

**SAFETY + FIRST
SIMULATORS**

Creating an MVP of a Construction Telehandler Simulator Hardware-Software Complex and Its Further Development

Together with Safety First Simulators and its creator Matthew Vitti, the Focus21 team created the innovative construction telehandler simulator.



Introduction

Every construction project faces challenges that need to be addressed. But the key decision for companies is when to tackle these issues: beforehand, during, or after the fact. Matthew Vitti believes that addressing challenges upfront is the best approach, and it's hard to argue with that logic.

That's why Matthew focused on the Safety First Simulators project. This initiative aims to train new employees to operate telehandlers and other construction equipment safely, thereby preventing accidents on site. By addressing potential problems before they occur, the project takes a proactive stance.

The technical aspects of the Safety First Simulators project are managed by the Focus21 team. Working closely with Matthew Vitti, we developed a compact and user-friendly hardware-software system that accurately simulates telehandler operation. Our solution was put to the test by an experienced operator with 30 years of experience, who confirmed its effectiveness during testing.

Services & Capabilities

- Hardware engineering
- Product Strategy
- User Research & Testing
- UI/UX
- Software Architecture
- Software Development
- 3D Unity Development
- Simulator Development
- QA
- Hardware Distribution
- Video Production

Core Technologies

- Unity
- C#
- Blender

Industry

- Construction

Background

Matthew Vitti has extensive experience and background in various fields. For over 20 years, he worked as an architect not only in North America but also in Europe and

Asia, holds a California (USA) architect's license for about 15 years, and has dozens of successful projects around the globe.

By the end of 2015, during the virtual reality entertainment boom, he began considering this technology from a business perspective. After thematic presentations at numerous conferences and events worldwide, he became known as an architect who tamed VR.

VR Safety Training



VR Safety Training = 75% Retention Rate

As compared to the typical 5% - 15% with lectures, audio and video



Reduce Workplace Accidents by up to 43%

This can save millions of dollars per year



Track Data + Analytics

Performance grading and analysis for each user

Room Scale Labs offers construction companies architectural and other services within virtual reality.

In late 2017, he founded Room Scale Labs and began offering virtual reality design services to the construction business. Extensive B2B interaction experience with

various contractors taught him to identify companies' pain points and find effective solutions.

"All construction projects have problems and there are only 3 options as to when you can resolve them - Before, During or After Construction. By utilizing technology, we better our chances in exposing these issues as early as possible in the process." — Matthew Vitti

Safety is one of the most critical issues for any construction project without exception. Preventing any accidents is the number one mission for major contractors in North America. And Matthew has helped many companies avoid them with virtual reality.

Safety

Protecting the health and safety of our employees, partners and customers isn't just a pledge we make. It's essential to what we do. We count on, and expect, our team to uphold our corporate commitment to prevent accidents and injuries—for their own safety, and the good of our business, too.

*With safety as our guide, we will continue to Build America—one beam, one bridge, one structure at a time.
— Patrick Schueck, president and CEO*



The image block contains five small photographs arranged horizontally. From left to right: 1. A construction worker in a hard hat and safety vest is working with a large metal wheel. 2. A worker is silhouetted against a bright background while working on a large structure. 3. A group of workers in safety gear holds a banner that reads 'SHORTCUTS CAN CUT LIFE SHORT'. 4. A worker in a heavy jacket and cap is handling a large white bag. 5. Two workers wearing full-body white protective suits and hoods are looking at the camera.

One of the key areas of activity for the company Lexicon, with which Matthew is currently collaborating, is precisely safety.

In 2022, Matthew worked with the major contractor Lexicon, for which he created Safety Training solutions using virtual reality. One of the company's requests was to train new employees on handling loading and other construction equipment as safely as possible.

It was important to give the contractor the ability to train employees without risking the lives of others. Plus, newcomers should not have access to expensive equipment on site. After a year of discussions and negotiations, it was decided to create a simulator, which laid the foundation for Safety First Simulators.

Challenges

Matthew Vitti immediately realized that virtual reality was not the best fit for such a project. He believes that there is no point in using such technologies everywhere. VR would have made the simulator a single experience for one person with no onlookers learning as well, where the aim here was to promote learning in all ways possible - even those watching. The idea is similar to the experience of watching friends play a racing game in a video arcade – a crowd gathers, watches the main player, but also learns simultaneously.

