Saint Petersburg University
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Master in Management

The Impact of Innovation Attributes on University Staff's Adoption Intention: the Case of EdTech Solutions

Master's Thesis by the 2nd year student
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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

Я, Бойко Виктор Викторович, студент второго курса магистратуры направления «Менеджмент», заявляю, что в моей магистерской диссертации на тему «Влияние инновационных атрибутов на намерение их принятия сотрудниками университетов на примере EdTech решений», представленной в службу обеспечения программ магистратуры для последующей передачи в государственную аттестационную комиссию для публичной защиты, не содержится элементов плагиата.

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АННОТАЦИЯ

Автор	Бойко Виктор Викторович
Название магистерской диссертации	Влияние инновационных атрибутов на намерение их принятия сотрудниками университетов на примере EdTech решений
Факультет	Высшая Школа Менеджмента
Направление подготовки	Менеджмент
Год	2021
Научный руководитель	Страхович Эльвира Витаутасовна
Описание цели, задач и основных результатов	Цель данной работы – определить взаимосвязь между инновационными атрибутами EdTech решений и намерением сотрудников университетов принять эти инновации. Для выявления взаимосвязи было необходимо обозначить определяемые параметры, что было сделано с помощью анализа и объединения теоретической базы. Данное исследование основано на теории Роджерса о принятии решений об инновациях и нескольких дополнений, предложенных Торнацким, Капуром, Двиведи и другими учеными. Опрос из 19 вопросов был распространен среди как академических, так и административных сотрудников университетов пяти государств, и выборка из 503 ответов была использована для дальнейшего моделирования, включая регрессионный анализ. В результате, данное исследование восполняет пробел ограниченных знаний о рынке EdTech и добавляет понимание, какие инновационные атрибуты EdTech решений являются наиболее важными для сотрудников университетов и должны быть отражены в самом начале.
Ключевые слова	Инновационные атрибуты, принятие инноваций, намерение принятия, EdTech

ABSTRACT

Master Student's Name	Victor Boyko
Master Thesis Title	The Impact of Innovation Attributes on University Staff's Adoption Intention: the Case of EdTech Solutions
Faculty	Graduate School of Management
Main field of study	Management
Year	2021
Academic Advisor's Name	Elvira V. Strakhovich
Description of the goal, tasks and main results	The goal of the thesis is to identify relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff. In order to do it, parameters of such relationships had to be identified, and it was done through analysis and merge of theoretical frameworks. This study is based on the Rogers' innovation-decision theory and several updates to this framework by Tornatzky, Kapoor, Dwivedi and other scholars. A survey with 19 questions was distributed among Universities' staff in five countries, both academic and administrative staff, and the sample of 503 responses was used for further modeling, including regression analysis. As the result, this research fills up the gap of limited knowledge within the EdTech field and contribute to the understanding which innovative attributes of an EdTech solution are the most important to Universities' staff and should be addressed first.
Keywords	Innovation attributes, innovation adoption, adoption intention, EdTech

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Introduction

Acceleration of technologies development, along with changing consumers' behavior and needs, is altering the system of education, which was designed for the needs of industrial society decades ago [Wisbauer, 2017]. Traditional Higher Education institutions are failing to keep up with the times, and as a result they suffer budget deficits and lose the fight for students' time and money. However, traditional Universities possess various irreplaceable attributes and perks for students, they have to evolve in order to keep the place in the sun. And technologies embracing might be one of the ways, which can level up the service Universities provide and meet the expectations that current students and society have [Navas, 2020].

Fundamental reforms are linked to high risks and uncertainty, and many old-fashioned institutions are too risk averse to start and conduct them. Fortunately, procedural changes may be launched with the help of third parties and services they provide. Therefore, all necessary for Universities' transformation technologies are out there already, and they are developed by private companies, which provide services to anyone who pays. Consequently, there is no need to run sophisticated software and hardware development programs in-house and allocate formidable portions of budget to them [Williamson, 2021]. Instead, Higher Education Institutions can address the EdTech market and choose solutions, which are designed for their needs. The EdTech market has a lot to offer, and it is estimated to reach 100 billion USD by the end of this year [Grand View Research, 2021].

However, thousands of advanced technological solutions, which aim to solve Universities' issues, remain unnoticed by the latter ones due to the EdTech companies' failure to communicate with the target audience adequately and properly. For instant, EdTech startups do not understand what particular attributes are the most crucial for their target audience, when it decides whether to give a product or service a try or not [Lynch, 2017]. By virtue of this situation, Universities do not utilize technological solutions, which have been designed by private out-of-house companies in their interest.

Technology implementation is inseparable from its adoption lifecycle and crossing the chasm in particular. A large gap between early adopters and early majority is what every technological company has to overcome to reach the phase of hyper-growth and success at the market [Schmutzler, Presse, 2021]. It is not a simple endeavor as early adopters' needs differ a lot from the early majority's ones. The latter is also more risk-averse, and it demands a proof of how

the product can help them and a number of success stories par excellence. Unfortunately, existing studies do not cover this topic regarding the University staff's traits and preferences in technological solutions, though there is a plenty of papers on students as B2C users of EdTech solutions and Universities as B2B clients and partners. Therefore, EdTech startups lack information on what Universities' employees look at, when they decide to try a product, which may improve job duties execution, or not [Shulman, 2017]. And this thesis is to help them out and pave the way to customers in Universities.

In order to estimate and calculate innovation adoption, which result in University staff's willingness to use new services and products, influencing parameters or EdTech solutions' attributes should be identified and measured. Today, many theories dedicated to this topic are designed, which can be grouped in two divisions: the former ones focus on product intrinsic innovative features, while the latter ones are built around environmental conditions, which influence the perception and readiness to utilize innovations [Wisdom, Chor, Hoagwood, Horwitz, 2014]. For the sake of this research, the former approach to calculate innovation adoption is chosen, as it aims at identifying the impact of every innovation feature separately, over which an EdTech startup has a direct control. Therefore, the Everett Rogers' Innovation-Decision theory altered by Kapoor and other scientists was selected to be a cornerstone of the theoretical framework of the thesis [Rogers, 2003; Kapoor et al, 2014]. It allowed to define the relationship between innovation attributes and their impact on adoption intention by an end-user.

Hence, the research goal of the paper was set to identify relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff. In order to do it, parameters of such relationships had to be identified, and it was done through analysis and merge of theoretical frameworks. However, the Rogers' Diffusion of Innovations theory was originally developed in 1962 and revised later in 2003, it faces both criticism and alterations from today's scientists due to its simplification and attributes grouping. Moreover, it may deliver unexpected and biased outcomes, when applied in places with different cultures and levels of development [Chiyangwa & Alexander, 2016; Yang et al, 2016; Hsu et al, 2007]. Therefore, this study covers the gap of University staff's adoption intention and their evaluation of EdTech solutions' innovation attributes.

The following two research questions were set to help in reaching the thesis' goal:

Q1. Are there relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff?

Q2. What EdTech solutions' innovation attributes affect Universities' staff adoption intention?

The research was designed the way, which contribute to both theoretical and managerial fields. First, the evolutionary trajectory of Universities was studied. Within this part of the first chapter, issues and challenges that Higher Education institutions face were identified with the help of the Porter's Five Forces analysis. Then, the insights on how Information Technology solutions were introduced in Universities were presented and the EdTech startups' contribution was identified. Second part of the first chapter was dedicated to the Innovation Adoption theories and frameworks, which allow to distinguish particular attributes of innovative solutions and measure them. By the end of the chapter, six hypotheses regarding the relationship between a particular attribute of an EdTech solution and University staff's adoption intention were formulated. The purpose of the second chapter was to justify research design and methodology for further usage. Thus, a questionnaire with nineteen questions was developed, which covered six hypotheses and respondents' personal willingness to use innovative solutions. The survey was built on the SoGoSurvey platform with the list of protective tools in order to prevent the sample from manipulated inputs. Next, third chapter is for quantitative analysis, which was conducted in the IBM SPSS Statistics environment. When the reliability test was done, the multiple regression model was built. Finally, conclusions and implications of the studies were discussed in the last chapter.

The thesis is designed to contribute new insights and knowledge to both theoretical and managerial fields of science. For the former one, the research is aimed at checking the applicability of the Rogers' theory for the EdTech market and its altering, if found necessary. For the latter one, the study is set to deliver recommendations for EdTech startups on which attributes of their innovative solutions to stress on during pitches and advertising campaigns, so the product's value is delivered and understood by the target audience, and tips on closing the Chasm gap in the field of EdTech University-focused market in general.

Chapter I. Overview of Research on Innovation Adoption and University's change

In the following chapter, we explore the evolutionary trajectory of Universities and through the perspicacious lens of. history extract insights on how Information Technology solutions were brought to Universities and what was the EdTech startups' contribution. From there, we will look at the Innovation Adoption theories and frameworks and suggest hypothesis on a relationship between EdTech solutions' innovation attributes and adoption intention of Universities' staff. In order to do it, parameters of such relationships had to be identified, and it was done through analysis and merge of theoretical frameworks.

1.1. General Discussion on University and Higher Education transformation

In recent years and decades, conflicts around terminology occur nearly in every field of science due to the obsolescence of previously accepted definitions of particular terms. It is caused either by emergence of new doctrines and approaches within the field or revision of the old ones. Situation with the educational market is no different. However, education is not equal to schooling and tutoring and is not limited to schools, universities and teacher-led processes. Therefore, it is necessary to outline the role of University, its definition and evolution prior to any further discussion, as it will set a common language for everyone involved in the topic.

Scholars and scientists fail to determine when exactly the first university was established in Europe. It is believed that University of Bologna is the oldest one and has quite a rich and nearly a millennial old history. Therefore, we may say that first European universities were established in late XI - early XII centuries. As they had been created during the feudal fragmentation period in Europe, they became one of the key and long lasted means of it integration [Avrus, 2001]. Moreover, they were seen as knowledge carriers and disseminators, and a place which is bothered neither by violence nor turbulence from outside. Indeed, at the beginning European universities did bring people together regardless their national or ethnic background, as they were practicing same academic curriculum, Latin as learning language, and dedication to Catholic beliefs. Therefore, they contributed to the European internal peace and appreciation the idea that European nations belong to the same civilization not less than to international trade or political agreements.

Medieval universities used to have only four faculties: medical, theological, legal and liberal (artistic), where the latter was considered as the first step to enter the University. When a

student mastered the material on seven liberal arts, he or she was allowed to choose from medical, theological or legal faculties to join. The process was the following: students attended lectures, participated in debates, passed exams and defended dissertations. Ordinary lectures could not be interrupted with questions, though extraordinary lectures did not have such limitations. It is worth to notice, that professors were not allowed neither to read nor to repeat their speech: they had to deliver it smoothly by heart. Nevertheless, medieval university had only two functions: to teach priests, public servants and lawyers, and to produce knowledge limited to theological, philosophical, medical and some other topics [Byrd, 2001].

Over time as the surrounding social environment changed, so Universities' functions evolved. There was a demand to educate students in particular disciplines, and not to cover many topics with no comprehensive study. Hence, universities started to group academics into departments, so they could work together rather than compete with each other and deliver new more specialized courses. It led not only to Universities' concentration on particular topics and emerge of new ones, but also to the further separation from the Church and its supervision. Therefore, created by national governments and focused on technologies or liberal arts universities occurred. One the one hand, the Catholic Church had little or no control over them. On another, Universities started to be different from each other, shape own curricula and switch from Latin to national languages. Moreover, such processes undermined the Universities' mission of bringing people together and uniting them.

By the second half of the XIX century, three types of universities were established, which exist to these days [Sternberg, 2014]. First, there are "land grant (regional)" universities, which serve local needs and allow the locals to gain higher education or additional courses. Second, there are "national" universities, which attract students from all regions of a country to get enrolled and address national-level issues and problems. Third, there are "international" universities, which educate both local and foreign students and focus on macro-level issues and challenges. Such educational institutions gain more both funding and awareness, thus their programs and services experience more demand.

As we briefly looked through the history of Universities, let us answer the following question: what a university in its traditional definition is. Britannica, the oldest English-language encyclopedia, defines University as an "institution of higher education, usually comprising a college of liberal arts and sciences and graduate and professional schools and having the authority

to confer degrees in various fields of study" [Britannica]. This definition does not have a linkage to the original Latin word "universitas", which embraces the idea of gathered together people into one body, community or corporation. Oxford Advanced Learner's Dictionary does not include the reference to gathered people or experience, giving the following definition: "an institution at the highest level of education where you can study for a degree or do research". However, this source focuses on obtaining the knowledge, but not the experience and processes along with it, it leaves a comment that current students appreciate not only the gained knowledge, but also atmosphere and engagement. Moreover, if we look at the John Newman's "The Idea of a University" written in 1852, we find these values: "A University is a place for communication and circulation of thought, by means of personal intercourse" [Boulton, Lucas, 2008]. And he continues with the statement that "mutual education is one of the great and incessant occupations of human society", and it is why people are willing to attend universities [Watson, 2002]. Geoffrey Boulton and Colin Lucas came with a study on the Universities' role in 2008 and concluded that University delivers two packs benefits: drives people to socialize and tolerate more, and gives them institutional opportunities to gain knowledge but does not teach them, as it is not possible if they are not willing to.

For the sake of this study, the following definition of a word "University" is to be applied: an institution of higher education, usually comprising a college of liberal arts and sciences and graduate and professional schools, where a person can study for a degree, do research, exchange ideas and maintain personal intercourse.

