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Online Assessment Format for BIM Skills at the WorldSkills Russia National Championship 2020: Experiment and Results

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Online assessment format for BIM Skills at the WorldSkills Russia National Championship 2020

Experiment and results

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Abstract

This article describes a new online format for WorldSkills Competitions based on Digital Construction-BIM (Building Information Modelling) Skills at the Russian National Final 2020.

The COVID-19 epidemic has affected many aspects of our lives. Locked down cities, remote on-line education, mask-wearing in public spaces, are all our today's reality. As a result, the vast majority of WorldSkills National Championships which initially were planned for 2020 were postponed to 2021, including in Ireland, the UK and most other participating countries.

There were new requirements for the 2020 Competition Venues, for infrastructure, and even for Competition Rules due to Covid 19 restrictions. WorldSkills Russia, however, decided to experiment with an online format for the Russian National Championship.

During the 2020 Competition, the BIM Skills Team piloted an automated assessment tool which enables a fast and objective process to assess the measurement aspect of the Competitor's work. This article explains how that new process was developed, piloted and evaluated.

As an output we offer conclusions from the pilot and recommendations for further improvement of the on-line format for WorldSkills Competitions. We off pros and cons of the online assessment form and analysis of the first, real automatic assessment tool implementation.

Keywords: Online Education, WorldSkills, Automatic assessment tool, BIM Skill.

1. BIM Skills at WorldSkills Russia: a brief overview

Historically, Ireland and Russia were the two countries that pioneered BIM Skills in 2018. Both countries have developed BIM Skills independently. However, as the Skills Teams in both countries have developed BIM Skills based on the same framework, the specifications presented in the competition documents were very similar. That helped in 2019 to create a unified BIM Skills Technical Description and Occupational Profile which is now accepted by WorldSkills International (WSI) as an official document.ⁱ

In the WorldSkills Russia competition cycle 2019/2020, eight Russian Regions conducted local Competitions in BIM Skills and selected the strongest teams among their local vocational schools and colleges ready to send these teams to the Russian Final.

Due to the COVID lockdown, the initially planned Russian national final in May was postponed to September. As the situation with the pandemic was not resolved, WorldSkills Russia decided to conduct the National Final in an online format.

Each of the 58 competition Skills Teams had to develop special Competition Rules which enabled them to conduct the Competition according to WorldSkills requirements adapted to the online format.ⁱⁱ

2. BIM Skill Team special rules and competition environment

As BIM in its origins is based extensively on modern ICT technologies and has many supportive technologies to work in distributed (remote) environments, there was no problem with converting BIM Skills from the traditional large arena competition to an on-line format.

BIM Skills team have followed the WorldSkills Russia recommendation for setting up the Competition Environment which creates a fair competition context.

The typical Competition layout is presented in Figure 1 (below). There are two working places for the Competitors (on the left) and an additional place for Technical Assistants (on the right). There are three cameras that were capturing the Competition area for 24 hours. The role of Technical Assistant was to ensure the problem-free functioning of the Competitor's workstations. Manipulation could be done only under the permission of the Chief

Expert (remotely).