Matthew began searching for a software development team that could help him bring this rather unique project to life. The task was not simple due to the clearly defined budget, tight deadlines, and a rather complex technical brief.



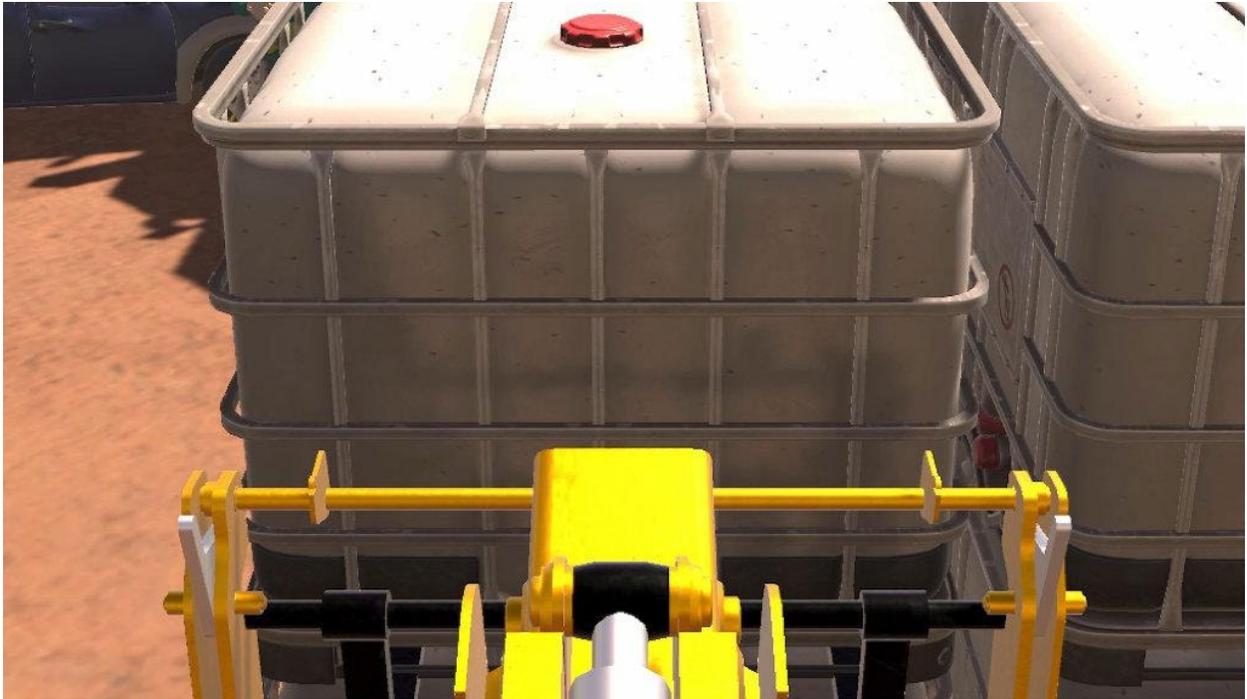
The simulator was meant to resemble a high-end three-dimensional game and it had to be perfectly suited for the educational process. The belief was the graphics would act to engage the user further in the training and therefore learning.

Matthew found Focus21 through a recommendation. He immediately liked that we deeply immerse ourselves in the client's problem, trying not just to find a simple solution but also to provide useful recommendations for improving the

project. Matthew set several challenging tasks for our team.

- The simulator had to be affordably priced so that construction companies could easily get approval for purchase.
- The simulator had to be custom developed and fine-tuned for the specific client purchasing it.
- The simulator had to be simple in customization and fine-tuning for the specific client purchasing it.

Most simulators on the market today are very bulky. They usually occupy an entire room of considerable size and are absolutely not suitable for transportation. Plus, they are not always efficient, as they use outdated software and hardware.



A key task of the simulator was to have software with the ability to be flexibly customized to the requirements of a specific construction company.

The cost of such simulators is usually in the range of several hundred thousand dollars, so not all companies can afford them. However, due to their low efficiency and logistical difficulties, even large contractors do not purchase them very often.

Ultimately, there are no standardized training standards for operating telehandlers and other heavy machinery in the construction industry today. Therefore, each contractor uses their own educational developments, and it is

important to customize the software of each simulator to them.

Process

As part of the collaboration with Safety First Simulators, the Focus21 team was involved in designing not only the software but also the hardware. Our specialists also worked on some marketing materials for the pilot version of the construction telehandler simulator.

