESCO) Project by the European Commission published in 2017. ESCO created a new way for categorising and linking occupations, skills and qualifications.

Like O*NET, it draws on job evaluation expert input. The key difference is that skills are measured at a very high level of granularity, with around 13,500 distinct skills appearing in a multi-level hierarchy. In practical terms, this lends it a granular emphasis.

ESCO measures job requirements and therefore does not capture any direct information about which skills are in demand within an occupation or are driving any shortage.

The mapping are divided into 3 parts:

1. Occupation: ESCO uses ISCO mappings in order to structure the occupation
2. Skills: Divided into four groupings. Knowledge; Language skills; skills; and transversal skills and competence
3. Qualification: Based on the databases of national qualifications Frameworks that are owned and managed by the European Member States

<table>
<thead>
<tr>
<th>Nesta skills taxonomy (UK)</th>
<th>Skill taxonomy developed by Nesta UK that add significant value in two areas: technology skills and specific skills in shortage.</th>
</tr>
</thead>
</table>

Derived using ‘graph clustering’ analysis of online job adverts in the UK, with skills that appear in the same adverts being placed in the same cluster. Like ESCO, the Nesta taxonomy has many skills (10,500), which are organised in a multi-level hierarchy, also giving this a granular emphasis.

- ESCO presents skills at a more granular level than O*NET
- ESCO provides a facility to interface with many aspects of labour market information, which would potentially provide a powerful integrated tool concerning job mobility or online CVs.
- ESCO data science team using artificial intelligence to automatically maintain the occupation pillar and facilitate cluster analysis using vacancy and qualification metadata.

- A wide range of detailed technology skills are available in the Nesta taxonomy
- Nesta taxonomy can reveal the specific skills demanded by employers and give some indication of what is driving any occupational shortage
- Using O*NET and periodic update and maintenance from global online vacancies data to create new and emerging occupations

Source: Review of Skills Taxonomies, UFS UK (2020)
Recognising relevant skills:

3. Like, ESCO a2i should endeavour to categorise skills into groupings. The World Bank created these categories, based on a contextual analysis of youth skills mismatches in Bangladesh. They concluded the following skills would be of most importance in the future:
   - Technical Skills: based on technology, emerging industries and the business environment.
   - Higher Order Cognitive Skills: Critical thinking, problem-solving, effective communication and leadership.
   - Foundational Cognitive Skills and Soft Skills: Numeracy, literacy, science, basic computer skills, personality, socio-emotional and behavioural.

4. Alternatively, a2i may consider a data driven approach to building a skills taxonomy. This method employs the use of a third-party company to collect online job advertisements, after which semi-supervised ML practices are applied to them to extract key skill words and order them into the classified occupation levels recognised above.48
   - To facilitate the scraping, third party vendors may be onboarded to conduct this process.
   - Websites such as Linkedin, BDJobs, and others may be utilised for scraping.

Validating the methodology:

5. Similar to Horizon Scanning, a working group dedicated to validating the finalised skills may be assembled. This may include experts from government, industry and academia. This may be further validated through formal qualification frameworks. The proposed skill taxonomy should be shared with stakeholders for feedback and validation.

6. Once the taxonomy has been created, the NISE platform should create skills programs based on emerging and required skills for current and the future. This could either be through internal E-Learning developers or, by outsourcing programs from global skills websites such as Udemy, Coursera and edX. More information for this linkage can be seen in part 3 (Tables 5.2, 5.3, and 5.4).

Monitoring updates to taxonomies:

7. The taxonomy should be updated at frequent intervals, with consistent feedback from the stakeholders involved.
Conclusion
As the labour market faces changes, skilling, re-skilling, and upskilling populations, particularly the youth, will serve at the forefront of multiple countries’ policy agendas as new occupations emerge. Devising strategies and curricula to meet the skills labour market mismatch is difficult without well-defined skills. As no cohesive, global approach exists, a2i will have to create a methodology and definitions of skills that are fit to purpose.49

3.4. Forecasting Module Guidelines
All three of the above sections will make up a part of the Forecasting Module to be developed on the NISE platform. The purpose of the outputs above is to provide the content to make up the pages of the modules. The information and insights emerging from the forecasting, horizon scan and taxonomy will be adapted to fit the needs of the NISE platform and its users.

A set of design recommendations and guidelines for the creation of the Forecasting Module on NISE can be seen in Table 3.5. It includes the structure and sections of the module and its purpose, a potential layout, and the team’s UX and additional considerations.

3.5. Limitations and Recommendations
The research above aims to provide a2i with guidelines for beginning to design their own LMIS’ system, the first step in what is a primary objective for NISE. This system would include quantitative methods of analysis, to enable a numerical forecast of industries, skills and jobs and qualitative methods of analysis, to inform the direction of industries and the labour market through a horizon scanning and creation of a skills taxonomy. The team recognises, however, that while significant efforts were taken to ensure the relevance of the methodology for Bangladesh, context-specific information that would have adjusted certain outputs and recommendations may have been unavailable to us through this project. In light of this, the following limitations and future recommendations are provided.

3.5.1. Limitations
- **Public spending**: Creating an LMIS system of this nature requires significant public spending which the government may find difficult to allocate. If this relies on international support, questions may arise over the sustainability of this project.
- **Data accuracy**: The quality of an LMIS system depends on data accuracy. Incomplete, outdated or inaccurate information may lead to flawed analysis. To create a system of this nature, Bangladesh requires a sophisticated and mature data analysis system and skilled human capital with the skills to work on it.
- **Stakeholder coordination**: Creating a system of this nature requires coordination from multiple stakeholders in different sectors. This may hinder the speed of development.
- **Rapidly evolving labour market**: Industries and labour markets are evolving rapidly, Bangladesh might have to rely on and work with other countries that share its data to create such an information system, as information quickly becomes redundant.
<table>
<thead>
<tr>
<th>Section</th>
<th>Purpose</th>
<th>Layout</th>
<th>UX &amp; Other Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homepage</td>
<td>To introduce users to the purpose and uses of the forecasting module, with a quick description of the purpose of developing a forecast or in this case a Futures LMIS by key sectors or industries.</td>
<td>The page includes a quick blurb about the purposes of the module and an explanation of how it is organised.</td>
<td>The navigation of the page should be simple and engaging, and convey the format of the module. Users should know what their journey will be across the next few pages. Users should be able to return back to this homepage at any time.</td>
</tr>
<tr>
<td>Individual industry/sector page Ex. Education</td>
<td>This page should serve as the homepage of each main industry. It will include a description of the importance of the industry and links to the available jobs, future direction and skills requirements within it. Education could be one of these sectors, as an example.</td>
<td>Layout should match the elements of the previous page layout. There should be consistency in the way the description is written. The page should display the three parts offered within the forecasting module: Available jobs, industry trends, skills required. These should be placed in buttons like the ones on the previous page (See Figure 3.6). The page should include some of the key industry numbers and averages that emerged from the descriptive analytics done as part of the numerical forecast, including number of jobs in the sector, sector growth, available positions, etc (See Figure 3.7).</td>
<td>Navigation elements should match the previous page. Buttons leading to the next interface should be neatly labelled. An optional element is when hovering over the buttons, a quick tool tip explaining the next section could be displayed. For example, if a user hovers over the Available jobs, it could say “Lists the current vacant jobs and their applications.” There should be a way for users to return to the previous screen as well as navigate to any of the other sectors.</td>
</tr>
<tr>
<td>Available Jobs page (per industry/sector)</td>
<td>The navigation of this page should clearly display the industry and all the jobs available within the industry - including the date by which youth must apply. The apply link should open the position in another tab. Users should have to familiarise themselves with only one job listing format. If the format can be changed to the table layout, wherever jobs are displayed it should be displayed in this format. There should be a way for users to return to the previous page (sector main page), as well as be able to navigate directly to the industry trends page or skills pages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This page should list the available jobs by company and positions in the sector/industry. This should pull directly from a2i’s current job vacancies database. Optional but recommended: Job listing could be displayed in a table format, with position, company, and link to apply. From there it can lead to the application pages as currently structured. This will improve readability and allow for a search and filter feature within the jobs list. This could then be the same layout on the forecasting module page as well as in other parts of the website.</td>
<td>A2i should create an online repository of reports on the NISE platform, on this page they should publish any horizon scans or research papers based on future jobs/skills or direction of the industry. This can go under the ‘publications’ tab. In an example from the UK’s unit for future skills, their landing page has content including data, research and other resources (See Figure 3.8). The Horizon Scan documents should be clear, concise documents with a focal point on research, clearly highlighting directions of emerging industries.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry Trends (per industry/sector)</td>
<td>The navigation of the page should be simple and hyperlinked with different research papers. Documents should be clearly defined and developers should ensure that PDFs are viewable and downloadable. There should be a way for users to return to the main sector page, as well as be able to navigate directly to the available jobs or skills pages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To enable users to access Horizon scans conducted throughout the years, with consistent display of updated information.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills Required</td>
<td>This will list the most popular skills necessary to work in the sector. Where possible the list of skills provided by the skills taxonomy, should link to the skills training program,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Layout should match the frame of the remainder of the module but be similar to the jobs and skills listings' pages already on the NISE platform. Wherever possible, skills should be listed by industry/sector and occupation. An example by sector and role is provided. (See Figure 3.9).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>An optional but recommended view is linking all the available jobs associated with the skill required. This can be done through a hyperlink that then takes the user to the jobs page, filtered by that skill.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>There should be a way for users to return to the main sector page, as well as be able to navigate directly to the available jobs or industry trends pages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A future feature can also include the projected trend of the demand of a skill. If a skills forecast is conducted through a similar methodology as the one presented, the results of the skills forecast could be included here as well.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Navigating Changes: How Technology Can Help Empower Bangladeshi Youth in an Evolving Labour Market

Figure 3.5. Industry Overview Main Page Website Mock-Up

Figure 3.6. Industry/Sector Overview Example – Education Industry Website Mock-Up

Figure 3.7. Industry/Sector Overview Analysis Example
Collection
Job and skills data

Data and research to help understand current and emerging skills gaps and the type of jobs people take after training.

Contents
- Data
- Research
- Other resources

Figure 3.8. UK Unit for Future Skills Landing page

Figure 3.9. Nesta’s Skills Taxonomy
• **Coverage:** As the informal sector makes up a significant portion of Bangladesh’s Labour Market, excluding it from the census means the LMIS will not be able to capture a holistic representation of those who work in Bangladesh.

• **Black Swan events:** LMIS and forecasts are effective as they consider the expected direction of industries and jobs; they cannot, however, take into consideration Black Swan events.

### 3.5.2. Future Recommendations

• **Open data:** As developing countries face several barriers to creating LMIS’, to increase capacity and ensure success, a2i may work with several other countries in similar contexts to Bangladesh. By using an open data approach, cooperation with emerging economies could create a sophisticated Forecast, especially when resources are spread thin. This can result in systems serving as a new form of Digital Public Infrastructure.

• **Local Partnerships:** a2i can partner with local private businesses to harness the data they collect. This would enable quicker turnaround in obtaining specific data types, rather than commissioning them from scratch.

• **A simpler methodology:** It is recommended that a2i adapts the methodology above to create an end product that is feasible and helpful for their future.

• **Formalising the informal sector:** By tackling the formalisation of the informal sector a2i can expand their reach to even the most vulnerable populations and provide them with interventions to inculcate them into the formal economy.

Governments around the world will need to prepare their youth towards changes in the labour market. The first step to resolving this policy problem is the creation of a Futures LMIS. These systems provide governments, policymakers, youths and industry with a direction for the future, thus strengthening countries’ commitments to SDGs and ensuring the population responsible for the future course of countries is not left behind.
SELF-ASSESSMENT AND CAREER GUIDANCE

Source: a2i, n.d
4.1. Introduction
With a2i acting as a matchmaking service between youths, SSPs, TSPs, and industry professionals, a2i requested the creation of a self-assessment and career guidance module, with self-assessment revolving around the “process of exploring and evaluating yourself (or your skills, abilities, traits, personality, or performance)” and career guidance referring to the “services which help people of any age to manage their careers and to make the educational, training and occupational choices that are meaningful for them”. This module was commissioned to ensure youths are guided towards optimal reskilling and up-skilling opportunities and are personally and professionally prepared to pursue their chosen career pathways.

The theoretical development of the module was subdivided into contextual and secondary research efforts; primary research efforts (including the interviews and survey); recommendations for module layout; and limitations. Key findings from the literature review (Appendix B) included barriers to obtaining relevant skill sets; lacking career guidance services; and social, cultural, and economic factors being drivers of career choices.

4.2. Interview Analysis
4.2.1. Interviews with Bangladesh-based Experts
Interviews with Bangladeshi career guidance experts, listed in Appendix G, corroborated the trends and concerns surrounding career guidance in Bangladesh unearthed during the literature review. Participants who requested to remain anonymous are referred to as ‘Participant’ followed by their number, e.g., Participant 1.

The main findings from the Bangladeshi interviewees (visualised in Figure 4.1) are as follows:

- An absence of structured career guidance within universities, particularly compared to the UK;
- Youth career pathways are disproportionately influenced by external factors unrelated to the state of the Bangladeshi labour market;
- Limited career guidance counselling for marginalised and rural communities;
- Youths exhibiting skills mismatches with the demands of the Bangladesh labour market;
- And self-assessments being touted by the interviewees.

Many interviewees highlighted weaknesses in existing career guidance structures. Sadman Kabir, a lecturer and a career club advisor at the Bangladesh University of Professionals (BUP), acknowledged the presence of a bi-weekly career club, a career counselling and placement centre, and self-assessment testing at his university. Yet, speaking at the national level, Kabir noted that “youths in Bangladesh...have been deprived of any kind of career guidance.” As per Kabir, youths largely rely on “what their family wants [and] what their friends are doing.”

This was echoed by Mariam Haque Mousumi, a counsellor within an English medium secondary school. Whilst students in her institution benefit from personalised career
guidance, such initiatives were absent during her previous experiences at a Bangla medium school. Additionally, Mousumi and Participant 3 argued that oftentimes parents require career guidance counselling alongside their children to dispel inaccurate understandings of the labour market.

Moreover, whilst Mousumi noted that “Bangladesh is progressing” with respect to aligning labour market trends with career guidance counselling, the majority of youths are not exposed to LMI and consequently pursue career paths based on family or peer recommendations. Additionally, as per Participant 2 (an international education counsellor) families, who are the primary guides of children, frequently favour the prospect of lucrative careers that may be misaligned with the skills and interests exhibited by their children. Worryingly, concerns regarding familial and peer influences on youth career pathways were emphasised by all of the Bangladeshi interviewees.

Universities teaching outdated skill sets were emphasised as a barrier to employment post-graduation. Iqbal Bahar Jahid founded Nijer Bolar Moto Ekta Golpo (Create Your Own Story to Tell Others) to encourage youths to learn leadership, communication, and information and communications technology (ICT) skills that could enable them to pursue entrepreneurship. As per Jahid, universities fail to provide youths with these skills, leading to high unemployment. Skill gaps were further discussed by Participant 3, who argued for an extension of re-skilling and up-skilling opportunities within universities. Similarly, Jahid emphasised the importance of encouraging youths to explore employment prior to, or alongside, their university careers. A noteworthy recommendation given that a handful of interviewees, including Mousumi and Participant 3, emphasised that industries typically reject recent graduates, rather preferring experienced employees. Overall, Jahid poignantly noted that, whilst the high number of unemployed youths in the country is extremely concerning, the vast number of Bangladeshi youths should be considered a “blessing” that motivates government and academic institutions to equip the youths with skill sets most likely to guarantee their professional success.

Figure 4.1 Bangladesh Interview Coding Visualisation
Another concern was barriers to career guidance for marginalised and rural communities. Jahid emphasised that, where public career guidance services are absent, private-sector initiatives are oftentimes too costly for most youths. Mousumi observed that her current counselling experience is positive as the students she works with do not “have many financial problems,” whereas youths that struggle financially may be enrolled in secondary schools with less robust guidance services. Participant 1, an Assistant Director of an Employment Investment Program, noted that costly private universities are more focused on securing employment opportunities for their graduates, whereas such efforts are virtually non-existent for public universities. This guarantees that wealthier students have higher likelihoods of procuring employment than their less fortunate peers.

Moreover, career guidance services are often inaccessible to youths living in rural areas. To counter this, Jahid has recruited participants to his program from all 64 districts of the country. Participant 3 noted that geographic divides also lead to students from smaller, rural towns being driven towards all available employment opportunities, with Kabir commenting that many youths in rural areas do not know what career guidance constitutes. Contrastingly, those living in urban areas have the opportunity to pursue higher-paying jobs, particularly as career guidance services are particularly prevalent in Dhaka.

According to numerous interviewees, career guidance opportunities also vary depending on the gender of the recipient. Dr Mohammad Khasro Miah, a professor at Dhaka’s North South University, acknowledged that gender roles currently influence youth career choices. Similarly, Participant 3 discussed the fact that women often choose “culturally appropriate jobs, such as teaching” or jobs that will allow them to spend time with their families. As per Participant 3, men are contrastingly advised to pursue higher-paying career pathways. This issue can, according to Participant 3, be addressed by raising awareness, particularly amongst older generations, of the ramifications of gender divides. Positively, whilst Mousumi noted that gender divides mean that women are not considered for many roles, she argued that via determination such barriers are gradually being broken, with women working in increasingly more diverse fields.

Another finding was the perceived value of self-assessment tools. Miah emphasised the existence of various online assessments that can assist students in making informed decisions by allowing them to gain valuable insights into their strengths and interests. As per Miah, “these resources are highly beneficial in empowering students to pursue fulfilling and successful futures.” Additionally, Participant 3 noted that one of the key mistakes youths make when pursuing certain career pathways is abstaining from self-exploration via ways that can aid them in identifying their interests. According to Participant 3, universities capitalising on assessment tools can foster “self-awareness, self-confidence, development, [and] personal growth” in youths.

Beyond the main findings, numerous interviewees discussed the fact that their universities capitalise on LMI to inform curricula structures. Kabir recalled the fact that his institution has collaborated with the Unilever CEO and other industry experts to inform their curriculum. Likewise, Miah noted that his institution utilises research on the labour market to ensure that the educational program “remains relevant and aligned.
with industry needs” and “prepares students for the ever-changing job market.” Participant 1 even recommended utilising LMI within the academic curriculum from ages 7-10 to ensure that youths do not grow up with a “superficial understanding of the world.” Given this willingness to utilise LMI, it is arguable that universities would be open to addressing the sustained absence of structured career guidance mechanisms if provided with opportunities for collaboration with a2i.