1.1.1. Universities through the lens of the Porter's Five Forces Analysis

Now, when we are agreed on the definition of the term, we will examine the higher education system with a focus on Universities through the theoretical application of Porter's Five Forces Analysis. It is essential for identifying current state of universities, determining challenges and downsides, and developing the roadmap how to overcome them via contemporary IT solutions. This framework will help to identify areas where EdTech solutions are likely to be concentrated, which will be used further in this research.

However, Michael Porter's Five Forces model was developed in 1985 and was criticized later by Mintzberg and others, still it is said to be a popular and useful strategic frameworks [Bruijl,

2018]. Under this analysis, competition is defined as a fight for extra margins caused by five different forces. The threat of new entrants: new players may bring extra capacity and put additional pressure on prices and costs trying to gain market share. Supplier power: bargaining power of suppliers is great, if their number is limited, the number of customers is large and clients are disorganized, and few substitutes are available on the market. Buyer power: bargaining power of buyers is great, if they are organized, able to force down prices, and drive suppliers to compete aggressive among each other. The threat of substitutes: a substitute or generic product executes a similar function and achieves the result through another mean. If the threat of substitutes is high, profitability for suppliers and their growth potential are low. Industry rivalry among existing competitors: it may be performed in different ways, including price and costs rivalry, new product development, marketing. Rivalry limits profitability for suppliers and lets customer win, as they get the best quality-price ratio.

As Michael Porter admits that economic crises and technological development affect every element of the Five Forces analysis, we will discuss these risks throughout this framework. Figure 1 highlights five forces depicted through the lens of the industry of higher education and gives us the framework for further discussion.

Figure 1. Higher Education industry through the Porter's Five Forces Framework. [Source: author]

Threat of Entry

Public image or prestige, brand, ranking, quality of teaching and networking are the attributes students look at, when they choose a university or a program to apply for. Newly established higher education institutes hardly can cover any of these features and compete with well-known and old-fashioned schools. It is explained as a demand-style economies of scale, when a customer is less ready to purchase anything from a newcomer and he or she demands a discount for a service or product. Typically, it takes years for Universities to gain reputation and academic legacy. However, there are rare exemptions, and the New Economic School (NES) is one of them. This University has chosen to focus only on economics and finance and not to compete with traditional universities in other programs. Today, only 29 years after it was established, the school is a renowned Russian university with world-class research and foreign professors from the world's leading schools, including Harvard, MIT, Columbia and other.

Customer switching cost is another phenomena, which keeps new entrants from the higher education market. Students suffer large fixed costs, if they change suppliers of educational services, transfer the gained credits, have to move to another location and establish social network in a new environment.

Supply-side economies of scale plays in favor of Universities as well, as it restricts new entrants and pushes them to have large initial investments, capital. Established and big universities are able to decrease the average cost per student by increasing number of people attending the class, while any new entrant may find it difficult to enroll a hundred student for one program, so the educating process is to be more individual but expensive.

Also, restrictive government policies are a strong barrier for new entrants [Vedder, 2019]. It takes both time and capital to register a new educational body, gain licenses recognized by the state government and keep all processes up to the set level. In this regard, the higher education industry is close to the banking industry, when it is easier to acquire a private bank in order to gain its banking license, rather than getting your own one. It is faster and easier to join an existing educational body and lead its change, and not to form another one from the scratch.

In summary, the barriers to enter the higher education industry are high. Therefore, the threat of entry is relatively low.

The Power of Suppliers

Universities accumulate thousands of students and provide a big list of services and goods to them, including technical and physical infrastructure, materials and books, sports facilities and libraries, access to professors and peers. The higher education institutes combine all these features and act as a hub or point of access to them.

Universities have the following units in their portfolio: brand and perception in society, ranking, professors and assistant teachers, courses to choose from, technical and physical infrastructure, access to graduates and networks. In general, the higher education institutes' governance can be described as a merge of the academic body, which addresses academic questions, and the administrative body, which governs managerial questions. These two bodies do not possess the same degree of power [Martinez and Wolverton, 2009]. Typically, top-notch professors and faculty members have more power and influence during the decision-making process than employees of the managerial body, as the latter ones are there just to help the professors in their work and resource allocation [Duczmal, 2006]. Moreover, the former ones bring both prestige and respect to the place they work, and it is not easy to replace.

Clearly, the bargaining power of suppliers is moderate, as all units are not gathered together and split in two major bodies, and there are trade unions, faculties and groups of interest within the higher education institutes. Therefore, the power of suppliers is moderate.

The Power of Buyers

Majorly, the beneficiaries of the services which Universities provide are students. However, the service itself might be paid not by a student and his or her family, but by the governments, ministries, corporate customers or federal agencies, for example. And depending on the case, the power of a buyer differs from low to high.

When a student pays for educational services out of his own pocket, he has nearly no impact on the higher educational institute due to the lack of power concentration and high potential switching costs. In this case, a student cannot ask University to revise the tuition cost or terms of enrollment. However, a drastically different situation occurs when the educational service is paid by a party, which acts as a provider of educational benefits for the public and accumulates hundreds or thousands of payment orders. In this situation, University competes for an order to educate a set number of students and is willing to negotiate both the price and the terms of the program it

provides to clients. Hence, large clients and ministries, for instance, can not only impact the price of service for those who are paid by them, but also require adjustments to the curriculum in accordance with their orders, including changing courses and adding additional workload.

The power of buyers differs from country to country. Thus, in the USA the only major vendor which is able to negotiate the price on educational services due to a big number of accumulated orders is the US military forces, in Europe situation is different, as higher education is declared a public utility, which is provided or at least subsidized to a certain extent by the governments [Gapinski, 2010]. Therefore, we conclude that the bargaining power of buyers is moderate as there are major vendors and certain working instruments to impact the tuition fee.

The Threat of Substitutes

For Martinez and Wolverton, the threat of substitutes is determined by time, application and convenience [Martinez & Wolverton, 2009]. The attribute of time is considered as the most crucial attribute for people, when they choose between traditional four-year bachelor degree and substitute products. It is more relevant for the Master's, as not many professionals are ready to leave the workforce for one or two-year graduate program. Therefore, many potential students look at substitutes, which leave them more flexible in their time and studies. Online courses and online MBAs are the choice of those, who want to get the knowledge, but not the sense of community or academic atmosphere. Moreover, online education offers individual programs, made from different modules, and delivers it in a convenient for professionals way: evening or weekend classes, prerecorded lectures, extended deadlines.

Today, the economic rationale for getting a degree is dominating: people are driven to get training and knowledge, which will give them a job. And four years of liberal arts or sociology might not be worth in a short run. However, those who invest in themselves and do not expect quick payoffs, fundamental traditional education is a no brainer and a must-to-have stage. Therefore, the threat of substitutes depends on interpretation of necessary educational experiences. If a person is ready to pay for ideas exchange and personal intercourse, he or she is to stay with the traditional educational system, rather than impersonal online processes [Green, Donovan, 2020]. However, the Internet and further digitalization of the world are driving the higher education industry to change, and modern technology allows to organize ideas exchange and

personal interaction via Zoom or Miro, for instance, as well. Therefore, the threat of substitutes is extremely high.

Industry rivalry among existing competitors

The market of existing higher education institutes is divided and experiences little changes. As it was mentioned above, there are three types of universities: regional (land grant), national, international. They address different issues and focus on different people. The only place of universities' scrimmage is metropolitan area, which hosts both national and international universities and attracts students from rural areas. In heavily populated areas the industry of higher education institutions can be quite competitive, when Universities with similar concentrations have to differentiate their offers from others in order to get the best students and return on investments. However, most of countries have only one or several leading higher education institutions in a particular field, thus such rivalry has limited implementation. It is not applicable neither to national nor to regional universities, as they execute drastically different budgets and tend to focus only on local students, who does not spend more than an hour or two on their commute. Therefore, rivalry among existing competitors is moderate.

The discussion, which was demonstrated above, has proved the value of the Porter's Five Forces Analysis regarding Universities and highlighted the area for higher education institutes to focus on: the threat of substitutes from the Internet and online learning, and closer work with those, to whom educational services are provided, the students, who may either reinforce University or weaken it. Every other Force, examined above, reassures the dominance of existing Universities and does not pose a major threat. Moreover, the Porter's Five Forces Analysis helped to identify areas of strengths and weaknesses, which are applicable to universities. This framework that university is not a homogeneous body, and there are challenges for both the academic and administrative staff. Thus, we may proceed with highlighting issues of traditional higher education institutes, which embrace both professors' and managers' duties.

1.1.2. Issues Universities face

The Porter's Five Forces Analysis helped us to determine the area where most challenges for universities exist: they are both academic and administrative. Coincidentally, they are covered by both media and researches, and addressed by many for-profit and non-profit organizations. Let us highlight them.

The Online Computer Library Center identified three primary forces, which work against traditional universities and drive them to change. They are transformation of student behavior, technology development and economic pressure on big and ossified higher education institutions.

First, students' behavior changes just like the world does. Last major transformation universities had undergone during the industrialization, which primarily ended by mid-1950s. By that time, higher education institutions were designed for a SPOD-world (SPOD: steady, predictable, ordinary, definite) [Vinogradova, Smirnova, 2020]. Since then, our society has experienced a massive technological development and moved to a service economy, which combined with the free markets policies created a VUCA-world (VUCA: volatility, uncertainty, complexity, ambiguity). Today, changes are rapid and unexpected, their paths are not fully controlled, either as the results are not predetermined. As the result, Universities which are not adapted for a VUCA-world, suffer from a discreteness of management processes, which lead to a wave-like changes. Moreover, institutions face nonlinearity, when there is a variety of paths to develop the educational body, but none of them can guarantee the best outcome. Lastly, cognitive flexibility is not easy to reach for old-fashioned hierarchical organizations, as adjustments tp changing external environment require adaptive thinking and different models of decision-making processes [Korsakova, 2019]. Students have adapted to the ever-changing SPOD environment, but Universities did not. Hence, the gap in understanding emerges. Today's students are likely to be a millennial or a zoomer, who was raised as a digital native and possesses excellent online skills [Albulescu, 2021]. These young adults consume twice and thrice more information than the previous generations, staying online an average of 53 hours per week [Wisbauer, 2017]. As they are used to be immersed in the digital world, they bring the same expectations of immersion to the universities. But the latter ones only require them to spend dozens of hours each week on classes, and fail to provide an immersion comparable to the one students have outside the class [Ideland, 2020].

Second, technological development in recent years encourages people to use new forms of learning. Indeed, there is an ability to learn wherever and whenever you want. Internet and information technology allows people to save time, which was usually spent on commute or break between classes. You are able to turn on a video on Coursera or YouTube, watch it several times, fast forward or back and adjust playback speed. Moreover, online courses offer not only a flexible schedule and a greater school choice, but also a unique group of chosen disciplines. On another hand, such differentiation from standard and well-recognized academic programs may be a weakness as well, as there is no history of their success and recognition. Therefore, every student may get one in a kind set of skills, which will differentiate him or her on the market, but face risk of being misunderstood by the public and potential employers due to the lack of degree's standardization. Massive Open Online Courses (MOOCs) paved the way for free or quite affordable online learning experience for millions of students. Such platforms have already transformed the global education playfield, as they execute amazing economies of scale and offer a choice of courses no traditional university is able to provide. Besides that, they eliminate obstacles to enrollment, including admissions screening and wait time.

Third, university tuition continues to grow faster than both the living standard and inflation in most of countries, as higher education institutions have to spend enormous amounts of funding on physical infrastructure maintenance, digital transformation and wages [Salmi, 2018]. Therefore, these costs are transferred to students, who borrow money to fund their education and pay it out in following decades. This scenario used to work as long as a degree guaranteed a well-paid job and good career. Today, university's diploma does not automatically correlate to comfortable income and high social status. Therefore, such arrangement is not seen viable by many people, as they turn to online learning as an option to obtain a higher education at a lower cost [Taparia, 2020].

Jisc, once a UK-national Higher Education sector think-tank and a non-profit organization today, highlights the following five issues, which universities can overcome only with the help of private companies and their expertise, in its newest report: delivering the best, most equitable student experience; adapting to changing student expectations about employability and career outcomes; expanding the university's reach by attracting more (and more diverse) students; transforming digital and physical infrastructure; recruiting, retaining and developing world-class staff [Jisc, 2020]. These are all problems of traditional higher educational institutes, which we identified earlier in the chapter. Let us take a closer look at each issue.

First priority, which cannot be tackled by traditional universities alone, is delivering the best and most equitable student experience. It is an administrative issue, which bears the risk for university. Changing demographics in the students body creates new expectations from the educational process itself, but universities are not able to collect, analyze and visualize student data, which would give them clients' perspective. This issue can solved by companies, which combine university internal analytics and outside data with artificial intelligence to deliver more individual services for students. Lasse Rouhiainen, an international expert on AI and a contributor to Harvard Business Review, notices that students tend to enjoy personalized learning approach, which if fully tailored to his or her individual abilities and needs, and to show better results [Rouhiainen, 2019]. Moreover, AI-based system is able to provide professors useful information about students' learning styles and abilities, and to give suggestions how to adjust teaching methods to clients' needs. Personalized help and guidance can be automated as well, and create an environment where 91% of questions are solved within the chatbot and not at master's or dean's office. Thus, the experiment at the University of Murcia in Spain was conducted, where an AI-based chatbot provided an instant answer to around 38,700 students' questions, answering correctly to more than 91% of them. It is worth to notice that the chatbot not only provided immediate answers to students, but also increased their motivation and willingness to study, as their needs were solved. As a side note, it helped to tackle mental health issues and anxiety of both students and staff, driving their retention and engagement rates up.

