



**NATIONAL COMPETENCY STANDARDS  
FOR  
SOFTWARE DEVELOPER  
(DIPLOMA)**

**INFORMATION AND COMMUNICATION  
TECHNOLOGY SECTOR**

**TECHNICAL & VOCATIONAL EDUCATION AND  
TRAINING QUALITY COUNCIL  
BHUTAN QUALIFICATIONS AND PROFESSIONALS  
CERTIFICATION AUTHORITY  
THIMPHU, BHUTAN  
DECEMBER 2025**

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## FOREWORD

The TVET Quality Council, BQPCA, is pleased to present the National Competency Standards (NCS) for **Software Developer, Diploma**, developed in collaboration with industry experts and trainers. These standards establish a nationally recognized qualification aligned with international best practices, setting a benchmark for TVET qualifications in Bhutan.

The NCS ensures that trainees acquire the necessary skills, knowledge, and attitude required by industries. Developed through close consultation with experts, it enhances the relevance of training to labor market needs, equipping graduates to meet industry expectations and improving their employability. A strong and responsive TVET system will also make vocational education more attractive to youth.

The Council acknowledges the valuable contributions of industry experts and trainers in the development of these standards. We urge employers and training providers to continue their support in implementing the NCS, fostering a skilled and productive workforce that contributes to national socio-economic development. Moving forward, we look forward to enhanced industry engagement and collaborative efforts in building a quality-assured, demand-driven TVET system.

Director  
BQPCA

## ACKNOWLEDGEMENT

Date of Endorsement : 10<sup>th</sup> December 2025

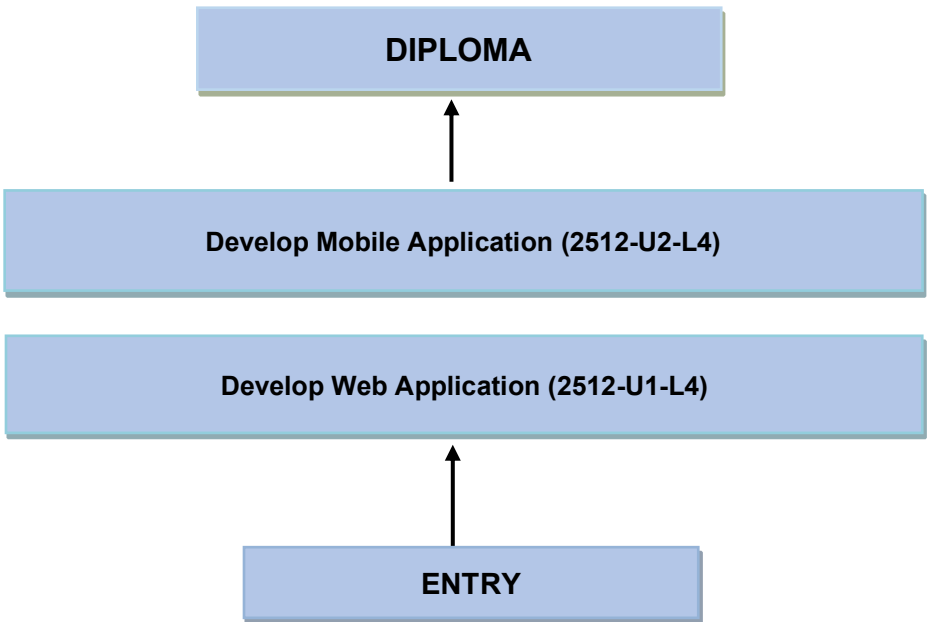
Date of Revision : 9<sup>th</sup> December 2030

The TVET Quality Council, Bhutan Qualifications and Professionals Certification Authority would like to express our deepest appreciation to the following industry and subject matter experts who have participated in development of the National Competency Standards for Software Development:

| Experts involved in the validation of NCS |                      |                          |                      |
|-------------------------------------------|----------------------|--------------------------|----------------------|
| SN                                        | Name                 | Designation              | Organization         |
| 1                                         | Pema Tshering        | CEO                      | DrukSmart            |
| 2                                         | Khusant Chhetri      | TNT Head                 | SELISE               |
| 3                                         | Lalit Pokhrel        | Senior Software Engineer | SELISE               |
| 4                                         | Kinzang Chedup       | Software Developer       | Thimphu TechPark Ltd |
| 5                                         | Krishna Powdyel      | Software Developer       | NGN Technology       |
| 6                                         | Deepak Kumar Ghalley | Software Developer       | Yang Khor Pvt. Ltd   |

