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FLEXIBLE TECHNOLOGIES OF UNIVERSITY MANAGEMENT AS A TOOL TO INCREASE THEIR COMPETITIVENESS

Abstract. Higher education faces global challenges caused by the dynamic change of the socium itself and the educational environment under the influence of globalization and extensive digitization of the society. The labor market requires the formation of a new generation of professionals capable of effective development and self-realization. The main problem that impedes the development of the Ukrainian education is the excessive bureaucratization of the educational process in universities where innovations do not find their practical implementation. This makes the higher education system unresponsive to external changes, which leads to the production and transfer of redundant and irrelevant knowledge for modern business environment. The above-mentioned factors determine the low level of competitiveness of Ukrainian higher education institutions. In this regard, there is a need to introduce Scrum management technology in the university education, based on the effective interaction of all participants of the educational process with a prominent level of flexibility and adaptability.

Theoretical and methodological base of the article - conceptual positions and researches of experts on flexible technologies of management. Based on the results of the study, the authors formed the main provisions of the Uniscrum.

The article deals with the crucial problems in the field of higher education. The employment of flexible Scrum technology in the management of higher education institutions to increase the efficiency of their activities is justified. The relevance of the values and principles of Agile flexible approach to the activities of universities in Ukraine is investigated. Authors' definition of "Uniscrum" is proposed. The functions and principles of Uniscrum in relation to the management of the activities of universities are formulated. The key approaches to the use of Uniscrum are defined.

The introduction of Uniscrum management technology in higher education as a project approach to managing the training of highly skilled professionals at universities will contribute to the effectiveness of educational activities, since it will provide the production and transfer of valuable professional knowledge for modern business.

Keywords: scrum; institution of higher education; university competitiveness; Uniscrum; Agile values, Uniscrum principles and functions.

Introduction. The issues of competitiveness under market economy conditions are the most urgent. Regarding the educational system in general and universities in particular, the issues mentioned above are becoming especially pressing as at the background of the economic, political (particularly, the protracted military events in the East), demographic crisis in Ukraine we are witnessing a rapid increase in the number of university entrants who prefer to enter foreign higher education institutions. Ukrainian students (and even high school students) go abroad to study – primarily to Poland, the Czech Republic, Germany, and other countries. Along with many other reasons this causes an aggravation of the crisis of the domestic educational system, the need for its substantial modernization, and the strengthening of the competitiveness of higher educational establishments.

It is possible to carry out a qualitative education reform in the conditions of dynamic social and economic changes in society only in the presence of detailed worked strategy considering as the real situation which developed in education, the accruing tendencies, and the operating relations, and possible ways of future development of society and state [43].

Modern medium of higher education is characterized by a significant degree of complexity and indefiniteness due to the processes of globalization, digitalization, and high level of competition. The

rapid development of digital technologies leads to a change of the way an individual perceives information, fast aging of the latter and transformation of the teacher – student interaction. Under the influence of modern information-communicative technologies, dynamically changing social life changes the society itself as well as the needs and possibilities of an individual living in it. This causes the need for adaptation of both students and academic teaching staff to the conditions in which the educational services market operates, interacting with a changing external environment. Search and application of effective methods of management of an educational institution, organization of educational activity and introduction of the newest teaching methods, based on digital technologies are the most important tasks of modern university education. Approaches to the management of institution of higher education and organization of the educational process require fundamental changes.

A highly developed intellectual resource aimed at achieving the settled objectives and tasks should be the main competitive advantage of an institution of higher education (IHE). Scrum management technology provides effective interaction of academic teaching staff and features high flexibility and adaptability. These factors are currently inaccessible to the complex bureaucratic structures of national universities.

Analysis of recent researches and publications. There is a considerable amount of studies on the management of institutions of higher education done by home scholars; among them are the works by: Kalenyuk I.S., Dyachenko (2016), Padalka O.S., Kulishov V.V. (2016), Shevchenko L.S. (2014), Sakun Ya. A. (2014), Hryshchenko I.M. (2014) [1-5].

The most interesting studies on higher education management have been published by foreign scholars: Porter L. W., McKibbin L. E. (1988), Bates A. W. (2000), Coleman M. (2000), Thrupp M., Willmott R. (2003), Clark B. R. (2003), Salter R. L. (2014), Khavari S. A., Arasteh H., Jafari P. (2016) [6-12].

