



**The Bucharest University of Economic Studies**

**Faculty of Business Administration**

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# **eLearning in corporations**

## **Master's thesis**

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# Contents

<b>Introduction</b>	<b>01</b>
<b>Chapter 1: eLearning</b>	<b>03</b>
1.1 Definition and insights	03
1.2 Categories of eLearning	03
1.3 Learning theories	04
1.4 Gilly Salmon's Five Stage Model	05
1.5 Limitations of eLearning	07
1.6 Advantages of eLearning	08
1.7 Some numbers on eLearning	09
1.8 Traditional learning versus eLearning	10
<b>Chapter 2: Gamification</b>	<b>12</b>
2.1 Definition and insights	12
2.2 Game design elements	13
2.3 Psychological theories of motivation	18
2.4 Examples of successful implementation in recruitment and retention	21
<b>Chapter 3: Virtual and augmented realities</b>	<b>24</b>
3.1 Augmented reality (AR)	25
3.2 Virtual reality (VR)	26
<b>Chapter 4: Scientific research</b>	<b>28</b>
4.1 An overview of the situation of IT&C in the EU-28	28
4.1.1 Internet connections	28
4.1.2 Internet connection speed	30
4.1.3 IT&C workforce	32
4.1.4 Social networking	32
4.1.5 Cloud computing	34
4.1.6 Devices	35
4.1.7 Internet use behavior	37
4.2 An overview of the worldwide situation of eLearning	37
4.3 An overview of the worldwide situation of AR and VR	40
4.4 An overview of the worldwide situation of gamification	41
4.4.1 The market	41
4.4.2 Mobile games	42
4.4.3 Platforms	42
<b>Conclusions</b>	<b>44</b>
<b>Appendix</b>	<b>48</b>

# Introduction

eLearning is an ever-growing phenomenon. Nowadays, it is being employed by all manner of organizations, be them private or public institutions. While this research paper might occasionally tackle into the insides of public institutions (public administration and/or educational institutions), the focus will be set upon its use inside private businesses.

The reasons why I chose to delve into this subject are too numerous and too complex to write down in one piece. I will thus try to summarize the importance and attractiveness of this vast subject in a few words. Having been born in the early days of the Internet, I have always been connected with technology and the wide world in some way or another. I have witnessed and firsthand experienced both traditional learning methods and, until recently, unknowingly, eLearning techniques. I became curious with what this learning format has to offer and, in consequence, wished to conduct a type of research that might reveal its full potential for practical use.

Successful contemporary businesses are, for the most part, involved in technology. Even if the field of activity is apparently unrelated to science, communications, software and devices, organizations have become inseparable from technology, on various scales and degrees. Having the edge with the latest investments in technology is a clear competitive advantage.

I wish to make a comparison with traditional methods of corporate training and establish both their advantages, disadvantages and present a way of mixing them up so as to better benefit both the businesses, the employees and, why not, even the clients. eLearning is also a worldwide multi-billion dollar industry and it is said to expect a lot of growth. The potential for expansion is evident even though the profitability of such a business is questionable, to say the least, in absence of a longer history of practice, trial and error. In this fast-paced age of technology and instant communication, “Online learning is not the next big thing, it is the now big thing.” (Donna J. Abernathy)

By studying the subject in more detail, I began to ponder on several questions. Is eLearning better than traditional learning? Does it benefit the companies, the employees or both? Can it be used to transform the face of recruiting? Does it create a competitive advantage? Is it a profitable business? Is the population ready for widespread use of eLearning? Is the current infrastructure enough to

support eLearning? Where does Romania stand in all of this? Is eLearning coming to us? Should we use more of it?

Is eLearning the future or the present? And when I say the future I am thinking about the evolution of business to customer interaction, employee training, recruiting of the workforce and even the management functions of control and assessment. “So, let’s drop the “e” – or at least give it a new and wider definition.” (Elliot Masie)

Steve Jobs stated that “Computers are like a bicycle for our minds” and eLearning in Romania is currently still riding with its helping wheels. When will it take them off? Will it ever? I will try and answer these questions with as much insight and research as possible and offer a series of conclusions, recommendations and best practices based upon the knowledge that exists presently on the subject matter.