Besides that, students can be invited to participate in courses development as by sharing templates and best practices from other institutions, so universities adapt curriculum to market demands faster and do not reinvent the wheel.

Second priority is to adapt to changing student expectations about employability and career outcomes. The average tenure of a job is down to 4-5 years and today's students are likely to have 10-15 different jobs in their lifetime. In order to be successful, students are provided with more courses and workload to meet employers' needs. At the same time, the word "career" has changed the meaning as people are more willing to run their own enterprises and pursue the chance outside the comfort zone. As more than 25% of current students have intentions to become entrepreneurs, leading higher education institutes, including Falmouth University, commit to change the structure of their organizations and transfer universities to full incubators in the medium term, where everyone is taught to lead, manage and pivot.

Third priority, and an issue at the time, is to expand the university's reach by attracting more students. For long time, traditional universities relied heavily on higher education fairs and field trips, when universities' representatives would go on a road trip, present institutions, and talk to potential students face-to-face. It is neither efficient nor cheap affair, as the marketing funnel of such activities cannot be measured with those result, which are gotten via social media and online targeting. Further focus on online presence and promotion through advanced technical solutions might be a key to reach the desired target audience and not to rely on third party agents. It can be done both through VR campus tours and chatbots, along with traditional online open days. As the result, there is a room for EdTech providers, which license advanced solutions to universities, continue to develop and adjust products to clients' needs.

Fourth priority is to transform digital and physical infrastructure, which can constrain growth. City-based and logistically dispersed universities face high costs of maintaining estate and renting buildings and land [Eynon, 2007]. Digitalization of processes and optimization of space allocation are two drivers to lower fixed costs and decrease ballast universities have. Today, there might be no need to maintain dozens of conference rooms, as most of lectures can be hold online or in a shared by different schools and faculties venue. Instead, co-working areas and meeting rooms are what students appreciate the most, as it creates space to meet new people and collaborate with them. Existing digital infrastructure quite often does not meet the requirements students have, thus it is another point of interest for companies which can create tailored solutions that suit the needs of a particular university and its students.

Fifth priority is focused on recruiting, retaining and developing world-class staff. The pandemic proved that staff is poor of time, and such situation does not allow them to adopt new technologies and means of teaching. If some routine but time-intensive tasks can be automated, then staff get more focused on developing themselves and sharing with others the best techniques. Hence, both professors and students will experience more value from the time they spend, and more satisfied be. Lack of digital literacy can be successfully tackled by developing simple and intuitive user interfaces, thus the resistance to adopt new innovative technologies will decrease.

We have thoroughly examined and determined the list of issues, which higher education institutions face and cannot solve by themselves today. It happens either to lack of communication with the target audience, outdated structure of universities or inability to meet students'

expectations. Hence, they lose to technically advanced competitors and let their market share shrink.

1.1.3. Educational Technology (EdTech) startups and their role

As the scope of the Thesis is limited to digital issues that universities are facing, and which are tackled by technologically advanced for-profit and non-profit organizations, next we are to focus on them, rather than theoretical issues of higher education triggered by macroeconomic decisions. Consequently, we will look at universities' issues and challenges within the scope of their digitalization and identify them more specific. To start, we define educational technology (EdTech) startups and the field they work in.

Educational technology (EdTech) is defined as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" [Robinson, Molenda, Rezabek, 2007]. In essence, it is the technology usage in order to improve educational practices, students' experiences and performance. In early days, it was limited to "tools for student and curriculum management, education management information systems (EMIS)" and learning management systems (LMS) [Alkhalialh, Rababah, 2019]. Intentionally, these technological solutions were developed for costs reduction and profit generation. As it involved big money, startups, or newly established businesses, rushed to enter the market and offer educational institutions solutions, which would facilitate learning experience and generate profits. Along with B2B-market saturation, startups pivoted to B2C solutions and competition with traditional universities expanding the market dramatically.

Surprisingly, but newly established EdTech startups have an upper hand over universities in understanding the needs and pains of everyone, who is involved in the market. To be exact, such phenomenon was described earlier and attributed to any startup, which follows the Customer Development technique. Steve Blank, an author of the Customer Development Manifesto, developed a guideline with 14 rules, which should be remembered by a startup or a company, which is introducing a new product [Blank, Dorf, 2012]. In order to succeed, you have to run the business lean and know your customers better than anyone else. Communication with the target audience, running in-depth interviews and drawing customer journey maps (CJMs) are key to

identify pains and issues people are willing to pay for to be solved. Apparently, in order to succeed and create a valuable and selling product startups have to know both the customer and the market very well, otherwise they come up with a product which has no value for people. This is the major point of differentiation between a startup and a higher education institute. The former talks to clients constantly, identifies what they need and deliver it, while the latter fails to understand the pains of those, whom it serves, and satisfy their needs [Maguad, 2007; Eagle, Brennan, 2005]. Educational technology is no different. Universities do not keep up with the times, and EdTech startups fill the niche, satisfying the demand students and teachers create.

In its nature, any startup is an innovative enterprise, which brings novelty to life. For marketers, novelty and innovation are related to the perception, which a customer gives to a product or a serviced. [Garcia, 2011] However, in a more common definition of innovation for management, the term corresponds to any changes in product quality, delivery, design, promotion, pricing, placing, packaging, design or positioning [Rainey, 2005]. Companies continuously work on innovations and new product development, as it enables them to stay competitive and show sustainable long-term growth [Ganguly, 2017]. Introduction of innovations can take different forms and cause different outcomes, and to classify them Christensen developed the Innovation Matrix, which evaluates innovations according to problem and domain definitions [Christensen].

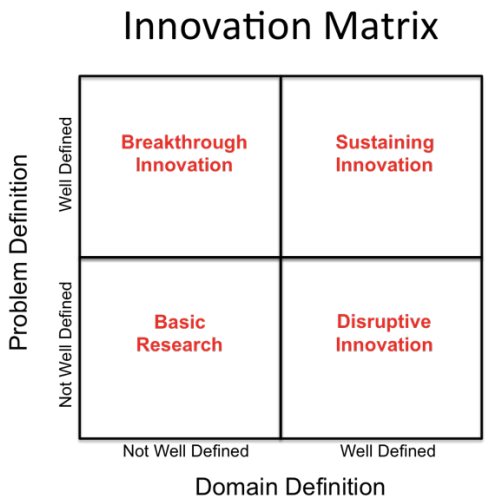

Figure 2. Innovation matrix. [Source: Christensen, 2015]

Any business aims either at disruptive or sustaining innovation. The former enters or creates new markets via targeting new products to the underserved or new audience, while the

latter is focused on developing existing markets by improving existing products or services, and it brings higher profits from existing customers [Deloitte, 2017].

However, EdTech startups and innovative SMEs have many similarities in their foundation, they keep distinctive features due to the industry they operate in. The Omidyar Network, an investment firm founded by eBay cofounder Pierre Omidyar, highlights a key principle of releasing and scaling EdTech projects: effective scale-up requires considerable redesign of EdTech products and services to every big client, thus it is not enough to give access to the exact same product to two different higher education institutions and expect similar impact. As the result, implementation of EdTech solutions may take years and different phases, which are shown below.

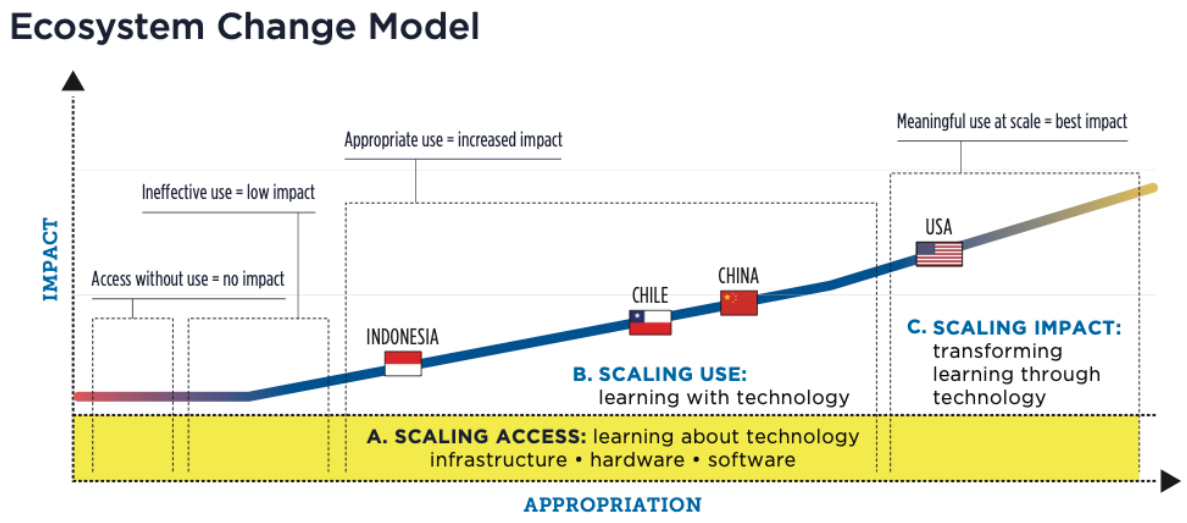

Figure 3. Ecosystem Change Model for EdTech. [Source: The Omidyar Network, 2019]

EdTech Ecosystem Change Model consists of three stages, which are designed in accordance with both impact and appropriation of the proposed technology. First, EdTech solution enters the stage of scaling access, when it has low impact and is used in an ineffective way. Second, the stage of scaling usage comes in place, when the market is ready to use a solution appropriately and utilize it for the sake of learning experience. Third, EdTech product or service is used at a meaningful scale, which guarantees the highest impact within the targeted market. Moreover, only at the scaling impact stage, the third phase, it starts not only to enhance learning experience, but also to transform it through technology [Omidyar Network, 2019]. These three stages of EdTech

solutions implementation are not a stand-alone framework. They are connected to company's incentives to innovate and adapt to changes.

1.1.4. Current state of the EdTech market

EdTech startups have two business models to be built around. First, to work in the B2B market and serve Universities themselves through automating and enhancing their services. Second, to target the B2C market, offer services to an end-user and challenging Universities there.

Typically, EdTech startups can be grouped in twelve divisions depending on their value proposition: language and international programs, campus life, undergraduate schools, networking and job placement, tech and engineering, continuing education, admissions, scientific and medical research, libraries, online certifications, graduate schools, course management systems. [CB Insights, 2020]. Let us take a closer look at each category.

Language and international programs — companies which work in this sector disrupt traditional language learning processes and gamify it. They offer more languages to study than most of land grant and national universities, and they make the entire process interesting and fun. International programs are the attribute which distinguishes universities from each other. Startups work with partner schools and match students for abroad programs, what if useful for small and regional schools, as they do not have a wide network of foreign partners themselves.

Campus life — companies enhance the college experience, including dorm living and socializing. They not only help to rent houses and get a virtual event organized, but also work on students' wellness and provide mental health services through online therapy.

Undergraduate schools — startups make remote learning accessible and engaging for students. They recreate the atmosphere of a classroom and boot collaboration during online classes. Moreover, companies help to manage remote testing via proctoring and online verification procedures.

Networking and job placement — companies connect existing students with alumni, other students and potential employers. Also, they provide mentoring services and give students real-world skills, including data analysis and problem solving.

Tech and engineering — bootcamps organized and hosted by EdTech startups are there to update or replace traditional engineering degrees, when it used to take 4 years to get a degree.

Today, coding schools prepare students in 4-6 months for a junior software engineer position at leading tech companies. Indeed, 6 months of a bootcamp can prepare you for a junior software engineer position, but the impact on personal development will be not the same, as from 4 years at university, when you are taught to think critically and broaden your horizons.

Continuing education — in a VUCA-world, professionals and former students have to upskill themselves if they want to stay on top of the value chain. MOOCs, executive education and other programs offered by universities are in demand.

Admissions — EdTech startups enhance typical university admissions functions, including recruiting and enrollment. They launch AI chatbots to retain students and evaluate applicants' behavior and competency.

Scientific and medical research — companies assist universities in topic mapping, scanning academic papers and making them publicly available on the internet.

Libraries — startups help universities to provide online sources and course readings to students. E-book reading platforms give students an access to digital library, e-textbooks and research studies.

Online certifications — these companies allow universities to issue e-certifications for specific skills and successfully passed courses. It helps to move away from paper-printed certifications towards digital ones.

Graduate schools — startups tackle the issue with expensive and time-consuming graduate degrees by allowing to create your own curriculum and pay for time you spent within the learning platform. Moreover, they introduce augmented and virtual realities for science-heavy programs.

Course management systems — companies create a digital learning environment, wherein documentation, exams and records can be stored and checked. It helps to bring your traditional physical classroom online.