Various aspects of the competitiveness of universities and the educational system under modern conditions attract the attention of many domestic and foreign scholars – Antonyuk L.L. (2017); Verhohlyadova N.I. (2004); Hrynkevych O.S. (2011); Johnson L., Becker A. (Johnson L., Becker A., Cummins M., Estrada V., Freeman A. and Hall C., 2016); Dyakon A.A., Kalenyuk I.S. (2014); Kolota A.M. (2007); Fathutdinova R.A. (2006), Yakovenko L.I. (2011) and others [13-24], and are also considered in international ratings (2013-2017) [25-33].

Higher educational establishments work on a highly competitive market, complicated by the processes of globalization and rapid technological changes. This involves the use of flexible technologies in the management of IHE and organization of the educational process. Scrum is an example of such technology, a method used in designing and development of complex products.

The term "scrum" has its origin in the sport of rugby; it means the situation "when a group of attacking players from each team who come together with their heads down and arms joined, and push against each other, trying to take control of the ball". In the field of economy this term was first used by Japanese professors of the Economics Hirotaka Takeuchi and Ikujiro Nonaka (1986) [34]. In their book, Degrace P. and Stahl L. H. (1998) [35] consider scrum as one of flexible and effective methods of software development.

Jeff Sutherland and Ken Schwaber formulated and presented the technology of scrum at the annual research conference OOPSLA'95. They extended the use of scrum technology in many IT companies.

The initiators of application of scrum in the educational process are the teacher of Ashram College (the Netherlands) Willy Wijnands and Alphen aan de Rijn [36].

In their work, Arno Delhij, Rini van Solingen, Willy Wijnands (2015) gave a detailed account of the employing of scrum technology in the educational process [37].

However, the issues of the use of flexible methods, particularly scrum technology, in the management of an educational institution, remain insufficiently highlighted.

The **purpose** of the paper is to develop conceptual framework of the use of the Scrum technology in the management of universities with the aim of increasing of their competitiveness.

Main results of the study. The competitiveness of a university is its capability of: 1) preparing specialists that can stand the competition in their professional sphere at the domestic or foreign labor market; developing competitive innovations in this sphere; conducting an effective reproductive policy in all spheres of its activity (Fatkhutdinov R.A. (2006) [23]; 2) carrying out activities and forming educational product and assortment of services that meet the needs of a competitive market (Verhoglyadova, N.I., 2004) [15]; 3) standing out among other higher educational establishments (including foreign ones)

with better socio-economic indicators, increasing their positions in the ratings, being attractive both for domestic and foreign students; 4) functioning avoiding crisis, being mobile, adapting to new requirements, rapidly changing conditions of the labor market and social requests.

When examining the competitiveness of the domestic educational system, it is worth paying attention to international ratings. The general issues of the competitiveness of the educational system are represented in The Global Competitiveness Report (2015-2018) [26-30], evaluation of higher education in various countries is carried out in rating Universities 21 (2017) [33]. A rather positive tendency is the growth of the quality of Ukrainian educational system by the integral indicator: in 2017-2018 it grew by 23 points in the Global Competitiveness Index in comparison with 2013-2014 (see table 1).

Table 1 – Components of the Global Competitiveness Index that characterize
the educational system of Ukraine in 2013-2018*

Characteristic	Position of Ukraine in the Global Competitiveness Index by years				
	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Quality of the educational system in general	79	72	54	56	56
Quality of primary education	37	40	45	51	42
Coverage by secondary education	54	41	39	53	51
Coverage by higher education	10	13	14	11	16
State of higher and professional education (in general)	43	40	34	33	35
Quality of education in the sphere of management	115	88	87	93	88
Quality of higher education in Mathematics and Natural Sciences	28	30	38	27	27
Quantity of countries that participated in the research	148	144	144	138	137
*Compiled by the authors on the basis of the data The Global Competitiveness Report (2013-2018) [26-30].					

To become successful in all of these areas of competitiveness, effective management of the university is a determining factor. Flexible management technologies are most effective in complex, changing environment and help ensure a company or organization's competitiveness in the market. Scrum is one of the flexible approaches that is advisable to use in the management of educational, scientific and other activities of an educational institution, since it is based on ensuring the effective interaction of all participants in educational, scientific and commercial projects.

