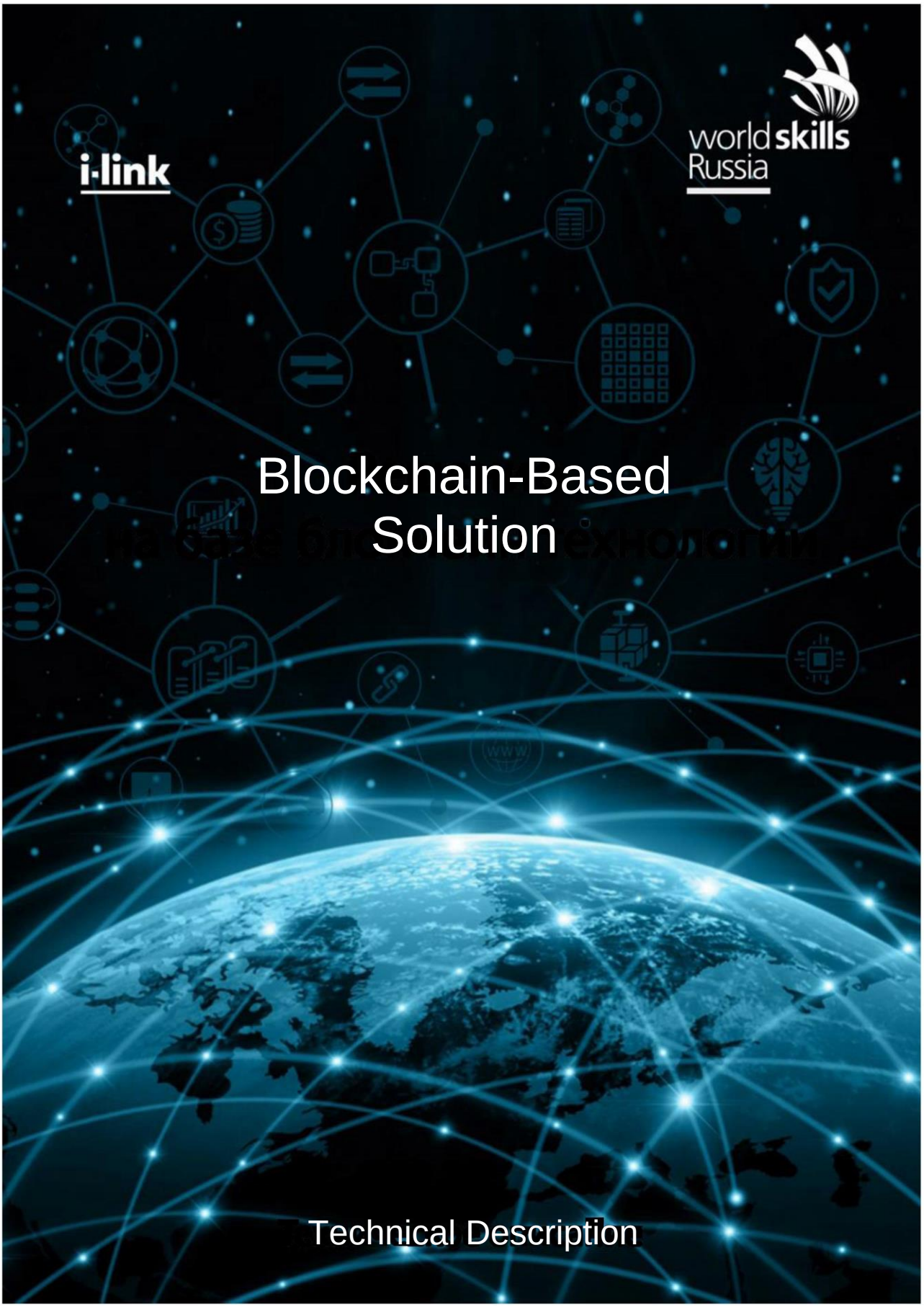

i-link
world skills Russia
Blockchain-Based Solution
Technical Description

WorldSkills Russia "Young Professionals" Union (hereinafter referred to as WSR) in accordance with the charter of the organization and rules of the competition has established the following minimum requirements to this professional skill required for participation in the competition.