# **Chapter 1: eLearning**

## **1.1 Definition and insights**

E-Learning is the use of electronic media and IT&C technologies in training and education. Other terms used to describe the phenomenon are: multimedia learning, computer based instruction (CBI), computer assisted/aided instruction (CAI), Internet-based training (IBT), technology enhanced learning (TEL), web-based training (WBT), etc. The alternative names of eLearning represent different approaches and paradigms.

Thus, EL might be better understood as the total sum of educational practices that make primary use of IT&C. EL is a method of teaching and learning from a distance. The educational program generally employs a pre-planned educational scheme but the experience is highly personal and the beneficiary of the materials may choose to tackle them in a matter that is most suitable to his or her needs and limitations.

## **1.2 Categories of eLearning**

### **1) Online**

This category is the most obvious format and its main particularity is that it requires no human interaction. It is self-directed and perfectly customizable, to suit the learner's pace and needs and interests. It presents the advantage of fully cutting on the quantitative and qualitative costs of traditional training. The main disadvantage would be the complete absence of communication with trainers and peers.

### **2) Hybrid**

This format is a blend between on-line and face-to-face learning. Typically, it implies around 30% face-to-face learning and the rest is on-line learning. This type of eLearning offers convenience, increased interaction, flexibility, increased motivation and higher information retention. The most obvious advantage is that it can be used to exploit the full potential of eLearning, while at the same

time getting an edge by experiencing the unique advantages of traditional training, such as socialization and information sharing, creating communities united in the desire to achieve more.

### **3) Asynchronous**

Some human interaction is being offered by this format of eLearning, although it does not take place in real-time. The learner might ask questions and receive ulterior feedback. Spreadsheets and discussion board are examples of this practice, where the students complete the tables and write down questions when it is more convenient for them, time-wise, and those will be answered at a later moment.

### **4) Synchronous**

Synchronous learning can be achieved by implementing human interaction in real-time (but now face-to-face). This can be done through chat rooms, webinars, group discussions. The participants must agree to come together at a certain time, in order to profit of the benefits of direct interactions with other peers and instructors.

## **1.3 Learning theories**

All efficient and established learning formats stand upon empirical learning theories. Due in most part to the fact that eLearning is extremely flexible and has become quite varied in its specific purposes and methods of implementation, there is no widely accepted best-practice.

The same is true about the technology, which is constantly evolving, thus changing paradigms and approaches to multimedia teaching practices. Even so, at their core, every practice is related to some major psychological theory on learning, which I will further discuss in more detail.

### **1) The emotional perspective**

This theory is based upon our understanding human feelings and emotions and how they impact the process of teaching and learning. It focuses on how emotional reactions to different external stimuli can either make or break the ability to learn. Motivation is the biggest theme and is also considered to be the engine that drives the subject's involvement in the learning process.

## **2) The behavioral perspective**

This perspective explains how learning influences the individual by growing new skills and forming new patterns of behavior and vice-versa. For example, playing a role can help someone get into a different mindset and develop different perspectives and subsequent approaches to existing questions and issues, which he wouldn't have otherwise

## **3) The Social-constructivist perspective**

This theory approaches learning from a deeply socially active point of view. It manifests itself in the form of various collaborative platforms such as forums, blogs and wikis. Thus, the content is open, subjected to questioning and change. Both learners and instructors can participate in creating the learning content.

## **4) The cognitive perspective**

This theory mostly tries to approach learning through the understanding of the underlying neurological processes that happen in the human brain, while also taking into consideration the psychological aspect of the human psyche, consciousness and the unconscious ego. By exploiting what we do currently know about the brain and the mind, we can bring out greater potential for processing and storing information. Basically, it's all about using tricks and best-practices in eLearning to act as catalysts for transforming the subjects into information sponges.

