

# The Potential of the Agile Technology Application in University Education

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## ABSTRACT

The research is devoted to analysing the transformation of the SPOD world (Steady, Predictable, Ordinary, Definite) into the VUCA world (Volatile, Uncertain, Complex and Ambiguous) and defining the main features of the VUCA in the education system. The authors of the article consider the feasibility and effectiveness of the application of the Agile Manifesto in the education system. The research also attempts to interpret the education system through the principles of the Agile Manifesto and shows the impact that modern educational environments have on maintaining relative stability in conditions of uncertainty. The article outlines some fundamental issues that identify potential trajectories of the education sector development and pinpoints the skills that should be developed in modern university teachers in order for the potential of both universities and their students to be fully unlocked.

**Keywords:** *Agile in education, VUCA world, flexible learning, learning for a complex world, relevant training, Agile technology and universities*

## I. INTRODUCTION

The SPOD world<sup>1</sup> has transformed into the VUCA world<sup>2</sup>. In the new reality, students learn rapidly, prefer individualized learning and study what is of interest to them [1], [2]. They are extremely fast to acquire new competencies [3], which is why the existing teaching methods are no longer suitable within the current educational process [4]. Therefore, new technologies, approaches, and methods are required [5], [6]. In this regard, it is becoming necessary to create visionary programs, which allow taking a different view of development strategies for educational and government institutions<sup>3</sup>. Companies are also looking forward to

employing new professionals who would favourably compare with those already working. It means that universities have to train people for the jobs of the future, the jobs that do not exist yet [6].

According to Jerome Bruner, the American psychologist and educator, specialist in cognitive research, in times of transition, when uncertainty in the society is on the rise, a person needs extra inner strength to deal with a variety of problems. Most people feel fear of the unknown and tend to avoid such situations. Those who aim at certainty are believed to have stereotyped thinking, exaggerated respect for power, the inability to understand people and analyse their actions, as well as serious personal problems.

Transition to the VUCA world has revealed numerous problems including the shift of focus, inability to rationally plan one's activity for the future, difficulties in defining the content and methods of training future professionals. In fact, in the coming years, young professionals will have to perform work, which today's teachers know nothing about or have a

<sup>1</sup> SPOD: steady, predictable, ordinary, definite.

<sup>2</sup> VUCA: volatile, uncertain, complex, ambiguous.

<sup>3</sup> The Global Education Futures is the initiative by the Russian community of educational innovators, which since 2008 carried out research and experiments at MGIMO, EduCamp in Bekasovo, SKOLKOVO Moscow School of Management, the Agency for Strategic Initiatives, WorldSkills Russia, Metaver Community and Communities of practice developers, etc.

very limited grasp of. This problem can be divided into several components:

- The demands of the society are changing fast and unexpectedly; the society is waiting for the return from maintaining universities, even if they are not directly taxpayer-subsidized;
- The preferences and demands of employers are transforming: they look for a whole set of new skills and practical experience in university graduates aged 20;
- The request from applicants and student is changing in terms of teaching approaches and methods.
- Universities themselves have to transform, meet the demands of the society and be prepared to provide new forms and relevant content of training in advance.

Transformation processes imply profound comprehensive changes. The present article discusses the ways of adaptation to the reality of the uncertain world, the mechanism that can make a university a trendsetter, a leader, generating knowledge and demonstrating how it can be applied in the world of the future. The world we live in forces us to shift from passing along knowledge to developing a knowledge economy, the ability of educated people to increase economic potential in qualitative rather than quantitative terms. As the practice of leading universities shows, strong knowledge economy is not a linear process – it is always discrete and sometimes exponential. It is often associated with the ability of scientific and teaching staff to pose challenging questions forcing students not just to reflect, but to keep thinking, not just to find answers, but to promote further discussion. Additionally, this can be the result of the appearance of bright, originally thinking university teachers, with independent research taking priority.

**II. ANALYSIS OF THE POSSIBLE INTRODUCTION OF THE AGILE MANIFESTO INTO THE EDUCATION SYSTEM**

The Agile technology is rather complex in application to education and can be implemented in almost 20 scenarios (Extreme Programming, Feature-driven development, Lean software development, etc.) [7], [8].