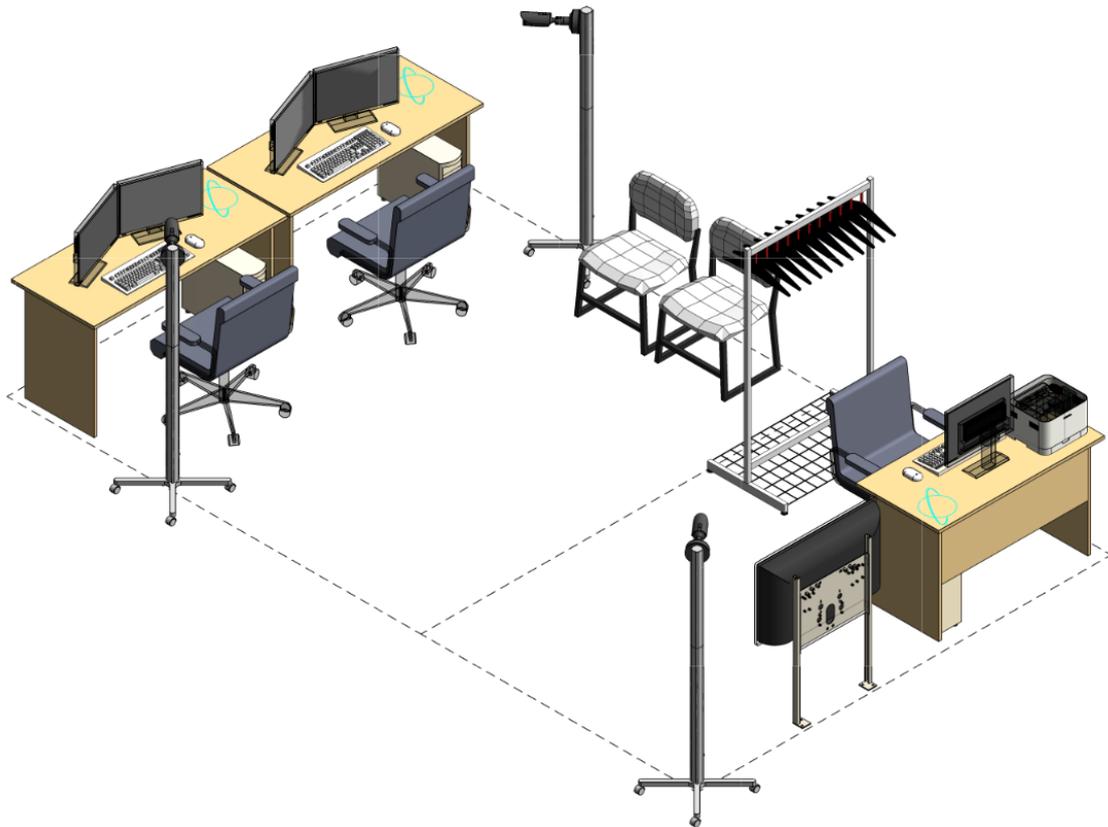


Figure 1. Required Competition Area Layout

To manage the Competition process, a special Center for Competition Management (CCM) was set up, which looked similar to the Competitor's area. The Chief Expert and Chief Expert Deputy were in the CCM together with the Technical Assistant with ability to engage with each remote centre. Their goal was to ensure that the Competition process flowed according to the WorldSkills Code of Conduct and according to the National Final Rules and Special Skills Rules.

3. Automatic assessment tool

Having the chance of experimenting, the Russian BIM Skill team decided to use the opportunity to develop and test an automated assessment tool.

The ideas behind that were the following:

- Manual assessment processes take a long time, as the assessment team needs to adjust the assessment level and agree on the common understanding of each aspect.
- For BIM Skills, much time will be required for the manual model opening, adjustments of views, and searching for the assessment elements in the models.
- In the National Final there were eight Russian regions distributed over seven time zones. Having joint expert teams distributed over these time zones would cause inconvenient working-time adjustments.
- As BIM Skills is still a very young Skill, there are very different levels of Regional Experts. In the on-line format that makes the joint assessment procedure especially difficult.

Accordingly, an Online Test Project was developed. The online test project with multiple layered objects proved to be more complex than with the traditional competition in a face-to-face format, as the communication between the Competitors and the Chief Expert/Deputy Chief Expert was limited due to differing time zones and the need to inform all competitors in a simultaneous manner to ensure fairness.ⁱⁱⁱ

Additionally, the Marking Scheme had to be redesigned. WorldSkills marking schemes are broken into aspects which are assessed by subjective and objective marks. The revised marking scheme was designed to have a majority of objective marks to be very easily converted into the automatic proofing mechanism.