| Experts involved in the development of NCS |                 |                              |                      |
|--------------------------------------------|-----------------|------------------------------|----------------------|
| SN                                         | Name            | Designation                  | Organization         |
| 1                                          | Pema Dendup     | Software Developer           | Dragon Coder         |
| 2                                          | Phub Dorji      | Software Developer           | Dragon Coder         |
| 3                                          | Namgay Wangchuk | Software Developer           | Dragon Coder         |
| 4                                          | Dewan Rasailey  | System Analyst               | NGN                  |
| 5                                          | Sameer Pradhan  | Software Development Manager | aBit Private Limited |
| 6                                          | Indra P Sharma  | Software Developer           | Dragon Coder         |

## **PACKAGING OF QUALIFICATIONS**



## OVERVIEW OF THE NCS

| Unit Title                    | Element of Competence                                                                                                                                                          |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Develop Mobile Application | 1.1 Design Mobile Application Interface and work flows<br>1.2 Develop Mobile Application features<br>1.3 Test Mobile Applications<br>1.4 Deploy and update mobile applications |
| 2. Develop Web Application    | 2.1 Design Web Applications<br>2.2 Develop Web-based Components<br>2.3 Test and Deploy Applications                                                                            |

| UNIT TITLE                      | Develop Web Application                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DESCRIPTOR                      | This unit contains competencies required to design web application, develop web-based components and test and deploy the applications                                                                                                                                        |
| CODE                            | 2512-U1-L4                                                                                                                                                                                                                                                                   |
| ELEMENTS OF COMPETENCE          | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                         |
| 1. Design Web Applications      | 1.1 Interpret system design, architecture and <b><i>project documents</i></b><br>1.2 Design database schema/architecture as per the requirement<br>1.3 Design prototype (UI/UX) as per the requirement following standard procedure<br>1.4 Design integration and API schema |
| 2. Develop Web-based components | 2.1 Develop secure and maintainable features using appropriate technology stacks and version control system (VCS)<br>2.2 Perform unit testing and debugging as per the requirement<br>2.3 Integrate external services as per the requirement                                 |
| 3. Test and deploy applications | 3.1 Prepare test scenario and acceptance criteria as per the requirement                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                             |
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|  | 3.2 Test web applications using <b><i>appropriate tools</i></b><br>3.3 Configure and deploy applications to cloud/server environments following standard procedure<br>3.4 Monitor and maintain applications |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>RANGE STATEMENT</b>                                                                                                                                                                                                |                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>Project documents may include but not limited to:</b>                                                                                                                                                              |                                                                                                    |
| <ul style="list-style-type: none"> <li>• SRS</li> <li>• BRD</li> </ul>                                                                                                                                                | <ul style="list-style-type: none"> <li>• PRD</li> </ul>                                            |
| <b>Features may include but no limited to:</b>                                                                                                                                                                        |                                                                                                    |
| <ul style="list-style-type: none"> <li>• Authentication</li> <li>• Dashboard</li> <li>• User management</li> </ul>                                                                                                    | <ul style="list-style-type: none"> <li>• Report</li> <li>• Search</li> <li>• Pagination</li> </ul> |
| <b>Technology stack may include but not limited to:</b>                                                                                                                                                               |                                                                                                    |
| <ul style="list-style-type: none"> <li>• Back-end</li> <li>• Front-end</li> </ul>                                                                                                                                     | <ul style="list-style-type: none"> <li>• APIs</li> </ul>                                           |
| <ul style="list-style-type: none"> <li>• <b>Appropriate tools may include but not limited to:</b></li> </ul>                                                                                                          |                                                                                                    |
| <ul style="list-style-type: none"> <li>• Automated</li> </ul>                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Manual</li> </ul>                                         |
| <b><i>Critical Aspects</i></b>                                                                                                                                                                                        |                                                                                                    |
| <ul style="list-style-type: none"> <li>• Competencies to apply occupational health and safety procedures</li> <li>• Competencies in developing web applications</li> <li>• Competencies in troubleshooting</li> </ul> |                                                                                                    |