This technical description includes the following sections:

1. INTRODUCTION

1.1. PROFESSIONAL SKILL NAME AND DESCRIPTION

1.1.1 Professional skill name:

"Development of Blockchain-Based Solutions".

1.1.2 Professional skill description.

A smart contract developer works in commercial, private, banking and manufacturing industries. There is a direct relationship between the nature and quality of requirements to the final product and the payment from a customer. Therefore, a developer's work has to meet the professional standards in order to satisfy the customer's requirements and to promote professional development. Blockchain-based smart contracts are (currently) closely associated with the financial sector.

The blockchain technology was developed in the end of 2000's and is a database storing all transaction data. Each new transaction entered into the block is assigned with a hash, an encoded identifier reflected in the transaction detail record. In order to verify a new transaction a consensus is required, which is a consent of the majority of the network members (51 %), in theory, any recordable data can be presented in the form of a blockchain.

A developer should be able to plan and design distributed de-centralized applications, select, install and deploy a development platform and environment, upload (deploy) smart contracts, check them, prepare reporting documentation, render technical support, be able to find and eliminate failures in smart contracts. Work organization, self-organization, communication and interpersonal communication, problem solving abilities, flexibility and in-depth knowledge of his/her own field are the universal qualities of a professional smart contract developer.

Regardless of a developer’s works, independently or in a team, he/she must be able to accept a high level of responsibility and independence. A developer must work in accordance with the acting standards and in compliance with the OHSE rules, and must understand that any mistake can be irreversible, expensive, and endanger other people.

Growing mobility of people across the world expands the opportunities of a talented developer, however it is required to understand and be able to work in different cultural environments. In the nearest future, the use of smart contracts will become even more relevant.

1.2. RELEVANCE AND SIGNIFICANCE OF THIS DOCUMENT

This document contains information about the standards required to compete in this skill competition, as well as the assessment principles, methods, and procedures that govern the competition.

Every expert and competitor must examine this Technical Description.

1.3. ASSOCIATED DOCUMENTATION

Since this Technical Description contains only skill-specific information, it must be used in association with the following documents:

- WSR – (Regional/National) Competition Standing Orders;
- WSR – WSR Internet resources
- WSR Policy and Statutory Regulations.
- Skill-specific OHSE Instruction.

2. WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

2.1. GENERAL WSSS GUIDELINES

The WSSS determines the knowledge, understanding and specific skills that underpin best international practices of technical and vocational work performance levels. It should reflect a shared global understanding of what associated work role(s) or occupation(s) represent for industry and business.

The skill competition is intended to reflect best international practices as described by the WSSS, and to the extent that they are able to be implemented. Therefore, the WorldSkills Standards Specification is a guide to the required training and preparation for the skill competition.

In skill competitions, the assessment of knowledge and understanding will take place through the assessment of work performance. There will be no separate knowledge and understanding tests.

The WorldSkills Standards Specification is divided into clearly defined sections with headings and reference numbers.

Each section is assigned with a percentage of total marks to indicate its relative importance within the Standards Specification. The sum of all the percentage marks is 100 %.

The marking scheme and the test project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme and the Test Project will follow the allocation of marks within the Standards Specification to the practically possible extent.