The figure below showed the Interface of the program, the marking aspects and subjective marks. BIM competition protocol required uploading of the assessment results to MS Excel for further check (the screen-shots were made during the development phase of the tool).

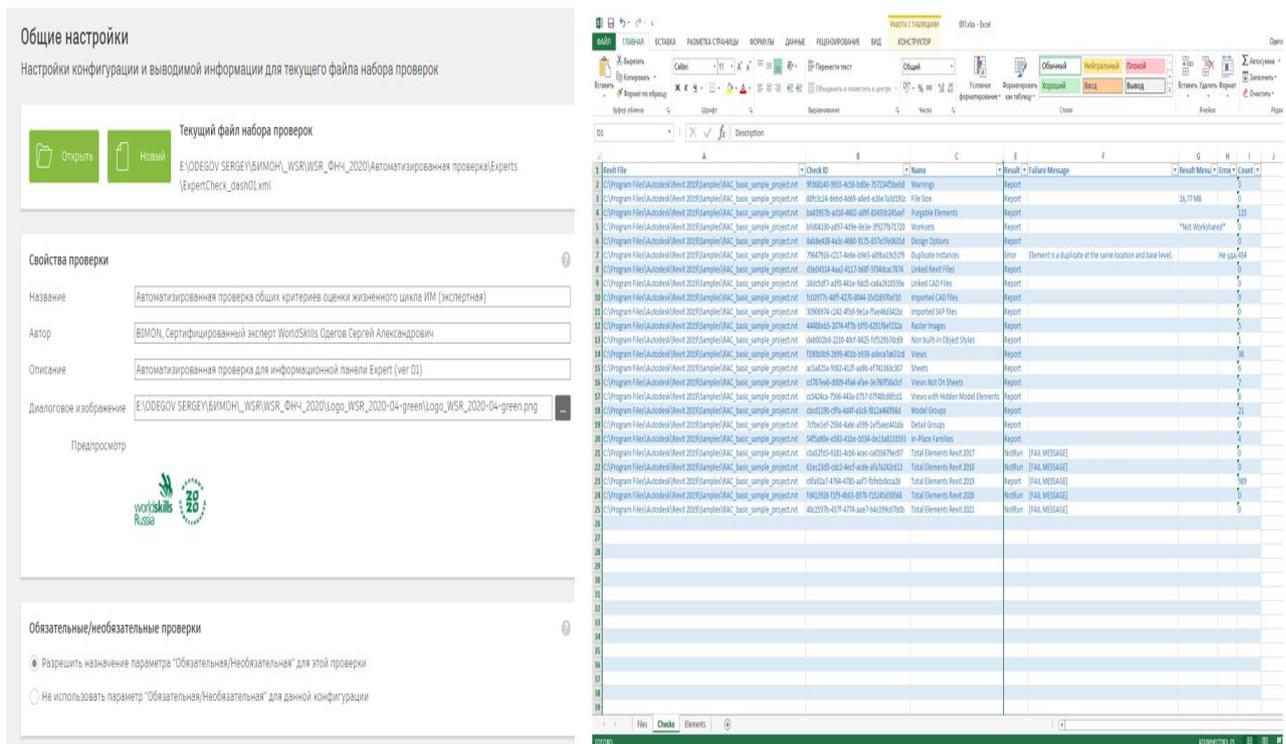


Figure 2. Example the interface of the assessment tool and the assessment protocol upload to MS Excel (in Russian)

4. The marking team

The changes made in the Test Project and the Marking Scheme still left several Judgment (subjective) aspects. To complete the judgement (subjective marking), the BIM Skill Team found the following solutions:

- An additional role of the Marking Expert was defined
- The Marking Experts were formed from the Certified Experts (Experts, who passed WorldSkills Russia (WSR) Expert's Exams, had an experience of being a Chief Expert at some previous competitions, and passed additional accreditation by WSR)
- The Marking Experts must not be Experts-Compatriots (to avoid any conflict of interests)

The Measurement aspects were marked by the auto-assessment tool and the Judgment aspects were marked by a team of Marking Experts (three Experts and using the assessment procedure as it will be used for the Judgement aspect at any other WS Competitions).