## **5) The contextual perspective**

Learning can be stimulated and enhanced by the context in which the process takes place, taking into consideration extrinsic factors, such as the environmental setting, the social structure, the culture, etc. The opposite can also be true. The wrong context can put incredibly hard to pass limits on an individual's potential. The lack of working conditions or the lack of stimulating human interaction can negatively affect a person's motivation and therefore, his or her engagement and focus.

## **1.4 Gilly Salmon's Five Stage Model**

Gilly Salmon is a contemporary innovator in the learning industry. She proposed the following model, with five stages, in order to help implement successful eLearning.

### **1) Access and motivation**

The first stage basically addresses infrastructure. Access must be assured through connectivity. This is why eLearning must be open to a variety of platforms, available anywhere and anytime. Thanks to cloud computing and mobile technologies, this is easily obtainable.

A moderator must be somehow present, in order to offer support. The experience should leave the first impression of being welcoming and encouraging.

In Gilly's publication, "E-tivities – the key to active online-learning", she argues that eLearning should focus on interaction and group participation. Which takes us to the second stage.

### **2) Online socialization**

The goal of socialization in the online is to create a community in which exchanges of information takes place, under the supervision of the moderator. There must be a medium which facilitates easy sending and receiving of messages, brings down the bridges that separate people (culture, time, space, environment).

### **3) Information exchange**

The exchange of information must be encouraged by completing tasks and making use of the most suitable materials. Up to and including this stage, the learning process takes place at a greater scale. Individuals are somehow bound together to help each other reach personal goals.

### **4) Knowledge construction**

Finally, at this stage, the learner has become sufficiently prepared to extract his own conclusions and best-practices. Knowledge is being created. Still, the collaboration between the learners is crucial to knowledge construction.

### **5) Development**



At this stage, the learner takes his individuality to a whole new level by using exterior forces to make an evaluation of his achievements and act upon his findings, which take place on a purely intrinsic level.

## **1.5 Limitations of eLearning**

### **1) Infrastructure and development**

The implementation of eLearning requires a strong company foothold in IT. The proper hardware must be present. After (or if) the infrastructure is present and functional, the subsequent development (after research has been done) is to be debuted. Here, there are two available paths: in-house development (requiring actual software developers) or outsourcing (Which could benefit the company because of lack of own talent, inexperience, costs of developing, etc. The experience and expertise of a specialized company is beneficial).

### **2) Employee motivation**

The receivers of eLearning must be highly self-motivated in order for actual development to take place. The vulnerability is existent because in traditional learning, the actual format is imposed upon the employees and usually they are required to attend courses at a physical place, where they interact with instructors and colleagues. Thus, both a figure of authority and peers pressure are present, which are known to be powerful extrinsic motivators. In eLearning, the level of external motion must be countered by a higher level of internal motivation.

### **3) Change aversion**

This is probably the worst problems that can affect the successful application of eLearning. Efficient change management strategy implementation must deal with resistance. If a particular business had never experienced the phenomenon before trying to implement it, without proper preparations, the experience might be rejected by reluctant employees. This is of particular concern, taking into consideration the above-mentioned crucial self-motivating aspect of this type of learning.

## **1.6 Advantages of eLearning**

### **1) Travel economy**

Most obviously advantageous for multinational corporations. Flying employees and trainers incurs immense costs for the company and fatigue, personal time and other travelling risks (accidents can happen) for the employees.

### **2) Globalization**

With eLearning, in the context of businesses going continental or even global, there is less need for travelling, for training purposes. eLearning platforms can bring the advantage of training employees on the same level, at the same quality, anywhere, anytime, in any language.

### **3) Learning materials always available**

The materials are not physically stored, so they can be accessed anywhere, by anyone in need (fresh employees included). The training can be referred back at any ulterior time and reviewed if necessary.

Updating the information is easy because it means just inputs inside a digital system, not printing of new materials and their subsequent distribution to instructors and other employees.

### **4) Return on investment**

Quantitative/tangible: Cost savings (travelling, training, materials)

Qualitative/intangible: Time saving (of trainers and travelling), easily updatable content, improvement in employee satisfaction, maximizing internet and intranet investment's returns, improved employee retention, efficiency raise, creating a competitive advantage.