WSSS Section		Importance (%)
1	**Work Organization**	**15**
	A specialist shall know and understand: • OHSE documentation and rules • general principles of safe PC operation • blockchain technology application scopes and purpose • blockchain technology operation principles • data storage and safe data transfer principles • main principles of code optimization without sacrificing work quality • importance of planning of the entire working process, how to effectively organize work and manage working time • impact of new technologies	
	A specialist shall be able to: • meet the OHSE requirements • meet the PC operation safety requirements • correctly choose and apply technologies • correctly choose and apply templates and algorithms during development • organize a workstation for maximum performance • effectively utilize working time • work efficiently, constantly tracking work results • implement and constantly use high work and technology quality standards	
2	**Communication Skills and Intersocial Relations**	**20**
	A specialist shall know and understand: • importance of establishing and maintaining customer's trust • importance of maintaining a high level of knowledge • main requirements to associated professions • importance of building productive working relations • main team work principles • importance of the ability to resolve conflict situations and misunderstandings	
	A specialist shall be able to: • fulfill customer's requirements and meet his expectations • consult and recommend products or solve required tasks on behalf of a customer • represent customer's wishes by proposing recommendations on the project improvement for the purpose of reducing costs • interview a customer accurately and in detail in order to understand his requirements • provide clear operating instructions • provide associated professions in support of customer's requirements • prepare written reports for customers and organizations	

	• estimate costs and required time for customers • adapt to changes in associated professions • effectively work in a team	
3	**Programming**	**45**
	A specialist shall know and understand: • data algorithms and structures • design templates and programming paradigms • how do network protocols work (tcp/ip) • program code testing, debugging and optimization	
	A specialist shall be able to: • have high-level knowledge of one of the programming languages (JavaScript, C++, Python, Go) • work with development environments (IDE) • use the object-oriented programming (OOP) or functional programming (FP) principles • refactor a program code • cover a program code with tests • test, debug and optimize a program code	
4	**Operation and Troubleshooting**	**20**
	A specialist shall know and understand: • different types of blockchain solutions for different applications • different blockchain technology generations • customer's need (demand) in different blockchain functions • vectors of attack on consensus mechanism and a blockchain as a whole	
	A specialist shall be able to: • create a finished blockchain-based application prototype • justify a technology choice	

3. ASSESSMENT STRATEGY AND TECHNICAL FEATURES

3.1. GENERAL GUIDANCE

Assessment is governed by the WorldSkills Assessment Strategy. The Strategy establishes the principles and techniques to which the WSR assessment and marking must conform.

The expert assessment practice lies at the heart of the WSR Competition. For this reason, it is the subject of continuous professional improvement and scrutiny. Growing experience in assessment will make its own informational contribution to the use and direction of main assessment tools used on the WSR Competition: The Marking Scheme, Test Project, and Competition Information System (CIS).

Assessment on the WSR Competition falls within one of the two categories: objective assessment and jury's opinion (subjective assessment). For both types of assessment, the use of explicit benchmarks against which to assess each aspect is essential to guarantee quality.

The marking scheme must follow the weightings from the Standards Specification. The test project is the assessment vehicle for the skill competition, and also follows the Standards Specification. The Competition Information System (CIS) enables timely and accurate recording of marks, and has an expanding supportive capacity.

In general, the Marking Scheme will lead the process of the Test Project development. After this, the marking scheme and the test project will be designed and developed through an interactive process in order to ensure that together they optimize their relationship to the Standards Specification and the Assessment Strategy. They will be submitted to WSR for approval together in order to demonstrate their quality and conformity with the Standards Specification.

In order to be submitted to WSR for approval, the Marking Scheme and the Test Project shall be approved by certified WSR Skill Experts.

4. MARKING SCHEME

4.1. GENERAL GUIDANCE

This section describes the role and place of the marking scheme, how the experts will assess competitors' work demonstrated through the test project performance, and the procedures and requirements to marking.

The Marking Scheme is a pivotal instrument of the WSR Competition, in that it ties assessment to the standards that represent the skill. It is designed to allocate points between each assessed performance aspect in accordance with the weightings.

By reflecting the weightings specified in the WSSS, the Marking Scheme sets out the Test Project development parameters. Depending on the nature of the skill and the needs for its assessment, it may initially be appropriate to develop the Marking Scheme in more detail as a guide for the Test Project design. Alternatively, the initial Test Project design can be based on the outline Marking Scheme, more specifically: the Marking Scheme and the Test Project shall be developed together.