Table 1. EdTech startups by their focus. [Source: author]

Traditional Universities' attributes	EdTech companies
Language and International Programs	ABA English, Duolingo, StudyPortals, MPower Financing, Busuu, Babbel, ApplyBoard, AMOpportunities
Campus Life	Facebook Campus, Everfi, goPuff, Omegafi, Studapart, Uwill
Undergraduate Schools	Brainly, Chegg, Class for Zoom, Course Hero, Everspring, Examity, Noodle, Quizlet, Proctorio, Top Hat
Networking and Job Placement	AstrumU, Congregate, Fullbridge, Graduway, Handshake, Hiverbrite, Reculta
Tech and Engineering	Codecademy, FullStack Academy, General Assembly, InterviewBit, Lambda, Podium Education, SVAcademy
Continuing Education	Coursera, Udemy, Udacity, Teachable, Openclassrooms
Admissions	AdmitHub, Kira Talent
Scientific and Medical Research	Academia, Iris.ai, Meta, ResearchGate
Libraries	BibliU, Grammarly, OverDrive, RedShelf
Online Certifications	Edupristine, Simplilearn
Graduate Schools	Law Dojo, Pleaders, Jolt, OMS, Smart Sparrow, zSpace, Osso VR
Course Management Systems	Blackboard, Canvas, Moodle

EdTech startups enhance and challenge Universities at the same time, depending on the business model and business proposition. They focus on very specific issues either students or higher education institutions face and deliver a product or a service, which solves these problems. Due to their nature of an agile and tech enterprises, EdTech startups manage to understand customers' pains and come with a perfect solution to it [Eynon et al, 2019]. Moreover, as they work in market environment, startups compete among each other as well. Thus, Universities can choose the most suitable solution for their particular needs and instead of developing it themselves just pay for the service, which will increase students' engagement, employees' retention rate or overall institute's competitiveness. These are the reasons why Universities cooperate with EdTech startups and pay for their services.

However, competition among EdTech solutions and inability to reach the scaling impact stage are not the only issue, which startups face. Just as any newly established enterprises, many

EdTech startups struggle to overcome the Chasm, a point when early majority starts to embrace their service or product [Zwilling, 2012]. Both the Rogers' Diffusion of Innovations theory and Moore's Crossing the Chasm book stress on the difficulty of finding a way to move over Innovators and Early Adopters and reach a bigger part of the market, an Early Majority, which is nearly 3 times greater in volume than Innovators and Early Adopters combined [Lambert, 2018]. Unfortunately, EdTech startups fail to communicate properly with the target audience and deliver information on topics which are cornerstone for customers. No matter how good and advanced the technology behind an EdTech solution is, no one will use it, if the value and advantages of the product or service are not clear.

On average, it takes 7 seconds to make a first impression on an advertised product or service, and this time cannot be wasted on irrelevant information, which adds little or no value for a potential customer [Gibbons, 2018]. EdTech market is no different, and Universities' staff make decision as anyone else: quick and with a portion of irrationality. Nevertheless, both marketing campaigns and business presentations do not reach the goal frequently due to the lack of understanding how the target audience evaluates and decides whether to give something a try or not [Maurya, 2010].

As the scope of the research is limited to University staff's adoption intention, the EdTech market for the following study is to be limited to EdTech solutions which focus on improving University staff's job execution. Therefore, we will identify what are the most important attributes of a technological solution, which make Universities' staff to give it a try. Consequently, EdTech startups will get a list of features, which should be covered or omitted during the process of new user acquisition.

1.1.5. Enterprises' incentives to innovate

Universities and their employees are the part of the free market system, where everyone competes for a customer and money. They have to stay competitive, otherwise they lose to competitors and go bankrupt, as we concluded previously. Further development and innovations are the only way to react to the changing world.

From the theoretical point of view, there are three separate clusters of economic models, which can interpret forces and incentives behind companies' will to embrace innovations: game-theoretical, endogenous growth and evolutionary models.

Game-theoretical models are majorly focused on research and development (R&D) decisions within the strategic environment and list two incentives to follow innovations: threat of a disruptive innovative from a rival company and seek for higher profits and bigger margins, though a unified model which suits any market has not been offered yet [Easley & Kleinberg, 2010]. Recently, Professor I. Gurkov from the Higher School of Economics connected the dots and concluded that companies' aspiration to follow innovation and embrace them is caused by their perception of technological changes and optimistic evaluation of trends within markets. [Gurkov, 2013].

Endogenous growth models are centered around competition and its impact on innovation, and according to them companies innovate in order to beat high competition and survive [Kogan, Papanimolaou, Seru, Stoffman, 2012]. There is a scientific evidence of dependence of increase in R&D expenditures of one company and symmetric follow-up increases by others in a high competitive environment [Aghion, Bechtold, Cassar, Herz, 2014]. It is defined as a market leader's technological lead time gap, which creates tough price competition and generates more profits for the leader, while others experience margins decrease and, as the result, smaller capital to invest in R&D and innovations [Gottinger, 2016]. Hence, anticipation of such situation drives every major market player to keep up with rivals and invest in what the others have previously done. Although, such scenario often takes from companies away their current dynamic efficiency, as the enterprises' resources and capabilities are spent on improving future efficiency instead of securing present positions [Zhang, 2017]. Partly, it can be examined as a short-term versus long-term planning conflict.

Evolutionary models focus on dynamic processes and challenge both rationality and economic equilibrium [Cantwell, Dunning, Lundan, 2009]. According to this approach, working practices imitation and copy are the best options for those companies, which find themselves in a competitive environment and are willing to survive. Thus, from the economic development side, innovations can be seen as a process of choosing the right and most suitable practices, which exist and compete with each other on the market. As the result, the laggards adopt developed by others innovations and cutting-edge technologies. On the one hand, they do not spend a lot, as it is cheaper

and often easier to copy rather than invent. Though on the other hand, they neither lead the market nor set trends for the industry, and only strive to survive.

Table 2. Incentives for companies to innovate. [Source: author]

Model	**Game-theoretical**	**Endogenous growth**	**Evolutionary**
Incentive to innovate	To tackle the threat of innovations by competitors, and to get bigger margins	To escape from severe competition	To get a source for evolutionary growth and firm survival

The above-mentioned three models propose various incentive for companies to innovate, still they treat innovations as a response to changing environment and an attempt to preserve the current market share at least. Universities are no different, and as we examined before, there are powers, including educational technology startups, which pose a threat to their market share and push them to evolve. Now, when Higher Education institutions' motivation to innovate and the place of EdTech startups are clear, we move to theoretical part of the study and look at adoption theories.

1.2. Theories on consumer behavior towards innovation adoption

Majorly, literature and articles related to the topic of consumers' view on innovation can be grouped in several subdivisions: innovation adoption, its diffusion and domestication. The latter one is especially crucial for the market of education, which has regional and cultural attributes to it. The former one is described as the process of decision-making when a person decides to use a particular innovative solution, while innovation diffusion is described through the total number of embraced users and the share of the total market, and the latter one is based on political and social outcomes of the applied innovations [Rogers, 2003].

Typically, literature on innovation adoption examines attributes, which affect behavioral intentions, and utilizes questionnaires in order to determine consumers' willingness and readiness to use a certain product or service. It is worth mentioning that some studies mess up adoption intention with actual adoption, and it is necessary to draw a line between them. The former focuses on clients' emotions and emotions, while the other one is built around more factual and quantifiable metrics. As this Thesis is to create practical value, the focus is made at innovation adoption, which can be validated and tested by others in different environment.

1.2.1. Research on Innovation Adoption

The more sources and articles are printed, the more takes on innovation adoption emerge. For instance, economists treat innovation as an outcome and a result of a certain activity, while both social and managerial scientists view it as a continuous process without a predefined output. It is believed that such attitude allows to look at innovation adoption from a wider angle and separate dynamics which affect the transition from knowledge shortages, related to adoption of a particular innovation. Everett Rogers sees the process of innovation adoption as a procedure through which someone with the authority of making a decision passes [Rogers, 2003]. It may be both an individual and an organization or a company.

According to the Rogers' theory, there are five stages of innovation adoption [Rogers, 2003]. It all starts with the knowledge of a particular technology, and introduction to it. Next, the stage of persuasion comes in place. Then, a decision-making unit decides and tries to implement an innovative solution. Finally, the confirmation stage comes, when an individual or an

organization evaluates the result and an innovation itself. Thus, the innovation-decision theory offered by Everett Rogers embrace all stages of innovation adoption and offers a smooth path to analyze it.

However, this theory is not the only one, which exists. Cooper and Zmud, for instance, focus on the decision-making unit's behavior during implementation and confirmation stages [Cooper & Zmud, 1990]. They offer an alternative version of innovation adoption, which consists of six stages and suits better those cases, when an innovative solution is domesticated and adjusted to clients' particular needs, what is important but not crucial for the market of EdTech. Under this framework, the first stage is initiation, which is quite similar to Rogers' knowledge acquisition and introduction to a particular technology. Though, then new stages come, which are closely interconnected among each other: adoption, adaptation, acceptance. When an innovative solution is accepted and implemented, a decision-making unit starts to routinize the usage of a newly adopted innovation and adjust it, thus the best outcome and usage scenarios are achieved. Finally, the infusion comes, a stage when a particular innovation becomes an integral part of the current system, and particular processes are built around using it. Another theory, which contributes to the innovation adoption conversation and is well known was offered by Ruud Flambach and Niels Schillewaert. This time, adoption process is divided in several phases, and the innovation adoption itself is seen as one of two possible outcomes: an adopted innovation and a not adopted one [Frambach & Schillewaert, 2002]. Unfortunately, this theory does not examine situations when a particular innovative solution has not been implemented, but it started a chain reaction of other changes within an organization or a decision-making unit. Also, authors do not provide explanations to attributes which may affect the outcome.

Table 3. Adoption models. [Source: Khan, 2017]

ID	Rogers' theory	Cooper & Zmud's theory	Frambach & Schillewaert's theory
1	Knowledge	Initiation	Awareness
2	Persuasion	Adoption	Consideration
3	Decision	Adaptation	Intention
4	Implementation	Acceptance	Adoption Decision
5	Confirmation	Routinization	Continued Use
6	-	Infusion	-

For the purposes of this particular research, Rogers' innovation adoption theory suits the best due to its exclusive concentration on innovation itself. Additionally, a plenty of literature linked to the considered above theories allows us to look at the Rogers' approach from different angles and enhance the theory if necessary.

This study focuses on the persuasion stage of innovation adoption, as it is a phase which influences intention to adopt or give up on a particular innovative solution. By this time, a decision-making unit has acquired information about a particular innovation but has not decided to use or not. During the persuasion stage, a unit forms his or her attitude towards an innovation, which leads to a certain set of actions. Primarily, these actions are linked and prompted by emotions and feelings, and not the knowledge itself [Rogers, 2003]. By the end of the persuasion stage, a decision-making unit forms a positive or negative adoption intention, which transforms into one of two behavioral states during the decision phase: adoption or rejection of a particular innovative solution [Rogers, 2003]. Typically, positive adoption intention results in innovation adoption, and negative adoption intention leads to innovation rejection.

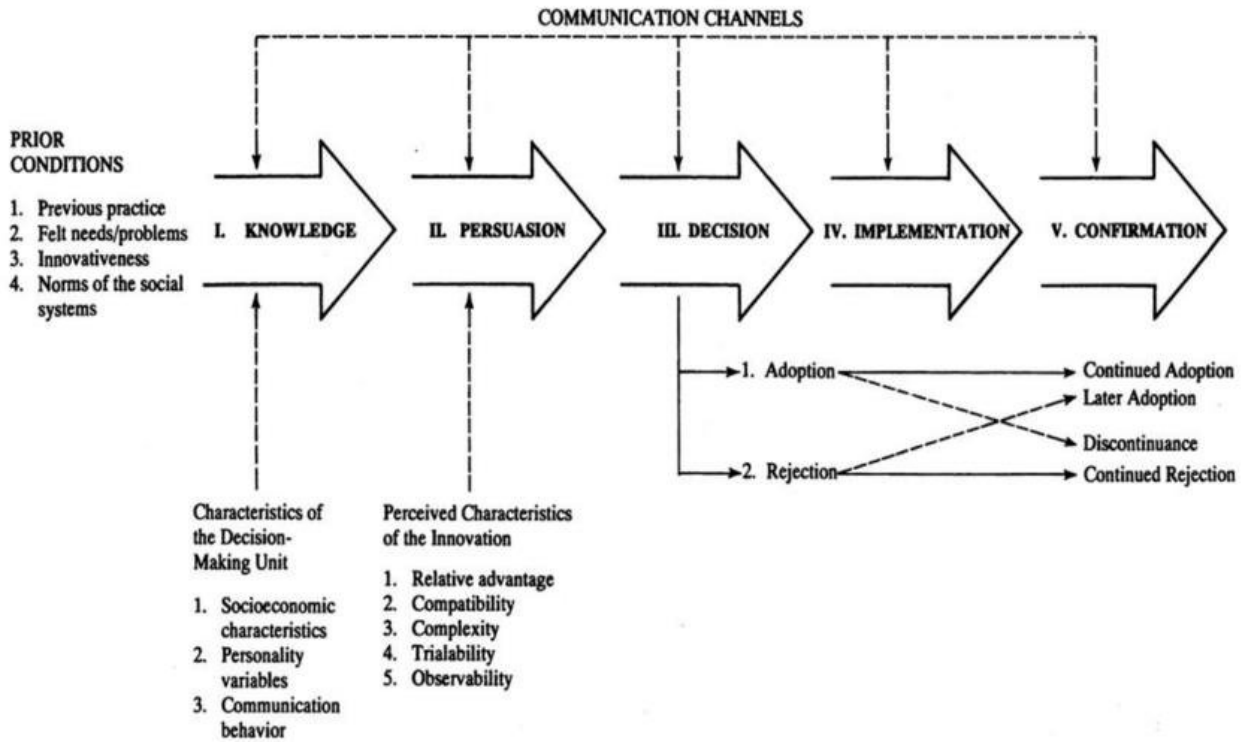

Figure 4. Rogers' innovation-decision theory. [Source: Rogers, 2003]

As we set the Rogers' theory as the fundamental piece for designing a decision-making unit's adoption intention, we may proceed with the attributes inherent in innovations.