In the SPOD world, where people used to live, all algorithms were clear and familiar, communication was well-established and results could be realistically expected. However, everything has changed with the shift towards the VUCA world: our reality is no longer convenient, familiar and predictable; we are left with the feeling of frustration and being ineffectual and cannot find the new and the rational that could establish the framework of the new reality, set new goals, formulate new objectives, and build new algorithms ("Table I").

Nevertheless, there is a VUCA response to the VUCA challenge, which involves:

- Vision: communication and belief in oneself and one’s partners; the ability to direct the team’s efforts into productive activity;
- Understanding: empathy, natural curiosity, the desire to respond to new challenges in a non-standard, original way, open-mindedness that allows thinking outside the box and seize new opportunities;
- Clarity: the ability to intuitively follow a new path; the old knowledge is an obstacle that stands in the path to the new; system thinking and dynamic vision of a situation;
- Agility: eagerness to provide new opportunities for employees, openness to new, non-standard, innovative approaches to processes and projects at the university.

With such a response to the challenges of our time, it becomes clear that unless one is Agile, they are Fragile.

TABLE I. TRANSFORMATION OF PROCESSES AND VIEWS IN THE VUCA WORLD

VUCA world	VUCA reply
VOLATILITY	VISION
UNCERTAINTY	UNDERSTANDING
COMPLEXITY	CLARITY
AMBIGUITY	AGILITY

There are some fundamental questions that have to be answered along the way to the VUCA world – Are we ready for changing training formats? Changing ideological guidelines? New forms of cooperation?

Swapping roles within the “authority – university teachers – students” system? What resources will be required?

**III. TECHNICAL ASPECTS AND METHODS OF THE INTRODUCTION OF AGILE INTO EDUCATION**

In order to create a relatively composite and comprehensive picture of the present and the new world, a university should take the following steps in building awareness of how it can implement the Agile principles:

- Step 1: localization of the current situation both mentally and verbally, understanding why it has become unstable. It may not be bad at present, but it is important to be flexible to readjust when necessary.
- Step 2: instability and polarization, when the existing education system still works but fails to meet stakeholders' demands; new institutions and technologies are just being created, somewhere and by someone.
- Step 3: context: studying the causes and the course of change, analysing the previous approaches and trying to understand what they should be like in the future.

- Step 4: compatibility and development of new educational approaches, systems, technologies and practices. Many of the approaches fail to be combined with the practices of the past and future.
- Step 5: consolidation of the elements of the education system within the new framework and classification of universities into the leading and standard ones.
- Step 6: reflection - extra evaluation of the transformation process, new educational practices and obtained results. This step will also help to assess how the university, its staff and processes have changed along the way to the VUICA world.

The analytical experiment in "Table II" demonstrates the possible implementation of the Agile principles in university practices.

TABLE II. IMPLEMENTATION OF AGILE PRINCIPLES IN TRANSFORMING UNIVERSITIES

Agile principles	Stakeholders	SPOD world context (what it used to be like)	VUCA world context and the implementation of the Agile principles
1. Individuals and interactions over processes and tools	<i>Comment (user story): up until the 2010s, reporting to the Ministry, was of the utmost importance for a university, as it was the main assessor of the university's work.</i>		
	1) Request from employers	Employers' request was accounted for, but only just, and was not updated annually. Having received the feedback from students doing internship, university chairs hardly ever adapted their actions to meet students' needs.	<p>Complexity: Employers are willing to take only motivated students for internship; writing a motivation essay is an essential requirement.</p> <p> Agile: Motivate students and realize that employer evaluation of the university's work on personnel training will be situation-dependent – if not satisfied with the quality of training, the company organizing internship may refuse to take interns in the following years.</p> <p>Volatility: If priorities or management change, organizations may refuse to take interns without reasoning.</p> <p> Agile: Attract alternative organizations and introduce new internship opportunities.</p> <p>Ambiguity: Employers are not willing to reason their selection of the best students only, they would like universities to take it for granted.</p> <p> Agile: Teach students to find their own interests in the profession and write motivation letters to the employer, and teach them to create portfolios, etc.</p> <p>Uncertainty: Employers are willing to cooperate with the university, create new training courses, and improve the existing ones, but do not know the entry point.</p> <p> Agile: Actively cooperate with employers in creating student internship programs, writing scientific articles, conducting research, and becoming expert council members in these organizations. Invite employers to join the state certification commission, work individually<sup>4</sup>.</p>

<sup>4</sup> The rest of table presents a shorter analysis and Agile implementation.