Section 2.1 above indicates the extent to which the Marking Scheme and the Test Project may diverge from the weightings given in the Standards Specification if there is no practicable alternative.

The Marking Scheme and the Test Project may be developed individually either by one person, or by a group, or by all Experts. The detailed and final Marking Scheme and Test Project developed separately must be approved by the International Expert or the Skill Competition Manager prior to the Competition.

In addition, the Experts are encouraged to submit their Marking Schemes and Test Projects for comment and preliminary approval 2 months prior to the competition in order to avoid setbacks at a later stage. They are also recommended to work with the Skill Competition Manager at this intermediate stage.

In all cases, the complete and approved Marking Scheme must be entered into the CIS at least two days prior to the Competition using a standard CIS table or other approved methods. The Chief Expert is responsible for this process.

4.2. ASSESSMENT CRITERIA

The main headings of the Marking Scheme are the assessment criteria. These headings are generated concurrently with the test project development. In some skill competitions, assessment criteria may be similar to section headings in the standards specification; in others, they may be completely different. There will normally be between five and nine assessment criteria. Whether or not they match the headings, the marking scheme must reflect the weightings specified in the Standards Specification.

The assessment criteria are created by the person(s) developing the marking scheme, who is free to define the criteria he or she considers most suitable for the assessment of the test project performance.

The Mark Summary Form generated by the CIS will include a list of assessment criteria.

The number of points allocated to each criterion will be calculated by the CIS. This will be the cumulative sum of points awarded to each aspect within that assessment criterion.

4.3. SUB CRITERIA

Each assessment criterion is divided into one or more subcriteria. Each subcriterion becomes a heading for a WorldSkills marking form.

Each (subcriteria) marking form is specified with a certain date on which it will be completed.

Each (subcriteria) marking form contains assessable aspects that are due to objective assessment or jury's decision (subjective assessment). Each subcriterion has aspects assessed by both measurement and judgement, in which case there is a marking form for each one of them.

4.4. ASPECTS

Each aspect defines, in detail, a single item to be assessed and marked, and the instructions on how the points are to be awarded. Aspects are assessed either objectively or by jury's opinion (subjectively) and appear in the corresponding marking form.

A marking form in detail lists every aspect to be marked together with a mark allocated to it and a reference to a section of the skill as set out in the standards specification.

The sum of the points allocated to each aspect must fall within the range of the marks specified for that section of the skill in the Standards Specification (WSSS). This will be displayed in the CIS mark allocation table in the following format, when the marking scheme is being reviewed (Section 4.1)

Criterion					Total points for the WSSS section
WorldSkills Standard Specification (WSSS) Sections		A	B	C	
	1				0
	2	6		2	8
	3	14	48	13	75
	4	2			2
Total points for criterion		22	48	15	85

4.5. ASSESSMENT AND MARKING ACCORDING TO A JURY'S OPINION (JUDGEMENT SCORE)

A jury's opinion is using a scale from 0 to 3. This assessment is used to render a jury's decision on the quality of an object. 3 experts shall participate in the assessment. Each of them should give their assessment; in this case, the permissible difference shall not exceed 1. If the assessment difference is more than 1, the assessment will not be accepted and the experts shall negotiate with bringing appropriate arguments.

Each aspect of such assessment shall have additional information with the description of each assessment level.

For example:

•0 — performance is below the industry standard or has not been carried out;

•1 — performance does not correspond with the industry standard;

•2 — performance corresponds with the industry standard and, in specific respects, exceeds it;

•3 — performance wholly exceeds the industry standard and is assessed as excellent.

4.6. OBJECTIVE ASSESSMENT AND MARKING

Each aspect shall be assessed by three experts. Unless otherwise specified, only the maximum mark or zero will be awarded. Wherever they are used, the benchmarks for partial marking are explicitly defined within the aspect framework.