1.2.2. Research on Innovation Attributes

The perception of the attributes inherent in innovation is identified and measured via two methods. The first method is built around the thesis that environment influences the perception of innovative solutions, and it is possible to calculate the rate of technology adoption by a particular decision-making unit. Initially, it started as the Theory of Reasoned Action and later evolved in the Theory of Planned Behavior. Recently, the Unified Theory of Acceptance and Use of Technology emerged, and it brought several previously developed theories together.

The second method is focused on intrinsic attributes of innovative solutions, which affect a decision-making unit's innovation adoption. This approach branched out from the Rogers' innovation-decision theory and was developed by three groups of scientists: Kapoor, Dwivedi, and Williams; Moore and Benbasat; Tornatzky and Klein.

Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB)

The Theory of Reasoned Action has been created to forecast and calculate intentions and behavior of people. According to it, decision-making processes are based on Attitude - Subjective Norms - Behavior linkage, and information does not contain value in itself. Instead, information works as a mediator and an empowering mechanism to this linkage. The key disadvantage of the Theory of Reasoned Action is in its inability to include required from a decision-making unit resources for an action with the product in its framework. As the result, this drawback led scientific community to come up with the Theory of Planned Behavior (TPB), a new framework where individuals' ability to assume a certain behavior is included. Hence, this theory treats people's behavior as a consequence of their intentions, which are designed by attitude or a unit's feelings towards a specific mode [van der Linden, 2011].

Therefore, the Theory of Planned Behavior (TBP) not only brings decision-making units' beliefs and their behavior together, but also connect with each other. Nevertheless, this framework is criticized by the scientific community as it does not consider units' needs, which can influence their mode with no regard to the attitude [Belkhamza & Niasin, 2017].

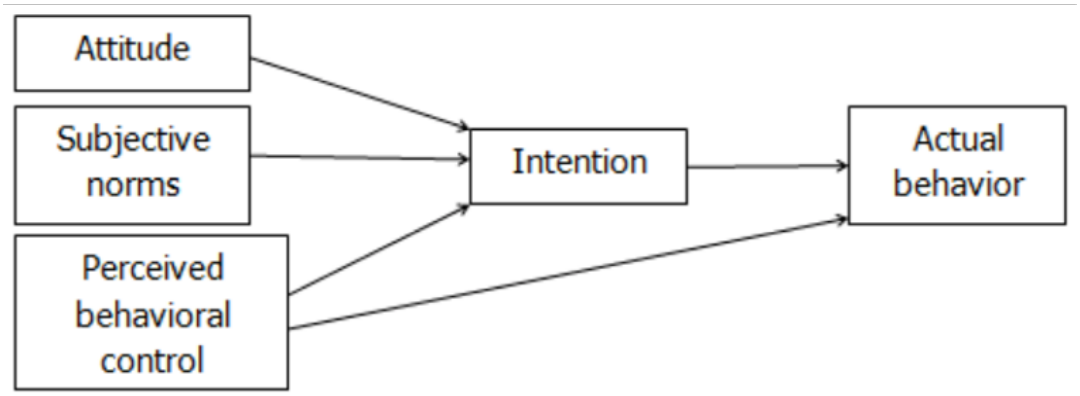

Figure 5. Theory of Planned Behavior model. [Source: Belkhamza & Niasin, 2017]

TPM theory cannot be used for the purposes of this research, as it gives no credit to the nature and origins of innovative solutions, and does not separate adoption intentions for traditional and innovative products. Thus, the Theory of Planned Behavior is not chosen to work with for further analysis.

Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT)

This theory is a recent one, it was created in 2003 and updated in 2012 by Venkatesh, Thong and Xu [Ventakesh, Thong & Xu, 2012]. Today, it is one of the most popular theory used for the projects and services related to the information technology sphere [Dwivedi, Rana, Jeyraj, Clement & Williams, 2017]. This framework is similar to the Rogers' theory, though it takes environmental context into consideration and focuses on adoption and behavior intentions.

The UTAUT theory is based on TAM and TPB models, and it encompasses several attributes to calculate and predict behavioral intention for technology usage [Venkatesh, Thong & Xu, 2016].

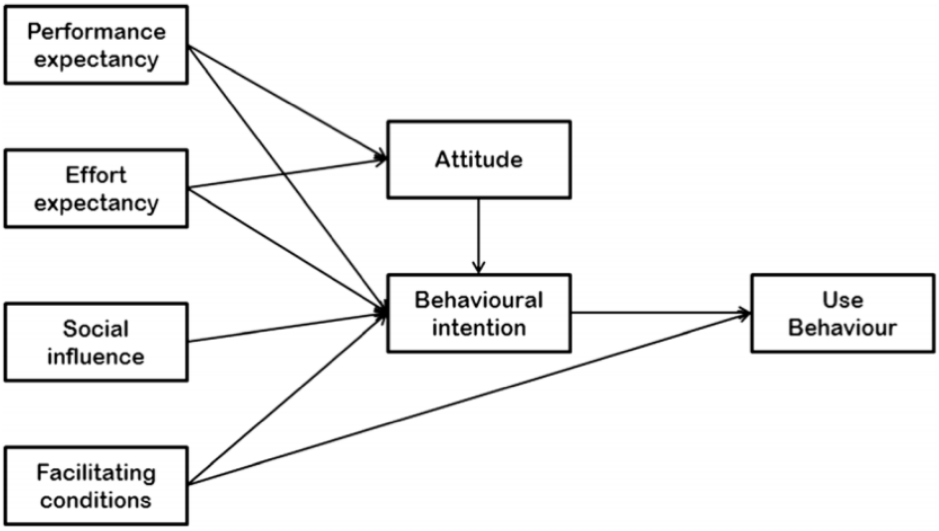

Figure 6. The Unified Theory of Acceptance and Use of Technology model. [Source: Dwivedi et al]

This model is built around a hypothesis that decision-making unit's attitude is the key in understanding behavioral intention of adoption of a certain innovative and technological product. However, UTAUT is widely used to analyze adoption rates of mobile banking and retention rates of social networks, this framework is not the best fit for this particular research paper [Workman, 2014; Sun, Liu, Peng, Dong & Barnes, 2014]. This model limits the number of attributes, which can be included to its core model and whose influence can be calculated.

Innovation-decision theory

Innovation-based theory, developed by Everett Rogers and defined earlier in this chapter, is built around innovation itself. This framework allows to identify innovation attributes one by one, not limiting yourself to an artificial frame set by UTAUT or TPB models. A list of attributes, which help to calculate influence of innovative product's attributes on general innovation adoption, was identified by Kotler and Keller and is examined below [Kotler & Keller, 2015].

First, relative advantage — advantages seen by decision-making units, when they compare with substitute products [Rogers, 2003]. It is similar to performance expectancy under the UTAUT model, and is criticized for being quite vague. However, Kapoor in his recent studies concludes that relative advantage is majorly evaluated with the help cost and accessibility parameters [Kapoor et al, 2014].

Second, complexity — comparative intricacy of a new product usage or its mastering.

Third, compatibility — an extent to which an offered service or product fits decision-making unit's values and past experiences [Rogers, 2003].

Fourth, trialability — an extent to which an offered service or product can be utilized on a bounded or restricted basis.

Fifth, observability — an extent to which an offered service or product is simple to present and understand for people, who are not familiar with it yet. Sometimes, researchers split observability into several separate attributes: image, visibility, result demonstrability [Kapoor et al, 2014]. Moreover, under the UTAUT model it is examined as Social Influence, while the TPB model covers everything under the Attitude attribute.

However, the Roger's theory was not designed for information technology innovations specifically, it is an efficient framework, which is widely used to identify innovation attributes and their influence in a homogeneous population [Lyytenin, 2001]. To depict interconnections of theories, which were examined above, the following table was designed.

Table 4. Interconnections of innovation perception theories. [Source: author]

School of Thought	Innovation-Decision Theory		Adoption of Technology Theories	
	Rogers	**Kapoor et al**	**TPB**	**UTAUT**
Innovation attributes	Relative Advantage	Cost	Attitude	Performance expectancy
	—	Accessibility		—
	Complexity	Ease of Operation		Effort Expectancy
	Compatibility	Riskiness		—
	Trialability	—		—
	Observability	Social Approval		Social Influence
		Image		
		Visibility		
		Result Demonstrability		
		Voluntariness		
Consumer characteristics	Adoption Intention	—	Perceived Behavioral Control	Behavioral Intention
	—	—	Subjective Norms	—
	—	—	Adoption Intention	—
Environment	—	—	—	Facilitating Conditions

Time and again, the Roger's theory is the best fit for this research. First of all, it is built around an innovation itself and concentrates on its attributes rather than technology acceptance by decision-making agents. Second, this framework allows to identify attributes of innovation and look at their effect on adoption intention. Thus, we proceed with the Everett Rogers' attributes of Innovation-Decision theory onwards.

As the research goal is to identify relationship between EdTech startups development and technological changes of Universities and the Higher Education market and the phenomenon of EdTech startups have been examined already examined, we may proceed with hypotheses suggestion.

1.3. Research gap and hypotheses formulation

As we identified earlier, the Rogers' Innovation-Decision theory was not designed for Information Technology solutions originally, though majority of quantitative researches regarding the innovation adoption intention are based on this framework, which was revised by Everett Rogers last time in 2003. However, in the recent decades, several updates were offered by Kapoor, Dwivedi, Williams, Tornatzky and other scholars, still there is no generally accepted framework, which would calculate innovation adoption intention. Moreover, existing studies do not contain sufficient insights on which EdTech solutions' attributes are more significant for Universities' staff during the decision-making process of giving solution a try or not. Hence, this research will fill up the gap of limited knowledge within the EdTech field and contribute to the understanding which innovative attributes of an EdTech solution are the most important to Universities' staff and should be addressed first.

With the Rogers' innovation-decision theory and the proposed five innovation attributes at the core of the research, it is reasonable to formulate a hypothesis within the EdTech market for each piece of the framework: relative advantage, complexity, compatibility, trialability, observability. It is worth mentioning that hypotheses were designed in non-concrete settings, thus questions in the questionnaire and the results may be considered to be abstract.

Hypotheses on the first attribute: relative advantage

The relative advantage innovation attribute affects decision-making units' adoption intention the most, along with complexity and compatibility. However, the original framework was both criticized for its vague definition and updated by some researchers. Thus, Tornatzky and Klein suggested to look at the relative advantage attribute through the lens of economic value and cost of good for end-users [Tornatzky & Klein, 1982]. Kapoor, whose version of the innovation-decision theory was examined and compared with other views in the table above, looked at this attribute more recently and offered to evaluate it with the help of an accessibility rate [Kapoor et al, 2014]. The higher it is, the more advantage a particular innovation possesses.

The key idea of EdTech startups is to democratize the market of educational services by both making them individualized and available from any place on Earth and creating a better price-value ratio, when clients enjoy the service they get and can adjust the speed and difficulty of curriculum by themselves [Hockly & Dudeney, 2018]. Currently, leading universities are adopting

these values and changing themselves with either in-house developed technological solutions or those ones which are available on the market, as this path allows them to stay competitive in the changing VUCA-environment. Typically, EdTech solutions help to scale individualized educational practices and reach new markets with a lower price tag, and these are top priorities of Universities, according to Jisc, as they secure the position of Higher Education institutes [Jisc, 2020].

Relative advantage, provided by EdTech startups to Universities, is perfectly aligned with cost and accessibility propositions, which were offered by Tornatzky & Klein and Kapoor to improve the Rogers' Innovation-Decision theory. Therefore, for the first attribute of the framework two hypotheses are formulated:

H1. High perceived accessibility of EdTech solutions results in University staff's positive adoption intention.

H2. Low perceived cost of EdTech solutions results in University staff's positive adoption intention.

Complexity

According to the head of the Management Information Systems Department at the King Khalid University Said Al-Gahtani, complexity is best described as the extent to which an innovative solution is hard and unpleasant to utilize [Al-Gahtani, 2003]. As one of the key attributes of the phase of persuasion, it is involved in the process when a decision-making unit tries to apply a particular innovation to his or her issue and evaluates whether it is a good fit or not.

This attribute includes user experience and user interface, but not limited to them. It does not matter how good an EdTech solution in its core it, it will not succeed if it is difficult to master and use [Kommuru, 2020]. Therefore, for the second attribute of the framework the following hypothesis is formulated:

H3. Low perceived complexity of EdTech solutions results in University staff's positive adoption intention.

Compatibility

A nightmare for any organization is to face a situation, when corporate internal document systems have to be changed. It is best illustrated with the state of accounting market, where companies spend from months to years transitioning from one ERP system to another, as it is neither easy nor quick to become native to another programming environment [Kenge, 2020]. In

order not to get in the similar situation, most of the Higher Education institutions tend to stay with the software they have, update it and enhance with modular or embedded tools, rather than overhaul everything and retrain employees to use a new one. In this case, EdTech solutions should be compatible with existing products and, as the best scenario, work as an extension or additional module, if companies target mass market and do not sew solution for one customer only. Therefore, for the third attribute of the framework the following hypothesis is formulated:

H4. High perceived compatibility of EdTech solutions results in University staff's positive adoption intention.

Trialability

When a decision-making unit has a chance to try a particular innovation before making his or her final decision, the uncertainty regarding risks and understanding of an innovation decreases. [Hetzel, 2018] Many startups and software companies offer a trial period or a limited version of their product, so a potential client suffers no costs if the solution does not suit his or her needs. Moreover, it helps to conserve time of support service and business representatives, as some potential clients will be filtered, as they find the service neither suitable nor valuable for them during the trial period or free version usage. Therefore, for the fourth attribute of the framework the following hypothesis is formulated:

H5. High perceived trialability of EdTech solutions results in University staff's positive adoption intention.