Agile principles	Stakeholders	SPOD world context (what it used to be like)	VUCA world context and the implementation of the Agile principles
<b>1. Individuals and interactions over processes and tools</b>	2) Request from students	Students' request was nominally accounted for. A university created the image of providing the "necessary and sufficient education".	The VUCA world situation: An applicant comes to a university with a certain request about their future education, which often does not correspond to the actual learning process; a student looks for the necessary information and training courses on other platforms, including online.  Agile: Keep in touch with students, regularly monitor their priorities and interests, implement projects in mixed groups (different training programs), provide a wide range of disciplines within minors, develop online courses with assessed for free, and involve students in teachers' research.
	3) Request of the region (Third mission)	The region was obviously not considered a customer and delegated the mission and influence to employers. A university was a "thing in itself".	The VUCA world situation: The region recognises its role in the maintenance of a university and expects economic growth due to the developing knowledge economy.  Agile: Contact university management, update training courses, modernize the content of education, and actively engage local authorities and enterprises into the training process.
	4) Position of the university	All processes were clearly defined and had to comply with the instructions of the Ministry; the content of education and the schedule of student internship were regular and predictable.	The VUCA world situation: The circle of stakeholders has greatly expanded – it includes local authorities, businesses that provide employer-sponsored quotas and Master's programs, and scientific organizations that can test their research results within training courses.  Agile: Not only will taking into account the interests of all stakeholders significantly improve the majors, but it will also greatly diversify the minors. It will attract students and draw their attention to courses; they will also be able to choose the authors of particular courses as internship organizers.
	<i>Comment (user story): The Agile YAGNI (You Aren't Going to Need It) principle is often applied. The flexible approach implies rejection of something that is not in demand.</i>		
<b>2. Working product over comprehensive documentation.</b>	1) Request from employers	Employers neglected what a university thought to be important, did not look for the necessary skills in graduates, took everybody and retrained for their needs.	The VUCA world situation: Employers cooperate with universities more actively and offer properly updated courses, which allow training graduates effectively and greatly reduces the time for retraining.  Agile: It is important for universities to maintain contact with a different organizations in order to update training courses more properly, improve the content of practical lessons, and draw up internship plans in advance, during the semester.
	2) Request from students	Students were eager to learn, but needed to understand what exactly to learn and from whom to learn in order to be able to compete successfully in the labour market.	The VUCA world situation: Students realize that they need a set of specific subjects that can be learned fast rather than get a general education and develop their knowledge and skills in Master's programs and further. The courses seem to be excessive, with too much focus given to non-major disciplines.  Agile: The university should encourage students to understand the importance of general education and knowledge, provide opportunities of working in mixed professional groups, and combine creative and technical disciplines, but set different tasks for those who major in technical disciplines and in humanities.
	3) Request of the region (Third mission)	Having a university in the region was considered an advantage. The region expected to get the necessary number of trained professionals.	The VUCA world situation: If jobs for graduates are created in the region, young professionals do not leave the region, which local authorities see a significant factor. Meanwhile, the fact of reducing training programs as excessive for the region is a negative factor.  Agile: A university should work in cooperation with ministries to regularly update admission quotas and encourage business to create employer-sponsored quotas and programs, relevant for the region.
	4) Position of the university	A universities was to provide general knowledge and give students professional outlook. They later defined themselves what skills and knowledge would be necessary.	The VUCA world situation: There is an urgent need for courses to be updated. The best international practices should be introduced, knowledge and skills should be more relevant, so that they could be implemented in the real economy, preferably in the same region.  Agile: Universities actively cooperate and collaborate with all stakeholders and increase the number of teachers coming from the real economy sector. The attitude towards organising student internships is changing.