Other isolated comments included the informality of the labour market, wherein employment largely relies on networking and connections (Participant 1, 2023); the importance of facilitating collaboration between academics and industry experts when designing career guidance initiatives (Jahid, 2023); the tendency of graduates to prioritise high salaries above other characteristics of employment opportunities (Miah, 2023) (Participant 3, 2023); a scarcity of trained career counsellors (Miah, 2023); and the value of developing an app-based version of the NISE platform to encourage youth engagement (Participant 1, 2023).

4.2.2. Interviews with UK-based Experts

Interviews conducted with UK-based experts also resulted in valuable insights. The main findings, visualised in Figure 4.2, are as follows:

- Career guidance services should be promoted to students throughout their university careers to ensure they are prepared prior to graduation;
- Career guidance and LMI should be integrated into the university curriculum to encourage engagement with the available services;
- Youth career pathways are highly influenced by families, peers, and cultural expectations, with this being particularly prevalent amongst international students;
- Youths tend to believe that their career trajectories need to be faultless from the get-go, although career pathways are prone to change as the individual grows personally and professionally and the labour market undergoes transformations;
- Students need to learn how to recognise and articulate skills developed throughout their academic journey when applying for employment opportunities.

Participant 6 (a careers initiative director) argued that the optimal period to begin exposing university students to career guidance is the second term of the first year to “socialise them” and aid them in avoiding the pressures of searching for a career pathway at the last minute. Participant 5 similarly expressed the value of integrating career guidance into a student’s entire academic career, with their recommendations highlighting the importance of focusing on interests in the first year; engaging with employers and networking in the second year; and applying for employment opportunities or internships in the final year.

Additionally, Participants 6 and 5 discussed the recent development of a UK university-based postgraduate assessed elective module focused on providing career guidance and placement opportunities to students, which aims to encourage engagement with career guidance services. As per Participant 5, initiatives based on integrating career guidance into curriculums are particularly important due to the difficulties of ensuring youths hear about available career guidance services.
Participant 4, a careers professional working on the career guidance module, helpfully expanded on its structures. The module, which consists of formative and summative assignments and peer reviews, is a ten-week course comprised of ten taught hours and a self-sourced 70-hour placement. Whilst the course is not designed to offer 1-on-1 guidance, students are taught practical skills; the importance of sustainability and DEI in the workplace; the reality of the future of work; and the skill of creating résumés and cover letters. To ensure students are exposed to expert and up-to-date advice, guest speakers are invited, industry professionals are included on the university’s program boards, and LMI informs the course curriculum. Whilst the module is currently offered solely to postgraduate students, two similar undergraduate modules are currently in the works.

Numerous interviewees also discussed the value of integrating LMI directly into the curriculum and the operations of career guidance services. According to Participant 5, their university’s careers department is extremely data-driven, with annual graduate outcome surveys and other relevant datasets shaping career guidance strategies and sessions. This was corroborated by Participant 7 (a UK-based Careers Consultant) who discussed the presence of a dedicated LMI research team that disseminates their findings via their university’s career news feed. Similarly, Dr Kate Daubney (the Director of the University of London Careers Group) noted that diverse datasets, including from recruiters and concerning employment trends, are utilised to inform operations.

A further crucial finding was the influence of families, peers, and cultural expectations on youth career pathways. Katie Dallison, a UK-based counsellor with 15 years of experience counselling in universities, argued that whilst cultures approach careers in different ways, students often pursue career pathways based on family preferences. Likewise, Daubney, Participant 4, and Participant 5 noted that family and friends are particularly influential, with international students tending to be disproportionately affected by family expectations with respect to selecting their career pathways and their higher education routes. To mitigate this issue, Participant 7 recommended youths initially concentrating on themselves and their specific interests to understand their personality types. Similarly, Dallison suggested that youths need to be offered the space to make their own decisions.
Worryingly, numerous interviewees underscored that youths unnecessarily believe that their career pathways should be immediately certain and thereafter inflexible. Participant 6 noted that students need to be taught to view their careers not as immutable but rather as formed out of a series of stepping stones. Daubney argued that deviations from the ideal career can aid the individual in learning more about themselves, thereby highlighting the value of encouraging youths to be flexible in their career explorations rather than feeling the pressure of having to commit to employment paths from the get-go or, as per Participant 5, limiting themselves to the employment opportunities directly related to their degrees. As per Daubney and Participant 6, those who feel pressured to determine their exact career pathways but are unsure about their aspirations often avoid seeking career guidance. Therefore, within career guidance services it is critical to minimise expectations and stigmas so as to not dissuade students from engaging.

Finally, Participant 7 noted that students frequently approach them with concerns about lacking valuable skill sets required by employers without realising that skills acquired throughout their academic journey are transferable to the work environment. As per Participants 4, 6, and 7, students need to learn to recognise these skills and describe previous applications of said skills to employers. Whilst strategies vary from university to university, to facilitate this within UCL, the careers department utilises the UCL Pillars of Employability, as exemplified in the below figure (see Figure 4.3).

![UCL Pillars of Employability](image-url)
4.3. Survey Analysis

The survey was disseminated to National University Bangladesh students (see Figure 4.4) in July 2023. 132 students, of whom 51.5% self-identified as male, from 6 separate college campuses responded to the survey. The majority (76.4%) of the respondents were aged 18-23 and were studying at the undergraduate level. Having the majority of respondents being undergraduates was particularly useful due to career guidance services being specifically recommended and regarded as crucial at this stage of an individual’s academic career. The majority of the respondents also hailed from tourism & hospitality, finance & banking, business administration, or economics academic backgrounds and consequently were interested in roles related to these fields. This lack of academic and professional interest diversity within the respondent pool highlights the need to repeat the survey with more engagement from youths with varied career interests to provide a more comprehensive image of student perceptions.

![Respondent Age](image1)

![Respondent Areas of Study](image2)

![Respondent Industries of Interest](image3)

Figure 4.4 Demographic Survey Results
Despite aforementioned research efforts indicating a lack of structured career guidance services in Bangladeshi universities, 68.9% of respondents said they were aware of university opportunities for career guidance (see Figure 4.5). The majority (51.6%) of the respondents aware of such initiatives believed that the quality of the services was limiting career choices post-graduation. Interestingly, and slightly contradictory to the quantitative responses, a question enquiring about university capacities to provide career guidance, as perceived by the respondent, resulted in the majority (60.4%) of the qualitative responses having a positive valence and 35.2% having a neutral valence or being non-interpretable.

However, respondents noted that more guidelines for career guidance structures should be developed; additional career guidance professionals need to be recruited; access to the services should be improved and career guidance events should be more frequent as “many students are [currently] deprived of this facility”; internship opportunities and up-skilling courses (specifically English language and ICT courses) should be made available to students; career guidance services should receive additional funding and resources; more 1-on-1 guidance opportunities should be offered; and services should be increasingly digitised.

Whilst responses to the question focused on gender-based differences within career guidance services were limited, one respondent noted that career guidance tends to be gender-specific, with female students receiving different recommendations to their male peers. Interestingly, with one of the partaking institutions being an all-female college, respondents hailing from that college primarily noted the high quality of their career guidance initiatives.

Of the 31.1% of respondents who were unaware of career guidance opportunities at their institutions, 68.3% felt that the lack of career guidance opportunities acted as a barrier for students attempting to start a career post-graduation, whilst 82.9% reported expecting equal career guidance opportunities for all students at university. Whilst the issue may be rooted in poor promotion and a lack of awareness of available career guidance opportunities, the critical takeaway is that a significant number of respondents feel disadvantaged due to inadequacies in the career guidance strategies of their respective universities.

Beyond universities, 38.6% of respondents reported having access to career guidance initiatives offered by external organisations, whilst the remaining respondents either did not have access (53%) or were unaware that such initiatives existed (8.4%). Whilst access exceeds expectations, this finding highlights that the majority of Bangladeshi youth are limited to university-provided career guidance. Moreover, respondents also listed numerous career guidance initiatives they would like to gain access to, including structured and digital career guidance guidelines; soft and hard skills training; job platforms; freelancing, ICT, and digital courses; and placements. Some specifically noted the absence of vital skill development initiatives, particularly ones focused on presentation, the English language; résumé preparation, and technical training. Such responses highlight that many students lack access to some of the most basic features of career guidance.
Navigating Changes: How Technology Can Help Empower Bangladeshi Youth in an Evolving Labour Market

Figure 4.5 Career Guidance Survey Results

With respect to external pressures on career pathways, family and professors were doubtlessly perceived to be the most significant sources of influence, with 43.9% and 34.1% of respondents reporting that families and professors, respectively, influenced their career decisions to a great extent. Whilst peer pressure was identified as prevalent by numerous interviewees, 59.1% of respondents reported that they experienced either very little or no peer pressure with respect to their career choices. The exact extent of the influence of the Internet, meanwhile, was dependent on the respondent, with 40.1% viewing it as not at all or hardly influential, whilst the remainder regarded it as somewhat or extremely influential.

Worryingly, whilst the majority (40.9%) of respondents reported feeling very confident about entering the workforce post-graduation, a significant 19.7% reported feeling only slightly or not at all confident (see Figure 4.6). Likewise, 26.5% of the respondents felt that the skills they learned throughout their academic journey were misaligned with in demand skills. Whilst this could signify the issue of youth inability to identify and articulate skills learned in university, it also underscores the probability of skills mismatches between skills taught within universities and skills required by emerging industries.

The final interesting takeaway is youth awareness of a2i and the NISE platform. 30.3% and 25.8% of respondents knew about a2i and NISE, respectively. With NISE being a recently-launched platform, these findings highlight the fact that awareness of the platform has been spreading relatively fast. However, it is worth noting that only 7.6% of respondents reported utilising NISE to search for employment opportunities, compared to social media being utilised by 72% and Bangladeshi job site bdjobs by 50.8%. This highlights that engagement with the platform remains fairly low. Consequently, a2i should capitalise on
the amplified interest in NISE to encourage engagement with the platform’s features by developing additional partnerships with the Ministry of Education and universities and working towards the recommendations laid out in the ‘NISE implementation in universities’ section.

4.4. Recommendations
The secondary and primary research efforts revealed an absence of structured career guidance initiatives within universities, wherein most youths should traditionally be exposed to career guidance and have underscored the socioeconomic and geographic barriers to accessing non-university career guidance initiatives. Consequently, guidelines for the development of a self-assessment and career guidance module were designed, as outlined below in Tables 4.1 and 4.2. Figures 4.7, 4.8 & 4.9 showcases potential mock-ups of the web pages that take into consideration the user experience (UX) of the module. Additional pages can be found in Appendix R.
Navigating Changes: How Technology Can Help Empower Bangladeshi Youth in an Evolving Labour Market

Figure 4.7 Career Guidance page mock-ups
Icons downloaded from Flaticon (left to right: surang, Freepik, bearicons, and Flat Icons)

Figure 4.8 Self-Assessment page mock-up
Icons downloaded from (left to right): Openclipart (kuba), Wikipedia Commons (Vectortoons), and Flaticon (monkik)

Figure 4.9 Occupational Profiler Test page mock-up
**Table 4.1 Self-Assessment Module Guidelines**

<table>
<thead>
<tr>
<th>Section</th>
<th>Purpose</th>
<th>Layout</th>
<th>UX &amp; Other Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>An introductory section is necessary to summarise the benefits of self-assessment, including its value in guiding users towards suitable employment options.</td>
<td>The page should open with a concise explanation of self-assessment, consisting of purpose, strengths, and expected outcomes.</td>
<td>As the introductory page prefaces the entire self-assessment module, a highly engaging layout - capitalising on graphics, easily-interpretable data visualisations, and success stories - is recommended. Text should be minimal to mitigate user fatigue when utilising the module, particularly due to the fact that subsequent assessment sections of the module are hands-on and will require high levels of concentration.</td>
</tr>
<tr>
<td></td>
<td>In addition, this section might motivate users, who would otherwise prefer to solely utilise the career guidance page, to undergo a self-assessment that would, in turn, provide them with more tailored career guidance.</td>
<td>This should be followed by a process guide, covering the different aspects of the assessment and their unique value in terms of informing the resulting personalised self-assessment report.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Finally, this section will ensure that users comprehend the structure of the subsequent assessments and are able to complete the assessments effectively.</td>
<td>The introductory page should culminate with prompt steering users towards the personality, interests, and skills assessment tests.</td>
<td></td>
</tr>
<tr>
<td>Personality Assessment</td>
<td>A personality assessment section is necessary to aid users in identifying their inherent traits, strengths, weaknesses, and areas for growth, thereby stimulating both personal and professional development.</td>
<td>The assessment will consist of a number of forced-choice questions.</td>
<td>Each assessment should be prefaced with a brief explanation regarding its unique value and contribution to the final personalised self-assessment report. Questions should be presented one-by-one to avoid user confusion or overload. Questions should also be as simple as possible, with clear and concise instructions. They should be broken down as specifically as possible to increase the preciseness of the final report.</td>
</tr>
<tr>
<td></td>
<td>Critically, such an assessment can showcase how alternate personalities are more or less suited to specific employment industries, work environments, and/or available training opportunities.</td>
<td>Questions will focus on various personality traits, including - but not limited to - ability to handle pressure, multitask, organise, socialise, etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Users will have the ability to respond on a strongly agree to strongly disagree scale, with a neutral/unsure option provided.</td>
<td>Users will have the ability to respond on a strongly agree to strongly disagree scale, with a neutral/unsure option provided.</td>
<td></td>
</tr>
</tbody>
</table>
### Interest Assessment

An interest assessment section is necessary to create a comprehensive overview of the user's passions and interests, and indifferences and dislikes.

This can therefore help the user in identifying industries and/or training opportunities that align with their interests, conceivably resulting in improved job satisfaction and work efficiency.

This assessment is also particularly important as it allows users to explore and consolidate their interests, thereby hopefully leading to a minimisation of familial and peer influences on youth career paths.

The assessment will consist of a number of forced-choice questions.

Upon completion of the assessment, users will be provided with a short summary of their interests and a prompt to proceed on to the subsequent assessment.

The navigation of this page should clearly display the industry and all the jobs available within the industry - including the date by which youth must apply. The apply link should open the position in another tab.

Users should have to familiarise themselves with only one job listing format. If the format can be changed to the table layout, wherever jobs are displayed it should be displayed in this format.

There should be a way for users to return to the previous page (sector main page), as well as be able to navigate directly to the industry trends page or skills pages.

### Skills Assessment

A skills assessment section is necessary for users to identify and evaluate their expertise across various sectors. Such an exercise will permit them to map their existing soft and hard skills and visualise how they can feed into different career pathways.

The assessment will consist of a number of forced-choice questions.

Questions will focus on various sectors and their associated skills - e.g. engineering and solving mechanical problems or medicine and performing surgery.

The navigation of the page should be simple and hyperlinked with different research papers.

Documents should be clearly defined and developers should ensure that PDFs are viewable and downloadable.
Moreover, a skills assessment can also pinpoint gaps within a user's skill set, allowing them to seek training, re-skilling, and up-skilling opportunities that can complement their existing skills and prompt professional development.

Both hard and soft skills will be included, particularly as many of the experts interviewed during the course of the research highlighted an absence of critical soft skills. Users will have the ability to respond on a beginner-to-expert scale, with each skill having associated examples of what the beginner, expert, and other answer options constitute. Broad definitions of each level of proficiency will also be provided. This is exemplified in Figure 4.5.

Upon completion of the assessment, users will be provided with a short summary of their skills and a prompt to proceed on to personalised self-assessment report.

There should be a way for users to return to the main sector page, as well as be able to navigate directly to the available jobs or skills pages.

The purpose of the personalised self-assessment report is to consolidate the findings from the personality, interests, and skills assessments in order to provide informed and tailored recommendations regarding both additional training opportunities and possible career pathways.

The report will be divided into five sections: brief summary of all assessments, personality trait findings, interests findings, skills findings, and overall recommendations.

The report will subsequently focus on actionable steps, leading the user to additional self-assessment resources, training opportunities, and the career guidance page.

The report should be visually engaging, pairing simple language with easily-interpretable data visualisations showcasing the unique results of each user and their links with specific career pathways.

The report should be downloadable or emailable to allow users to save the findings. Users should also have the option of linking the findings from the personalised report to their personal NISE platform profile if they wish to showcase their traits, interests, and skills.

An option should be integrated for the user to repeat the three self-assessment tests and contrast and compare their progress and professional development.
Whilst the specific technical build of the module is beyond the scope of the research, it is nevertheless imperative to acknowledge the methodological considerations necessary for a robust technical build. For one, the self-assessment portion of the module relies on three distinct evaluations - personality, interests, and skills - and is complicated by the need to combine the results of each test to produce a comprehensive self-assessment report. There are consequently three recommendations concerning the technical build. Firstly, a2i should examine the possibility of integrating existing self-assessment tests, which have the application programming interface (API) feature, directly into the module to avoid the complex process of designing new tests. The US-based O*Net Interest Profiler, CareerOneStop, and the Truity tests can be assessed as potential collaborators. However, these might be limiting due to them being based on international contexts. A list of available career guidance self-assessment tools can be found in Appendix S.

Secondly, whilst the recommendation is to have distinct tests that result in a self-assessment report informed by the three sets of results, a2i should consider the feasibility of combining the unique results in a way that produces informed career pathway recommendations. For instance, most existing self-assessment tools reviewed throughout the course of this research have concentrated on offering two, rather than three, self-assessment tests - a combined personality and interests one and a skills one - that each result in their own sets of recommendations. Whilst perhaps limiting in terms of comprehensiveness, this technical build is significantly less complex and requires the use of fewer datasets.