Observability

Observability was defined earlier as an extent to which an offered service or product is simple to present and understand for people, who are not familiar with it yet. According to the Rogers' study, observability does not influence a lot during the phase of persuasion. Moreover, it is stated that software input is even less noticeable than a hardware one [Roger, 2003]. Additionally, observability exists only in cases when the product is talked about rather than tried. Therefore, for the fifth and last attribute of the framework the following hypothesis is formulated:

H6. High perceived observability of EdTech solutions results in University staff's positive adoption intention.

To sum up, we have formulated the following six hypotheses to test all five attributes of the Rogers' innovation decision-theory in accordance with a proposed relationship between EdTech startups development and technological changes of Universities.

Table 5. Formulated hypotheses. [Source: author]

Rogers' innovation attributes	Hypotheses
Relative advantage (accessibility & cost)	H1: High perceived accessibility of EdTech solutions results in University staff's positive adoption intention. H2: Low perceived cost of EdTech solutions results in University staff's positive adoption intention.
Complexity	H3: Low perceived complexity of EdTech solutions results in University staff's positive adoption intention.
Compatibility	H4: High perceived compatibility of EdTech solutions results in University staff's positive adoption intention.
Trialability	H5: High perceived trialability of EdTech solutions results in University staff's positive adoption intention.
Observability	H6: High perceived observability of EdTech solutions results in University staff's positive adoption intention.

Chapter II. Research Methodology and Design

2.1. Research Design

The research design is built around two research questions, which were highlighted in the Thesis' introduction:

Q1. Are there relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff?

Q2. What EdTech solutions' innovation attributes affect Universities' staff adoption intention?

We started with the role of universities and higher education institutions, proceeded with their market positioning and environmental challenges they face. Then, we identified the nature of EdTech startups and issues they aim to solve. When these topics were examined, theoretical research on innovation adoption was done and innovation attributes which are applicable for EdTech solutions were chosen. It allowed to formulate hypotheses, which are to be tested next. The following phases are to draw a quantitative research, analyze the gathered data, interpret it and come up with conclusions. The overall outline of the Thesis can be depicted the following way.

Table 6. Thesis' outline. [Source: author]

ID	Phase
1	Review of Higher Education a& EdTech markets
2	Literature review of innovation adoption theories
3	Narrowing the Theoretical Focus According to EdTech market's features
4	Research Questions Outline
5	Quantitative Research Design
6	Data Gathering
7	Data Analysis (IBM SPSS)
8	Interpretation & Conclusions

The *main goal* of this thesis is to identify relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff. And the *research problem* is to identify parameters of the relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff.

Deductive approach is applied for the Thesis, as it allows to test and validate existing theoretical framework via gathered real-world data. In this particular case, the Rogers' Innovation-Decision theory, enriched with Kapoor's studies, and the gathered via online survey data from Universities' staff were used.

This is an *exploratory research* with the aim to identify an extent to which adoption intention variables have impact and confirm the Rogers' theory applicability for the EdTech market. It is an *applied study*, as it seeks to contribute additional knowledge to the field of adoption intentions and to provide useful tips for EdTech startups how to address Universities, if they choose to work on the B2B market.

To validate hypotheses, a *quantitative method* is chosen due to its nature of being the only one which is suitable for the deductive approach of the Thesis. Standardized data gathered via online questionnaire allows to get a decent sample, which decreases the margin of error, thus significant and valid results can be received. Moreover, it lets to compare data within the sample and to draw a model of adoption behavior.

2.2. Data collection

Data gathering procedure is a non-liner one, as insights of the research drive to revise and review previous phases and to adjust the research design itself. The questionnaire, which was used to gather data from Universities' staff, was done in the English language, as the focus was to cover respondents in several countries, and English is the best option as it is the language which is spoken and understood by academia around the globe. Respondents participated voluntarily and selected answers on their own. The survey was built on the SoGoSurvey platform due to its focus on protection. This system allows to turn on reCAPTCHA tool, protection question and duplicate protection based on browser cookies, so neither bots nor multiple answers from one person can undermine the overall sample. However, SoGoSurvey offers other survey protection tools as well,

including randomization and IP check, not all of them were used due to legal limitations in certain countries.

Data gathering was split in several steps. First, the author reached Universities' staff in Russia and two CIS countries using his own personal contacts with those people who work in Universities and may pass it further within the target group. Second, the survey reached the US market and Eastern states in particular. Due to the work and life experience in the US, the author has many contacts in University of Pennsylvania, University of Pittsburgh and University of Michigan, and one of them is ranked top-4 in the Reuters' world's most innovative universities list [Ewalt, 2019]. Universities' staff from the US and Russia contributed 162 and 121 responses respectively, which had answers to all questions and met the requirements to be included in a final sample. As 283 responses lead to quite a massive margin of error, the decision to reach more countries was made, as it was an easier option for the author rather than reaching new people in the US and Russia in a "cold message" way. Moreover, the Higher Education market is believed to be quite similar and homogeneous around the globe in terms of its behavioral traits, thus the decision to use personal contacts with Universities' staff in China, Korea and the UK was made [Zha, 2009; Gidley, 2008]. At this stage, the questionnaire reached Peking University, Qinghua University, Yonsei University and some smaller Higher Education institutions in the listed above countries.

In total, 572 responses were gathered. However, for further analysis only 503 were selected, as 69 of them did not make it to the final sample due to missing data and protection tools violation, which were used at the SoGoSurvey platform during the data gathering stage. Average response rate cannot be calculated, as in some cases the author relied on Universities' internal distribution of the survey, when asked friends or acquaintances, who teach at Universities, to pass it further. However, the process took nearly three months and required several proof readings in order to make the questionnaire smooth and easy to understand.

2.3. Questionnaire design

In the previous chapter, secondary research was done and six hypotheses to test were formulated. In order to confirm or reject hypotheses, it is necessary to identify the list of measurement items and variables, which are to be tested via a survey. Thus, recent literature on

the Innovation-Decision theory and rapidly technology adoption has become a cornerstone of the survey design [Chiyangwa & Alexander, 2016; Yang et al, 2016; Hsu et al, 2007]. Every question is a closed one and is based around a 5-point Likert scale, where a respondent chooses an answer according to the suggested scale: 1 – Completely Disagree, 5 – Completely Agree. The only four questions, which do not use a 5-point Likert scale, are the last ones. Instead, two of them are multiple-choice questions where a respondent evaluates him- or herself in accordance with willingness to use innovative solutions and specifies the country he or she is from. And the last two questions are optional: respondents are asked to leave an email and a name, if they want to be contacted later and receive the results of this study. Overall, there are 19 questions, and none of them are demographic ones, as the questionnaire targeted the US market, and such topics are considered to be sensitive and useless for the sake of this research.

The designed survey allows to identify an extent to which EdTech solutions' innovation attributes can predict University staff's adoption intention. In case of cost and complexity, it is expected to determine a negative relationship, as low cost and low complexity are more likely to result in positive adoption intention. In case of accessibility, compatibility, trialability and observability, a positive relationship is expected, as high values of these attributes are more likely to result on positive adoption intention. Adoption intention and Hypotheses scheme may be depicted the following way.

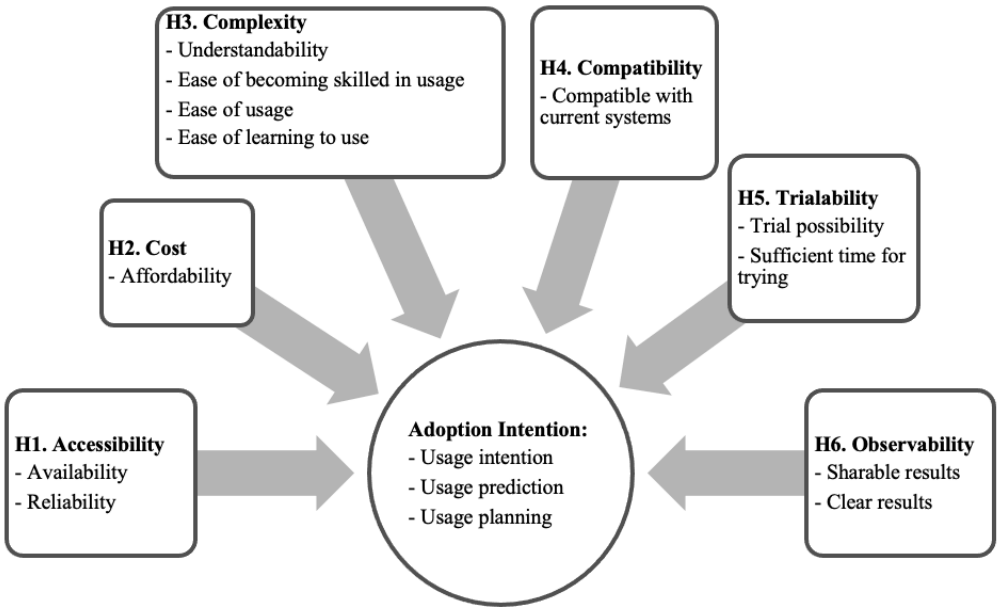

Figure 7. Research model. [Source: author]

In order to run quantitative methods of research, the eight variables and twenty variable measurement items were designed. Based on them, the final version questionnaire of developed. Prior to the data gathering start, they survey was piloted with six Higher Education professors from both the US and Russia. It allowed to identify biases embedded in questions and come up with adjustments and clarifications, where it was necessary. In the table below the list of specific variables asked in the survey is depicted.

Table 7. Survey design and metrics. [Source: author]

ID	Variable	Measurement items title	Variable measurement items
1	Accessibility	Availability	I would use an EdTech solution, if my employee provides a corporate access to it.
2		Reliability	I would rely on an EdTech solution, if it always works and online.
3	Cost	Affordability	I would NOT pay for an EdTech solution subscription myself for job duties.
4	Complexity	Understandability	My use of an EdTech solution would be clear and understandable.
5		Ease of becoming skilled in usage	It would be easy for me to become skilled at using an EdTech solution.
6		Ease of usage	I would find an EdTech solution easy to use.
7		Ease of learning to use	Learning to operate an EdTech solution would be easy for me.
8	Compatibility	Compatible with current systems	An EdTech solution is compatible with systems I use today.
9	Trialability	Trial possibility	Prior to subscription, I would be able to try an EdTech solution out.
10		Sufficient time for trying	I would have a long enough trial period to examine an EdTech solution.

11	Observability	Sharable results	I would face no difficulties telling others about the results of using an EdTech solution.
12		Clear results	The results of using an EdTech solution are clear.
13	Adoption intention	Usage intention	I intend to use at least one EdTech solution, which is new to me, in the next 12 months.
14		Usage prediction	I predict I will use at least one EdTech solution, which is new to me, in the next 12 months.
15		Usage planning	I plan to use at least one EdTech solution, which is new to me, in the next 12 months.
16	Personal willingness to use innovative solutions	(Innovator) I am interested in EdTech solutions and both check and use them at a beta-stage.	
		(Early adopter) I start to use a new EdTech solution, when niche tech media and geeks start to praise it.	
		(Early majority) I start to use a new EdTech solution, when it has become popular, and its utility is proven.	
		(Late majority) I start to use a new EdTech solution, when it has large market share, and it is used by many people.	
		(Laggards) I think about giving a try to a new EdTech solution, if I have to do it due to corporate or other decisions.	

2.4. Statistical techniques

The gathered data from the questionnaire were exported from the SoGoSurvey platform to a MS Excel file, and then analyzed via a special software tool – IMB SPSS Statistics. In order to validate six hypotheses formulated earlier, three separate tests were run: descriptive statistics, reliability and regression analyses.

The former one was applied to identify the overall demographic picture of 503 respondents and ensure that every response meets the set requirements. Then, the Cronbach's alpha technique, in other words a reliability check, was done to evaluate the gathered data.

In the end, the regression analysis was applied. It allowed to test six hypotheses and identify relationships between attributes and adoption intention. In particular, a multiple regression analysis was done, where adoption intention was a dependent variable, and six innovation attributes were independent variables. It is a widely utilized type of analysis for studies related to the Rogers' Innovation-Decision theory [Chiyangwa & Alexander, 2016; Yang et al, 2016]. First, it allows to check the model for assumptions and identify possible multicollinearity. Second, it provides information on model evaluation itself.

More details regarding each step of the utilized in this research statistical techniques are provided in the next chapter, when the data are analyzed, and the model is calculated.

Chapter III. Data analysis

3.1. Descriptive statistics

The sample contains 503 responses from Universities' staff of five different countries: the United States of America, the Russian Federation, the United Kingdom, the Republic of Korea (South Korea), the People's Republic of China (China).

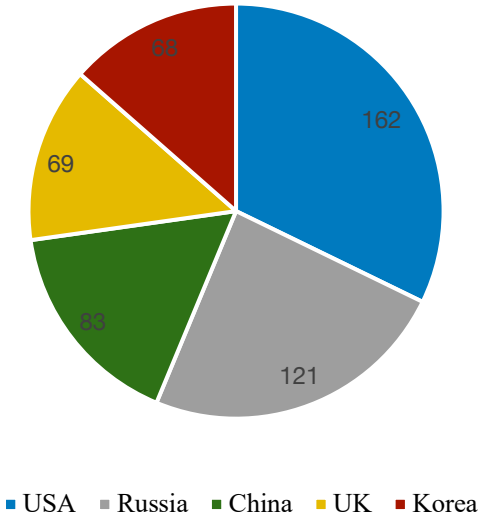

Figure 8. Respondents' location. [Source: author]

The number of responses is not distributed equally among these five countries. There are 162 contributed responses from the US and 121 from Russia. Other three countries have a smaller footprint, from 83 to 68 responses. However, such geographical distribution of respondents does not undermine the sample and the results we are to get due to the similar and homogeneous Higher Education society around the globe in terms of its behavioral traits [Zha, 2009; Gidley, 2008].