Scrum was first introduced in the sphere of software development. Today, this method of project management has been successfully applied in many areas: IT services, production, trade, finance, marketing, recruitment, another creative work, etc.

As to the employment of the Scrum technology in the field of higher education, it should be noted that it is due to the very philosophy of Scrum, the essence of which is in a consistent, based on efficient team work, approach to solving project problems by combining the potential of creativity of its participants. The use of Scrum in the management of a higher educational establishment will allow solving of the following problems: students' low motivation to study and research, imperfect technologies of teaching and methodological support in the system of higher education, outdated teaching methods, bureaucratic management of higher educational establishments, complex document circulation, too long scalar chain of command transfer, etc. And most importantly, the use of the Scrum technology can significantly reduce the market and financial risks of IHE.

The Scrum technology is based on Agile principles that received detailed description in The Agile Manifesto by Ken Schwaber and Mike Beedle (Agile Software Development with SCRUM, 2001) [38]. This approach to management is focused on creating the maximum value for business (project). There are four main ideas and twelve major principles formulated in the Manifesto. We will consider whether these values are important and relevant in the management of a higher education institution.

Value 1: *Individuals and interactions over processes and tools*. This value is the most consistent with the mission of educational institutions and is one of the main principles of educational activity. In particular, the main value of an educational institution is the human capital, which consists of scientific and pedagogical staff and management personnel. It is due to them the labor potential of the country is

formed. The educational activities of the university are successful when effective communication between teachers and students is established.

Unfortunately, the payment of the scientific and pedagogical staff of Ukrainian universities is far from being worthful, which contributes to the outflow of the best teachers to foreign universities or business sector. A complex bureaucratic organizational structure reduces the effectiveness of interaction between university staff as well as between teachers and students. Moreover, a significant faculty load on teachers is an obstacle to professional communication of the pedagogical staff with students and providing students with efficient counseling.

Value 2: *Working software over comprehensive documentation*. Educational software in a university is a curriculum and/or qualification. The ultimate goal of the students who enter higher educational institution is getting knowledge and a certain qualification. However, this value is practically impossible in Ukrainian realities since both managerial and educational activity of higher educational institutions are overloaded with formal requirements to paperwork. It concerns all spheres of university activity: from a syllabus of a certain subject to licensing or accreditation requirements of a higher educational institution. The scientific-pedagogical staff and the management of an IHE must develop stacks of papers; submit copies of the documents that already exist in electronic form on a university's website and at the USDE (the Unified State Database on Education). In certain cases, a scientific-pedagogical staff member spends more time on paperwork than teaching. Often, in the field of higher education, the quality of the required papers dominates the quality of the educational product.

Value 3: *Customer collaboration over contract negotiation*. The most important final users and customers for an educational institution are entrepreneurs who act as employers for their graduates. Unfortunately, national higher educational institutions prepare specialists whose skills do not meet the requirements of employers. Herewith, universities actually do not cooperate with business and vice versa. The situation is worsening due to the lack of interest of business regarding the formation of curricula, the provision of places for practice, the provision of orders for scientific developments. In fact, entrepreneurial structures do not act as customers of specialists graduating from higher educational institutions. In most of cases, IHE use outdated training technologies, and future specialists do not receive relevant knowledge and skills.

Value 4: *Responding to change over following a plan*. Variable external environment and quick-changing technologies make obtained knowledge irrelevant and obsolete at the stage of graduating from the university. This requires constant updating of the educational product, and the long term of licensing of a new specialty and ineffective organizational structure of the university hinder this.

Thus, all values mentioned above are important and relevant to ensure full competitive educational activities of institutions of higher education. Values are based on the twelve principles of Agile, which are clustered into four groups: meeting requests and customers' needs; quality; team work; project management (Layton C. Mark, 2012) [39]. We are planning to apply them to managing the higher educational institution.