Due to NDA agreements, unfortunately, we cannot disclose the technical nuances of developing the entire product. However, we can note that Unity tools were used as the platform for three-dimensional graphics, and C# as the main programming language.

```

331     /**
332     * Returns true if the button is pressed
333     */
334     ♣ Frequently called 14 usages toropov023
335     public bool IsPressed()
336     {
337         if (GetValue() == 0)
338         {
339             return false;
340         }
341
342         _pressed = true;
343         return true;
344     }
345
346     /**
347     * Returns true if the button was pressed and released
348     * This relies on the IsPressed() method being called before this method
349     */
350     ♣ Frequently called 8 usages toropov023
351     public bool IsReleased()
352     {
353         if (IsPressed())
354         {
355             return false;
356         }
357
358         if (!_pressed)
359         {
360             return false;
361         }
362
363         _pressed = false;
364         return true;
365     }
366
367     /**
368     * Returns true if only when the button is first pressed down
369     */
370     ♣ Frequently called 15 usages toropov023
371     public bool IsPressedDown()
372     {
373         var currentPressed:bool = IsPressed();
374         var pressedDown:bool = currentPressed && !_wasPressed;
375         _wasPressed = currentPressed;
376         return pressedDown;
377     }
378 }

```

The vast majority of the simulator's code is written in the programming language C#.

It's important to note that together with Matthew, we intended to create a detailed environment with game-like qualities and realistic graphics. This positively impacts the depth of immersion and the effectiveness of training new employees.

During the development of the MVP, the Focus21 team was in constant contact with Matthew. The project was very unconventional, so there were many unforeseen moments during its implementation that needed to be promptly addressed.



Before creating the real simulator cabin, several three-dimensional models were worked out, which included both the exterior of the body and the control elements.

For the first version of the simulator, several basic tasks were created that a new employee of a construction company must complete without errors to pass the training. If necessary, new ones can be created according to the specific request of each customer of this hardware-software complex.

The Focus21 team continues to work on improving the project for Safety First Simulators and is currently developing a second version of the simulator with improvements in all aspects of its operation. It also participates in its promotion in the construction industry.

Outcome

After completing the first version of the simulator, it was tested by an operator with 30 years of experience. This was not just any manager, but a real specialist who spent most of his life operating such equipment, so he could accurately pinpoint any weaknesses.

The operator began to control the telehandler in the simulator without any problems and without any instructions. All the elements were familiar to him, so he managed to complete all the training tasks with ease. The only request was the ability to move your head in the simulator which the Focus21 team has added.



The demonstration of the MVP telehandler simulator by a member of the Focus21 team looked like this.

Safety First Simulators and Focus21 have achieved a very high level of immersion using their simulator. After undergoing training on Telehandler Forklifts, the initial testers felt as though they were genuinely on an actual construction site.

Indeed, the telescopic handler simulator is also engaging due to the gamification of the training process for new employees. They effectively receive educational missions that need to be completed, systematically increasing their

level. The more missions they complete, the closer they get to working on a real project.

Today, there's no other simulator like this one on the market. Even the most basic version of the hardware-software setup is so portable that it can be easily moved around in a small truck. This feature is especially crucial for big contractors who hire lots of new workers in various regions.



The process of using the simulator from the inside resembles a modern computer game, as one main focus was the realism of the graphics during its development.

The software and even the hardware of the simulator can be easily changed according to the requirements of a specific construction company. Today, there are no clear standards for employee training in North America, so Safety First Simulators' clients will receive a product adapted to their needs.

There is no specific cost for the simulator, as it depends on a multitude of factors, including the complexity of customization for a particular company. But it is already clear that Matthew Vitti, together with Focus21, has achieved a tenfold reduction in costs compared to traditional solutions available on the market.

Conclusion

Safety First Simulators and Focus21 continue to work on the unprecedented construction telehandler simulator, unparalleled in the market. This is a unique product that solves a specific problem — it truly reduces the risk level at construction sites.

It is quite possible that in the near future, Safety First Simulators with the technical support of Focus21 will become the initiator of creating specific educational norms in the construction industry of North America. Then the

simulator could become standardized and even more accessible.

The hardware-software complex project has very high prospects today. They were made possible only thanks to the successful synergy between Matthew Vitti with a truly new and already in-demand idea, and the Focus21 team, which possesses a wide range of technical qualifications.