As this questionnaire targeted the US market and demographic topics are considered to be sensitive ones there, they were not included in this research. Moreover, it would not generate any additional value to the study. Nevertheless, there was another question, which depicts the audience quite fair. In the very end of the survey, our respondents were asked to evaluate themselves in terms of their willingness to use innovative solutions. Thus, there were five options to choose from: Innovator, Early Adopter, Early Majority, Late Majority, Laggards.

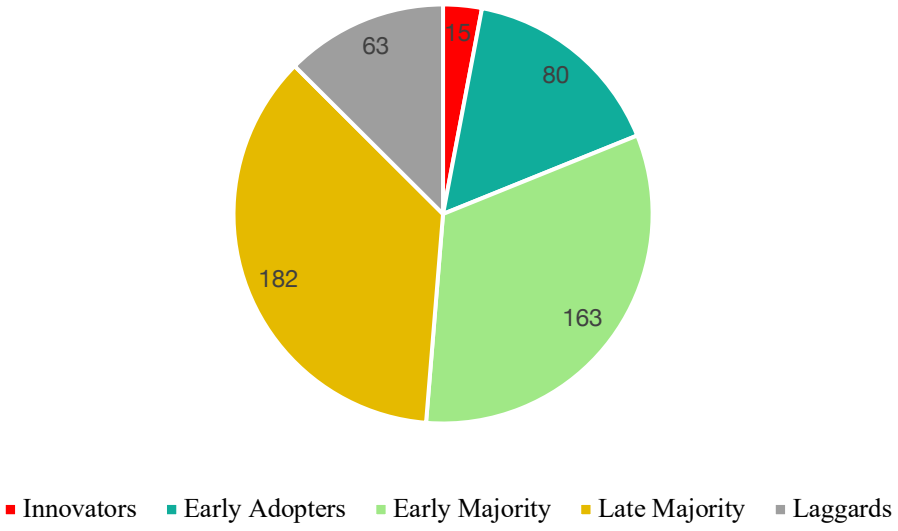

Figure 9. Respondents' self-evaluation regarding the willingness to use innovative products. [Source: author]

These results are quite in line with the Innovation Theory, which states that the distribution of people is the following: 2.5% innovators, 13.5% early adopters, 34% early majority, 34% late majority, 16% laggards [Rogers, 2003]. In the case of our sample, the results are the following: 2.9% of respondents defined themselves as innovators, 15.9% - early adopters, 32.4% - early majority, 36.2% - late majority, 12.5% - laggards. Therefore, the sample corresponds to the Diffusion of Innovation concept, represents the population of Universities' staff and with the confidence level of 95% results in 4% margin of error [Page & Patton, 1991].

3.2. Reliability analysis

Prior to the regression analysis, the internal consistency of the survey via a reliability test has to be checked. The most common way to measure it is the Cronbach's alpha reliability test. It is "a function of numbers, which test items and the average intercorrelation among them" [UCLA]. Here is the formula of the Cronbach's alpha: letter 'N' stands for the number of items, letter 'c' is there to identify the average covariance between items, and letter 'v' is the average variance:

$$\alpha = \frac{N\bar{c}}{\bar{v} + (N-1)\bar{c}}$$

When the Cronbach's alpha is below 0.5, the reliability of internal consistency is not acceptable, as it is quite low. When the number is more than 0.5, it is considered to be sufficient enough, and the higher it is, the higher internal consistency is [Field, 2013]. For this research, internal consistency was calculated for both innovation attributes and innovation intention, where at least two questions were grouped to measure a particular parameter. The results of the reliability analyses, which were done in IBM SPSS Statistics, are presented below.

Table 8. Cronbach's alpha for the data of the Accessibility questions set. [Source: author via IBM SPSS Statistics]

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.846	.873	2

Table 9. Cronbach's alpha for the data of the Complexity questions set. [Source: author via IBM SPSS Statistics]

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.945	.949	4

Table 10. Cronbach's alpha for the data of the Trialability questions set. [Source: author via IBM SPSS Statistics]

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.670	.674	2

Table 11. Cronbach's alpha for the data of the Observability questions set. [Source: author via IBM SPSS Statistics]

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.827	.829	2

Table 12. Cronbach's alpha for the data of the Adoption Intention questions set. [Source: author via IBM SPSS Statistics]

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.958	.958	3

Table 13. Cronbach's alpha for the data of all questions. [Source: author via IBM SPSS Statistics]

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.844	.839	15

According to the results of six separate reliability tests, the internal consistency of the survey is sufficient. For the last test, all questions of the questionnaire, except personal willingness to use innovative solutions and country of origin, were included. The Cronbach's alpha for the entire data set proved to be sufficient, as it was calculated to be equal to 0.844. Hence, the internal consistency is sufficient to be proceed for further analysis.

3.3. Regression analysis

A multiple regression model was generated to test six hypotheses, which were formulated earlier. Adoption intention was chosen as a dependent variable, while the following factors were

independent variables: accessibility, cost, complexity, compatibility, trialability, observability. Sample size is 503 responses, which resulted in a massive dataset and a 1:83 independent predictors–to–responses ratio. It exceeds a minimum sample size for a multiple regression analysis, which should be at least 1:15, according to the rule of thumb [Austin, Steyerberg, 2015].

Prior to the regression model evaluation, it is necessary to check assumptions and confirm that the outcome is both reliable, useful and valid. First, we take a look at the Correlations table and examine two sets of correlations: between two different independent variables and between an independent and a dependent one. The former one is expected to be less than 0.7, while for the latter one it is preferred when it is above 0.3 [Field, 2013].

Table 14. Correlations table. [Source: author via IBM SPSS Statistics]

Correlations

		Adoption	Accessibility	Cost	Complexity	Compatibility	Trialability	Observability
Pearson Correlation	Adoption	1.000	.659	-.453	.591	-.023	.556	.254
	Accessibility	.659	1.000	-.262	.720	-.065	.299	-.059
	Cost	-.453	-.262	1.000	-.397	-.116	-.030	-.007
	Complexity	.591	.720	-.397	1.000	-.068	.235	-.297
	Compatibility	-.023	-.065	-.116	-.068	1.000	.253	.082
	Trialability	.556	.299	-.030	.235	.253	1.000	.525
	Observability	.254	-.059	-.007	-.297	.082	.525	1.000

In the case of this research, there is no correlation between two independent variables for more than 0.7, except Complexity-Accessibility multicollinearity, which is calculated at 0.72. However, it is at the borderline of 0.7 and can be rounded to this amount, thus we assume that it is acceptable [Hsu et al, 2007]. However, negative correlation between several independent variables and a dependent one, an adoption, can be noticed, it is not a reason to exclude them on this stage, as it will be done later, when hypotheses and overall regression analysis results are discussed.

Next, we proceed with the Coefficients table and examine more Collinearity Statistics. First, variables' tolerance should be equal or above the edge of 0.1. This parameter stresses out by how much a particular variable is not explained by other variables. Second, Variance Inflation Factor (VIF) is expected to be less than 10. It estimates by how much the variance is inflated because of the multicollinearity in the regression model [Eberly].

Table 15. Coefficients table. [Source: author via IBM SPSS Statistics]

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-.470	.295		-1.592	.112					
	Accessibility	.440	.045	.352	9.716	.000	.659	.400	.237	.452	2.214
	Cost	-.379	.036	-.296	-10.470	.000	-.453	-.425	-.255	.744	1.344
	Complexity	.249	.063	.173	3.937	.000	.591	.174	.096	.309	3.241
	Compatibility	-.139	.030	-.125	-4.716	.000	-.023	-.207	-.115	.848	1.180
	Trialability	.607	.061	.355	9.948	.000	.556	.408	.242	.465	2.150
	Observability	.193	.046	.148	4.187	.000	.254	.185	.102	.474	2.110

a. Dependent Variable: Adoption

Collinearity Statistics, highlighted in the Coefficients table from the regression analysis, confirms that the model is valid and reliable, as VIF lies between 1.180 and 3.241, while Tolerance is greater than 0.1 in every single case. Hence, assumptions are checked, and it is possible to proceed with the model evaluation itself.

Model evaluation starts from the looking at the Model Summary, and 'R Square' in particular, as it shows by how much a dependent variable, an Adoption Intention, is explained by the model. In case of a small sample size, it is recommended to focus on the 'Adjusted R Square' number. Typically, model is useful when Adjusted R Square is greater than 0.3 [Field, 2013].

Table 16. Model Summary table. [Source: author via IBM SPSS Statistics]

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.840[a]	.706	.702	.8108	.706	198.417	6	496	.000

a. Predictors: (Constant), Observability, Cost, Compatibility, Accessibility, Trialability, Complexity

b. Dependent Variable: Adoption

Adjusted R Square differs from R Square by 0.004 only, as the sample size is massive and a 1:83 independent predictors–to–responses ratio is achieved. Adjusted R Square is equal to 0.702, what is more than 0.3. Hence, this model explains an Adoption Intention value, a dependent variable, by 70.2%.

Next, we look at the ANOVA table, or analysis of variance in other words. The model is considered to be significant, if p-value is less than 0.05, otherwise model is not considered as a good prediction tool [Field, 2013].

Table 17. ANOVA table. [Source: author via IBM SPSS Statistics]

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	782.710	6	130.452	198.417	.000[b]
	Residual	326.101	496	.657		
	Total	1108.811	502			

a. Dependent Variable: Adoption

b. Predictors: (Constant), Observability, Cost, Compatibility, Accessibility, Trialability, Complexity

According to the mentioned above ANOVA table, p-value is less than 0.05. Hence, the model can be used to predict a certain outcome concerning the Adoption Intention score.

Finally, we return to the Coefficients table to validate the proposed hypotheses, around which the entire regression model was designed. In order to test the hypotheses, six sets of variables were created, which correspond to particular attributes of EdTech solutions.

Hypothesis 1 was set to establish the relationship between high perceived accessibility of EdTech solutions and University staff's positive adoption intention. This hypothesis is confirmed, as strong correlation is determined by the model. Standardized Beta Coefficient is set at 0.352 with p-value less than 0.05, therefore the Accessibility attribute explains Adoption Intention quite well.

Hypothesis 2 was set to establish the relationship between low perceived cost of EdTech solutions and University staff's positive adoption intention. This hypothesis is rejected, as respondents expressed their willingness to pay for EdTech solutions from their own pocket for job duties. Standard Beta Coefficient is negative, and it does not support the hypothesis that University's staff have no will to pay for EdTech solutions.

Hypothesis 3 was set to establish the relationship between low perceived complexity of EdTech solutions and University staff's positive adoption intention. This hypothesis is confirmed, as positive correlation is determined by the model. Standardized Beta Coefficient is set at 0.173 with p-value less than 0.05, therefore the Complexity attribute contributes to overall explanation of Adoption Intention.

Hypothesis 4 was set to establish the relationship between high perceived compatibility of EdTech solutions and University staff's positive adoption intention. This hypothesis is rejected, as respondents expressed their willingness to deal with EdTech solutions' incompatibility, if it does

what promises. Standard Beta Coefficient is negative, and it does not support the hypothesis that University's staff want only module or embedded solutions.

Hypothesis 5 was set to establish the relationship between high perceived trialability of EdTech solutions and University staff's positive adoption intention. This hypothesis is confirmed, as strong correlation is determined by the model. Standard Beta Coefficient is set at 0.355 with p-value less than 0.05, therefore the Trialability attribute provides the best separate explanation of Adoption Intention within the model.

Hypothesis 6 was set to establish the relationship between high perceived observability of EdTech solutions and University staff's positive adoption intention. This hypothesis is confirmed, as positive correlation is determined by the model. Standard Beta Coefficient is set at 0.148 with p-value less than 0.05, therefore the Observability attribute contributes to overall explanation of Adoption Intention.

Therefore, these four hypotheses were confirmed:

H1. High perceived accessibility of EdTech solutions results in University staff's positive adoption intention.	**H3.** Low perceived complexity of EdTech solutions results in University staff's positive adoption intention.
H5. High perceived trialability of EdTech solutions results in University staff's positive adoption intention.	**H6.** High perceived observability of EdTech solutions results in University staff's positive adoption intention.

And these two hypotheses were rejected:

H2. Low perceived cost of EdTech solutions results in University staff's positive adoption intention.	**H4.** High perceived compatibility of EdTech solutions results in University staff's positive adoption intention.

Chapter IV. Conclusion

The research was built around a goal of identifying relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff. In order to reach the set goal, several questions were highlighted:

Q1. Are there relationships between EdTech solutions' innovation attributes and adoption intention of Universities' staff?

Q2. What EdTech solutions' innovation attributes affect Universities' staff adoption intention?

Next, the research on the Higher Education and EdTech startups market was done, which allowed to identify areas, where technical solutions developed by private companies are utilized by Universities and staff themselves. At the same time, we identified that EdTech startups struggle to reach the scaling impact stage, when their solution transforms educational practices and enhances them. On the whole, when an EdTech startup focuses on B2B market and Universities, it fails to communicate properly with the target audience and deliver its advantages clearly due to the lack of understanding how the customer, Universities' staff, decides when to give a try to a new software product.