## **1.7 Some numbers on eLearning**

- 1) A Brandon-Hall study found out that eLearning requires, on average, 40 to 60 percent less time spent by employees, when compared to traditional learning. This is due to its asynchronous characteristic. To study also concluded that less time does not mean a decrease in the quality of the learning. The opposite is in fact found to be true.
- 2) The Research Institute of America made a study in which they concluded that eLearning manages to increase the level of retention by 25 to 60 percent. On the other end of the spectrum, the retention rates associated with traditional training is much, much lower: 8-10 %.
- 3) The giant IBM implemented eLearning in their company. What they found out was exceptional: their employees managed to learn five times more material, in the same amount of time as traditional learning. No more, no less. The simple math they did demonstrated that companies can cut down on employee training (time and costs). In turn, the employees could spend more time working, which, again, reduces costs and raises productivity and thus, revenues. The same experiment by IBM found out that every dollar invested in eLearning was the equivalent of a 30\$ rise in productivity. They also said that they saved 200 million US dollars, taking into account cost reductions in travel expenses, accommodation, rent, materials, instructors, etc.

- 4) The Ambient Insight research done on the worldwide mobile learning market found out that 42% of the surveyed companies had witnessed increases in revenue, after the implementation of eLearning.
- 5) The Molly Fletcher Company proposes three reasons to implement eLearning in companies: low cost to implement, increase in successful results and increase in employee engagement. Regarding the last reason, the company proposes that businesses can benefit off of up to an 18% increase in workforce engagement.
- 6) According to Elearning Magazine's Industry Fact book from 2013, 41.7% of the Fortune 500 enterprises employed modern technology in instruction.
- 7) CertifyMe.net published some information about the state of corporate online education. Out of the total number of surveyed businesses, 72% of them considered that eLearning is a competitive advantage.
- 8) Regarding the latest trend in growing concern about the environment, a research conducted by Britain's Open University found out that eLearning can consume 90% less energy to produce 85% less carbon dioxide than traditional learning (on average, per student).

## **1.8 Traditional learning versus eLearning**

This University of Texas at Arlington study found out that the GPA (Grade Point Average) was a determining factor, which was correlated to the performance of students. The students were made to attend three different types of learning environments: traditional learning environment, a hybrid environment and an active learning (such as gamification).

The students with low grades scored lowest when receiving traditional teaching curriculums and highest in the active learning format. On the opposite end of the spectrum, the high graded students performed better with traditional learning methods and not so well with active learning. The scores of the low GPA segment improved with higher exposure to active learning.

“Learning is more effective when it is an active rather than a passive process”. - Kurt Lewin

“Once we free ourselves from the mental limits of viewing this technology as a weak sister to face to face synchronous education, the potentials to revolutionize education and learning become readily apparent.” - Turrof, 1995

Content Oriented, Passive		User Oriented, Active	
TRADITIONAL LEARNING		eLEARNING	
Pros	Cons	Pros	Cons
<ul style="list-style-type: none"> <li>▪ Direct interaction</li> <li>▪ Personal communication</li> <li>▪ Suitable for those who have yet to join the workforce</li> <li>▪ Human interaction, schedules, discipline, fitness</li> <li>▪ True motivation, satisfaction, rewards, etc.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sometimes fails in practical aspect</li> <li>▪ Can be expensive</li> <li>▪ Limited by time and space</li> <li>▪ Does not take into account individual needs and preferences</li> </ul>	<ul style="list-style-type: none"> <li>▪ Convenient (time, money, energy and space-wise)</li> <li>▪ Individualized</li> <li>▪ Non-standardized</li> <li>▪ Diversity</li> <li>▪ Suited for globalization</li> <li>▪ Rapid transfer of knowledge</li> <li>▪ Defeats language barriers</li> <li>▪ Multitude of platforms</li> <li>▪ Can use local or cloud storage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Indirect interaction</li> <li>▪ Impersonal communication</li> </ul>

*Table 1: Traditional Learning vs. eLearning [Own contribution]*

Problem: Impersonal communication and indirect interaction

Workaround: There are alternatives to live-query resolution such as forums, chat rooms, e-mails, video conferences, spreadsheets, synchronous on-line courses.