| UNDERPINNING KNOWLEDGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | UNDERPINNING SKILLS                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Ethics and Integrity</li> <li>• SRS – Software Requirement Specification</li> <li>• BRD-Business Requirement Document</li> <li>• Design Principles</li> <li>• Methodologies-agile/scrum</li> <li>• Basic System Administration (Linux fundamentals)</li> <li>• Object-Oriented Programming (OOP) principles</li> <li>• Secure Coding Practices (OWASP)</li> <li>• Data structure and algorithm</li> <li>• Server architecture</li> <li>• Web standards and best practices</li> <li>• Responsive design and mobile-first approach</li> <li>• Frameworks and programming language</li> <li>• UI/UX design principles, wireframing, and accessibility</li> <li>• UML Diagram</li> <li>• Application architecture patterns (MVC, MVVM, RESTful services)</li> <li>• Session and state management</li> </ul> | <ul style="list-style-type: none"> <li>• Team Work</li> <li>• Communication</li> <li>• Problem Solving</li> <li>• Interpersonal Relationship</li> <li>• Creativity</li> <li>• Time Management</li> <li>• Innovation</li> <li>• Entrepreneurship</li> <li>• Growth oriented</li> </ul> |

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| <ul style="list-style-type: none"> <li>• Authentication &amp; authorization methods(OAuth/JWT, Input validation)</li> <li>• Type of databases</li> <li>• Database query optimization</li> <li>• Lazy loading, pagination, and asynchronous processing</li> <li>• CRUD Operation and data validation</li> <li>• Command prompt</li> <li>• REST API and Third-party API integration</li> <li>• Web services and microservices concepts</li> <li>• JSON/XML data formats</li> <li>• Sanitization and encryption</li> <li>• Protection against common attacks (XSS, SQL injection, CSRF)</li> <li>• Debugging and testing tools</li> <li>• Web hosting concepts and domain management</li> <li>• Continuous Integration/Continuous Deployment (CI/CD) pipelines</li> <li>• Version control (Git)</li> </ul> |  |
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| <ul style="list-style-type: none"><li>• Cloud platforms and containerization basics (Docker)</li><li>• Error logging and monitoring tools</li><li>• User behavior tracking (Google Analytics, Mixpanel)</li><li>• Middleware concepts</li><li>• Competitive programming</li><li>• Prompt engineering</li><li>• Desktop Applications</li></ul> |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

| UNIT TITLE                             | Develop Mobile Application                                                                                                                                                                                                                                     |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DESCRIPTOR                             | This unit contains competencies required to design, develop, test and deploy mobile applications                                                                                                                                                               |
| CODE                                   | 2512-U2-L4                                                                                                                                                                                                                                                     |
| ELEMENTS OF COMPETENCE                 | PERFORMANCE CRITERIA                                                                                                                                                                                                                                           |
| 1. Design Mobile Applications          | 1.1 Interpret system design, architecture and <b>project documents</b><br>1.2 Design prototype (UI/UX) as per the requirement following standard procedure<br>1.3 Prepare and maintain <b>project documents</b><br>1.4 Design Prototype as per the requirement |
| 2. Develop Mobile Application features | 2.1 Develop secure and maintainable features using appropriate technology stacks and version control system (VCS)<br>2.2 Perform unit testing and debugging as per the requirement<br>2.3 Integrate external services as per the requirement                   |
| 3. Test Mobile Applications            | 3.1 Collect reviews and feedbacks from users<br>3.2 Fix bugs using debugging tools<br>3.3 Resolve performance, security, and compatibility issues                                                                                                              |
| 4. Deploy Mobile Applications          | 4.1 Publish applications on app store following standard procedure<br>4.2 Enhance mobile applications as and when required                                                                                                                                     |

|  |                                                  |
|--|--------------------------------------------------|
|  | 4.3 Perform troubleshooting as and when required |
|--|--------------------------------------------------|