Lastly, as discussed in the recommendations for the development of the forecasting module, a2i should endeavor to develop a skills taxonomy database to facilitate the matching of skill sets with specific industries. This would, in turn, simplify the process of producing informed and comprehensive self-assessment reports.
### Table 4.2 Career Guidance Module Guidelines

<table>
<thead>
<tr>
<th>Section</th>
<th>Purpose</th>
<th>Layout</th>
<th>UX &amp; Other Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>An introductory section is necessary to familiarise the user with the</td>
<td>The introductory section should be minimalistic and concise, prioritising a clear explanation of the purposes and nature of the career guidance module.</td>
<td>As the introductory page prefaces the entire career guidance module, a highly engaging layout - capitalising on graphics, easily-interpretable data visualisations, and success stories - is recommended.</td>
</tr>
<tr>
<td></td>
<td>concepts of the labour market and of career guidance, including the</td>
<td>An introductory paragraph should be accompanied by visualisations based on the survey conducted as part of this research in order to highlight both the absence of existing career guidance services within universities and the value for the user of engaging with career guidance initiatives.</td>
<td>Text should be simple to foster understanding and mitigate user fatigue. Clear navigation pointers to the subsequent parts of the page should be included.</td>
</tr>
<tr>
<td></td>
<td>ways in which a self-assessment can be utilised to personalise career</td>
<td>Additionally, a2i should collaborate with existing NISE platform users to gather audiovisual testimonials that can be integrated into the introductory page to reassure new users of the validity of a2i’s career guidance methods.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>guidance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In addition, this section should provide an overview and an orientation</td>
<td>This page should include information on labour market trends, in-demand skills, and employment rates.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of the various components of the career guidance page in order to</td>
<td>Additionally, it should link out to, and provide visualisations of, the forecasting module to showcase the fact that supplied guidance is based upon consistently-gathered data and sustained labour market assessments.</td>
<td>Forecasting visualisations should be interactive and include a search functionality to allow users to customise their view of the provided information.</td>
</tr>
<tr>
<td></td>
<td>engage the user and encourage them to explore the diverse features</td>
<td>Specifically, visualisations of emerging, growing, and faltering</td>
<td>All visualisations should be accompanied by concise, explanatory text and instructions on interpretation.</td>
</tr>
<tr>
<td></td>
<td>offered via the module.</td>
<td>industries should be included, with links out to the ‘virtual work</td>
<td></td>
</tr>
<tr>
<td>Labour Market Overview</td>
<td>An overview of up-to-date labour market information is crucial to</td>
<td>experience’ and ‘education &amp; training opportunities’ sections to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ensuring that users are aware of the fluctuating, and oftentimes</td>
<td>facilitate user exposure to various industries and their respective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>unpredictable, nature of the labour market, particularly under 4IR.</td>
<td>requirements, benefits, and challenges.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Virtual Work Experience Section | This section would enable users to virtually experience typical tasks associated with any given industry or with specific companies. Broadly-speaking, this section would “simulate the real-world experience of starting a career” 61.

With the NISE platform being targeted to youths - many of whom lack prior work experience - a virtual work experience section would aid users in evaluating their suitability for, and enjoyment of, certain employment opportunities.

Moreover, such simulations would offer youths the opportunity to enhance existing skill sets, as well as obtain novel skills, without the pressures associated with finding a physical internship, funding a training course, making errors, or working in-person. |

| Taken from The Forage platform, the attached visualisations showcase the recommended layout for this section. (See Figure 4.8) |

Each virtual work experience is associated with a specific company (e.g. J.P. Morgan), industry (e.g. tech), and job role (e.g. software engineer). Whilst these can be completed at any pace, an estimated time for completion (e.g. 5 hours) is included. (See Figure 4.9)

An overview of the tasks and skills associated with each program should be provided prior to enrolment. Once enrolled, the user should gain access to their program of interest and be provided with the tasks they need to complete. Each task should be accompanied by a difficulty rating and an expected time for completion. (See Figure 4.10)

Post-completion, certificates and integration of the experience into the user’s profile should be offered. |

| Numerous leading companies offer free English-language job simulations, which have been consolidated on websites such as The Forage. Whilst these can be presented to NISE users, their utility is limited due to the language barrier, with only 10-12% of the Bangladeshi population being proficient in English. |

Alternatively, a2i could utilise The Forage format to replicate the type of content offered in Bangla. This could be achieved by leveraging partnerships with Bangladeshi industries and utilising the existing training courses provided by domestic companies to create a selection of such job simulations. Due to the additional workload associated with these experiences, the development of this portion is optional and entirely dependent on a2i’s capacity to collaborate with relevant actors and persuade them to develop experience programs. |

| AI-Powered Career Copilot | The purpose of this section is to provide users with the opportunity to capitalise on cutting edge AI technology to receive personalised career guidance. |

Utilising sophisticated AI and machine learning (ML) methodologies to analyse a diverse array of data points, career copilots can consider an individual’s unique skill set, educational background, hobbies, and professional aspirations to provide vital advice and decision-making support for users. |

The page should begin with a comprehensive ‘About’ section which outlines the basic methodology and reasoning for which youth should choose AI-based career pathing. This should be featured at the top of the page.

Taken from the career copilot website, a clear landing page below the above section should provide details of the copilot’s offerings, with customer testimonials beneath. |

The primary consideration is the relatively novel nature of AI-powered career copilots. Consequently, as with the virtual work experience section, development of this portion of the module is optional and entirely dependent on a2i’s capacity to acquire and deploy the technology. |

If implemented, a2i should take steps to ensure that the use of the career copilot does not interfere with Bangladeshi privacy and data storage standards. |
Such guidance is particularly pertinent for youths requiring guidance with respect to which interests, skills, and industries they should prioritise to augment their probability of achieving professional success.

To foster transparency, the page should also stipulate the limitations and the risks of inaccuracies and bias reproductions associated with career copilots.

Moreover, a2i should carefully evaluate the copilots prior to deployment to assess their accuracy and the accuracy of the datasets they have been trained on; minimise the risk of bias; and ensure their mode of providing guidance is user-friendly and responsive to user follow-up questions.

**Job Search Process & Strategies**

The purpose of this section is to provide the user with best practices and informed guidance on the job search process to boost the user’s chance of success when applying for future employment opportunities.

The section should be subdivided according to the various parts of the job search process, including:
- Assembling a résumé;
- Developing an online professional profile;
- Leveraging your network;
- Researching industries of interest and corresponding companies;
- Assessing and interpreting job descriptions;
- Mapping skill set strengths and gaps to avoid skills mismatches;
- And writing a cover letter.

Each part should include a brief description of the purpose and significance of the part; a checklist for completing each part; and examples of model outputs (e.g. a sample résumé).

The page should also include a ‘frequently asked questions’ (FAQ) page covering common enquiries regarding the job search process. An AI-driven chatbot should also be integrated into this section to answer any unique or individual-specific queries.

To enhance engagement with, and attentiveness to, provided materials, step-by-step checklists should be included for each part, thereby allowing users to tick off important steps as they work through the guide. All example outputs and checklists should also be downloadable.

Whilst text-based recommendations should be utilised, audiovisual content covering tips and strategies from career guidance professionals should be integrated to boost engagement with the content and minimise user fatigue.
Applications & Interviews: Tips & Walkthrough

Whilst the previous section aims to provide users with general tips, this section enables users to master the process of tailoring job applications - including the résumé and cover letters - and participating in job interviews. Moreover, with different industries having varying application processes, this section can aid users in crafting unique applications for the specific industries they are interested in applying for.

This section should be subdivided into two key parts:
- The résumé and cover letter checker, which utilises AI to assess a user's inputs and subsequently provide detailed feedback on their quality and potential improvements.
- The interview preparation section, which should include general tips on interview best practices and common interviewee blunders; types of interviews (e.g. in-person, online, and interviews involving tests); and an overview of popular interview questions and suggested non-individual specific responses. If the AI-powered career copilot discussed above is integrated, AI can also explore the potential of providing users with the opportunity to undergo simulated interview practice.

The page should also include a ‘frequently asked questions’ (FAQ) page covering common enquiries regarding the application and interview process. An AI-driven chatbot should also be integrated into this section to answer any unique or individual-specific queries.

Utilising a user’s self-assessment results, this section should provide personalised recommendations and feedback related to the industries suggested to the user following the self-assessment.

Users who did not complete the self-assessment should be provided with the option to select industries of interest in order to receive relevant guidance specific to those industries.

To boost engagement and minimise user fatigue, audiovisual tutorials should be utilised, particularly within the interview preparation section.

Education & Training Opportunities

This section should provide users with the opportunity to utilise the results of their individual self-assessment tests to both select training, re-skilling, and up-skilling opportunities from those offered via the NISE platform and to discover other relevant education and training opportunities offered by external providers.

Given the overlap between this section and the existing ‘skills’ section already integrated into the NISE platform, the recommendation is to link the ‘skills’ section to the career guidance module. An additional amendment would be to allow users to view the ‘skills’ section - and thereby the available training and education opportunities - in conjunction with the recommendations set out in their self-assessment reports.

The existing web pages for the available training opportunities lack overviews and other critical details - including prerequisites and training methods - about the opportunities. Hence, it is recommended that as much detail as possible is provided for each opportunity to ensure that users are informed prior to enrolment, particularly given that many of the opportunities are not free.
<table>
<thead>
<tr>
<th>Networking Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>This can, in turn, prepare youths seeking employment and boost confidence levels prior to job applications.</td>
</tr>
<tr>
<td>It is also recommended that a ‘funding’ section is developed to allow users to explore existing opportunities to receive government and/or private funding to complete certain training courses.</td>
</tr>
<tr>
<td>This section should provide users with the opportunity to interact with other users, including job seekers, industry professionals, and career guidance experts. Moreover, this section should build on the recommendations provided in the ‘job search process &amp; strategies’ section to issue additional guidance on leveraging and interacting with your network.</td>
</tr>
<tr>
<td>This section should be subdivided into three key parts:</td>
</tr>
<tr>
<td>• Recommendations on networking in a professional and effective manner.</td>
</tr>
<tr>
<td>• A moderated forum to facilitate user discussions.</td>
</tr>
<tr>
<td>• An events section to promote all-access remote and in-person networking opportunities happening throughout Bangladesh.</td>
</tr>
<tr>
<td>To boost engagement and minimise user fatigue, multimedia content - including audiovisual tutorials, podcasts, and infographics - should be utilised to convey the value and the process of networking. The forum should also be easily-searchable and organised according to specific industries and/or skill sets to ensure users can engage with those who share their interests and career pathways.</td>
</tr>
</tbody>
</table>
Navigating Changes: How Technology Can Help Empower Bangladeshi Youth in an Evolving Labour Market

Figure 4.10 Virtual Work Experience Section - Forage Platform

What will you learn?

1. Interface with a stock price data feed
   Interface with a stock price data feed and set up your system for analysis of the data.
   - Practice: Stock market trading
   - Skills: Data analysis, Python, Java

2. Use JPMorgan Chase & Co. frameworks and tools
   Implement the Perspective open source code in preparation for data visualization.
   - Skills: JavaScript, ExpressJS, Web applications

3. Display data visually for traders
   Use Perspective to create a chart for a trading dashboard.
   - Skills: Technical communication, Financial analysis, Web applications

4. Bonus task: Open source contribution
   Make a contribution to Perspective or other open source repositories.
   - Skills: Contributing to open source repositories

Figure 4.11 Virtual Work Experience Steps - Forage Platform

How will you benefit?

- Earn a Certificate: Complete the Software Engineering Virtual Experience and earn a personalized certificate of completion to share with prospective employers and your professional network.
- Be seen by JPMorgan Chase: The profile in your profile is visible to JPMorgan Chase recruiters and can help you stand out in the job market.
- Do it in your own time: Flex your schedule. Log in at your own pace and reach your personal goals.
- Make your resume and LinkedIn stand out: Include this experience on your CV and LinkedIn profile to showcase your practical skills and ambition.

Figure 4.12 Virtual Work Experience Benefits - Forage Platform
Across all aspects of the module, responsive web design should be prioritised to ensure that the pages function similarly on all devices. Additionally, the module should contain opportunities for user feedback to allow users to evaluate their experience with the module, including the module’s usefulness; strengths; weaknesses; accessibility functions; etc. Data gathered from feedback can consequently be utilised to inform subsequent redesigns of the module and optimise the UX.

Instant feedback options should also be embedded into every page of the module to ensure that users can evaluate their experience as they work their way through both self-assessment and career guidance components. Feedback should primarily be gathered via quantitative rating scales and multiple choice questions to facilitate easy data analysis and encourage users to provide feedback. Feedback should also include demographic questions to allow for an analysis of a2i’s user base. An open-ended question should be added to the end to allow for any additional comments. Critically, feedback should be optional and anonymised, to ensure that users feel comfortable submitting their thoughts. Users should also be informed of the ways in which the feedback will be stored and utilised and how any personal data will be safeguarded. Similarly, the existing NISE automated chatbot feature should be integrated into all pages to ensure users can submit enquiries and receive timely responses.

Likewise, both module parts should culminate with an additional resources section, which provides users with further materials. Additional resources should be sorted into categories, including a link to the forecasting module and to training opportunities; external readings, guides and multimedia resources; DEI and employment information; relevant news and blog posts; and a2i events. A Q&A forum should be integrated into the page to ensure users can submit queries concerning the given resources or the broader modules.

If possible, personalised resources should be offered based on the user’s personalised self-assessment report and their recommended career pathways. Content should also be regularly updated to reflect the fast-paced changes in the domestic and international labour market. Resources should be sorted into clear categories, with relevant filters, such as most popular, added. Metadata - including publication year, keywords, and tags - should be added to each resource to optimise user searches. Users should be allowed to rate and review resources, with ratings being informative for other users and acting as content evaluations for a2i.

The module should also prioritise web accessibility within each section to ensure all users, including those with disabilities, are able to engage effectively with the provided content. Some accessibility-related recommendations include utilising alt text to provide written descriptions for images and infographics; including closed captioning and transcripts for audio-visual content; ensuring intuitive navigation; allowing users to toggle the colour contrast and text size and font; providing clear instructions for each portion of the self-assessment module; and verifying that text-based content is concise and easily-understandable. Finally, it is recommended that a search functionality be added to each offered module to ensure that users can effortlessly find the exact information they are seeking by searching for resources utilising specific keywords.
4.5. Conclusion and Limitations of Study

The module is doubtlessly critical in ensuring that NISE platform users are adequately prepared to enter the labour force and begin their professional career journey. Additionally, as discussed in subsequent sections, this module is the basis of the recommendation on how to integrate a2i’s work into the national university curriculum.

However, the module is not without limitations. One methodological limitation is the relatively small and non-nationally representative pool of survey respondents. Whilst the survey was disseminated to National University Bangladesh, an institution boasting 2,000+ campuses and over 2 million students, respondents registered as attending only a handful of the colleges. Moreover, with a2i’s distribution of the survey occurring relatively close to the deadline for receiving results, fewer responses were gathered than anticipated. To address the shortcomings of the survey, the interview process was intensified and a literature review (Appendix B) was conducted to ensure ample data was acquired.

With respect to the interviews, limitations included a language barrier. However, this was addressed via the hosting of interviews on Zoom, where the auto-generated transcripts were corrected by reviewing interview recordings. The digital divide also led to the team largely relying on a2i for the provision of potential Bangladeshi-based interviewees. Whilst slightly limiting due to the small number of contacts, this motivated the team to seek interviews with UK-based experts, a methodological pivot that ultimately provided the team with crucial data on best practices that informed the development of the third part of the project.

On the recommendation side, the complexity of building the recommended three-part self-assessment testing structure could lead to difficulties in producing a comprehensive self-assessment report that considers all three testing outputs, especially their overlaps and impacts on one another. Some approaches to mitigating this issue is to limit the self-assessment to two tests; to offer mini-reports at the end of each test; and/or to utilise existing API-providing self-assessment tools instead of building a unique testing structure.

Mitigating the listed limitations was imperative in ensuring that the module was not only comprehensive, based on precedent, and user-friendly, but also designed in a way that could facilitate its potential integration into the national university curriculum.
NISE IMPLEMENTATION IN UNIVERSITIES
5.1. Introduction
With the NISE platform being developed for the purposes of connecting youths with emerging employment opportunities, a logical expansion of the program should involve partnering more closely with the Ministry of Education and universities to ensure youths are exposed to NISE services prior to graduation. Consequently, the final output of this project revolves around the development of a short to long-term plan for the eventual integration of the NISE platform into the national university curriculum. Alongside being based on the designed modules, this part was informed via findings from a literature review (Appendix C). The review emphasised the benefits of early exposure to Career Development Learning (CDL), which allows students to explore career pathways, gain practical skills, and develop their identities, leading to improved academic and professional performance.64,65,66

5.2. Stakeholder Mapping
Integrating platforms such as NISE can provide numerous benefits to university students to ensure graduating students meet the demand for current and future jobs in the labour market. Theoretical models pertaining to labour demands all present a similar conclusion; to enjoy the benefits of education, students need to be aware of the ever-changing nature of the labour market. Consequently, to acquire the main competencies needed now and in the future of work, the higher education sector plays a pivotal part.67

a2i currently partners with numerous universities on a plethora of projects ranging from providing career guidance, mitigating the effects of the 4IR and partnering with skills providers to ensure that their labour force is shielded from the effects of automation:

- National University, existing under the umbrella of the Ministry of Education (career guidance);
- Bangladesh University of Professionals (career guidance and 4IR);
- Daffodil University (career guidance and 4IR);
- North South University (career guidance and 4IR);
- Bangladesh University of Textiles (4IR);
- The Ministry of Education blended education and skills task force.

To map out the flow of the project, the below project management organogram was created (Figure 5.1)

![Figure 5.1 Project Management flow with key stakeholders](image-url)
## 5.1. Implementation Recommendations

### Short-term Plan, 2023-2025
A short-term strategy should focus on encouraging universities to embrace LMI, self-assessment and career guidance mechanisms, and the evolution of domestic and international labour markets. Given the value of continued development of both a2i’s partnership with the Bangladeshi education department and their collaborations with universities - and relatively few collaborations with Bangladeshi universities - short-term strategies should focus on motivation and optional recommendations, rather than mandated instructions to integrate a2i findings into university curricula. Consequently, short-term strategy recommendations are included in Table 5.1.

### Medium-term Plan, 2025-2029
A medium-term strategy should leverage partnerships created in the short-term to ensure universities have the necessary capacities and are equipped with the required tools to eventually integrate a NISE module into their curricula in the long-term. Activities discussed in the short-term plan should also be continued during this stage. Medium-term strategy recommendations are included in Table 5.2.

### Long-term Plan, 2029-2034
Building on the efforts outlined in the short- and medium-term plans, the long-term strategy should focus on the formation of a compulsory NISE module integrated into the education department’s policy for the university curriculum of all universities. The module should include self-assessment and career guidance; forecasting and LMI; training, up-skilling, and re-skilling opportunities; placement opportunities; engagement with alums and industry professionals; amongst others. Based on secondary research and advice offered by interviewed career guidance experts, the module should be part of the first- and second-year undergraduate curriculum, to ensure that students can digest the information ahead of graduation and seek work experience concurrently with their studies.

Thereafter, students should experience sustained exposure to the resources covered in the module and to career guidance services, including reminders to utilise the NISE platform for additional training courses, professional self-exploration, and career guidance. Most importantly, those who are interested should be able to repeat the self-assessment testing at any point during their academic career. Finally, whilst compulsory evaluations are integrated into the module structure, optional follow-up evaluation surveys should be disseminated to alums who have taken the module to assess the strategy’s impact.

Whilst the exact design of the module should be developed by an interdisciplinary team of education, labour market, self-assessment and career guidance experts, the approximate structure can be seen in Table 5.3.
A2i should create a comprehensive overview of NISE, their findings, their forecasts of labour market transformations, and their recommendations for career guidance within tertiary education institutions.