The first group of principles: *satisfying customer demands and needs*. There are two types of clients (customers) in the sphere of higher education: students and business entities that have both common and diverse needs. It is expedient to include to students' needs the following issues: getting training from the best teachers; recognition of achievements; the opportunity to be engaged in a modern, interesting research project; academic mobility; social interaction in the student environment. Business entities' needs are as follows: the opportunity to involve the highly skilled specialists with relevant professional skills as well as those who are capable of creating innovations. A quality educational product belongs to the common needs.

The second group of principles: *quality*. The quality of an educational product is an integral indicator that is determined by the relevance of students' knowledge and skills acquired during training and their ability to meet the needs of the labor market. The quality of education for graduates of educational institutions is expressed in decent wages and labor market demand. The quality for potential employers is the human capital with appropriate professional skills and competencies that can ensure the growth of the efficiency of enterprises.

The third group of principles: *teamwork*. It is the harmonious interaction of teaching staff, managing personnel and students of university aimed at performing the settled tasks and achieving goals. Teamwork involves the motivated staff within teams.

The fourth group of principles: *project management*. This involves the possibility of making changes at any stage of development of the educational product, as well as reducing excessive, formal and insignificant work. It allows educational institution to develop and offer a competitive educational product of high-quality.

Values and principles of Agile are realized through many managerial techniques. The most widespread among them is scrum, which is intended to solve complex problems on the basis of organization of effective work of project groups (teams). According to the report "State of Scrum 2017-2018", the above-mentioned management technology is successfully used in 27 branches of the economy, including education. This report is based on the results of the survey among certified members Scrum Alliance (2000+ respondents) from 91 countries. According to the results of the survey scrum is most spread in the USA (48%) as well as in India (7%), Germany (6%), Great Britain (5%), Australia and Canada (4%) (State of scrum, 2018) [40,41]. The data of the survey shows that besides IT sphere scrum is used in other departments of various enterprises and organizations (see table 2).

Table 2 – Departments other than IT using scrum, %, according to the results of the survey*

Departments	2015	2017
Operations or Production	48	42
Research and Development	46	31
Sales and Marketing	26	25
Content Development, Management	–	24
Consulting	–	22
Human Resources	12	19
Financial or Accounting	16	18
*Compiled by the authors on the basis of the data (State of scrum 2017–2018; The 2015 State of scrum report) [40, 41].		

It should be noted that 15% of the projects implemented with the help of scrum do not belong to the IT sphere. The effectiveness of the projects implemented on the basis of Scrum technology is 63% (State of scrum, 2018) [40].

It is important to note that in the system of higher education, it is advisable to consider scrum in two planes:
– teaching of disciplines;
– management of an educational institution.

Regarding the first plane, the use of this technique will not only improve the quality of learning, but also increase the level of students' motivation and their focus on the result. The use of scrum in the learning process is detailed in the EduScrum Guide "The Rules of the Game" (Arno Delhij, Rini van Solingen Willy Wijnands, 2015) [37].

We will focus on the second component. The use of scrum management technique will significantly improve the efficiency of university administration, as well as its interaction with stakeholders which is the basis of its competitiveness.

Among the caveats it should be noted that the above technology has been developed for small project teams of 5 to 10 people. Therefore, the question arises whether it is appropriate to use this managerial technology for university management, which has a complex bureaucratic structure and a considerable number of stuff?

The survey results presented in the report Scrum Alliance give a positive answer to this question. LeSS scrum (Large-Scale Scrum) is efficient for big organizations, and its use allows abandoning command-administrative management methods and apply flexible ones. Respondents from large companies single out the following advantages of the use of scrum: fulfilling customers' needs, improving time to market and reducing cycle time (State of scrum, 2018) [40]. Thus, the use of scrum allows solving of the most pressing issues of universities, namely: to eliminate the discrepancy between the acquired knowledge and skills of graduates of IHE and the requirements of employers to the competences of potential employees; reduce the time spent on developing new educational programs and bringing them to the educa-

tional market. An additional advantage of Scrum technology is the possibility to use mobile applications, which is important for the digital generation, to which students belong. With the mobile app it is possible to notify students of changes in the schedule, correspond with a supervisor, receive information about assessment, establish cooperation within academic groups and so on. The use of mobile applications is also relevant for scientific and teaching staff and managerial board of university.