4.7. USE OF OBJECTIVE ASSESSMENT AND A JURY'S OPINION (JUDGEMENT SCORE)

The final understanding of objective and subjective assessments will be available after the approval of the Marking Scheme and the Test Project. The provided table contains approximate information and is intended for the development of the marking scheme and the test project.

Section	Criterion	Marks		
		Subjective (if applicable)	Objective	Total
A	Implementation preparation	0	22	22
B	Implementation	2	46	48
C	Documenting. Presentation	0	15	15
	Total =	2	83	85

4.8. ASSESSMENT PROCEDURE

The Chief Expert and the Deputy Chief Expert shall discuss and divide the experts into groups (a group is composed of at least three people) for marking. Each group shall include at least one experienced expert. An expert shall not assess a competitor from his own organization.

The marking specifics within teams is basically regulated by Section 4.7. "Use of Objective Assessment and Jury's Opinion".

5. TEST PROJECT

5.1. GENERAL REQUIREMENTS

Sections 2, 3 and 4 regulate the development of the Test Project. The recommendations in this section provide additional explanation of the TP content. Regardless of the number of modules, the TP should include an assessment per each of the WSS Specification sections.

The Test Project shall not fall outside of the WSS Specification.

The Test Project performance shall take no less than 15 and no more than 24 hours.

Age qualification for the Test Project performance is based on the Competition line-up (conditions) (regional/interacademic/corporate).

A competitor's knowledge shall be assessed exclusively through the practical performance of the Test Project.

5.2. TEST PROJECT STRUCTURE

The Test Project contains 3 modules:

1. Module 1. Implementation preparation.
2. Module 2. Implementation
3. Module 3. Documenting. Presentation.

5.3. TEST PROJECT DEVELOPMENT REQUIREMENTS

Description of the Test Project module performance conditions:

Module 1. Implementation preparation**.**

- The module completion time is 4 hours;
- The organizer shall provide OHSE instructions, test project materials, equipment and software required for the performance of Module 1;
- The Module 1 performance shall be started on Day C1;
- The module shall be marked every day in stages, these stages shall be defined in the Test Project;
- Module 1 shall be completed on Day C3;

Module 2. Implementation

- The module completion time is 14 hours;
- Module 2 shall be completed on Day C3;

- All software shall be installed by the competitor during the performance of Module 1;
- The organizer shall provide the test project materials required for the module performance;

Module 3. Documenting. Presentation.

- The module completion time is 4 hours;
- Module 3 shall be completed on Day C3;

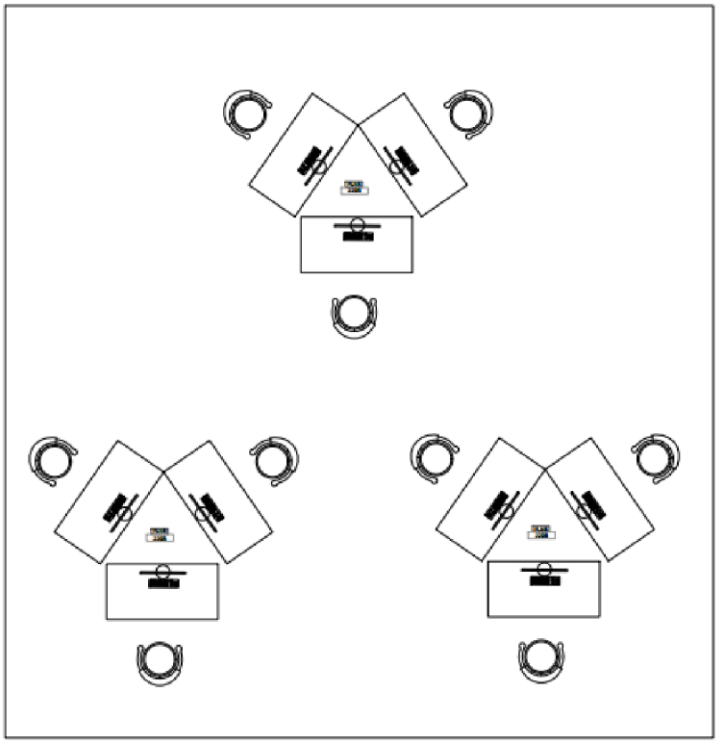
Competition workshop requirements:

General requirements to the competition workshop are provided in the documents "Infrastructure List" and "Development Plan", in case there is a need for the provision of additional equipment the Chief Expert or the Skill Competition Manager shall inform the Competition organizer's in advance.