This guide, alongside a pre-recorded demo showcasing navigation of the NISE platform, should be disseminated to universities throughout Bangladesh to emphasise what a2i can offer students enrolled in universities. As part of this step, a2i should also encourage students to sign up for the platform.

Firstly, a2i should endeavour to create partnerships with the education department to facilitate subsequent collaborations with tertiary education institutions.

Secondly, a2i should collaborate with universities throughout Bangladesh - including those they have already partnered with - and offer the opportunity for a2i employees to organise presentations and/or attend existing career fairs at Bangladeshi universities. As part of the collaborations with the universities, a2i should once again encourage students to sign up for the platform. A2i should also raise awareness of the training courses available on the NISE platform, specifically soft skills courses and self-assessment and application guidance resources. A2i should also offer to conduct internal assessments of universities in order to pinpoint existing gaps within both university career guidance structures and the ways in which universities utilise labour market information to inform their operations.

Finally, a2i should continue developing partnerships with industry professionals and leading companies to broaden the number of training courses and job listings available on the NISE platform.

<table>
<thead>
<tr>
<th>Action</th>
<th>Overview / Purpose</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summarising findings</td>
<td>A2i should create a comprehensive overview of NISE, their findings, their forecasts of labour market transformations, and their recommendations for career guidance within tertiary education institutions. This guide, alongside a pre-recorded demo showcasing navigation of the NISE platform, should be disseminated to universities throughout Bangladesh to emphasise what a2i can offer students enrolled in universities. As part of this step, a2i should also encourage students to sign up for the platform.</td>
<td>• Number of universities contacted. • Number of universities sending follow-up enquiries regarding the NISE platform.</td>
</tr>
<tr>
<td>Developing partnerships</td>
<td>Firstly, a2i should endeavour to create partnerships with the education department to facilitate subsequent collaborations with tertiary education institutions. Secondly, a2i should collaborate with universities throughout Bangladesh - including those they have already partnered with - and offer the opportunity for a2i employees to organise presentations and/or attend existing career fairs at Bangladeshi universities. As part of the collaborations with the universities, a2i should once again encourage students to sign up for the platform. A2i should also raise awareness of the training courses available on the NISE platform, specifically soft skills courses and self-assessment and application guidance resources. A2i should also offer to conduct internal assessments of universities in order to pinpoint existing gaps within both university career guidance structures and the ways in which universities utilise labour market information to inform their operations.</td>
<td>• Willingness of the education department to collaborate with a2i. • Number of partnerships developed with universities. • Number of new students signed up to the NISE platform. • Number of new students enrolling in a2i’s training courses or completing the self-assessment. • Number of new partnerships with industry professionals and leading companies.</td>
</tr>
<tr>
<td>Evaluating existing capacities</td>
<td>A2i should commission annual surveys - similar to the one disseminated as part of this research paper - to evaluate the existing capacities and efforts of Bangladeshi universities and colleges to ensure that their students are well-placed to enter the labour force.</td>
<td>• Results of the annual survey compared to previous iterations, specifically showing increases in awareness of the NISE platform and changes in graduate employment outcomes.</td>
</tr>
</tbody>
</table>
A2I should map gaps in Bangladeshi labour markets, specifically focusing on employment opportunities that are not favoured by recent graduates. These should consequently be communicated to Bangladeshi universities for the universities to offer them to students as placements and/or internships. This would simultaneously address gaps in the labour market and provide university students with valuable experience and skill sets.

| Placement provision | • Number of youths provided with a placement and/or internship.  
|                     | • Number of youths receiving subsequent employment offers as a result of the placement and/or internship.  
|                     | • Number of labour market gaps addressed. |
### Table 5.2 Medium-term plan (2025-2029) Action, Purposes, and Metrics

<table>
<thead>
<tr>
<th>Action</th>
<th>Overview / Purpose</th>
<th>Institution</th>
</tr>
</thead>
</table>
| Faculty and professional training | With numerous experts underscoring the absence of trained career guidance professionals and labour market experts within tertiary education institutions, a medium-term strategy could focus on guaranteeing training opportunities for Bangladeshis interested in working in the field of self-assessment, career guidance, forecasting, and job matching. University employees should be prioritised for recruitment into such training programs. This would have the two-fold benefit of creating new employment opportunities and ensuring that students can receive informed advice from trained professionals. | • Number of newly trained professionals.  
• Evaluation of career guidance services pre- and post- influx of newly trained professionals, with a particular focus on student satisfaction. |
| Facilitating expert-institution partnerships | A2i should focus on introducing career guidance and labour market experts to university faculty to encourage collaborative presentations, fairs, and events co-hosted and co-organised by experts in the field. Such partnerships would also ensure that university faculty gradually becomes more informed on both the changing state of the labour market and on career guidance best practices. | • Number of events hosted per year.  
• Metrics of hosted events, including attendance.  
• Evaluations of university faculty awareness of labour market information pre- and post-initiative.  
• Expert engagement with universities. |
| Training, reskilling, and up-skilling opportunity provision | A2i should utilise the proposed self-assessment and career guidance module, their existing bank of training opportunities, and data on emerging skill sets generated via the forecasting module, to propose training, reskilling, and up-skilling courses to university students. Whilst no courses would be mandated during the medium-term stage, a2i should nevertheless strongly encourage university faculty to disseminate these resources to their students. | • Number of new students signed up to the NISE platform.  
• Number of students completing courses pre- and post-initiative.  
• Student confidence in entering the labour market pre- and post-initiative. |
| Consistent data sharing | A2i should prioritise absolute transparency and data sharing - and ensure accessibility to relevant data sources - to ensure that tertiary education institutions are knowledgeable about the state of the labour market and can utilise available data to inform their existing career guidance services and curricula.  
As part of this, if additional funds are available, a2i should consider allocating more funding and resources to research efforts dedicated to studying the fields of self-assessment and career guidance. | • Tracking number of datasets made available for use by tertiary education institutions and the education department.  
• Tracking use of available datasets, including downloads, applications, and impact.  
• Tracking funding dedicated to self-assessment and career guidance research efforts. |
| **Evaluation** | At the end of the medium-term, a2i should carry out an evaluation of the success of the strategy to date, in terms of bettering the employment outcomes of graduating youths. In particular, the ‘placement provision’ and ‘training, reskilling, and up-skilling’ actions should be evaluated and recent alums should be consulted to ensure that youths are benefiting from their placements and training opportunities.

This stage is critical in proving the effectiveness of a2i’s work with respect to improving graduate employment outcomes and, consequently, in persuading the education department to accept a mandated NISE module within the national university curriculum. |
| --- | --- |
|  | • Data on new NISE users, placements, training course and self-assessment uptake, and graduate employment pre- and post-interventions.  
• Data extracted from the recommended annual student survey showcasing changing attitudes regarding career guidance availability, confidence in entering the labour market, and NISE awareness. |
<table>
<thead>
<tr>
<th>Item</th>
<th>Year/Semester</th>
<th>Purpose</th>
<th>Overview</th>
<th>Formative Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Career</td>
<td>1.2</td>
<td>To provide students with an elementary overview of career guidance,</td>
<td>An introduction to career guidance, including the consequences of lacking</td>
<td>A pre-module survey reviewing student career goals and confidence in securing</td>
</tr>
<tr>
<td>Guidance</td>
<td></td>
<td>including the importance of engaging with career guidance services</td>
<td>career guidance. An overview of the module content covering what students</td>
<td>employment post-graduation. A quiz and/or written assignment testing student</td>
</tr>
<tr>
<td></td>
<td></td>
<td>services to improve their graduate outcomes.</td>
<td>should expect to learn and to gain from completing the module.</td>
<td>understanding of the topics of self-assessment and career guidance.</td>
</tr>
<tr>
<td>Labour Market Overview</td>
<td>1.2</td>
<td>To guarantee that students are familiar with the state of the labour</td>
<td>An introduction to the forecasting module, specifically the novel trends,</td>
<td>A quiz and/or written assignment testing student understanding of the state of the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>market.</td>
<td>disappearing industries, in-demand skill sets, and emerging employment</td>
<td>labour market - particularly as it pertains to their chosen fields of study - and the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>opportunities in Bangladesh.</td>
<td>importance of relying on up-to-date labour market information and practices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>As part of this, important workplace considerations - such as sustainability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and DEI in the workplace - should also be taught.</td>
<td></td>
</tr>
<tr>
<td>Self-</td>
<td>1.3</td>
<td>To foster an environment of self-exploration and self-reflection</td>
<td>An introduction to the self-assessment module and the benefits of</td>
<td>The multi-part self-assessment test designed and disseminated by a2i. Upon completing,</td>
</tr>
<tr>
<td>assessment</td>
<td></td>
<td>amongst students, permitting them to consider interests and industries</td>
<td>completing each part of the test prior to the provision of the test to the</td>
<td>students will be provided with a comprehensive self-assessment report, detailing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>beyond those suggested by their families or peers.</td>
<td>test to the students.</td>
<td>potential industries for exploration and recommended training courses.</td>
</tr>
<tr>
<td>Education &amp; Training</td>
<td>2.1</td>
<td>To aid students in ensuring their skill sets align with the career</td>
<td>A review of the available training opportunities and a discussion regarding</td>
<td>Compulsory completion of at least two training courses offered by a2i.</td>
</tr>
<tr>
<td>Opportunities</td>
<td></td>
<td>pathways they are interested in pursuing and to improve their employment</td>
<td>which may be the most beneficial. For instance, ICT- or STEM-related</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>prospects post-graduation.</td>
<td>training courses may be prioritised for recommendation due to their</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.3 Long-term plan (2029-2034) Action, Purposes, and Metrics
| Job Search Process & Strategies | 2.2 | To encourage students to begin thinking about the principal steps and considerations underlying the job search process. | Teaching of various skills, including:  
- How to identify and articulate existing skill sets.  
- How to write a résumé and a cover letter.  
- How to develop an online professional profile.  
- How to assess and interpret job listings.  
- How to leverage your network. | A developed online professional profile on the NISE platform.  
A mapping of existing skill sets and strengths.  
Written practice cover letters and résumés. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications &amp; Interviews: Tips &amp; Walkthrough</td>
<td>2.2</td>
<td>To supply students with the necessary know-how with respect to successfully applying to employment opportunities.</td>
<td>Students should have the opportunity to interact with an AI-based résumé and cover letter checker prior to submitting a mock application for a job listing. Students should be taught interview best practices prior to undergoing a practice interview session.</td>
<td>Submission of one mock application per student. Completion of one simulated interview per student.</td>
</tr>
<tr>
<td>Networking</td>
<td>2.2</td>
<td>To both teach students the value and practice of networking and provide them with real-life opportunities to make valuable professional connections.</td>
<td>Students should be reintroduced to the concept and value of networking - previously discussed earlier in the semester. Universities should subsequently organise networking events with industry professionals and alums to allow students to grow their professional network.</td>
<td>A written reflection on the value of networking in terms of improving employment prospects post-graduation.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>2.3</td>
<td>To allow for an evaluation of the effectiveness of the module with respect to boosting student awareness of the nature of the labour market and confidence with respect to beginning their careers.</td>
<td>A survey similar in design to the one utilised for this research paper.</td>
<td>A post-module survey reviewing student career goals and confidence in securing employment post-graduation.</td>
</tr>
</tbody>
</table>
5.4. Conclusion and Limitations of Study

Limitations of the Policy Recommendations
The above module outline served as an informed policy recommendation for the integration of NISE into the national university curriculum. Nevertheless, several limitations and risks were identified:

• Changing a university curriculum is a long-term process that requires stakeholder coordination from multiple ministries on a national, provincial, and local level. As public administrations are bureaucratic by nature, timelines given in this research paper may prove insufficient.

• A database where all metrics and datasets are collated is necessary yet requires a high level of maturity in data systems and skilled human capital.

• The above is a high-cost solution requiring a substantial amount of funding from the government.

• Social norms still govern the way Bangladeshi youth choose particular subjects. This policy recommendation rests on the open-mindedness of youth, who may not comply with trying courses that may be out of the norm.

• The recommendation is geared towards university students and consequently, the strategy does not take into consideration individuals not pursuing university education.

The implementation of LMI and effective career guidance into universities is an unabating policy topic. Prior sections of this paper have depicted a myriad of issues youth in Bangladesh face, particularly when it comes to finding employment post-graduation. By aligning LMI and effective career guidance into higher education, Bangladesh can place itself as a global leader in university education, leading to a more content and productive workforce.
CONCLUSION
The NISE platform was developed to provide a resource for the Bangladeshi youth, government and industries to engage with the labour market. It aims to equip the youth with the resources to succeed in their careers, enable data-driven decision-making for government officials to face the 4IR, and provide industries access to shape a national talent pool. These stakeholders work collaboratively through NISE to ensure the Bangladesh labour market supply meets demand.

This study aimed to aid NISE, a2i and Bangladesh along in their mission to proactively prepare for changes to the labour market by building their capacities in data, information and intelligence; educating and empowering the Bangladeshi youth; and bridging the gap between education and employment (see Figure 6.1). Specifically, this meant:

- Designing a futures-focused LMIS for Bangladesh and a Forecasting Module for NISE.
- Understanding the state of career guidance and youth employment in Bangladesh and designing a Career Guidance and Self-Assessment Module for NISE.
- Using the insights of the first two sections to create an implementation plan for integrating NISE and labour intelligence into Bangladeshi universities.

### Figure 6.1 NISE Implementation in Universities: Building Blocks and Methodology

<table>
<thead>
<tr>
<th>Module</th>
<th>Building Blocks</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industry</strong></td>
<td>1. Market Intelligence and analysis</td>
<td>• Comprehensive labour market information systems are the backbone of education and employment strategies.</td>
</tr>
<tr>
<td><strong>Data Analysis</strong></td>
<td>2. Predictions/forecasts of jobs and skills</td>
<td>• The forecast acts as an early warning mechanism to help alleviate potential labour market imbalances, and help leaders make informed decisions.</td>
</tr>
<tr>
<td><strong>and Forecasting</strong></td>
<td></td>
<td>• Forecasting systems can serve as a form of Digital Public Infrastructure leading to increased mobility of the labour force and subsequently as a form of country-to-country capacity building and data sharing.</td>
</tr>
<tr>
<td><strong>Educators</strong></td>
<td>3. Career guidance and navigation tools</td>
<td>• Easily-accessible, comprehensible and inexpensive self-assessment &amp; career guidance initiatives are necessary to safeguard youths as labour markets fluctuate under 4IR.</td>
</tr>
<tr>
<td><strong>Guidance and Curriculum</strong></td>
<td>4. Shifting priorities and program/curriculum changes</td>
<td>• Career guidance structures must be based on initial self-assessments considering the individual’s personality, interests, and skillsets.</td>
</tr>
<tr>
<td><strong>Youth</strong></td>
<td>5. AI-based career knowledge and development tools</td>
<td>• Role of higher education is pivotal in preparing students with the skills needed for employment. Outputs of the forecasts can be used to inform and adapt curriculum to meet future demand.</td>
</tr>
<tr>
<td><strong>Career Empowerment</strong></td>
<td></td>
<td>• Platforms and tools that leverage AI to assist with career development by analysing a person’s existing skills, job market trends, and industry requirements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Providing personalised career recommendations, learning resources, and guidance based on an individual’s skills, interests, and goals.</td>
</tr>
</tbody>
</table>

Navigating Changes: How Technology Can Help Empower Bangladeshi Youth in an Evolving Labour Market
This approach was selected for Bangladesh after discussions with a2i and local experts, where a desire for grassroots change was expressed. Several countries have built forecasts, but to our knowledge, there is a lack of labour market analysis tailored to the youth and with an education lens in mind. This direction enables a longer, forward-looking government agenda that not only prepares the government and informs industries, but provides a clear policy, learning and growth prioritisation for all stakeholders. The coordination enabled by this model ensures the whole country can progress together to meet its future challenges and opportunities: governments will use the LMIS to inform policy; youth will build informed career pathways; industries will drive economic growth; and educators will provide the right knowledge and guidance to advance its nation.

Labour market changes are inherently dynamic, as will be the related policy implications. The emphasis placed on mixed methodologies throughout the study is centred on creating a model that is robust, feasible and replicable for all governments in time. By presenting different modes of analysis and overarching findings of youth goals and priorities, as well as a way to integrate it into national initiatives, the team provides the building blocks for this structural shift. The pulling of these different pillars, when appropriate, denotes a comprehensive strategy (see Figure 6.1).

6.1. Limitations

Whilst the team ensured the analysis and recommendations were well researched, comprehensive and relevant to Bangladesh, there was a reliance on international experts who may not be knowledgeable about the Bangladeshi context; a dependency on existing evidence, tools and technologies; and a limit to the time-frame in which this study could be conducted. These considerations, along with the below, should be reviewed prior to actioning the outputs:

- The study assumed that economies would grow, and jobs would be created. Strategies and initiatives to ensure these factors must be developed and actioned in parallel to the creation of LMIS and career guidance structures.
- Labour market changes are fast-paced, and findings can be quickly outdated; therefore, consistent efforts to update data sources feeding the model are necessary for accuracy.
- The survey questions and number of responses were not comprehensive enough to inform a national strategy, it should be repeated and disseminated further for more diverse and encompassing results.
- Recommendations provided can be costly and time-consuming; they require existing robust analytical, coordination, and delivery capacities to progress forward with the model. Bangladesh and other governments should consider the alternative suggestions made in the paper that are less resource-intensive in the initial stages.
- The study was specifically conducted for a2i and the Bangladesh context, despite there being a global lens. To scale internationally, the country’s context, including domestic resources and constraints, cultural practices, national capabilities and government priorities should be considered.
- The complete impact of AI and automation in many, if not all, of these techniques and recommendations is unknown. It must be monitored and included in the methodologies where necessary and feasible.
6.2. Global Impact & Future Research

Using a global assessment criterion together with a diversity of experts’ insights, our study aims to expand the early stage of NISE into a mature platform, whilst providing a benchmark upon which similar initiatives can expand. An online platform that centralises LMI forecasts, holistic self-assessment tests and career guidance modules is a pilot approach that countries and organisations could use to evaluate its effectiveness in stabilising labour markets and improving youth employment. The following avenues for future research have been identified to increase solutions:

• A comprehensive evaluation of global LMISs and career guidance mechanisms to identify best practices and assess labour opportunities worldwide. This will create an open network of transparency and learning and facilitate migration and international opportunities where beneficial.

• Literature on the intricacies of linking skills with occupations, like the O*NET framework, will be fundamental to accurately predicting emerging skills and incorporating them within an LMIS. Similarly, a standardised method of describing occupations as it relate to a skills taxonomy will further facilitate forecasting.

• A more structured assessment of the national curriculum and career guidance initiatives to enable specific short-term and long-term recommendations for the education sector that can be introduced by countries as and when feasible.