Since management of a higher educational institution has its own specific character, we will use the term "Uniscrum" to define this technology. This term is composed of two parts – "Uni" which is a contracted form of the word "university" and "scrum"(Azmuk N.A., Kuklin O.V., Kuznetsova N. B. (2017) [42]. We regard "Uniscrum" as the project approach to managing the processes of training highly skilled professionals in universities, in which the effectiveness of teaching, methodological, research, educational and other activities is ensured by the use of flexible teamwork tools based on the principles of creativity and control of quality of this process.

The essence of Uniscrum is revealed through its functions. The main of the latter are as follows:

– improving the quality of educational services on the basis of self-organization and creative approach to solving key problems in the activities of IHE and the use of intellectual potential of scrum-teams;

– formation of creative teams from the scientific and pedagogical staff, representatives of government, business, students, organized for solving certain tasks in the field of higher education;

– attracting private investment for the development and training of highly skilled professionals in the higher education sector for business needs;

– conducting of applied researches aimed at increasing the efficiency of socio-economic development of the regions;

– establishing interaction between universities and stakeholders – representatives of business, local authorities, etc.

We will define the basic principles of management of an educational institution.

The *basic principles* of the Uniscrum technology are:

– *flexibility* – rapid response to the challenges of the environment and making appropriate changes in the educational product. This will enable the universities to respond to labor market demands in a timely manner and make appropriate changes in the educational product;

– *transparency* – all aspects of management should be open to all individuals involved. The use of digital technologies should become the basis of this;

– *controllability* – qualitative monitoring of tasks execution for maximizing the effectiveness of team work on an educational product;

– *adaptivity* – prompt input of necessary task adjustments to avoid undesirable deviations in the process or work materials;

– *creativity* – free, favorable for development of creativity scientific-pedagogical environment, which will provide flexibility and efficiency of the work of a scrum-team;

– *motivatedness* – team work on the result increases the level of motivation of each member: motivation of the management structure members enhances motivation of the teaching staff, and the latter increases motivation of student in its turn;

– *interaction* – consolidation of joint efforts (heads of IHE, their structural divisions, representatives of the authorities, business, public organizations, students) aimed at the implementation of commercial and social projects in the field of higher education, science and business.

– *constant improving* predetermines that university constantly is constantly improving its activities through experimentation and training.

For successful implementation of the project task, in this case – educational project, it is important to form *Scrum Team* and distribute the major roles. To the latter we refer: Product Owner, Product Owner's assisting team, Scrum Master and Development Team.

Within the Uniscrum technology, the role of *Product Owner* belongs to a professional who is an expert in the educational product and understands the needs of business. This expert is president of a university and/or owner of an IHE; he/she has a clear understanding of the goal the team has to reach. Interaction with stakeholders is among the Product Owner's main functions. Stakeholders include business

representatives, Ministry of Education and Science of Ukraine, State Employment Service of Ukraine, regional and local structures for supporting entrepreneurship, research companies, public organizations, etc.

Product Owner's assisting team is characteristic for big organizations. It is aimed to help Product Owner to perform his/her functions and ensure effectiveness of his/her activities.

The main function of the *Scrum Master* is to ensure the productivity of the team – a group of scientific and pedagogical staff members who work on the educational product. The Scrum Master's major task is to secure the team from extra undesired interferences from the outside. Amongst other tasks of the Scrum Master (Head of educational product (program) are: forming a complete list of requirements (objectives) and assessment together with his team performance in hours.

The *Development Team* should include scientific and pedagogical staff members who work on the same educational project (program) or scientific research project. The team should consist of the workers possessing cross-functional skills that are able to perform all types of work from the beginning to the end of the project. All product teams cooperate because they are united for the sole purpose. An important stage of the team's work planning is the division of the project into several parts (sprints). Each stage of work on an educational or scientific product ends with a retrospective, where team members: discuss results, mark positive sides and identify shortcomings, determine the ways of improving their work in the future.

Based on the above, we formulate approaches to the Uniscrum. The main **approaches** to the Uniscrum technology in the modern information society are: empirical, competency, digital.

– *Empirical* approach suggests that knowledge is formed on the basis of the experience gained, that is, based on the results obtained by the decisions taken.

– *Competency* approach is closely connected with the empirical one and implies the formation of the necessary competencies by all participants in the educational process. The basis of this approach is the constant increase of the competence of the administrative, scientific and pedagogical and student staff of a university.