The Marking Experts had also examined the automatic assessment tool before the Competition and had done an ad-hock check to correct the working of it during the competition (or in cases of exceptionally good or exceptionally low marking results).

5. The result and conclusion

The Russian WorldSkills National Final is finished, and I can provide the following conclusions:

- An on-line competition and assessment format is workable.
- It requires additional equipment and infrastructure (e.g. cameras, video recording solutions, stable Internet connection etc.), but the additional cost is very moderate. If we will take into consideration the travel and accommodation cost, the on-line format is a very effective way for such a wide country like Russia.
- An automatic-assessment system can be implemented, and if it is developed and works correctly, it allows us to significantly increase the speed and accuracy of assessment for the measurement aspects.
- The development of the automatic assessment tool will require much time before the competition. The more complex and comprehensive the marking scheme used, the more difficult and time-consuming that will be. In our case, the additional adaptation of the marking scheme was done.
- As in the Russian context there are vendor-independent Competition rules, the development of the automatic assessment tool effort was distributed according to the

number of Competitors with certain software. As six teams used Autodesk Revit, the most advanced and comprehensive system was developed for the Autodesk software.

One option to reduce the development time could be designing the solution based on IFC models from the BIM Skill Competitors and using some IFC model-checking software. We decided not to use this option, as IFC converting could cause converting errors and information loss. An additional argument for the use of native formats was the existence of extensively built-in checking options, data access, and free tools for Autodesk Revit, the primary modeling solution at the Competition.

- One big disadvantage of the on-line format is the absence of real-time communication between the Experts which always happens at the off-line Competition. We did several on-line meetings before and during the Competition, but cross-teaching and experience exchange has not happened.

I think that that we need to further address the broader area regarding finding new, effective communication mechanisms in an on-line format. Perhaps some reshaping of the WorldSkills Competition will be required in future.

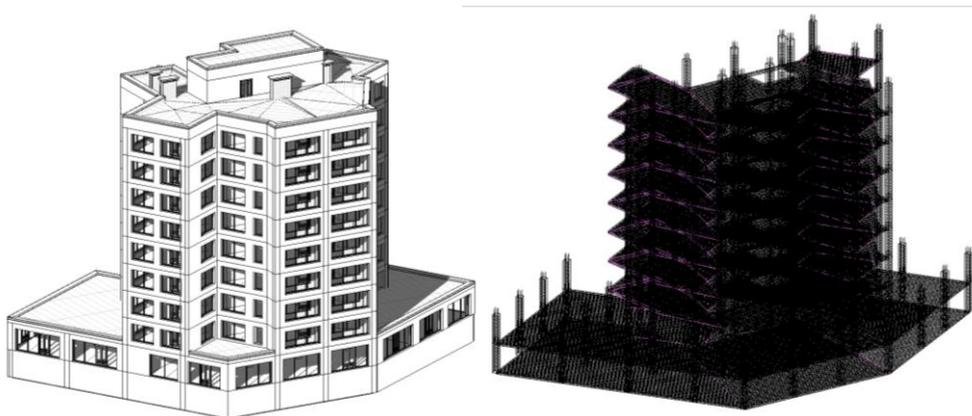




Figure 3. Example of one of the Competitor's work

Links and references

ⁱ <https://api.worldskills.org/resources/download/12300/13540/14453?!=en&tkn=0c0bd2a7-02c9-48bb-84d8-ea047747f25f>

ⁱⁱ <https://worldskills.ru/final2020/>

ⁱⁱⁱ <https://worldskills.ru/final2020/wp-content/uploads/2020/06/%D0%9A%D0%97-88.pdf>