6.3. Final Thoughts

The susceptibility of labour markets to global complexity and emerging technologies, like the current AI-driven automation, constantly threatens a supply and demand imbalance. New skills must be taught and acquired to seize emerging jobs, and education systems must promptly update curricula to teach the labour force accordingly. NISE and a2i’s work to date, along with the recommendations presented in this study, provide a direction for governments to manage these challenges and remain poised to capitalise on opportunities to advance their nations and improve the lives of their citizens through intelligence, coordination and youth empowerment.
REFERENCES


8. Eloundou, T. et al. (2023) GPTs are gpts: An early look at the labor market impact potential of large language models, GPTs are GPTs: An early look at the labor market impact potential of large language models. Available at: https://openai.com/research/gpts-are-gpts


12. NISE. Available at: https://nise.gov.bd/

13. a2i n.d. - (No date) NISE. Available at: https://nise.gov.bd/


https://www.proquest.com/docview/2331556049?accountid=14511&amp;parentSessionId=kv1V31dL5sWHoKwBsHyCBmpa5IlmNMRCzOAMgadNmdIk%3D


77. Foundation for Young Australians. (2016). The New Work Smarts: Ensuring young Australians have skills and experience for the jobs of the future, not the past. Retrieved from


89. V. Peristeras and K. A. Tarabanis, “The connection, communication, consolidation, collaboration interoperability framework (C4IF) for information systems interoperability,” Ibis, vol. 1, no. 1, pp. 61–72, 2006


106. Rana, Amjad (2020) Unsplash. Available at: https://unsplash.com/photos/MrKPi-yajCO

# APPENDICES

## Appendix A – Global Mapping Framework

![Figure A.1 General Global Mapping Framework](image)

<table>
<thead>
<tr>
<th>Continent/Country</th>
<th>Website</th>
<th>Description</th>
<th>Source of Information</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>National Career (<a href="https://www.ncg.gov.in">https://www.ncg.gov.in</a>)</td>
<td>The project is led by the Ministry of Labour (<a href="https://labour.gov.in">https://labour.gov.in</a>) and the Ministry of Skills (<a href="https://skilldevelopment.gov.in">https://skilldevelopment.gov.in</a>)</td>
<td></td>
<td>Their YouTube channel (<a href="https://www.nic.gov.in">https://www.nic.gov.in</a>)</td>
</tr>
<tr>
<td></td>
<td>World Skills India (<a href="https://www.worldskillsindia.org">https://www.worldskillsindia.org</a>)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td>TEDEA (<a href="https://www.tedea.org">https://www.tedea.org</a>)</td>
<td>TESDA is a for-profit organization, The official site of the TEDEA is (<a href="https://tedea.org">https://tedea.org</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>China Jobslink (<a href="https://www.chinajobslink.com">https://www.chinajobslink.com</a>)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>National Centre (<a href="https://www.nationalcentre.gov.au">https://www.nationalcentre.gov.au</a>)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Australian Apprenticeship Service (<a href="https://www.australianapprenticeshipservice.gov.au">https://www.australianapprenticeshipservice.gov.au</a>)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure A.1 General Global Mapping Framework**
<table>
<thead>
<tr>
<th>Country/Country</th>
<th>Website</th>
<th>Description</th>
<th>Labour Market</th>
<th>Search Engine</th>
<th>Tasks/Guides (Self-Assessment)</th>
<th>Social Media</th>
<th>Content</th>
<th>Online Tools</th>
<th>Education</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure A.2 Career Guidance Global Mapping Framework**
Appendix B – Self-Assessment and Career Guidance Literature Review

1.1 Methodology
Bangladeshi youths exhibit particularly high unemployment rates, with 39.6% of those aged 15-24 falling into the Young People not in Education, Employment, or Training (NEET) population category and 46% of graduates from Bangladesh's largest university - the National University Bangladesh - remaining unemployed for at least three years post-graduation. Given these high unemployment rates, the existing mechanisms, as well as failings, of career guidance services in Bangladesh universities are hardly understudied. As a result, a thorough literature review was conducted to pinpoint the most noteworthy aspects of current career guidance initiatives and to consequently inform the methodologies selected to facilitate subsequent primary research efforts. Academic publications were searched for according to the following broad search string executed on both ProQuest and Google Scholar.

("Career guidance" OR "Career counsel*") AND (universit* OR "tertiary education" OR "higher education" OR college) AND ("Bangladesh")

Final publications were chosen according to the inclusion-exclusion criteria in Table B.1. 10 academic publications were ultimately selected for review.

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the publication in English?</td>
<td>Yes: Include</td>
</tr>
<tr>
<td></td>
<td>No: Exclude (unless English copy is available)</td>
</tr>
<tr>
<td>Has the publication been peer-reviewed?</td>
<td>Yes: Include</td>
</tr>
<tr>
<td></td>
<td>No: Exclude</td>
</tr>
<tr>
<td>Does the publication focus on career guidance counselling in Bangladeshi universities?</td>
<td>Yes: Include</td>
</tr>
<tr>
<td></td>
<td>No: Exclude</td>
</tr>
<tr>
<td>Does the publication contain repetitive findings?</td>
<td>Yes: Exclude</td>
</tr>
<tr>
<td></td>
<td>No: Include</td>
</tr>
</tbody>
</table>

1.2 Results
Broadly speaking, the selected publications can be divided into three main argument themes:

1. University students face barriers to obtaining skills relevant to available employment opportunities and emerging industries.
2. Universities lack the career guidance and counselling services necessary to prepare students for employment post-graduation.

3. The career choices of students are significantly driven by social, cultural, and economic factors, rather than solely by personal interests and labour market information.

1.3 Skills Mismatches

With the Bangladesh labour market traditionally relying on the textile, agriculture, shipbuilding, service, and tourism industries, skills related to these industries have dominated educational and training settings. The automation-driven Fourth Industrial Revolution (4IR), however, has inspired an erasure of traditional skills and employment opportunities. This has kick-started the emergence of novel and consistently evolving industries and has consequently created demand for alternate skill sets. Yet, secondary and tertiary educational institutions have failed to keep pace with labour market transformation. As discussed by Alam et al. (2022) in their empirical 437-participant study, whilst graduates are cognizant of the skills required to bolster their employability, they nevertheless “face many obstacles in acquiring these necessary skill development opportunities”. As well as high graduate unemployment rates emphasising the likely prevalence of skills mismatches, graduates surveyed by Alam et al. (2022) exhibit a personal lack of confidence in their skill sets, with approximately ⅓ of respondents acknowledging that they require more development of their soft, hard, and technological skills to “ensure future employment”.

As per Rahman et al. (2021) such skills mismatches result in Bangladeshi companies seeking international talent and thus gatekeep domestic employment opportunities from Bangladeshi youth. The authors therefore argue that an urgent “policy shift” is required to ensure youths are equipped with relevant, in-demand skills that “would make them employable in the fast-changing job market both inside and outside the country”.

Further, as evidenced by Bhattacharya et al. (2021), skills mismatches are one of the primary drivers of youth disengagement with respect to Bangladesh’s development. Interestingly, the paper also discusses the fact that youth unemployment is highest for those who have acquired secondary and tertiary education, and is the lowest for those who have had no formal education. Whilst this is not concretely explained by any given factor, graduate selectivity - as well as overqualification for unskilled employment opportunities - could clarify this statistic. With only ⅓ of “employed graduates report[ing] that they have been able to apply skills learnt in university to their profession,” redesigning curricula to align with the needs of the changing labour market should therefore be a priority.
1.4 Lacking Career Guidance

Existing literature underscores the severe absence of career guidance mechanisms within Bangladeshi universities. Having categorised counselling into four key areas - self-assessments, resource provisions, engagement in the decision-making process, and assisting individuals to be active managers of their career paths - Ahmed et al. (2017) underscore the value of career counselling with respect to shaping a youth’s career path. Yet, their exhaustive review of 72 Bangladeshi universities reveals that 50% of the surveyed public and private universities “do not have career counselling programs”. Broken down by specific career counselling categories, 56% of surveyed universities did not have a career counselling centre, 74% did not have professional career counsellors, 44% had never arranged job or career fairs, 68% did not have internship placement services, 69% did not have job placement services, and 33% did not have an alumni association. Critically, lacking career guidance is not only observed in tertiary education settings, with Hossain and Faisal’s (2013) qualitative study evidencing an absence of “formal program[s] for guidance and counselling” and trained counsellors in secondary schools in Bangladesh.

Such lack of career guidance is directly correlated to youth career development. Ukil et al.’s (2016) survey of final-year Bangladeshi Bachelor of Business Administration (BBA) students revealed that a “lack of career counselling and lack of personal ability significantly affect students’ career”. Consequently, the authors recommend the development of independent or collaborative career guidance initiatives created “in cooperation with external organisations”.

Additionally, the majority (43.3%) of the 120 respondents to Siddiky and Akter’s (2021) study interestingly reported having never “undertaken any career development training”. Whilst career development trainings do not exactly constitute career guidance - nor does their absence necessarily correlate to a lack of career guidance - and although the sample size is small, this finding ultimately led the authors to conclude that:

“There is an urgent need for setting up a career guidance and counselling cell in all private and public universities in Bangladesh...for providing the students with necessary information about career development and present labour market conditions and thereby linking them with the current labour market.”

Looking beyond educational settings, Islam (2017) considers the broader absence of “formal mechanism[s]” and “specialised institution[s]” for career guidance in the country. Consequently, as
discussed further below, Islam (2017) notes that the haphazard and oftentimes minimal career
guidance provided in secondary and tertiary institutions is, as a result, outweighed by external
pressures.56

1.5 External Pressures
Finally, existing literature underscores the influence of external factors on the career choices of
youths, with Islam (2017) noting that, in Bangladesh, “parents diktat their kids, teachers influence their
students, and surrounding environment motivates [students] to belong to a particular group”.56

Considering the social, cultural, and economic environment, including familial expectations, is
certainly unavoidable. Yet, the prevalence of skills mismatches and lack of adequate career guidance
- both discussed above - highlights the likelihood of overreliance on subjective advice, rather than
solely objective labour market information and guidance. As evidenced by Siddiky and Akter (2021),
family preferences are moderately considered, and career prestige is significantly considered, by
students when making their career choices.55 Influences are visualised below in Figure B.1.

![Figure B.1 Factors influencing student career decisions](Taken from (Siddiky and Akter, 2021, p.425)).

These findings are corroborated by Suhi et al.’s (2022) paper on Factors Affecting Social Science
Students’ Career Choices, wherein the authors ascertain that students face familial, social, and
community pressures to “choose a professional career”. The web-based cross-sectional study found that, consequently, age and sex are significant determinants of career choices due to the associated external pressures. Likewise, Tumpa and Zayed’s (2016) survey of 212 respondents determined that career decisions are significantly driven by “family influence”.

1.6 Conclusion
Overall, whilst not exhaustive, the literature review was imperative in aiding the team in identifying central themes, strengths, and limitations with respect to the existing career guidance structures in Bangladesh. This, in turn, simplified the process of designing the interview and survey questions that formed the core of the team’s research and data collection efforts.
Appendix C – NISE Implementation in Universities Literature Review

As part of the study, the team conducted a comprehensive investigation into guiding individuals towards making well-informed career decisions that remain resilient to labour market fluctuations.

The third module specifically focuses on integrating a career guidance module into the university curriculum, as getting early guidance and knowledge is essential to supporting students beginning their career journeys.

To gain insights into existing initiatives and research pertaining to the integration of career development modules into university curricula, an extensive literature review was conducted. This review aims to comprehend the various methodologies employed in this area and provide a solid foundation for the design of the team’s proposed career guidance module. Academic publications were searched for according to the following broad search string executed on ProQuest, Google Scholar and Scopus.

("Integrat*") AND ("Career Development" OR "Career Guidance") AND (universit* OR "tertiary education" OR "higher education" OR college) AND ("Module" OR "Curricul*")

Final publications were chosen according to the inclusion-exclusion criteria in Table C.1. 5 academic publications were ultimately selected for review.

According to research done by Bridgstock et al., 2019, career development learning (CDL) can have co-curricular approaches or can be integrated into the curriculum of academic programs.

The paper has defined CDL as gaining skills and knowledge that are valuable for managing and advancing one's career. CDL is a continuous process of authentic learning, helping individuals understand both the professional world and their own strengths and abilities.76
Table C.1 Inclusion-exclusion criteria for NISE Implementation Literature Review

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Yes</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the publication in English?</td>
<td></td>
<td>Include</td>
</tr>
<tr>
<td>Has the publication been peer-reviewed?</td>
<td></td>
<td>Exclude</td>
</tr>
<tr>
<td>Does the publications include study done in developing nations?</td>
<td></td>
<td>Include</td>
</tr>
<tr>
<td>Does the publication focus on studies conducted in universities or higher education institutions?</td>
<td></td>
<td>Exclude</td>
</tr>
<tr>
<td>Does the publication been published in the last 5-10 years?</td>
<td></td>
<td>Exclude</td>
</tr>
</tbody>
</table>

Advancements in technology, such as automation and ML, along with changes in the job market have transformed how careers progress. Nowadays, most people will have multiple job experiences in their lifetime. Studies show that CDL has a positive impact on employability, leading to better career outcomes for graduates. Early exposure to CDL during degree programs helps students understand potential career paths, builds their professional identities, and fosters engagement with their studies. Different universities adopt various strategies to support graduate employability, with some focusing on developing skills and others offering a range of application-related training and networking opportunities.

Bridgstock et al.,’s research paper discusses a program model for integrating career development into the curriculum. From the first year of their studies, students embark on a process of shaping their career identity. They reflect on their interests, abilities, and values, and apply this emerging identity to real-world experiences, ideally in authentic industry settings with the guidance of industry professionals. This process helps them develop self-management skills for lifelong career development.

They are encouraged to create adaptive career identities, which means having a clear understanding of the job market and themselves, while also being flexible to adapt as needed over time. They explore various career opportunities they may not have considered before and refine their ideas about employment. Additionally, they are taught high-level skills related to career development, empowering them to continue this process on their own.
During this phase, students ask themselves questions like why they chose their course, how their work values align with their career options, which skills they need for their desired career, and how to handle setbacks or changes in the job market.

Once this career identity building process begins, students become more proactive in their learning and strive to acquire the capabilities they need to achieve their personal career goals. As they develop adaptive career identities, they also see the value in building industry-specific knowledge, creating networks, and finding or creating job opportunities.

In the second half of undergraduate courses, the focus shifts towards industry-specific knowledge and practical skills. This includes learning how to build networks within the industry and how to find and secure employment opportunities.

The article further explains how universities incorporate CDL into their course curriculum. It identified a four-step process for integrating CDL, each with its own method of providing career-related information: extra-curricular, co-curricular, curricular-subject level, and curricular-whole of course. Figure C.1 illustrates these approaches.

![Figure C.1 Integration of Career Development Learning into the Curriculum](image)

In this study, different universities had different ways of including CDL in their curriculum. Some treated CDL as optional extra activities outside of regular classes. Others integrated CDL into degree
programs through co-curricular approaches. There were also cases where CDL was present in certain units or subjects, but not fully integrated across the entire course. Lastly, some universities fully integrated CDL as a central part of their degree design.

In another study, the integration of professional knowledge into university curricula was discussed with a focus on incorporating Work-Integrated Learning (WIL) alongside Career Development Modules to improve graduate employability. These measures are being adopted globally, including in countries like Australia, where the 2015 National Strategy for Learning in University Education was established through collaboration with industry, employers, and educational groups. In Canada, the federal government invested 89 million GBP in WIL programs. Similarly, in New Zealand, WIL received significant attention in the Future of Education paper.

WIL involves carefully structuring the learning experiences to provide students with meaningful progression and preparation for their future careers. This may include integrating multiple WIL experiences into a student’s academic career, providing pre-WIL professional preparation, and facilitating post-WIL debriefing and reflection on skill development and professional identity.

Kaider and Bussey (2018) propose a gradual introduction to relevant graduate industry sectors, offering simulation and virtual WIL experiences in earlier years to familiarise students with practice before entering professional settings. It is essential to further develop and research these complex WIL structures, ensuring a continuous progression of increasingly challenging experiences throughout the study.

Effective student preparation before engaging in WIL is crucial and goes beyond merely providing information. It involves actively engaging students with potential scenarios that may impact the quality of their learning experiences. This includes orienting them to practical settings, identifying necessary capacities, clarifying roles and responsibilities, and preparing them for possible challenges. Supporting students to become reflective and proactive learners is an important aspect of effective preparation.

It is crucial to define clear and measurable indicators for Work-Integrated Learning (WIL) to ensure the quality and improvement of the program. Although the challenging aspect of ensuring good quality Work-Integrated Learning (WIL) is that it heavily depends on people, particularly the relationships between individuals within the higher education institution and external organisations.
These relationships are essential for WIL to be effective, but they are not easy to measure or quantify.\(^{66}\)

In another study, a framework was developed to enhance cooperation between universities and industries in preparing a skilled labour force for Industry 4.0.\(^{68}\) It draws inspiration from The C 4 Interoperability Framework (C4 IF), a typology that focuses on integrating organisations through Information Systems.\(^{89}\)

There are three main stakeholder groups in the framework: students and academic staff, awarding bodies and qualifications authority, and employers and employees, as depicted in Figure C.2.

![Figure C.2 Framework for University-Industry Cooperation.\(^{88}\)](image-url)

The goal of the framework is to support various processes that begin with selecting the curriculum and extending throughout an individual's career. These processes are categorised into four main areas: connection, communication, consolidation, and collaboration.\(^{89}\) ‘Connection’ involves identifying stakeholders for further interactions. It includes facilitating connections between
universities and industries for purposes such as recruitment and internships. Communication focuses on exchanging data in agreed formats. The framework ensures a continuous alignment of curricula, occupation qualification standards, and individual competencies based on the needs of the labour market. All stakeholders have access to this valuable information. Consolidation centres on understanding data through interpretation. Stakeholders continuously interpret labour market data acquired through communication processes to grasp the gap between market expectations and opportunities, curricula, and individual competencies. Finally, collaboration involves cooperative processes among stakeholders based on insights gained through consolidation. It includes providing education that meets specific needs, offering career guidance, and developing effective methods for workplace learning.

The framework also incorporates technologies related to Industry 4.0, such as big data, cloud computing, simulation, and improved human-computer interaction tools. These technologies support data-driven systems for decision-making, using competency management systems, learning analytics systems, and knowledge management systems.

In conclusion, the literature review emphasises the significance of Career Development Learning (CDL) and its integration into university curricula. CDL plays a crucial role in equipping students with essential skills and knowledge for their future careers. Early exposure to CDL benefits students by aiding them in exploring career paths, developing adaptive career identities, and engaging effectively in their studies.