## Chapter 2: Gamification

### 2.1 Definition and insights

Katie Salen and Eric Zimmerman define the concept of “game” in their 2004 work, *Rules of Play: Game Design Fundamentals* as “a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome”.

Gamification can be better understood as the implementation of concepts and practices from video game design in contexts not actually related to gaming. The intention at stake is to encourage the individual’s self-motivation and his actual performance related to a specific domain or activity of interest. It is considered that gamification can foster wishes of taking up the initiative and following up on activities, on the basis of a closely monitored and nurtured goal-oriented behavior, backed up by achievements, scores, leaderboards and other game design gimmicks.

Generally, researchers have been positive about the relative success of this type of practice, in regards to its aforementioned objectives. Basically, it is a philosophy that seeks to create game like content to suit the specific needs of the company in regards to various real-life situations, unrelated to actual gaming. It presents itself with different advantages such as, first and foremost, brand engagement. Games are all about the experience. The most desirable aspect of the game is the pleasure that comes with said experience.

Gamification promises an increase in motivation. Computer video games just keep becoming more and more popular and widespread. The user base is growing ever broader. Video games, at their inception, used to be regarded as more of a children’s activity, simply replacing traditional outlets for spending time through playful activities. While this is still somewhat the norm, it must be noted gamers nowadays come from all spectrums of life. Toddlers, children, teens, young adults and even senior citizens indulge. Sex, gender, culture, age and financial status become increasingly irrelevant, as this one hundred billion dollar global industry reaches higher and higher market value with each year that passes.

Up until this point in time, gamification has been successfully implemented in the following areas: work, education, crowdsourcing, health, environmental protection, data-collection and social networking. Gamification has the unique capacity to be extremely versatile by combining game design elements in such ways that it suits very specific interests. The games are very well targeted

and are therefore hard to study as a uniform concept with generic applications in real life. Different combinations of game design elements will foster different effects and responses on and from the users.

I will try analyze different aspects of gamifications through the lenses of psychological theory. The various gaming elements will be investigated by taking into account the different effects they have on the human psyche and how these effects impact the objectives of the organizations. This scientific research is concentrated on the area of eLearning. Consequently, I will be focusing on the teaching, training and learning aspects promoted through gamification.

## **2.2 Game design elements**

This is a sales technique actually used with existing and potential employees inside a Stimulation System. This system acts as an extension of the management's motivation function. This also has effects that positively impact the control of the human resource.

### **1) Points**

Points are a typical element, present in most modern video games. Thus, they are very familiar, even to casual gamers, they are easy to understand, and offer a digital form of instant gratification for successfully accomplishing certain objectives in-game. This is basically just offering quick, quantifiable feedback to the user, which can also act as a minor reward for a job well done. On top of that, these points enable a control system, through which the user's activity can be easily quantified. The resulting data can be studied and analyzed, which in turn offers insight on how the game is being used and on the behavior of the players.

Points themselves can be classified into multiple categories, depending on their purpose and source of achievement. Therefore, we can mention:

#### **a. Experience points**

They are awarded for completing certain activities. These points stack up and increase player's level and/or are required in order to advance to superior levels inside the game environment. Generally, the number of experience points which the player can gather is directly correlated to the volume and quality of his activity. This is done through a system of explicit rules, which

enables gamers to go at their own pace or challenge themselves in order to achieve more experience points and, therefore, progress faster.

#### **b. Reward points / digital currency**

These points can act as some sort of currency inside of the gaming environment. This currency can naturally be used to purchase certain advantages or perks. These types of points enable the user to achieve feedback as well as actual rewards of his choice. The higher valued the redeemable reward, the higher the number of reward points that must be spent in order to get a hold of it. This is intended to motivate the player to actively engage in more and more activities which reward him with points to spend inside the game. The digital in-game currency can create actual virtual economies, which allow people to spend them on real or virtual goods and services.