Agile principles	Stakeholders	SPOD world context (what it used to be like)	VUCA world context and the implementation of the Agile principles
<p><b>3. Customer collaboration over contract negotiation</b></p>	<p><i>Comment (user story): it should be comfortable for the customer to use the product. If the customer's preferences and needs change, the product should respond to the change respectvely.</i></p>		
	<p>1) Request from employers</p>	<p>Employers concluded a contract for internship with a university without prior assessment of students' skills and knowledge. They knew it in advance that they would retrain students to bring them up to their standards.</p>	<p>The VUCA world situation: At the very start of their cooperation with universities, companies introduce their requirements to the qualification of interns or graduates and assigns mentors to facilitate young professionals' adaptation.</p> <p> Agile: Student internship programs should fully address the issues of technological cycles and management.</p>
	<p>2) Request from students</p>	<p>When applying to universities, young people did not focus much on specialization, often decided on it later, when studying.</p>	<p>The VUCA world situation: An applicant makes a choice of a university judging by the description of training programs on the university website, taking into account scientific workers and teachers employed, as well as the opportunities the university provides in terms of student internships.</p> <p> Agile: A university employs a professional PR strategy and promotes its real achievements. In the era of social networks, any fake or inaccuracy can negatively affect university reputation and ratings.</p>
	<p>3) Request of the region (Third mission)</p>	<p>Regional authorities planned admission quotas through the ministries.</p>	<p>The VUCA-world situation: The same as for the Agile principle 2 of this table.</p> <p> Agile: The same as for the Agile principle 2 of this table.</p>
<p>4) Position of the university</p>	<p>Universities considered themselves to be the only institutions in the region to train professionals. Federal universities had even a stronger position.</p>	<p>The VUCA world situation: As the opportunities of academic mobility are developing, a university needs to compete for applicants, as well as retain students and graduate students.</p> <p> Agile: There is a demand for specialised schools, subject Olympiads, advanced summer programs, intellectual competitions, student loans, and grants for high-achieving students.</p>	
<p><b>4. Responding to change over following a plan</b></p>	<p><i>Comment (user story): it is important to introduce innovations rapidly and respond to changes.</i></p>		
	<p>1) Request from employers</p>	<p>It was more convenient for employers to take A-students: they are fast in learning and understanding what is expected from them and are much easier to retrain.</p>	<p>The VUCA world situation: Employers can organise open competition for internships and further employment among students from different universities. When assessing students' abilities they should focus on innovative knowledge and skills, the ability to retrain, and develop skills in the workplace.</p> <p> Agile: The company can promptly launch professional development courses, Master's and MBA programs of relevant training. This strategy and unique programs attract new students from other universities and regions.</p>
	<p>2) Request from students</p>	<p>Students learned online, chose the most relevant courses, some preferred courses from foreign universities. Many of students worked (nights, weekends). Unfortunately, what they did is not in line with their majors.</p>	<p>The VUCA world situation: Having started university, students analyse the demand in the labour market and develop relevant competencies.</p> <p> Agile: Students join scientific groups, attend practical seminars by different faculties, scientific institutions, and companies and do extra internships including summer and remote internships (on their own initiative). They learn to do research and publish its results; they get experience to put on their CVs.</p>
<p>3) Request of the region (Third mission)</p>	<p>Regions did not develop innovations but adopted ready-made solutions from the leading regions and cities. Specialists (few) could be trained within a short time, in top organizations, even on a fee-paying basis.</p>	<p>The VUCA world situation: New opportunities open up and new industries develop in the region. More jobs are created, interaction with other regions is promoted.</p> <p> Agile: Launch new educational programs in cooperation with business and guarantee employment for graduates. Impose requirements for retraining and advanced training for some categories of employees to improve their skills and maintain the necessary level of competence.</p>	

Agile principles	Stakeholders	SPOD world context (what it used to be like)	VUCA world context and the implementation of the Agile principles
	4) Position of the university	A university usually learned about innovations from employers, less often from scientific literature, and even less often in advanced training courses (taking place in universities in the capital).	The VUCA world situation: Increased requirements to publication activities of university teachers make their training courses more practice-oriented.  Agile: Actively collaborate with industries and science, increase the number of courses to select from, create interesting majors, short-term and highly relevant online courses, and develop individual education programs for students.