Work-Integrated Learning (WIL) further enhances graduate employability by bridging the gap between theoretical learning and practical application. Properly scaffolding WIL experiences and preparing students beforehand contribute to the program’s quality and effectiveness.

Additionally, the review discusses a framework for university-industry cooperation, aiming to align the curriculum with industry needs.

Overall, integrating CDL and WIL into university curricula and fostering collaboration with industries can lead to better-prepared graduates and improved alignment between education and the job market. Embracing these strategies will equip students with the necessary skills, knowledge, and real-world experiences to thrive in their careers.
Appendix D – Interview Questions – Forecasting

INTERVIEW QUESTIONS:
Adapted slightly between industry experts, labour market experts and technical experts in building forecasts

1. You have extensive research under the realm of skills gaps for youth, could you tell us a bit about what got you into this research and any main key takeaways?
2. What is the most effective way to work with governments and industries to meet future skills forecasting objectives?
3. In your opinion what are the biggest hurdles countries are facing in terms of youth employment and digitization and how do these challenges differ in a developing country context?
4. What skills or jobs do you believe will see a boom in the next 3-5 years?
5. What data sources and indicators do you believe are most important when analyzing and predicting future skills for youth and job requirements?
6. How do you ensure the accuracy and relevance of your forecasts over a three-year time frame?
7. How did you go about forecasting what emerging technologies will specifically affect the region you were working in?
8. How do you assess the potential for skills gaps or shortages in specific industries or regions?
9. Are there any limitations you have faced when conducting your particular research? (For example any data gaps that exist)
10. Do you have any country in mind that you believe is conducting this research particularly well?
11. Is there anyone you could refer us to that would have any expertise within our areas?
12. What have you learnt in the last 2-3 years that made your research more meaningful?
Appendix E – Interviewee List – Forecasting

The tables below reflect the list of interviewees who agreed to participate in this study. All experts detailed below are those who have given their permission (via consent forms) for their information to be shared.

Table E.1 List of Forecasting Interviewees

<table>
<thead>
<tr>
<th>Name (listed alphabetically by surname)</th>
<th>Position</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Bowley</td>
<td>Head of the Unit for Future Skills (UK)</td>
<td>The Unit for Future Skills provides decision makers in the skills system with the information they need to invest in the right skills to meet national and local employer needs and support economic growth.</td>
</tr>
<tr>
<td>Dr. Fahmida Khatun</td>
<td>Executive Director at Centre for Policy Dialogue (CPD)</td>
<td>Dr. Khatun is a Bangladeshi economist who focuses on policy analysis and project management.</td>
</tr>
<tr>
<td>Mustafizur Rahman</td>
<td>Distinguished Fellow at the Centre for Policy Dialogue (CPD)</td>
<td>Professor Rahman has carried out a number of research works in the areas of public policy analysis, macroeconomic management, and macro-fiscal-monetary performance of Bangladesh economy. Some of his very recent works have focused on implications of the Covid pandemic on the Bangladesh economy, and Bangladesh’s strategies in view of LDC graduation.</td>
</tr>
<tr>
<td>Syed Yusuf Saadat</td>
<td>Research Fellow at Centre for Policy Dialogue (CPD)</td>
<td>Syed Yusuf Saadat is a Bangladeshi economist currently working at a civil society think tank which promotes inclusive policy making in Bangladesh. Yusuf’s expertise is in assessing economic indicators and policies, analysing data, writing, and teaching.</td>
</tr>
<tr>
<td>Tricia Williams</td>
<td>Director, Research, Evaluation and Knowledge Mobilization</td>
<td>Tricia Williams brings a strong background across anthropology, sociology and economics disciplines to her role as Future Skills Centre’s Director of Research, Evaluation and Knowledge Mobilization. She has particular expertise in the future of work including digital economies, skills development, migration and gender.</td>
</tr>
</tbody>
</table>
Appendix F – Interview Questions – Self-Assessment and Career Guidance

**Bangladeshi Interviewees**

**Bangladesh youth context**
1. Can you share your experience providing career guidance counselling to Bangladeshi youths?
2. In your experience, are there any specific cultural or societal factors in Bangladesh that influence youth career choices?
   a. How should they be addressed?
3. In your experience, what are some common mistakes that youths often make when it comes to choosing their careers?
   a. In your opinion, are these mistakes rooted in the lack of career guidance provided to youths?
4. In your experience, what are the concerns and challenges faced by youths seeking career guidance?
   a. What resources are available to Bangladeshi youth for career guidance counselling, and what challenges have you observed in their utilisation?
   i. If there are any resources lacking, please elaborate on why they are not available.

**Universities career guidance**
2. Can you describe the existing career guidance mechanisms at your university?
   a. How are students currently guided to understand their interests, particularly in terms of career choices?
3. Are there any specific self-assessment tools utilised for personal and career guidance Exploration?
   a. If so, could you suggest any such tools and provide some information about their usage and benefits?
   b. In what ways can personality assessment tools like MBTI (Myers-Briggs Type Indicator) be beneficial for students to make informed decisions about their career paths?

**Labour market**
4. In your experience, how does your university utilise the available information on the labour market and in-demand career options?
   a. Is this information used to shape educational programs?
5. In your experience, how does the changing labour market impact individuals’ career trajectories?
   a. What strategies can universities employ to navigate and adapt to the changing labour market?

6. How do industries generally perceive fresh graduates in terms of the relevancy of their skill sets with respect to the skillsets demanded by leading Bangladeshi industries?
   a. Are there any specific tools or resources available for students to assess and determine their own skill sets? If such tools exist, could you provide some examples and discuss their potential benefits in helping students evaluate their skills for the job market?

7. Does your university provide any training, internship, or up-skilling opportunities to prepare the Bangladeshi youth for emerging employment opportunities?

8. Are you aware of the National Intelligence for Skills, Education, Employment and Entrepreneurship (NISE) platform?
   a. If you are aware of the platform, how do you think NISE could contribute to career guidance in Bangladesh?
   b. What would you like to see NISE offer in terms of career guidance initiatives for Youths?
UK Interviewees

Youth

1. Can you share your experience providing career guidance counselling to youths?
2. In your experience, are there any specific factors (e.g. cultural, societal) that influence youth career choices? How should they be addressed?
3. In your experience, what are some common mistakes that youths often make when it comes to choosing their careers? In your opinion, are these mistakes rooted in the lack of career guidance provided to youths?
4. In your experience, what are the concerns and challenges faced by youths seeking career guidance?
5. Can you describe the existing career guidance mechanisms where you work? How are students currently guided to understand their interests, particularly in terms of career choices?
6. What do you think is the most important point in a student's career when they should be exposed to career guidance?
7. Are there any specific self-assessment tools utilised for personal and career guidance exploration?
8. How can we effectively help students identify their skills and is there a reliable method to assess them?
9. In your experience, how does your university utilise the available information on the labour market and in-demand career options? Is this information used to shape educational programs?
10. In your experience, how does the changing labour market impact individuals' career trajectories? What strategies can universities employ to navigate and adapt to the changing labour market?
11. How do industries generally perceive fresh graduates in terms of the relevancy of their skill sets with respect to the skillsets demanded by leading industries?
12. Does your university provide any training, internship, or upskilling/reskilling?
### Appendix G – Interviewee List – Self-Assessment and Career Guidance

#### Table G.1 List of Self-Assessment and Career Guidance Interviewees

<table>
<thead>
<tr>
<th>Name (listed alphabetically by surname)</th>
<th>Position</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anonymous - Participant 1 (P1)</td>
<td>Assistant Director Executive at a Bangladeshi Development Centre</td>
<td>This interviewee has over 18 years of experience in textile and garment production, academic research and environmental consultancy, as well as liaising between industry and academia for future needs. The interviewee is also running a project for developing skills for executives in the Textile and RMG sector.</td>
</tr>
<tr>
<td>Anonymous - Participant 2 (P2)</td>
<td>Anonymised</td>
<td>This interviewee has experience providing counselling to youths interested in studying or working abroad.</td>
</tr>
<tr>
<td>Anonymous - Participant 3 (P3)</td>
<td>Head of the Tourism and Hospitality Department at a Bangladesh-based college</td>
<td>This interviewee has 12 years experience teaching and working in different tourism and hospitality institutes in Bangladesh and India.</td>
</tr>
<tr>
<td>Anonymous - Participant 4 (P4)</td>
<td>Careers Team Leader at a UK-based university</td>
<td>This interviewee has 12 years experience providing education and career guidance to youths, including developing and leading a career guidance module designed for university students.</td>
</tr>
<tr>
<td>Anonymous - Participant 5 (P5)</td>
<td>Anonymised</td>
<td>This interviewee has 7 years of experience providing career guidance counselling for higher education students and graduates at a UK-based university.</td>
</tr>
<tr>
<td>Anonymous - Participant 6 (P6)</td>
<td>Anonymised</td>
<td>This interviewee has been a careers consultant - working in and overseeing careers departments in multiple UK-based universities - for the past 23 years.</td>
</tr>
<tr>
<td>Anonymous - Participant 7 (P7)</td>
<td>Careers Consultant at a UK-based university</td>
<td>This interviewee has 5 years of experience providing career guidance counselling to students.</td>
</tr>
<tr>
<td>Iqbal Bahar Jahid</td>
<td>Founder of Nijer Bolar Moto Ekta Golpo (Create Your Own Story to Tell Others), an initiative that aims to provide youths with entrepreneurship skills.</td>
<td>Jahid has been running the initiative for the past 5 years and has trained over half a million Bangladeshi youths. He provides entrepreneurial skills training based on 16 subjects and 400 components, to people in 64 districts.</td>
</tr>
<tr>
<td>Katie Dallison</td>
<td>Careers consultant at the career service at Imperial College London.</td>
<td>Dallison has 15 years of experience providing career guidance counselling to students. At Imperial, Dallison works primarily with School of Medicine students.</td>
</tr>
<tr>
<td>Kate Daubney</td>
<td>Director of the University of London Careers Group.</td>
<td>Daubney has 19 years of experience providing careers and employability guidance. Daubney has also overseen the University of London Careers Group since 2020.</td>
</tr>
<tr>
<td>Name</td>
<td>Position and Experience</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Sadman Kabir</td>
<td>Lecturer in the Department of Business Administration - General at Bangladesh University of Professionals (BUP). Kabir has been lecturing at BUP for the past 3 years.</td>
<td></td>
</tr>
<tr>
<td>Dr. Mohammad Khasro Miah</td>
<td>Full-time faculty professor and director of the career centre at the School of Business and Economics at the North South University in Dhaka, Bangladesh. Miah has 17 years of experience teaching in Bangladesh, with his courses including training and development; managerial skills development; and managing high performance. He also supervises internships and/or placements for students.</td>
<td></td>
</tr>
<tr>
<td>Mariam Haque Mousumi</td>
<td>Career guidance counsellor at Bangladesh-based secondary school. Mousumi has over 8 years worth of experience providing career guidance counselling at the secondary education level, both in Bangla- and English-medium schools.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix H – Survey Questions – Self-Assessment and Career Guidance

Career Guidance Survey Questions

BACKGROUND

1. What university are you currently enrolled in?
   a. Open-ended.

2. Which of the following best describes your gender identity? (Optional)
   a. Female
   b. Male
   c. Transgender
   d. Non-binary
   e. Agender
   f. Gender fluid
   g. Gender queer
   h. Prefer not to answer
   i. Other

3. How old are you? (Optional)
   a. 18
   b. 19
   c. 20
   d. 21
   e. 22
   f. 23
   g. Prefer not to answer
   h. Other

4. What level of tertiary education are you currently pursuing?
   a. Undergraduate
   b. Master’s
   c. PhD / Doctorate
   d. Other

5. What is your class year in university?
   a. 1st year
   b. 2nd year
   c. 3rd year
   d. 4th year
   e. Other

6. Which area of study / degree are you pursuing in university?
   a. (Drop-down menu).

7. What industry are you interested in working in following the completion of your studies?
   a. (Drop-down menu).
CAREER GUIDANCE

Definition of career guidance provided (counselling, mentorship, internship, placement)

8. Are you aware of any career guidance initiatives or opportunities that your university offers?
   a. Yes -> routed to question 9, skip questions 13 & 14.
   b. No -> routed to question 13, skip questions 9, 10, 11, & 12.

9. In your opinion, what are the weaknesses and/or limitations of your university’s career guidance initiatives or opportunities?
   a. Open-ended.

10. Do you feel like the quality of the career guidance opportunities at your university is limiting your career options post-graduation?
    a. Yes/no/other.

11. Do you feel like the career guidance you have received at university has been tailored to your specific gender?
    a. Yes/no/other.

12. Please expand on your response to question 12 (Optional).
    a. Open-ended.

13. Do you feel like the lack of career guidance opportunities at your university is limiting your career options post-graduation?
    a. Yes/no/other.

14. Do you wish that your university offered career guidance opportunities to all students?
    a. Yes/no/other.

15. Do you have any opportunities to receive career guidance outside of your university institution?
    a. Yes/no/other.

16. To what extent have other people and other external factors influenced your career decisions?
    b. Options of family, friends, professors, the Internet. Not at all to a great extent scale.

17. Are there any specific opportunities for career guidance that you would like to see on offer, either at your university institution or via external initiatives? (Optional)
    a. Open-ended.
LABOUR MARKET

18. How confident do you feel about entering the workforce post-graduation?
   a. Not at all confident (1) to extremely confident scale (5).

19. Do you have any specific concerns about entering the workforce that you feel are unaddressed by your university?
   a. Open-ended.

20. Do you feel like you have been taught skills that are in-demand and relevant in the current labour market during your university studies?
   a. Yes/no/other.

21. Prior to taking this survey, had you heard of the Aspire to Innovate (a2i) government department?
   a. Yes/no.

22. Prior to taking this survey, had you heard of Aspire to Innovate’s (a2i) NISE platform?
   a. Yes/no.

23. How do you usually find out about job vacancies?
   a. Social Media (e.g., Facebook, Twitter)
   b. LinkedIn
   c. NISE
   d. Friends/relatives
   e. Newspapers
   f. BDJobs
   g. Other

24. How confident are you about the available job types, opportunities, and potential skills in the next 10 years?
   a. Not at all confident (1) to an extremely confident scale (5).

25. Is there anything else you would like to add on this topic? (Optional)
   b. Open-ended.
Appendix I – Underlying Methodology: Initial Research and Framework

Our first steps with respect to data analysis were related to understanding the broader Bangladeshi context, as well as the demographics of NISE platform users, in order to comprehend the specific landscape in which the platform is operating. This initial analysis, based on data provided by our project partner, revealed numerous points of interest that informed our subsequent research strategies and the proposals for project contribution put forth to our project partner. For instance, we discovered:

1. The growing rates of youth unemployment in the country
2. The unequal distribution of females versus males in the Bangladeshi workforce (reflected in the user base of the NISE platform)
3. The lack of NISE users in certain rural provinces; and the understandable under-representation of users on the platform who have completed higher levels of education.

![Figure I.1 Popular industries within each province in Bangladesh](Source: raw data provided by our project partner - a2i, 2019)

Based on this data analysis (Figures I.1, I.2, and I.3), we posed numerous questions to our project partner pertaining to their expectations for growth (with respect to users on the platform); their diversity, equity, and inclusion (DEI) goals; and the gaps they have mapped thus far. Subsequently,
they provided us with a list of modules that they were looking to develop in the near future, some of which would address our questions.

![Number of Respondents from each Province](image)

**Figure I.2 Number of respondents from each province in Bangladesh**
(Source: raw data provided by our project partner - a2i, 2019)

As part of our initial research strategy - based on the list of desired modules provided - we also designed a detailed framework (Figure I.4) that maps similar projects to NISE throughout the world. The mapping was carried out by creating and executing a search strategy, visualised in Table I.1. This
exercise has been useful in expanding our understanding of the necessity of such projects, as well as of the existing landscape of similar initiatives and the capacities of other organisations to fulfil the objectives set forth by our project partner.

The framework allowed for easy analysis of similar projects across the world, with the objective as follows:

- An examination of useful UX/UI characteristics.
- The identification of the sources of information, indicators, and methodologies used for Labour Market Intelligence.
- An assessment of the features alternate platforms is currently offering relative to the features our project partner is interested in integrating into the platform.
- The projects and platforms focused on forecasting emerging employment opportunities.
- Tracked reskilling and upskilling initiatives, education programs integrated into schooling systems, and job matchmaking platforms.

Therefore, alongside highlighting the similarities between NISE and other platforms, this framework underscored potential future avenues of expansion, growth, and development for our project partner.

<table>
<thead>
<tr>
<th>Term</th>
<th>Wider search term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation</td>
<td>Automation; Automation Revolution; Fourth Industrial Revolution; Industry 4.0; Labour Market Transformation; Labour Market Changes; Labour Market Intelligence; Labour Market.</td>
</tr>
<tr>
<td>Skills</td>
<td>Reskilling; Upskilling; Reeducation; Skill Forecasting; Future of Work; Emerging Jobs; Emerging Skills; Employment Pathways; Digital Skills Provision; Skill Anticipation; Vocational Training; Apprenticeships.</td>
</tr>
<tr>
<td>Matchmaking</td>
<td>Employment Matchmaking; Job-Matching; Recruitment Service; Workforce.</td>
</tr>
<tr>
<td>Policy</td>
<td>Policies; Initiatives; Active Labour Market Policies (ALMPS); Safety Net.</td>
</tr>
</tbody>
</table>
1.7 Proposal

Our subsequent research methods were based on the final proposal that we developed to inform our contribution to the project. The proposal consisted of three parts, with parts 1 and 2 running simultaneously and forming the basis of part 3. The parts are outlined below and their underlying methodologies are subsequently discussed in-depth.

1.7.1 Part 1: Developing a forecasting module

This part addressed the primary NISE objectives to accurately map emerging employment opportunities and skill sets, both on the demand- and supply-sides. The audience for this module is all potential NISE users and the specific output will be a forecast of emerging roles that can be utilised by NISE users to inform career paths, investments into specific industries, and the design of training courses.

1.7.2 Part 2: Developing a self-assessment and career guidance module

This part will address the need for guiding youths seeking employment and expressing interests in broadening their skill sets to align with emerging opportunities. The audience for this module is youths utilising the NISE platform and the specific output will be a self-assessment and career guidance module.
1.7.3 Part 3: Creating an implementation plan for integrating NISE into university curricula

This part is a practical, short-term implementation plan report to recommend how the modules developed in Parts 1 and 2 can best be utilised by Bangladeshi university students in their final-year of, or throughout, their university education. The audience for this module is the national university institution, specifically to be utilised by the career counsellors and the output would be a structured plan for executing the integration of NISE work into the education system.
Appendix J – Forecasting Module Methodology

The first component of our proposal is centred around designing a forecasting module. This part addresses NISE’s primary objectives, which are to accurately map emerging employment opportunities and skill sets, based on demand and supply sides considering the eventual automation of sectors mentioned in the initial research. This will enable youth to gear their skilling, university degree and career choices towards jobs that will be available in the future.