Competitor's workstation arrangement:

The development area for the skill shall be at least 30 sq. m.

The workstation layout is provided only for reference (3 teams of 3 people).



Desk 1,400x700

chair

computer

supply line filter with 8 sockets, 220 V

Internet sockets RJ45 (3 pcs)

5.4. TEST PROJECT DEVELOPMENT

The Test Project must be prepared in accordance with the templates provided on the WSR forum. The presented Test Project templates shall be changed at least once a year.

5.4.1. WHO DEVELOPS TEST PROJECTS/MODULES

The test project development team consists of:

- Chief Expert;
- Deputy Chief Expert;
- Certified WSR experts.

Proposals to the development team can be submitted on the WSR forum () by all experts.

The 30% of changes introduced into the Test Project shall be approved by the Skill Competition Manager or the Chief Skill Competition Manager in a mandatory manner.

When introducing 30% of changes into the Test Project, the above referenced people shall be guided by the principles of objectivity and impartiality. The changes shall not relate to other professional areas not described in the WSSS, as well as exclude any WSSS units. Furthermore, the introduced changes shall be performable using the infrastructure list approved for the competitions.

The sponsors/organizers cannot affect the Test Project development in any way.

5.4.2. WHO DEVELOPS THE TEST PROJECT/MODULES

Test projects for each competition are developed based on the unified Test Project approved by the Skill Competition Manager and the Chief Expert and posted on the Discussion Forum. Test projects can be developed both in their entirety or in modules.

5.4.3. WHEN IS THE TEST PROJECT DEVELOPED

The Test Project is developed in accordance with the following schedule:

Time frames	Test Project
On the previous competition	Selection of experts for the Test Project development team. The development team led by the Chief Expert is responsible for the development of modules. Module 1: Module 2: Module 3:
3 months after the previous competition	The experts submit their proposals on modules to the development team, with drawings and written descriptions.
2 months prior to the current competition	The Chief Expert shall make sure of the following: ● Performability of all test projects; ● Performability of each module within the allotted time; ● Reachability of correct operation; ● Accuracy of the infrastructure list; ● The coordination with the Technical Expert is performed; ● The instructions for competitors are clear and contain the least text possible; ● The Test Project is complete in all respects; ● The complete marking scheme is developed and contains accurate and fair assessment criteria for each module; ● The final changes to the test project have been introduced, if they were defined and necessary.
2 months prior to the competition	Test project circulation. Circulation of photographs or initial codes and documents used in the test project.
During the competition	The experts analyze the Test Project performance by the competitors and thereafter give feedback on further adjustments. ***Test project – "secret". The circulation begins on Day C-1.***

5.5 TEST PROJECT APPROVAL

The Chief Expert, the Skill Competition Manager and the Deputy Chief Manager shall make a coordinated decision on the performability of all modules. Taken into consideration are time, quality and workmanship of the competitors.

5.6. TEST PROJECT CIRCULATION

The test project will be released on the WSR web site (), additional attention shall be paid to the table in Item 5.4.3.

5.7. CHANGING THE TEST PROJECT AT THE COMPETITION

During the competition the experts must prepare proposals on possible changes in the performance, programming and troubleshooting.

Each proposal must be approved by the Chief Expert in accordance with the Technical Description and selected in a random manner. 30% changes are limited only by these proposals.