**IV. IMPLEMENTATION OF AGILE APPROACHES IN EDUCATION TO OVERCOME VOLATILITY FOR THE FUTURE**

The Agile approaches described in the Table 1 can be successfully applied [9, 10] at least in three types of modern educational environments:

- Basic educational environment, which can combine offline lessons and lessons on online platforms. In leading universities, which are already undergoing transformation this educational environment successfully builds up the picture of the world, develops relevant professional skills, and helps to analyse future changes and adjust training courses and practices to them.

- Practical communities, which involve professionals from the real economy sector or scientific institutions; group project work, horizontal learning (students learning from each other, peer correction, etc.), professional associations, collaboration, clubs, forums, etc.
- Individual education trajectory, which implies a student designing their individual education trajectory (under the guidance of a teacher), professional role-plays, business games, project laboratories, assess to training any time, etc.

The combination of at least three modern approaches ("Fig. 1") provides an opportunity to implement Agile in modern education.

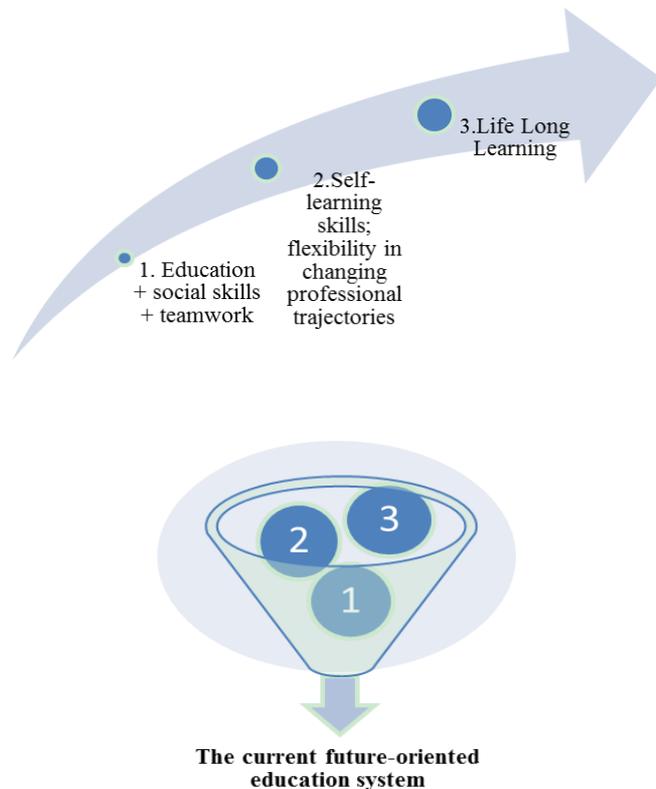


Fig. 1. Opportunities of Agile approach in modern education.

The described approaches will also require transformation of the roles and skills of a teacher of the future. The following skills will be particularly relevant:

- Project work skills: the ability to manage projects and guide project teams;
- Creating original and relevant online courses to promote the university brand and build up the network of potential university applicants and graduate students;
- Attracting professionals from the real economy on a parity basis, building partnerships;
- Conducting offline classes in creative forms, e.g. discussions to develop required skills in students.

## V. CONCLUSION

The article has analysed the possible implementation of Agile Manifesto in education and the VUCA response to the challenges of the VUCA world. The technical aspects and methods of integrating the Agile in education have been discussed. The composite picture of the VUCA world has been outlined in the form of the steps towards the awareness of how the Agile principles can be implemented in transforming universities. The directions for professional transformation of a teacher of the future have been identified. The described approaches, which are typical for the Agile methodology can be successfully applied in new educational environments.

Generally, it can be claimed that the educational model is becoming student-oriented. Teachers will offer new educational courses, while the Agile approach will allow to quickly integrate them into training courses and educational programs, just as the VUCA world requires.

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