| RANGE STATEMENT                                                                                                                                                                                                                                                                                           |                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <b>Project documents may include but not limited to</b>                                                                                                                                                                                                                                                   |                                                              |
| <ul style="list-style-type: none"> <li>• SRS</li> <li>• PRD</li> </ul>                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• BRD</li> </ul>      |
| <b>Technology stacks may include but not limited to</b>                                                                                                                                                                                                                                                   |                                                              |
| <ul style="list-style-type: none"> <li>• Framework</li> </ul>                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Language</li> </ul> |
| <b><i>Critical Aspects</i></b>                                                                                                                                                                                                                                                                            |                                                              |
| <ul style="list-style-type: none"> <li>• Demonstrate competencies to follow occupational health and safety procedures</li> <li>• Demonstrate competencies in development of mobile application features</li> <li>• Demonstrate competencies in troubleshooting at all phase of app development</li> </ul> |                                                              |

| UNDERPINNING KNOWLEDGE                                                                                                                                                                                                                                                                                                              | UNDERPINNING SKILLS                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Ethics and Integrity</li> <li>• (SRS – Software Requirement Specification)</li> <li>• BRD-Business Requirement Documents</li> <li>• Security-OAuth/JWT, Input validation, OWASP</li> <li>• Data structure and algorithm</li> <li>• Object-Oriented Programming (OOP) principles</li> </ul> | <ul style="list-style-type: none"> <li>• Team Work</li> <li>• Communication</li> <li>• Problem Solving</li> <li>• Interpersonal Relationship</li> <li>• Time Management</li> <li>• Innovation</li> <li>• Entrepreneurship</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Mobile frameworks</li> <li>• UI/UX design</li> <li>• Mobile security</li> <li>• Cross-platform vs native development</li> <li>• Security store compliance</li> <li>• Local storage (SQLite, Room DB, Core Data)</li> <li>• Syncing with cloud databases</li> <li>• REST APIs</li> <li>• Push notifications</li> <li>• In-app purchases and payment integration</li> <li>• Emulator vs. physical device testing</li> <li>• Debugging tools</li> <li>• App Store &amp; Google Play publishing guidelines</li> <li>• App signing, provisioning profiles, certificates</li> <li>• GIT and Version Control</li> <li>• Folder structure</li> <li>• Networking</li> <li>• Software Development Life Cycle</li> </ul> | <ul style="list-style-type: none"> <li>• Growth oriented</li> </ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|

## **ANNEXURE**

### **National Competency Standards (NCS)**

The National Competency Standards specify the skill, knowledge and attitudes applied to a particular occupation. Standards also specify the standards or criteria of performance of a competent worker and the various contexts in which work may take place. Standards provide explicit advice to assessors regarding the skill and knowledge to be demonstrated by candidates seeking formal recognition either following training or through work experience.

### **Purpose of National Competency Standards**

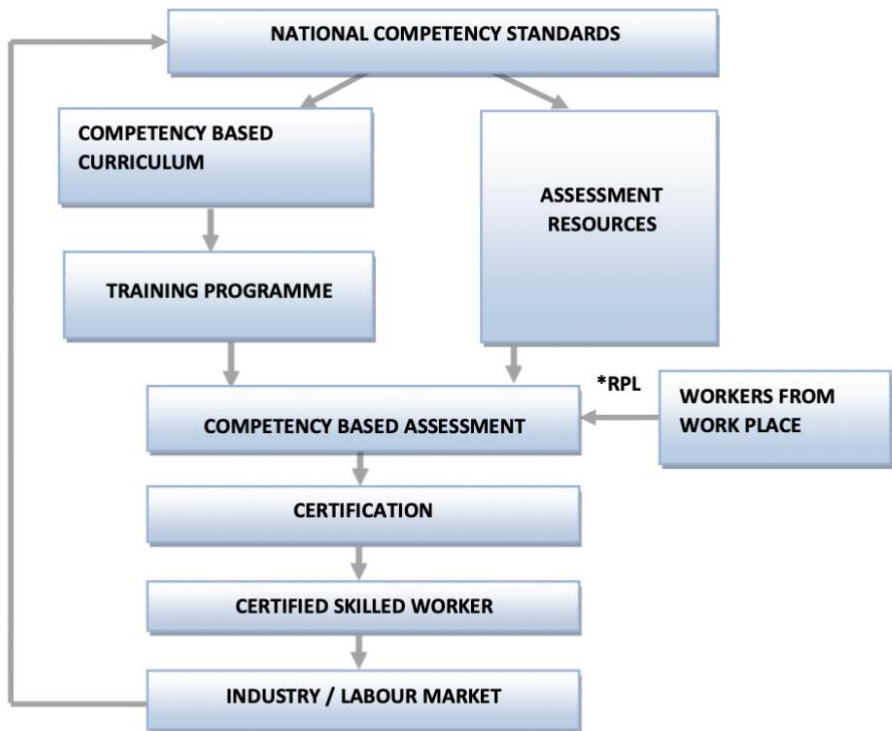
National Competency Standards serve a number of purposes including:

- Providing advice to curriculum developers about the competencies to be included in the curriculum.
- Providing specifications to assessment resource developers about the competencies within an occupation to be demonstrated by candidates.
- Providing advice to industry/employers about job functions, which in turn can be used for the development of job descriptions, performance appraisal systems and work flow analysis.

### **Bhutan Qualifications Framework (BQF)**

Bhutan Qualifications Framework is an integrated national framework that outlines all types of qualification in Bhutan. As an established and nationally accepted instrument, the BQF has been benchmarked against international practices in terms of standards. The BQF aims to recognize all forms of learning systems, including formal, non-formal, and informal learning. It acknowledges technological advancements and recognizes contemporary modes of delivery. It covers a broad range of education systems including the TVET education.

## Implementation of TVET Qualifications



\* RPL = Recognition of Prior Learning

## TVET Qualifications Levels

TVET Qualifications have seven levels as per the BQF, as follows:

*Bhutan Qualifications Framework 2023*

*Table 2: Qualification Types and Levels Based on Education Sector.*

| BQF Level | Community Education | School Education                              | TVET                                                                | Higher Education                                                                             | Monastic Education                         |
|-----------|---------------------|-----------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------|
| 8         |                     |                                               |                                                                     | Doctoral Degree                                                                              | <i>Khewang</i><br>མཁས་དབང་།                |
| 7         |                     |                                               | Master's Degree<br>Postgraduate Diploma<br>Postgraduate Certificate | Master's Degree<br>Postgraduate Diploma<br>Postgraduate Certificate                          | <i>Tsugla Gongma</i><br>གཞུག་ལག་གོང་མ།     |
| 6         |                     |                                               | Applied Degree                                                      | Bachelor's Degree<br>Bachelor's Degree (Honours)<br>Graduate Diploma<br>Graduate Certificate | <i>Tsugla Wogma</i><br>གཞུག་ལག་འོག་མ།      |
| 5         |                     |                                               | Advanced Diploma                                                    | Advanced Diploma                                                                             |                                            |
| 4         |                     |                                               | Diploma                                                             | Diploma                                                                                      |                                            |
| 3         |                     | Bhutan Higher Secondary Education Certificate | Certificate 3                                                       |                                                                                              | <i>Dringrim Gongma</i><br>འགྲིང་རིམ་གོང་མ། |
| 2         |                     | Bhutan Certificate for Secondary Education    | Certificate 2                                                       |                                                                                              | <i>Dringrim Barma</i><br>འགྲིང་རིམ་བར་མ།   |
| 1         | ALC                 |                                               | Certificate 1                                                       |                                                                                              |                                            |

## Level Descriptors

The TVET Qualification levels are set based on the level descriptors, as defined in the BQF. The detail of the qualification level descriptor is as follow:

| <b>Level</b> | <b><i>Knowledge</i></b>                                   | <b><i>Skills</i></b>                                                                                                                                                                                                                                                                                      | <b><i>Values</i></b>                                                                                                                                                                                                                                                                                                                                       | <b><i>Application</i></b>                                                                                                                                                                             |
|--------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | <b><i>Knowledge that is:</i></b>                          | <b><i>Demonstrate skills that involve:</i></b>                                                                                                                                                                                                                                                            | <b><i>Demonstrate values that involve:</i></b>                                                                                                                                                                                                                                                                                                             | <b><i>Applied in contexts that involve:</i></b>                                                                                                                                                       |
| 4            | Broad theoretical, technical and operational              | <p>Selecting and applying a range of standard processes relevant to varied and sometimes unpredictable tasks</p> <p>Selecting and applying a range of solutions involving formulation of solutions to resolve complex issues</p> <p>Demonstrating a high level of proficiency in English and Dzongkha</p> | <p>Strong level of awareness of self and others; and an appreciation of belief system, role of social norms, and the importance of relationship building</p> <p>Application of ethical norms and legal rules in decision-making; and comprehending the correlation between values and behavior</p> <p>Commitment to own profession and quality of work</p> | <p>Stable tasks with predictable changes</p> <p>Broad guidance with some self-direction that requires sound judgement</p> <p>Taking some responsibility for planning and coordination with others</p> |
| 3            | Theoretical with some technical and operational processes | <p>Applying a range of standard processes to known but varied tasks</p> <p>Selecting and applying a range of solutions to familiar</p>                                                                                                                                                                    | <p>Sound level of self-awareness and beliefs; and ability to apply social norms and</p>                                                                                                                                                                                                                                                                    | <p>Stable tasks with some aspects of change</p> <p>General guidance and supervision that require</p>                                                                                                  |