The issues, which face EdTech startups in communicating with their target audiences at Universities, were examined through a massive list of literature and research papers. Hence, the Rogers' Innovation-Decision theory was picked to identify attributes of innovative products, which are most crucial for Universities' staff, when they decide whether to try a new software solution or not. Moreover, the Rogers' theory was modified by the author and merged with recent developments within the field of innovation-decision theory by Kapoor. Thus, the framework with five innovation attributes, which influence innovation adoption, was developed, and six hypotheses were formulated.

The list of formulated hypotheses led to a quantitative study, which was designed as a survey with 19 questions, four of which were not directly used for the regression model lately, as they were either optional or demographic ones. The survey was built on the SoGoSurvey platform and distributed across five countries, including the US and Russia. Overall, 503 responses made it to the final sample, which resulted in a massive dataset and a 1:83 independent predictors–to–responses ratio for the regression model.

Prior to the multiple regression analysis run, reliability check via Cronbach's alpha was done. It confirmed that the internal consistency is sufficient and there are no obstacles to proceed with a regression model. Thus, the multiple regression analysis was done, and six hypotheses were tested.

The regression model confirmed four out of six hypotheses and rejected two. Either strong or moderate positive relationships between University staff's adoption intention and the following four EdTech solutions' innovation attributes were identified: accessibility, complexity, trialability, observability. Negative correlation was identified for cost and compatibility attributes, thus the corresponding hypotheses were rejected. However, majority of 503 respondents, whose data made it to the final sample, expressed willingness to pay for an EdTech solution for job duties out of its pocket. Similar case happened to the compatibility attribute, as respondents expressed willingness to work with stand-alone products, which are not completely compatible with those ones, they use at the moment.

The research identified positive relationships between four EdTech solutions' innovation attributes and adoption intention of Universities' staff, and negative relationships with other two. This research showed that cost and compatibility are not cornerstone attributes, which affect Universities' staff adoption intention in a negative way. Due to the list of certain limitations, this research could not elaborate more on findings regarding cost and compatibility, and it will be discussed later in the chapter.

4.1. Theoretical Implications

The research makes contributions both to the Innovation-Decision theory field and to the EdTech University-focused solutions market. This paper supports the Rogers' theory applicability for the EdTech market, as it delivers useful insights on how Universities' staff decide when to give a try to a new software tool or not. This research identified that not every attribute, designed by Everett Rogers, results in strong and positive relationship with University staff's adoption intention. Thus, cost and compatibility attributes do not suit the proposed framework. Moreover, quantitative study and multiple regression analysis explained 70.2% of the dependent variable, an adoption intention. Hence, there can be more attributes, which have great influence on the overall model and might be identified in further studies.

Accessibility and Trialability are the attributes, which contribute the most to the prediction of the Adoption Intention correctly. It is notable, the accessibility attribute was not developed by Everett Rogers and was suggested to look at by Kapoor just a couple of years ago. Therefore, this study confirms that the Innovation-Decision framework updated and designed by Kapoor is applicable and relevant for the EdTech market. On the other hand, both accessibility and trialability are the attributes, which are often assigned to contemporary technological solutions, which are easy to install, try and get used to, and EdTech solutions are part of such market. Therefore, this research has confirmed that Kapoor's update to the Innovation-Decision framework is not enough, and more attributes of technological and digital solutions can be examined separately under the framework, which was originally built by Rogers.

In contrast, cost attribute did not work within the designed framework, as it was suggested by Tornatzky and Klein and was tested in this research. Low cost-barrier to enter did not result in positive adoption intention of Universities' staff. This finding highlighted a certain flexibility of the survey's target audience in terms of paying for the product from own pocket. Similar case is recorded with compatibility attribute, when stand-alone products do not result in negative adoption intention, though it may lead to both financial and procedural costs, which include time, budget and efforts [Liang, Lee & Tung, 2014]. Today, many EdTech solutions are cloud-based today compatible with any mobile or desktop operating system and can be accessed from web or app as well. As users expect that services are compatible completely with each other, they may not consider it as an issue, though system administrators feel the difference [Pratt, 2020]. However, the former ones were the target audience of the survey and gave the results we examined, but a switch to technically advanced respondents can make a difference and highlight a positive relationship between compatibility attribution and adoption intention. Therefore, compatibility attribute is a promising area to look for in further research.

4.2. Managerial Implications

The research examined the relationship between EdTech solutions' innovation attributes and adoption intention of Universities' staff, and it was built around the Rogers' Innovation-Decision theory, which was updated by the author with insights from Kapoor, Tornatzky and Klein. Prior to the theoretical framework construction, key areas of EdTech startups' interest were

identified, which are determined by issues and challenges the Higher Education institutions face. At the same time, EdTech startups struggle to reach the scaling impact stage, when their solution transforms educational practices and enhances them on a massive level due to the number of reasons. Both the Rogers' Diffusion of Innovations theory and Moore's Crossing the Chasm book point out at gap, which has to be overcome in order to reach the stage, when early majority starts to embrace a particular product or service. EdTech is no different market, as educational technology startups fail to communicate properly with the target audience and deliver information on topics which are cornerstone for customers. Therefore, this research utilized updated Rogers' theory and identified attributes of EdTech solutions, which influence University staff's adoption intention. The following information will help EdTech startups to target the most crucial questions the audience has during their marketing campaigns and acquisition of new clients among Universities' staff.

Two crucial attributes of innovative EdTech products or services that positively influence University staff's adoption intention the most are Accessibility and Trialability attributes. The regression model, which was built for the research, confirmed that high perceived accessibility and trialability strongly result in positive adoption intention among Universities' staff. Hence, there are two recommendations, which can utilize these findings and help EdTech startups to acquire new customers among the desired target audience. First, Universities' staff are willing to adopt a particular technological solution more, when a software developer is partnered with their employer and its products are pre-allowed and advertised by a University itself. Thus, EdTech startups are advised not only to target Universities' staff as end-users, but also to collaborate with Universities' IT departments and Administration, as they can be the ones who understand a proposed EdTech solution and endorse it for further usage by employees. Second, Universities' staff prefer to have a trial period and examine an EdTech solution, prior to subscription or full transition to a new product. Thus, EdTech startups are advised to provide free of charge trial periods for an extended period of time, so Universities' staff have enough time to examine the service and decide whether it suits their needs or not. In case if not all of them are retained after a trial period, the onboarding process for potential clients will be eased.

Complexity and Observability attributes have an impact on University staff's adoption intention as well, a positive one. Due to a moderate relationship between low perceived complexity and high perceived observability of EdTech solutions and University staff's adoption intention,

the following two recommendations for EdTech companies are made. First, utilize user-friendly UI matrix and keep interface simple and native to use. It is important to help potential users to become skilled and comfortable with the software tool. Thus, help Universities' staff with a proper onboarding page and walk them through key functions, so it is clear and understandable how to navigate within the product or service. Additionally, stress University staff's attention on ease of use during the EdTech solution presentation or marketing campaign. Second, show clear results and changes of working routine, when an EdTech solution is utilized by your client. The before-after framework can be a useful way to depict the difference and deliver the true value of the product, as it may save time during the routine duties execution or lead to better results.

Instead of innovation attributes, which are mentioned above, Cost and Compatibility attributes did not lead to an expected outcome. The regression model did not support hypotheses that low perceived cost and high perceived compatibility of EdTech solutions result in positive adoption intention. In the first case, it turned out that Universities' staff are ready to pay for EdTech solutions out of their pockets, and the paid version of a particular software service does not discourage them to give it a try. In the second case, compatibility happened to be not a serious criterion Universities' staff look at, when they decide whether to give a try to a new technological solution or not. Therefore, there are several recommendations to EdTech startups regarding these findings. First, instead of wasting time on a subscription plan speech, it is better to share the value of the product and make sure that the audience has understood and is interested in a product or service, as low perceived cost does not result in higher levels of Universities' staff adoption intention. Second, compatibility is not a proper topic to waste time, when you present an EdTech solution to Universities' staff. One the one hand, not everyone is technologically advanced, and on the other hand, everyone expects a product, which is compatible with major mobile and desktop operating systems, or a cloud-based solution, which is easily accessed from any device via web browser. Therefore, EdTech startups can spend less time on cost and observability attributes of their innovative products and stress on other attributes, including accessibility, trialability, observability and core value of the product, as it results in positive adoption intention of Universities' staff.

The research has paved the way for EdTech startups to the data on how Universities' staff decide whether to try a new software solution in action or not. With the given data, EdTech startups, which focus on Universities and Universities' staff, are able to adjust the way they

promote and describe a product or service to the target audience. Reduction or elimination of irrelevant information, which does not cause in a higher level of adoption intention, is to give EdTech startups more room in designing marketing campaigns and stressing on those attributes, which are important for Universities' staff.

4.3. Limitations and Further Research

This research was done under an assumption that the global Higher Education market is a homogeneous body and University staff's behavioral traits do not change from one country to another [Zha, 2009; Gidley, 2008]. Thus, responses from five drastically different countries were combined in one sample, which then was used for the regression model in this study. However, the overall sample proved to be applicable for the research, there are certain fluctuations in attribute's mean values, if we compare data from the two different countries. Moreover, not only cultural but also corporate or organizational influence may be detected in the gathered data, which are still homogeneous enough. Hence, responses from top-notch universities, which are listed in the Reuter's world's most innovative universities list, tend to show higher adoption intention for new EdTech solutions among Universities' staff, compared to other Higher Education institutions [Ewalt, 2019]. In case of a potential national study, the geographical distribution of respondents can be limited to a particular country or city, as well as University or another institution, and it may result in a more homogeneous sample.

Likert scale usage is another limitation of the research, though it is widely utilized for parametric tests and studies connected to the Rogers' theory [Adams et al, 2017; Hsu et al, 2007; Norskov et al, 2015]. For this paper, a 5-point Likert scale was used, where a respondent chose an answer according to the suggested by the author scale: 1 – Completely Disagree, 5 – Completely Agree. Such scale allowed to limit respondents' choice and decrease the amount of time spent on a questionnaire. In case of a potential further study, a 10-point Likert scale usage is expected to deliver more diverse and precise answers, as there will be ten options to choose from with a gap of 10% in-between.

The Rogers' Innovation-Decision theory proved to be a reliable framework to use, though it was altered by the author to some degree. There were six innovation attributes to test, as the original relative advantage attribute was split in cost and accessibility features. Everett Rogers

highlighted the difference between target audience's adoption intention and actual adoption decision, though it was not examined in this research, as it requires real sales or at least started trial periods involved [Rogers, 2003]. Therefore, such discrepancy can be a separate topic to study during a further research.

Next, the research itself and the first mentioned limitation suggest further study on environmental attributes, which influence University staff's intention to adopt new EdTech solution. In this paper, innovation attributes were examined apart from cultural, corporate or any else environmental variables. Synergy of environmental and adoption intention attributes can be a separate topic for a further study, which will involve knowledge from different fields of science, including sociology and management.

Finally, a deeper analysis on the contribution of cost and compatibility attributes is required. This research suggested two hypotheses regarding these two innovative attributes, though they were rejected as the negative correlation with adoption intention was identified. Now, when the research is written and data are calculated, it is obvious that system administrators and IT department managers from the Higher Education institutions would be a better target audience to ask a series of questions on compatibility of EdTech solutions, as they are the ones who set and adjust corporate software. With the case of cost attribute, more studies are required. Current study on cost attribute identified University staff's potential to pay out of their pockets, though it did not show how much they are willing to pay and what is the exact impact on overall adoption intention.

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Annex

Annex 1. Questionnaire

Choose the number which describes the extent to which you agree to the following statements. (5-point scale, where 1 – Completely Disagree, 5 – Completely Agree).

1. I would use an EdTech solution, if my employee provides a corporate access to it.
2. I would rely on an EdTech solution, if it always works and online.
3. I would NOT pay for an EdTech solution subscription myself for job duties.
4. My use of an EdTech solution would be clear and understandable.
5. It would be easy for me to become skilled at using an EdTech solution.
6. I would find an EdTech solution easy to use.
7. Learning to operate an EdTech solution would be easy for me.
8. An EdTech solution is compatible with systems I use today.
9. Prior to subscription, I would be able to try an EdTech solution out.
10. I would have a long enough trial period to examine an EdTech solution.
11. I would face no difficulties telling others about the results of using an EdTech solution.
12. The results of using an EdTech solution are clear.
13. I intend to use at least one EdTech solution, which is new to me, in the next 12 months.
14. I predict I will use at least one EdTech solution, which is new to me, in the next 12 months.
15. I plan to use at least one EdTech solution, which is new to me, in the next 12 months.
16. Choose an option which describes you best:
    - (Innovator) I am interested in EdTech solutions, and both check and use them at a beta-stage.
    - (Early adopter) I start to use a new EdTech solution, when niche tech media and geeks start to praise it.
    - (Early majority) I start to use a new EdTech solution, when it has become popular, and its utility is proven.
    - (Late majority) I start to use a new EdTech solution, when it has large market share, and it is used by many people.
    - (Laggards) I think about giving a try to a new EdTech solution, if I have to do it due to corporate or other decisions.

17. Where is your employer (University) located?
    - United States
    - Russia
    - China
    - United Kingdom
    - South Korea
18. (Optional) Leave your email, if you want to get the results on the study.
19. (Optional) Type your name to be personally addressed with the results of this study later.