The objective for this module was to ensure that a robust methodology is created with a Bangladeshi-specific context. As most of the background research and leading forecasting modules are existent in the Global North, it was pertinent to ensure that the methodology and the eventual design were both feasible and accurate to a Global South context such as that of Bangladesh. Taking this into consideration, the development of the forecast was divided into 5 phases: Research & logistics, interviews, consolidation and analysis of findings (ensuring feasibility is approved with a2i), and finally, creating a forecasting module mock-up.

The first phase; research and logistics, defined our rationale as well as provided insights into global best practices for how countries have implemented forecasting. This included data sources, granularity of the data and number of indicators and data sets utilised. Next, we identified several methodologies for implementation, such as those seen in Singapore, Australia, Canada and the ILO: which provides forecasting services to several countries. This informed our understanding of the different approaches countries can take and how they may differ depending on context. We also identified existing Bangladesh data sources based on open repositories in order for us to gain an understanding on what gaps exist in data.

For interviews, we contacted a range of experts in the following domains:

1. Global Experts who have created forecasting systems;
2. Technical experts;
3. Industry-specific experts; such as Bangladeshi economists and labour market specialists;
4. The a2i working team, to inform us of the feasibility of our proposed methodologies.

All interviewees contacted were those who were reputable in the field. The interviews followed a semi-structured approach, with questions created beforehand (see Appendix D) and the option for interviewees to opt out of answering any questions and all ethical guidelines were adhered to.
interviews enabled us to gain a further understanding of forecasting systems, the context of the youth labour market, emerging technologies and skills that the Bangladeshi youth would require in the future. A list of interviewees who consented to be named in the study can be found in Appendix E.

As a result of the above, the team created a flow diagram outlining the potential methodology a2i might take and implement onto the NISE platform. This was created through an amalgamation of the aforementioned research keeping in mind the feasibility for developing country contexts.
Appendix K – Self-Assessment and Career Guidance Module Methodology

The second component of our proposal revolves around the development of a self-assessment and career guidance module that aims to provide NISE users with:

1. The opportunity to assess personality-related strengths, existing skill sets, and career interests.
2. The opportunity to receive customised career guidance and reskilling and upskilling training - based on the results of the self-assessments - that might otherwise be inaccessible via traditional routes, such as through university or private-sector companies.

The aforementioned objective was to design guidelines for the technical build of such a module, with the guidelines being tailored to the specific Bangladeshi context, both in terms of viable existing and emerging industries and popular educational paths.

As the guidelines relied on both primary and secondary data inputs, their development was divided into five key phases: secondary research and logistics; survey design and distribution; interviews; consolidation and analysis; and brief development on the recommended structure of the module based on the findings. The first three phases each had a distinct methodological approach, as outlined below.

The first phase revolved around contextual research efforts - based on secondary data - to inform the survey and interview design process in a way that would align with the Bangladeshi context. As part of this, Bangladeshi university career guidance initiatives, levels of education, popular subject areas, and student unions and representatives were researched to establish any existing gaps. The findings of this research - which are discussed in the literature and analysis sections - highlighted a lack of structured career guidance initiatives in universities, despite higher education institutions being an optimal environment for the provision of career guidance.

The first phase also included the continued development and utilisation of the mapping framework (Appendix A), in order to assess self-assessment and career guidance initiatives on a global scale in a way that could inform the questions designed for the survey and interviews. Utilising both this secondary domestic and international data, concrete survey and interview objectives were established.
For the survey, youths - specifically university students - were identified as the ideal respondents due to the need to tailor the module to youths and the fact that career guidance initiatives are most commonly found in higher education settings. The primary survey objectives were consequently determined to be the necessity of:

- Unearthing gaps and strengths of existing career guidance structures.
- Pinpointing concerns youths may have with respect to the availability or the quality of career guidance.
- Including with respect to gender-based differences.
- Mapping education route and industry preferences.
- Understanding the prevalence of mismatches between skills taught in higher education institutions and in-demand labour market skills.
- Ascertaining the current awareness of the NISE platform.

The survey was disseminated to youths attending the National University Bangladesh due to the existing relationship between a2i and the university; the high enrolment rate (numbering approximately two million); and the high number of campuses throughout Bangladesh (numbering over 2,000).

For the interviews, Bangladeshi university career guidance counsellors were identified as the ideal interviewees, due to their expertise in the field. Due to the interview period slightly clashing with a university break associated with the Eid al-Adha religious holiday, career guidance experts not associated with universities, as well as counsellors from beyond Bangladesh, were also interviewed to supplement the findings. The primary objectives, which were similar to those associated with the survey, included the importance of understanding career and labour market fluctuations; learning about existing career guidance initiatives, such as workshops and networking events; and gathering recommendations on existing self-assessment tools commonly utilised to inform career guidance. Following the completion of the interview stages, interview results were slated for coding to identify and further assess the primary themes discussed by the interviewees.

Subsequently, the team worked on crafting a draft structure for the career guidance (see Figures K.1 & K.2) and self-assessment module during the first phase, in order to ensure all desired features of the module - selected based on the domestic context and international mapping analyses - would be included in the survey and interview questions designed in phases two and three. Finally, a contingency plan – consisting of conducting a rapid evidence assessment (REA) and utilising other
research produced in phase one – was developed to ensure we had adequate data in the event that
the surveys and/or interviews did not generate sufficient or useful data.

Figure K.1 Draft self-assessment and career guidance module structure.

Phase two focused on the development of the survey. Following a thorough review of both survey
best practices and various survey platforms, Microsoft Forms was selected as the host platform for
the survey. The research conducted in phase one was subsequently utilised to inform the design of
the 26 survey questions (Appendix H). The survey was divided into three sections: background
information (including demographic data), career guidance assessments, and labour market concerns
and awareness. Due to limitations arising out of the language barrier, quantitative responses were
prioritised, whilst open-ended questions were restricted to 4 required and 3 optional questions. The
survey was thereafter forwarded to a2i for dissemination to university students via student unions,
with a July 3rd, 2023 deadline to collect the data and a preference for approximately 2,000 respondents to ensure we had a representative sample.

This aspect of the research was valuable in terms of providing mixed-methods data on the lived experiences of youths, with respect to their opportunities to receive career guidance and adequate preparation for entering the labour force via initiatives that consider the changing nature of the labour market.

Phase three revolved around the development of the interview strategy, with a review of both interview best practices and the research conducted in phase one informing the design of the interview questions and the interview strategy to ensure that interviewees were comfortable during the process and that any ethical concerns were addressed from the outset. 11 primary questions were crafted with an additional 11 sub-questions (Appendix F). However, during the interviews, interviewees were encouraged to be as detailed as possible and to raise any relevant information not directly addressed via the pre-set questions. Interviewees were selected based on recommendations from a2i, as well as mapping research conducted by our team. 13 individuals were ultimately interviewed. A list of interviewees who consented to be named in the study can be found in Appendix G. This phase crucially contributed to our understanding of the existing career guidance structures, including the gaps within current initiatives that counsellors with significant experience have identified themselves.

Overall, the methodological strategy to secure data that could inform the build of a self-assessment and career guidance module was specifically designed to ensure that the most affected stakeholders – youths preparing to enter the labour force and career guidance counsellors – had the opportunity to voice their views on the topic. Grounding our approach to gathering primary data in secondary research ensured that primary research was conducted in the most efficient and relevant, as well as ethical and context-conscious, manner.
Appendix L – Methodology for NISE Implementation in Universities

Lastly, the methodological approach for the third part of our proposal was primarily based on assessing and leveraging the data gathered during the primary and secondary research efforts conducted to inform the design of the forecasting and self-assessment and career guidance modules. To supplement these findings, a literature review focused specifically on the integration of career guidance initiatives into university curricula was executed.

An understanding of a2i’s existing relations with the Ministry of Education and with tertiary education institutions; the interview and survey findings; and the resulting guidelines for the development of the two modules were all critical to ensuring that the proposal for the integration of NISE into university curricula was considerate of the Bangladeshi context and the capacity of a2i to advance the recommendations and was informed by the designs of the existing international initiatives.
## Appendix M – List of Countries’ LMIS

### Table M.1 Labour Market Information Systems by countries

<table>
<thead>
<tr>
<th>Item</th>
<th>Country/Organization</th>
<th>LMIS</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Australia</td>
<td>Jobs and Skills Australia</td>
<td><a href="https://www.jobsandskills.gov.au/">https://www.jobsandskills.gov.au/</a></td>
</tr>
<tr>
<td>2</td>
<td>Austria</td>
<td>JobBarometer</td>
<td><a href="https://jobbarometer.ams.at/en/">https://jobbarometer.ams.at/en/</a></td>
</tr>
<tr>
<td>3</td>
<td>Canada</td>
<td>Job Bank</td>
<td><a href="https://www.jobbank.gc.ca/home">https://www.jobbank.gc.ca/home</a></td>
</tr>
<tr>
<td>4</td>
<td>Canada</td>
<td>Labour Market Information Council</td>
<td><a href="https://lmic-cimt.ca/">https://lmic-cimt.ca/</a></td>
</tr>
<tr>
<td>6</td>
<td>Czech Republic</td>
<td>Kompas</td>
<td><a href="https://www.predikcetrhuprace.cz/">https://www.predikcetrhuprace.cz/</a></td>
</tr>
<tr>
<td>7</td>
<td>Estonia</td>
<td>Tootukassa</td>
<td><a href="https://www.tootukassa.ee/en/barometer/map">https://www.tootukassa.ee/en/barometer/map</a></td>
</tr>
<tr>
<td>8</td>
<td>Estonia</td>
<td>OSKA</td>
<td><a href="https://oska.kutsekoda.ee/en/">https://oska.kutsekoda.ee/en/</a></td>
</tr>
<tr>
<td>9</td>
<td>Finland</td>
<td>Ammattibarometri</td>
<td><a href="http://www.ammattibarometri.fi/">http://www.ammattibarometri.fi/</a></td>
</tr>
<tr>
<td>10</td>
<td>Germany</td>
<td>QuBe Project</td>
<td><a href="https://www.bibb.de/en/11727.php">https://www.bibb.de/en/11727.php</a></td>
</tr>
<tr>
<td>11</td>
<td>Germany</td>
<td>Arbeitsmarktmonitor</td>
<td><a href="https://arbeitsmarktmonitor.arbeitsagentur.de/">https://arbeitsmarktmonitor.arbeitsagentur.de/</a></td>
</tr>
<tr>
<td>12</td>
<td>Italy</td>
<td>Excelsior Information System</td>
<td><a href="https://excelsior.unioncamere.net/en">https://excelsior.unioncamere.net/en</a></td>
</tr>
<tr>
<td>13</td>
<td>Netherlands</td>
<td>AZW</td>
<td><a href="https://www.azwinfo.nl/">https://www.azwinfo.nl/</a></td>
</tr>
<tr>
<td>14</td>
<td>Poland</td>
<td>Portal Pomorskiego Obserwatorium Rynku Pracy</td>
<td><a href="https://www.porp.pl/">https://www.porp.pl/</a></td>
</tr>
<tr>
<td>16</td>
<td>Sweden</td>
<td>arbetsformedlingen</td>
<td><a href="https://arbetsformedlingen.se">https://arbetsformedlingen.se</a> fora-rbetssokande/yrken-och-framtid/hitta-yrkesprognoser/yrkesomraden</td>
</tr>
<tr>
<td>17</td>
<td>USA</td>
<td>Employment Projections</td>
<td><a href="https://www.bls.gov/emp/">https://www.bls.gov/emp/</a></td>
</tr>
<tr>
<td>18</td>
<td>USA</td>
<td>Occupational Outlook Handbook</td>
<td><a href="https://www.bls.gov/ooh/">https://www.bls.gov/ooh/</a></td>
</tr>
</tbody>
</table>
Appendix N – Forecasting and LMIS Case Studies

Table N.1 LMIS Users and Use Cases of Labour Market Information Systems

<table>
<thead>
<tr>
<th>User</th>
<th>Use Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government</strong></td>
<td>Who will create major policy projects based on the information LMIS provides them. This LMI is important to make informed decisions on a national, provincial and local level.</td>
</tr>
<tr>
<td><strong>Individuals / Youth</strong></td>
<td>Can make better career decisions based on the labour market, for short and long term. Optimal LMIS should help individuals manage their careers over their life.</td>
</tr>
<tr>
<td><strong>Counsellors and career facilitators</strong></td>
<td>Will interpret LMIS’ to make informed decisions in order to work with their clients effectively.</td>
</tr>
<tr>
<td><strong>Education and Training Institutes</strong></td>
<td>Require LMIS’ to determine how curriculum design can be changed in order to integrate it with the labour market</td>
</tr>
</tbody>
</table>

Case Study 1: Australia’s Nowcasting

A contraction of Now and Forecasting, the Nowcasting method intends to be a close to real-time prediction of the present, the near future and the recent past. Elaborated by the National Skills Commission, Australia’s Nowcasting provides monthly updates of Australia’s current employment and recent labour market trends by region and occupations. As seen in Table N.2, the data sources used are exclusively quantitative. Their periodicity enables the frequent prediction of Australia’s labour market.

Table N.2 Australia Nowcasting input and output

The Nowcasting information is displayed in a Dashboard within the Jobs and Skills Australia webpage, as seen in Figure N.1. A Geographical Information System (GIS) is used to spatialize the Labour Market Information on the Australian territory.
Case Study 2: Future Skills Centre's Skills Forecasting

The Future Skills Centre from Canada suggests 3 different approaches to forecast emerging skills as shown in Figure N.2. The first approach is a 2-step process:

1. Forecasting employment by occupation
2. Map the aforementioned occupations to skills through a framework linking both, like O*NET does.

The second approach involves using Natural Language Processing (NLP) techniques to extract requested skills from online job posts’ description. Since historical data is needed for forecasting,
online job posts are collected through a period of time to extract skills and aggregate them into category sets. Once historical data has been built, forecasting can be performed.

The last approach predicts skills according to experts’ opinion about future occupation or skills.

Figure N.2 Future Skills Centre’s approaches to forecast skills in demand

Case Study 3: CEDEFOP/ETF/ILO traditional forecasting

In a joint document by CEDEFOP/ETF/ILO, quantitative data sources and models to perform skills and jobs forecasting are described, as shown in Table N.3. The only qualitative input considered to incorporate in quantitative modelling is experts’ judgement.
### Case Study 4: Singapore’s SkillsFuture

The SkillsFuture Singapore agency uses a different approach from the Canadian Future Skills Centre to determine emerging skills. Particularly, it uses a mix of forecast and foresight. To avoid confusion, we understand forecasting as the use of historical data to predict a plausible future while foresight embodies the exploration of possible futures through different means (e.g., scenarios, horizon scanning, roadmaps).

Among the sources of information used by SkillsFuture Singapore, the Industry Transformation Maps (ITMs) elaborated by the Industry Transformation Programme, overseen by the Ministry of Trade and Industry, are a highlight. These ITMs are roadmaps done in collaboration with stakeholders (e.g., employer, trade unions) of 23 industries of the Singapore economy, grouped in 6 clusters. The ITMs outline a vision and goals for each industry.

---

**Table N.3** Forecasting models covered by CEDEFOP/ETF/ILOM

<table>
<thead>
<tr>
<th>Forecast Model</th>
<th>Example</th>
<th>Institution</th>
<th>Use</th>
<th>Data Input</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macroeconomic</strong></td>
<td>SAPPiER II</td>
<td>Dutch Planning Office</td>
<td>Simulate developments on the German labour market</td>
<td></td>
</tr>
<tr>
<td>Interge</td>
<td>German Employment Services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3M3</td>
<td>Cedefop</td>
<td></td>
<td></td>
<td>EUROSTAT</td>
</tr>
<tr>
<td>HERMIN</td>
<td>European Commission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Computable General Equilibrium (CGE)</strong></td>
<td></td>
<td></td>
<td>Demonstrate how a specific scenario on the demand side will influence the volume and structure of employment and, by implication, the demand for education and skills</td>
<td>• Last available input-output table • Data on volume and structure of employment</td>
</tr>
<tr>
<td><strong>Input-output</strong></td>
<td>Lotus [Vietnam]</td>
<td></td>
<td>Builds up macroeconomic forecasts from industry detail and uses the input-output solution at its core</td>
<td></td>
</tr>
<tr>
<td><strong>Inter-industry</strong></td>
<td>Lotus</td>
<td>Ministry of Labour, Invalids and Social Affairs [Vietnam]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Forecasting is performed to identify growth opportunities in the ITMs by analysing job posting’s historical data. Particularly, the demand of a skill is determined based on the number of times a skill is mentioned in job postings’ descriptions. Once the data is validated and refined by experts’ opinions, the output is a bubble chart whose size reflects the growth demand for emerging domains of skills (see Figure N.3). The emerging skills determination from job postings and the expert validation of the demand growth scenarios are an implementation of horizon scanning.

**Figure N.3** SkillsFuture Singapore priority skills bubble chart
Appendix O – Predictive Models to Build a Forecast

**Input-Output Model** (taken directly from the “Guide to Anticipating and Matching Skills and Jobs Volume 2”).

The model procedure can be summarised in the following steps:

a) Calculate the value of each final demand vector (demand of households, government, for products of various industries), using either econometric equations or assumed values;

b) Solve for sectoral output, using the total final demand and input-output matrix;

c) Project labour productivity in sectors using time trends or assumptions;

d) Calculate employment in sectors from production and labour productivity;

e) Project compensation per employee in sectors using equation or assumption;

f) Determine total compensation by sector as a multiple of compensation per employee and number of employees in the sector;

g) Form macroeconomic aggregates, including totals of each final demand and value-added vector, GDP, personal disposable income, total employment, and the unemployment rate;

h) Multiply sector employment by the occupation coefficient matrix to obtain total employment by occupation by sector.
Appendix P – Literature Review Informing Horizon Scanning

A rapid evidence assessment was conducted in order to pinpoint the trends and drivers affecting youth in the Bangladesh labour market. Academic publications were searched for according to the following broad search string executed on Scopus, ProQuest and Google Scholar.

("Automation" OR “AI” OR “Artificial Intelligence” OR "Machine Learning" OR “Future”) AND ("Youth" OR “Student”) AND ("Labour Market" OR “Job” OR "Work") AND ("Bangladesh")

Final publications were chosen according to the inclusion-exclusion criteria in Table P.1. As this serves as a sample for the Horizon Scanning a2i would be conducting, only 5 academic publications were ultimately selected for review.