5.8. PROPERTIES OF MATERIALS OR MANUFACTURER'S INSTRUCTIONS

In case in order to perform the test project a competitor is required to become familiar with the instructions for any software or manufacturer's instructions, he shall receive them together with the TP, TD and IL 5 months prior to the competition on the WSR web site (). When required an expert can organize an on-site demonstration.

The software selected for modules and to be used by the competitors shall have open initial codes and be available to the public.

6. SKILL MANAGEMENT AND COMMUNICATION

6.1 DISCUSSION FORUM

All pre-competition discussions take place on the special forum ( ). No change will be accepted without a preliminary forum discussion. The forum is moderated by the Skill Competition Manager.

6.2. INFORMATION FOR COMPETITORS

The information for competitors is available at ( ).

The information includes:

— Competition Standing Orders;

— Technical Description;

— Marking schemes;

— Test projects;

— Infrastructure list;

— OHSE instruction;

— Additional information.

6.3. ARCHIVE OF TEST PROJECTS

The test projects are available at .

6.4. SKILL MANAGEMENT WITHIN THE COMPETITION FRAMEWORK

Skill management within the framework of a specific competition is performed by the Chief Expert in accordance with the previously approved workshop plan. The workshop working schedule shall be developed 2 months prior the competition.

7. OCCUPATIONAL SAFETY AND HEALTH REQUIREMENTS

The occupational health and safety requirements shall be provided by the Chief Expert for further familiarization and observance by the competitors.

8. SOFTWARE AND EQUIPMENT

8.1. INFRASTRUCTURE LIST

The infrastructure list includes everything necessary for the performance of test projects. The competition organizer will complement the list with the exact number of equipment and software required. The infrastructure provided by the organizer is included in a separate list.

Before each competition, the experts are required to check and adjust the list, as well as to coordinate it with the WSR Technical Department.

At each competition, the Technical Expert should maintain accounting of infrastructure elements.

8.2. MATERIALS, EQUIPMENT AND TOOLBOX TOOLS

(Toolbox can be empty).

9. SPECIAL SKILL RULES

Rules for specific competitions cannot contradict or take priority over the Competition Rules. They shall describe specific elaborations and clarifications in areas which can be changed between competitions. They include but are not limited to personal computing equipment, data storage devices, Internet access, work procedures and routines, as well as documentation management and distribution.

TOPIC/TEST PROJECT	SPECIAL RULES
Use of technology — USB, memory cards	• The competitors are allowed to use only the memory cards provided by the competition organizer. It is prohibited to insert any other memory cards into the competitors' computers. • It is prohibited to take memory cards or any other portable storage devices outside of the workshop. • Memory cards or other portable storage devices shall be presented to the Chief Expert in the end of each day for safe storage, they are not allowed be taken outside of the workshop.
Use of technology — personal laptops, tablets and mobile phones	• The experts and interpreters are allowed to use personal laptops, tablets and mobile phones in the Expert's room. Personal laptops and tablets can be taken outside of the workshop at nighttime.
Use of technology — personal photography and video recording devices	• The competitors, experts and interpreters are allowed to use personal photography and video recording devices at the workshop, but are not allowed to take any photographs of detailed test project information or marking forms.
Software	• The competitors can create software products, prepare instructions and make notes while being present at the workshop, however under no circumstance they can be taken out of the workshop.
Equipment failure	• If there is a clear proof that the competitors have caused damage to the equipment on their own, they will not be provided with a replacement and additional time.
Competitor monitoring	• The competitors should be monitored at all times during their work. In case an expert responsible for monitoring needs to leave, he or she shall take actions to be replaced by another expert. • The experts are not allowed to monitor their compatriot competitors.

10. SPECIAL RULES FOR THE 14-16 AGE GROUP

The test project performance time shall not exceed 4 hours per day.

During the development of the Test Project and the Marking Scheme, it is required to consider the specific features and the limitations of the applied OHSE rules for this age group. It is also required to take into account anthropometric, psychophysiological and psychological characteristics of this age group. This way the Test Project and the Marking Scheme can cover not all of the WSSS units and fields depending on the specific features of the skill.