#### **c. Reputation points**

These points are generally used within communities of digital users (such as forums, trading markets or freelancing platforms), where good cooperation, collaboration, communication and a helpful team-player attitude is rewarded accordingly. Reputation points tell a story about the individual's social status among his peers. This influences the way he is perceived by the other users and some limits might be imposed on his actions, depending on the level of reputation. For example, an individual with very low reputation might be banned from accessing certain levels or facilities of the environment. The fact that the software keeps track of the user's actions and rewards them accordingly can motivate users to behave better, knowing that their reputation is openly available and scrutinized by the others. Everybody wants to feel appreciated, trusted and acknowledged by his peer group.

### **2) Badges**

This element comes in the form a predominantly symbolical visual stimulus which represents achievements. Badges are won by working within the gaming environment. Badges mark cornerstones achieved by gamers who reach certain objectives, records or specific accomplishments. Many times, the badges are visible not only to the system, as a reference of the user's capabilities, but also to other gamers, thus acting as a status boasting element for the earner and as a competitive motivator for the other witnesses.

They can prove acknowledgement, give a sort of feedback and be considered as proof of membership to a specific group of select users who own certain qualifications and experience.



Badges also help keep track of progress, by providing very specific information of achievements. Badges might also serve other secondary objectives, acting as goals to be reached, by putting in more work and practice. If implemented correctly, badges can influence the learning path, by motivating the player to behave in certain ‘programmed’ ways. If badly implemented, they can act as distractions from the game’s main objectives.

### **3) Leaderboards**

Leaderboards are used in order to keep track of all player’s progress in the game environment, while at the same time comparing them to each other. The public rankings garnered by leaderboards foster feelings of pride, confidence, rivalry and acknowledgement. Leaderboards measure the activity of the players in regards to certain success criteria, applied to specific activities.

The danger with implementing transparent leaderboards is that they present themselves as two edged swords. The motivation factor is mixed, in the sense that those at the bottom of the board tend to garner feelings of uselessness and demotivation. This can lead to feelings of pressure to perform, which can be effective, if the gap between the contestants is minimal. The greater the gap, the greater the feelings of frustration that come with it.

### **4) Performance graphs**

These graphs are different from the abovementioned leaderboards due to the fact that they are used to track individual progress, relative to the past achievements of the user. It helps the gamer keep the tabs on his performance and gives pinpointed constructive feedback. This makes self-motivation easier, by keeping a history of effort over time, successes and failures, while at the same time offering a clear image of the strongest and weakest attributes which need to be improved.

### **5) Storylines**

Storylines are not connected to the player’s actual performance. Stories which hold meaning are introduced into game-like environments in order to provide a narrative which contextualizes the game elements. Activities and characters gain meaning and earn the attachment of the player. A more fantastical narrative can be created so as to draw the attention of the user, which would have otherwise had to deal with a boring context. The story can be real-life related or completely fictional, as long as it is stimulating and immersing.

## **6) Avatars**

Avatars have been around since the early days of the internet and are effectively a visual representation of the user's digital persona. The main purpose of the introduction of avatars is immersion. Generally speaking, most avatars are created and subsequently personalized by the player or at least chosen out of a given palette.

Avatars come in various forms. Most commonly, they are 2D images or fully fleshed 3D animated characters. Avatars allow the player to be easily distinguished from others. In some cases, the personalization of the avatar can be supported by effectively acting inside the gamification environment. New 'skins' or other modifications can be 'bought' with reward points or in-game digital currencies, further motivating the user to act well.

## **7) Quests**

Quests represent fixed objectives that need to be reached. Quests must be rewarded and usually, the reward is made known to the player, so as to act as a motivator. Different quests require different skills and experience to be unlocked, they have different difficulty of completion and they reward accordingly.

Some quests might only be available on special occasion or under certain conditions (such as needing a certain achievement or badge, or requiring the participation of a whole team). Daily quests have been introduced in various games and gamification platforms, so as to keep the players engaged at regular intervals.