– *Digital* approach presupposes the realization of the management of a higher educational institution on the basis of the use of modern cloud platforms, which will provide an opportunity to increase the efficiency of work, establish interaction between scientific and educational staff and the administration members of IHE, as well as between teachers and students. It allows to organize the interaction of the members of the university scientific and pedagogical team, control the quality and timing of the tasks. The examples of digital instruments can be the following products: Trello, Worksection, Scrumdo, etc.

Conclusions. Thus, the use of the Scrum technology nowadays opens opportunities for making management more efficient in various spheres of human activities, and especially in the field of higher education through better fulfillment of clients' requests and needs, improvement of service quality, coordinated team work and clear project management. It is a solid basis for increasing the competitiveness of universities by improving access to resources and more efficient use of them, increasing social capital (image, relations, support environment, etc.), diversification of educational services, etc.

We strongly believe that with the help of the Uniscrum technology, based on the involvement not only scientific and pedagogical staff and students but representatives of local authorities, business structures, and public organizations to scrum teams, it is possible to successfully implement definite strategic tasks, projects and programs of social and economic development of cities and regions. Universities are the institutions of city-formative and regional-formative value; it is them that should become centers of innovation infrastructure development for entrepreneurship. Uniscrum is based on the following principles: flexibility, transparency, controllability, adaptivity, creativity, motivatedness, and interaction. The major approaches to Uniscrum are as follows: empirical, competency and digital. Further work needs to be primarily focused on the analysis of cases (practice) of the application of the Uniscrum methodology to the management of higher educational institutions activities; research of other factors of competitiveness of universities, besides technology of management; substantiation of the use of the Scrum technology in the work of bodies that provide public services to population (for example, the State Employment Service).

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УНИВЕРСИТЕТТЕРДІ БАСҚАРУДЫҢ ИКЕМДІ ТЕХНОЛОГИЯЛАРЫ ОЛАРДЫҢ БӘСЕКЕГЕ ҚАБІЛЕТТІЛІГІН АРТТЫРУ ҚҰРАЛЫ РЕТІНДЕ

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ГИБКИЕ ТЕХНОЛОГИИ УПРАВЛЕНИЯ УНИВЕРСИТЕТАМИ КАК ИНСТРУМЕНТ ПОВЫШЕНИЯ ИХ КОНКУРЕНТОСПОСОБНОСТИ

Аннотация. В статье изучаются основные проблемы в сфере высшего образования, которые обусловливают низкий уровень конкурентоспособности национальных высших учебных заведений. Высшие учебные заведения работают в сложной и быстро изменяющейся внешней среде, которая трансформируется под влиянием глобализации и диджитализации. На современном рынке труда востребованы специалисты нового поколения, способные к продуцированию инноваций, эффективному развитию и самореализации. Основными препятствиями развития украинского образования являются чрезмерная бюрократизация образовательного процесса в университетах, отсутствие налаженного взаимодействия между учебными заведениями и бизнесом, снижение качества образовательных услуг, отток высококвалифицированных кадров. Это приводит к торможению инновационного развития, как университетов, так и предпринимательства.

В статье обоснована возможность использования гибкой технологии скрам в управлении вузами с целью повышения их конкурентоспособности. Теоретико-методологической базой статьи являются концептуальные подходы и результаты исследований экспертов из гибких технологий управления. Авторами исследовано актуальность ценностей и принципов гибкого подхода управления аджайл в деятельности университетов в Украине.

На основании результатов исследования авторы сформировали основные положения Uniscrum. Предложено авторское определение "Uniscrum". Сформулированы функции и принципы Uniscrum управления образовательной деятельностью университетов. Определены ключевые подходы к использованию Uniscrum в учреждениях высшего образования.

Внедрение технологии управления Uniscrum будет способствовать повышению эффективности образовательной деятельности, поскольку это обеспечит генерирование актуальных профессиональных знаний, активизацию инновационных прикладных разработок, и, вместе с тем, подготовку специалистов, отвечающих требованиям современного бизнеса.

Ключевые слова: скрам; учреждение высшего образования; конкурентоспособность университета; ценности аджайл; унискрам; функции и принципы унискрам.

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