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the publication in English?</td>
<td>Include</td>
<td>Exclude (unless English copy is available)</td>
</tr>
<tr>
<td>Has the publication been peer-reviewed?</td>
<td>Include</td>
<td>Exclude</td>
</tr>
<tr>
<td>Does the publication focus on the impact of automation and solutions geared towards youth?</td>
<td>Include</td>
<td>Exclude</td>
</tr>
<tr>
<td>Does the publication contain repetitive findings?</td>
<td>Exclude</td>
<td>Include</td>
</tr>
</tbody>
</table>
# Appendix Q – Review of Global Skills Taxonomies

## Table Q.1 Skill Taxonomy Global Best Practices.

<table>
<thead>
<tr>
<th>Skill Taxonomies</th>
<th>Description/Objectives</th>
<th>Methodology</th>
<th>Key takeaways</th>
<th>Limitations</th>
</tr>
</thead>
</table>
| ISCO - International Labor Organization | The International Standard Classification of Occupations (ISCO) is a system used to classify and group data related to occupations. This information is collected through statistical censuses, surveys, and administrative records. | The process of determining a person’s skill level for a particular job is based on their ability to perform the tasks and duties required. Skill level is determined by the complexity and variety of tasks and duties involved in a particular occupation. To gather information on job level and skill, classification codes are assigned to survey responses. | • The hierarchy of the taxonomy is based on skills and then narrowed down to industry and jobs.  
• Can be used internationally regardless of the economic status of a country  
• Available documents by ILO on the step to step process of using ISCO | • The grouping of the skills is based on the range of task regardless the Industry  
• The same title might have a different set of skills and understanding under different industry and work scales (e.g. manager of retail business and small business) |
| O*NET (USA)                     | O*NET is a valuable resource that provides comprehensive information about skills, abilities, work activities, training, and job characteristics for each occupation in the US system. It is the primary source of occupational competency information in the USA and covers the entire labour market. | O*NET is created by gathering data from workers’ self-reported assessments and professional evaluations by job analysts. The data is collected through standardised questionnaires to measure job requirements in 177 elements, across 177 elements, across | • Provides detail for most occupations and measures attributes that capture a broad range of job requirements  
• Provides summary for each job title that includes: What  
• Not updated technology/ ‘computers and electronics’-related knowledge. O*NET lacks granular detail on skills which may be relevant in more detailed applications.  
• Difficulty mapping to other countries qualifications. The ‘level anchors’ within O*NET are not readily comparable |
The taxonomy is regularly updated, easily accessible, and provides robust descriptors of job requirements. It has been compiled over two decades, making it a reliable source of information that is widely used by academics, decision-makers, and society. The Organisation for Economic Co-operation and Development (OECD) also uses it. The significant investment required to produce and update the taxonomy, along with its established usage, contributes substantially to its credibility.

| The European Skills, Competences, Qualifications and Occupations | A European Commission project, first published in 2017. ESCO has separate 'pillars' for categorising and linking occupations, skills and | ESCO measures job requirements and therefore does not capture any direct information about which skills are in demand within | • ESCO presents skills at a more granular level than O*NET  
• ESCO provides a facility to interface with many aspects of | • General technology skills may not be considered sufficiently essential for an occupation and may not be capture  
• Combining ESCO data with Bangladesh data needs technical |
ESCO qualifications. Like O*NET, it draws on job evaluation expert input. However, a key difference is that skills are measured at a very high level of granularity, with around 13,500 distinct skills appearing in a multi-level hierarchy. In practical terms, this lends it a granular emphasis.

The mapping are divided into 3 parts:
1. Occupation: ESCO uses ISCO mappings in order to structure the occupation
2. Skills: Divided into four groupings. Knowledge; Language skills; skills; and transversal skills and competence
3. Qualification: Based on the databases of national qualifications Frameworks that are owned and managed by the European Member States

labour market information, which would potentially provide a powerful integrated tool concerning job mobility or online CVs.

- ESCO data science team using artificial intelligence to automatically maintain the occupation pillar and facilitate cluster analysis using vacancy and qualification metadata

Nesta skills taxonomy (UK) Skill taxonomy developed by Nesta UK that add significant value in two areas: technology skills and specific skills in shortage.

Derived using ‘graph clustering’ analysis of online job adverts in the UK, with skills that appear in the same adverts being placed in the same cluster. Like ESCO, the Nesta taxonomy has many skills (10,500), which are organised in a multi-level hierarchy, also giving this a granular emphasis.

- A wide range of detailed technology skills are available in the Nesta taxonomy
- Nesta taxonomy can reveal the specific skills demanded by employers and give some indication of what is driving any occupational shortage

- The Nesta taxonomy does not include qualifications
- Vacancies do not necessarily result in external recruitment. Hence, employees may be recruited and trained internally to meet demand, which is the case if the external labour market is perceived as unlikely to contain the desired skills
- a high frequency of mentions of jobs (due to adverts) could reflect...
<table>
<thead>
<tr>
<th>Framework</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Skills Framework for the Information Age (SFIA)</strong></td>
<td>A competency framework which describes the skills requirements of digital occupations. It is periodically updated by sector experts but only covers digital skills (ICT Skills). SFIA provides a rich set of descriptors of technology skills which, in theory, would supplement O*NET well.</td>
<td>The SFIA is a good example of open and expert-led frameworks being developed autonomously. The framework is updated every three to four years in a collaborative exercise which brings together industry experts. It is therefore relatively timely and focused on a specific area.</td>
<td>Focuses only on ICT. Use a new set of competencies levels that is not used by other countries.</td>
</tr>
<tr>
<td><strong>The Singapore Skills Taxonomy (SST)</strong></td>
<td>The taxonomy was developed in collaboration with Nesta and uses the same hierarchical clustering approach as the Nesta UK taxonomy. The data used to generate the taxonomy is the SST uses the detailed text set out in Singapore Skills Frameworks (SFws).</td>
<td>Derived using neural network analysis of skills framework documentation. This is similar to the Nesta UK taxonomy in structure but has the advantage of not relying on vacancy data, thus avoiding concerns around representativeness or completeness.</td>
<td>The SFws are developed in collaboration with industry stakeholders and serve practical uses such as career advice and training. The resulting hierarchy has five layers and parallels the Nesta UK taxonomy in terms of</td>
</tr>
<tr>
<td></td>
<td>A detailed mapping for Saudi Arabia has been developed, which links skills requirements to occupation codes.</td>
<td></td>
<td>considerable resource is likely involved in generating and maintaining the frameworks. Significant manual effort would be needed to adapt it to other purposes.</td>
</tr>
</tbody>
</table>

- Using O*NET and periodic update and maintenance from global online vacancies data to create new and emerging occupations.
- an acute shortage of the skill or could reflect it being a popular descriptive term in job adverts.
SFws are detailed frameworks which set out the job descriptions, competencies, work functions, tasks and skill requirements of different occupations within a sector. the focus on classifying technical skills and the partition being defined in terms of occupational skillsets

| Canada Skills and Competencies Taxonomy | A system under development which draws on both O*NET and preceding national skills frameworks, illustrating a hybrid approach. | The taxonomy is used in the Occupational and Skills Information System (OaSIS) which will measure these descriptors of occupations and provide a similar tool with broad applications as O*NET in the USA | The data used and methodology is not open sourced/shared |

Source: Review of Skills Taxonomies, UFS UK (2020)
Appendix R – Mock-up of Self-Assessment and Career Guidance Module Additional Pages

Figure R.1. Mock-up of Self-Assessment and Career Guidance Module – Homepage
Figure R.2. Mock-up of Self-Assessment and Career Guidance Module – Labour Market Information Page
Skills Assessment

A Skills Assessment test measures how well someone can do a specific skill. It has different uses, such as for hiring, training, certification, finding skill gaps, evaluating job performance, education, self-improvement, and understanding competition.

Soft Skills
Soft skills, often referred to as interpersonal or people skills, are a set of non-technical skills and attributes that relate to how individuals interact with others, work in teams, and manage themselves in a professional setting.

Technical Skills
Technical skills, also known as hard skills, are specific and measurable abilities or knowledge related to a particular job, task, or field. Technical skills are essential for performing specific functions and tasks effectively.

Figure R.3. Mock-up of Self-Assessment and Career Guidance Module – Skills Assessment Page
Icons downloaded from Flaticon (from left to right: Freepik, Uniconlabs)
### Table S.1. Self-Assessment and Career Guidance Tools

<table>
<thead>
<tr>
<th>Item</th>
<th>Country</th>
<th>Self-Assessment Test</th>
<th>Description</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Brasil</td>
<td>Orientação Profissional</td>
<td>Do your basic and socio-emotional guidance and receive a complete analysis of your profile, in addition to indications of courses for you.</td>
<td><a href="https://www.mundosenai.com.br/carreira/orientacao-profissional/">https://www.mundosenai.com.br/carreira/orientacao-profissional/</a></td>
</tr>
<tr>
<td>3</td>
<td>Denmark</td>
<td>Erhvervsuddannelseskortet (The vocational training card)</td>
<td>Where does the vocational training take place? Use the map and see where you can take your vocational training.</td>
<td><a href="https://www.ug.dk/erhvervsuddannelseskortet/">https://www.ug.dk/erhvervsuddannelseskortet/</a></td>
</tr>
<tr>
<td>4</td>
<td>Denmark</td>
<td>Future Spin</td>
<td>Future Spin explores your personal traits, thoughts and interests.</td>
<td><a href="https://studievalg.dk/future-spin/">https://studievalg.dk/future-spin/</a></td>
</tr>
<tr>
<td>5</td>
<td>Denmark</td>
<td>JobKompasset (Job Compass)</td>
<td>Choose an area that interests you and see what jobs are available.</td>
<td><a href="https://www.ug.dk/vaerktoej/jobkompasset/">https://www.ug.dk/vaerktoej/jobkompasset/</a></td>
</tr>
<tr>
<td>6</td>
<td>Denmark</td>
<td>Min Kompetencemappe (My Competence folder)</td>
<td>Use the tool, for example, when you need to apply for a new job, or if you need to take part in a competence assessment in connection with applying for a degree.</td>
<td><a href="https://www.minkompetencemappe.dk/">https://www.minkompetencemappe.dk/</a></td>
</tr>
<tr>
<td>7</td>
<td>Denmark</td>
<td>Mine Realkompetencer (My Real Competences)</td>
<td>With the tool Mine Realkompetenzer, you as an education applicant can carry out an indicative competence assessment yourself. This way, even before you apply for admission to a vocational training course, you can get an idea of the possibilities for shortening your training.</td>
<td><a href="https://www.euv25.dk/">https://www.euv25.dk/</a></td>
</tr>
<tr>
<td>No.</td>
<td>Country</td>
<td>Service/Tool</td>
<td>Description</td>
<td>URL</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
<td>--------------</td>
<td>-------------</td>
<td>-----</td>
</tr>
<tr>
<td>8</td>
<td>Denmark</td>
<td>Mit UG - Mine jobforslag (My UG - My job proposals)</td>
<td>In the My job suggestions tool on Mit UG, the student states his wish for a future job and gets a list of job suggestions.</td>
<td><a href="https://www.ug.dk/webform/mine-jobforslag">https://www.ug.dk/webform/mine-jobforslag</a></td>
</tr>
<tr>
<td>9</td>
<td>Denmark</td>
<td>Retningsviseren (The direction indicator)</td>
<td>The direction indicator helps you to see all upper secondary courses and vocational courses that give direct access to a desired higher education. You can also see the courses and programs that require the selection of certain subjects in order to gain access.</td>
<td><a href="https://www.ug.dk/inspiration/retningsviseren">https://www.ug.dk/inspiration/retningsviseren</a></td>
</tr>
<tr>
<td>10</td>
<td>Denmark</td>
<td>Uddannelseszoom (Education zoom)</td>
<td>A digital tool where young people can compare up to three programs on a number of parameters regarding the quality and relevance of the program.</td>
<td><a href="https://www.ug.dk/vaerktoej/uddannelseszoom/">https://www.ug.dk/vaerktoej/uddannelseszoom/</a></td>
</tr>
<tr>
<td>11</td>
<td>France</td>
<td>Quels métiers selon mes goûts ? (What professions do I like?)</td>
<td>Identify your centers of interest and discover the professions in which you could flourish.</td>
<td><a href="https://www.onisep.fr/metier/les-quiz-de-l-onisep/quiz-quels-metiers-selon-mes-gouts">https://www.onisep.fr/metier/les-quiz-de-l-onisep/quiz-quels-metiers-selon-mes-gouts</a></td>
</tr>
<tr>
<td>12</td>
<td>France</td>
<td>Quiz études supérieures (Graduate Studies Quiz)</td>
<td>Introduce you to all these training courses and to help you find the one that suits you.</td>
<td><a href="https://www.onisep.fr/metier/les-quiz-de-l-onisep/quiz-etudes-superieures">https://www.onisep.fr/metier/les-quiz-de-l-onisep/quiz-etudes-superieures</a></td>
</tr>
<tr>
<td>13</td>
<td>France</td>
<td>Quiz secteurs (Quiz sectors)</td>
<td>Identify your centers of interest and discover the professions in which you could flourish.</td>
<td><a href="https://www.onisep.fr/metier/les-quiz-de-l-onisep/quiz-secteurs">https://www.onisep.fr/metier/les-quiz-de-l-onisep/quiz-secteurs</a></td>
</tr>
<tr>
<td>14</td>
<td>India</td>
<td>Video Profile</td>
<td>National Career Service (NCS) Portal now offers the functionality of creation of video profiles for the Jobseekers. Jobseekers can login to their account and go to the &quot;Video Profile&quot; option in the left panel of jobseeker’s dashboard to take them to the video creation platform. Jobseekers can showcase their ability to recruiters using short video clips as videos increase the chances of getting shortlisted by recruiters. Three videos of 20 seconds each can be created dealing with &quot;About Myself, My Skills and Area of Interest&quot;.</td>
<td><a href="https://www.ncs.gov.in/_layouts/15/NCS/P/job-seeker/JsVideoProfile.aspx">https://www.ncs.gov.in/_layouts/15/NCS/P/job-seeker/JsVideoProfile.aspx</a></td>
</tr>
<tr>
<td>15</td>
<td>Ireland</td>
<td>CPIP (Careers Portals Interest-Profiler)</td>
<td>The CareersPortal Interest Profiler (CPIP) is designed to help you discover your career interests, and then compares your results with those of thousands of others in hundreds of occupations.</td>
<td><a href="https://careersportal.ie/members/auth/interests/index.php">https://careersportal.ie/members/auth/interests/index.php</a></td>
</tr>
<tr>
<td>17</td>
<td>UK</td>
<td>Careerometer</td>
<td>Access to labour market information on your own website.</td>
<td><a href="https://www.lmiforall.org.uk/careometer/">https://www.lmiforall.org.uk/careometer/</a></td>
</tr>
<tr>
<td>18</td>
<td>UK</td>
<td>Career Planner</td>
<td>Career Planner matches your skills, motivations and desires to a career that’s perfect for you.</td>
<td><a href="https://www.prospects.ac.uk/planner">https://www.prospects.ac.uk/planner</a></td>
</tr>
<tr>
<td>19</td>
<td>UK</td>
<td>Job Match</td>
<td>Answer questions about what you find interesting, rewarding and purposeful and we’ll match you with our job groups containing more than 400 job profiles.</td>
<td><a href="https://www.prospects.ac.uk/job-match">https://www.prospects.ac.uk/job-match</a></td>
</tr>
<tr>
<td>20</td>
<td>UK</td>
<td>Skillsometer</td>
<td>Users take the quiz, which requires them to reflect on a number of statements and decide what they love, are not sure about or dislike. The statements are presented within six well established occupational categories (Artistic, Realistic, Investigative, Conventional, Enterprising, and Social), which are then ranked against jobs. Once the user has completed the quiz they are given a short list of job suggestions that are most likely to be suited to their own particular skills and interests.</td>
<td><a href="https://www.lmiforall.org.uk/skillsometer/">https://www.lmiforall.org.uk/skillsometer/</a></td>
</tr>
<tr>
<td>21</td>
<td>USA</td>
<td>Interest Assessment</td>
<td>Tell us what you like to do. And what you don’t like to do. We’ll show you careers that fit your interests.</td>
<td><a href="https://www.careeronestop.org/Toolkit/Careers/interest-assessment.aspx">https://www.careeronestop.org/Toolkit/Careers/interest-assessment.aspx</a></td>
</tr>
<tr>
<td>22</td>
<td>USA</td>
<td>Interest Profiler</td>
<td>Help you find out what your interests are and how they relate to the world of work. You can find out what you like to do.</td>
<td><a href="https://www.mynextmove.org/explore/ip">https://www.mynextmove.org/explore/ip</a></td>
</tr>
<tr>
<td>#</td>
<td>Country</td>
<td>Quiz Name</td>
<td>Description</td>
<td>Link</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>23</td>
<td>USA</td>
<td>Skills Matcher</td>
<td>Rate your levels on 40 key workplace skills. We’ll show you careers that match your ratings.</td>
<td><a href="https://www.careeronestop.org/Toolkit/Skills/skills-matcher.aspx">https://www.careeronestop.org/Toolkit/Skills/skills-matcher.aspx</a></td>
</tr>
<tr>
<td>24</td>
<td>USA</td>
<td>Work Values Matcher</td>
<td>The Work Values Matcher is a quick card sort exercise that asks you to rank statements to define your ideal job. Your choices indicate your top values.</td>
<td><a href="https://www.careeronestop.org/Toolkit/Careers/work-values-matcher.aspx">https://www.careeronestop.org/Toolkit/Careers/work-values-matcher.aspx</a></td>
</tr>
<tr>
<td>25</td>
<td>Wales</td>
<td>Career Match Quiz</td>
<td>Career Match Quiz asks questions and generates a list of jobs and careers that are matched to your skills and interests.</td>
<td><a href="https://careerswales.gov.wales/career-match-quiz">https://careerswales.gov.wales/career-match-quiz</a></td>
</tr>
<tr>
<td>26</td>
<td>Wales</td>
<td>The Buzz Quiz</td>
<td>Find out your personality type and what jobs might suit you.</td>
<td><a href="https://careerswales.gov.wales/buzzquiz">https://careerswales.gov.wales/buzzquiz</a></td>
</tr>
<tr>
<td>27</td>
<td>Wales</td>
<td>Who Am I? Quiz</td>
<td>The Who am I quiz is based on the Buzz Quiz personality profile</td>
<td><a href="https://careerswales.gov.wales/who-am-i-quiz">https://careerswales.gov.wales/who-am-i-quiz</a></td>
</tr>
</tbody>
</table>