|   |                                     |                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                         |                                                                                                                                                                        |
|---|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                     | <p>and unfamiliar problems</p> <p>Communicating effectively and clearly, both oral and written, in both English and Dzongkha</p>                                                                                                                                                                            | <p>build relationships</p> <p>Application of a set of ethical norms</p> <p>Commitment to own field of interest and apply self-management of learning and performance</p>                                                                | <p>discretion and judgement</p> <p>Adapting to own behaviour to work with others</p>                                                                                   |
| 2 | Basic, factual and conceptual       | <p>Applying standard processes relevant to carry out known tasks</p> <p>Applying a set of known solutions to solve simple and straightforward issues</p> <p>Using simple and direct exchange of information on familiar and routine matters</p> <p>Developing basic proficiency in Dzongkha and English</p> | <p>Some level of self-awareness and beliefs, and appreciation of social norms; and significance of relationships</p> <p>Awareness of ethical norms, and openness to different activities</p> <p>Developing own knowledge and skills</p> | <p>Structured and stable tasks</p> <p>General support and Supervision that require some discretion and judgement</p> <p>Collaboration with others to achieve goals</p> |
| 1 | Foundational, every day and general | <p>Applying operational literacy, numeracy skills required to carry out simple tasks</p> <p>Applying simple solutions to solve simple and straightforward everyday issues</p>                                                                                                                               | <p>Basic awareness of self, beliefs, and social norms; and understand the significance of relationships</p> <p>Basic awareness of</p>                                                                                                   | <p>Highly structured tasks with close support and supervision</p> <p>Minimal Discretion and judgement</p>                                                              |

|  |  |                                                                                     |                                                                                                                                                         |                                                            |
|--|--|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|  |  | Communicating using everyday expressions and simple phrases in Dzongkha and English | fundamental ethical norms, basic civil rights, and responsibilities<br><br>Willingness to understand tasks and motivated to implement them successfully | Readiness to work together and share knowledge with others |
|--|--|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|

## **CODING USED FOR NATIONAL COMPETENCY STANDARDS**

The coding and classification system developed in Bhutan is logical, easy to use, and also aligned with international best practices. The Bhutanese coding and classification system is based on the International Standard Classification of Occupations, 2008 (ISCO-08) developed by the International Labour Organisation (ILO). The coding of the National competency standards forms the basis of the identification code for the Technical & Vocational Education and Training Management Information System (TVET – MIS) both in terms of economic sector identification and that of the individual standard.

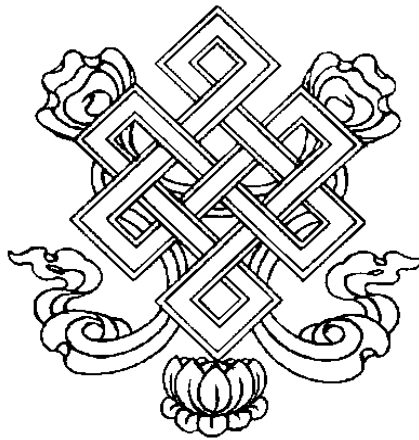
### **Coding the individual national competency standards**

Coding the individual skills standard has a multiple purpose:

- to identify the level,
- to identify to which module the standard belongs,
- to identify in which order the standard is clustered within that module.

A job can include a number of competencies described in the national competency standards.

However, in order to follow a logical order, only national competency standards related to each other and following a logical sequence in terms of training delivery, from the simple to the complex, are clustered into a module. Some standards are so complex that they need to stand alone.



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