## **8) Teammates**

Teammates are an element being implemented with the goal of introducing certain social effects such as: cooperation, collaboration, competition, friendship, conflict, etc. Teams can compete against each other, they can be placed on leaderboards, earn badges together and exert their influence in the environment.

This can stimulate the individuals to develop communication and team-working soft skills or even develop true real-life connections with others. Co-workers acting together in virtual teams to accomplish tasks can count as socializing and teambuilding, to a certain extent.

## **9) Time pressure**

Working under time pressure has been demonstrated to help people focus on a certain task. Coupled with decision making, it can lead to various interesting scenarios and their respective outcomes. It enables the user to better himself by improving speed, focus and decision making and it also helps the HR to evaluate performance under deadlines and critical situations.

## **10) Scarcity**

Unique or rare things are generally valued much higher. Making some elements in the environment to be especially scarce can foster feelings of desirability. For example, limiting the number of certain badges or titles can raise competition amongst the platform's users.

## **11) Consequences and loss aversion**

The players might face consequences for their actions, if they do not do well. Losing hard earned points, badges and other stimulating elements fosters negative feelings. Thus, users will probably try to avoid these consequences by doing their best. The fear of losing status, rewards, reputation, badges, etc. can act as a powerful self-motivator.

## **12) Tutorials**

Every video game starts with a tutorial which lets the user get acquainted with the system. A well designed tutorial can mean all the difference between winning or losing the player right from the start of the experience.

## **13) Mystery and curiosity**

Curiosity can act as a powerful incentive to do something. By intelligently designing the gamification environment by placing certain secret quests, levels, rewards, etc. that need effort to be discovered, the user can become increasingly immersed.

## **14) Customization**

As opposed to most traditional teaching methods, eLearning and gamification especially offer the learner the possibility of individualizing his experience to fit his needs and preferences. The platform can let the user choose or construct an avatar, choose a certain learning path or level of difficulty, progress at his own pace, access the software at preferred intervals, etc.

## **15) Reminders**

The involvement of the subject can be enhanced by the injection of systematic and constant reminders. These can come in various forms, which might be most suitable to the specific of the learning experience. Among these, we can remind of emails, popups and notifications. With the rise of the mobile devices and the widespread use of the internet, it is nowadays extremely convenient to connect apps to users. Emails have become a form of more official and formal way of communication. Thus, they should be restricted to notifying the end user of more important and attention demanding events.

## **2.3 Psychological theories of motivation**

Gamification has the potential to be more than just a new age trend or a clever sales gimmick whose aim is to generate revenue. I would see gamification become wholesome by incorporating its different present fields of use into a unified model of economic theory based on the understanding of human consciousness.

### **1) Maslow's Hierarchy of Needs**

These are the five levels of Maslow's "Pyramid":

- 1) Physiological
- 2) Safety
- 3) Love/belonging
- 4) Esteem
- 5) Self-actualisation

Inside the working environment, the employer is more or less obliged by law, and would be well advised to do so for the businesses' sake, to assure that physiological and safety needs are assured. This is done by creating a pleasing working space, with all amenities necessary for an ideal experience. Of course, the employees must also been remunerated accordingly.

So the first two levels of the pyramid are most easily taken care of and are pretty much a guarantee inside the confines of a modern workplace. But what about the higher most three levels? Obviously, the workplace is not (necessarily) a place for love and family, but it is a place where

working relationships are supposed to be based on professionalism and esteem for other and for yourself. Even the status of friendship might be achieved between co-workers. After all, it is a micro-community of people who should be like-minded. Self-actualization, as the most superior need, can become a powerful motivator at work, to be an achiever, to reach your full potential. This goal requires constant learning and self-development.

eLearning has the power to boost or recreate some conditions that are favorable to strengthening and controlling communities, shaping and evolving corporate culture, enabling the creation and distribution of knowledge and helping people get more in touch with their curiosity and ambitions.

## **2) The expectancy theory**

This theory stipulates that individuals will choose to behave in specific ways based upon the expected outcomes which result from their activities. Decisions are made based upon the possibility of the end result. Employees can become motivated if they expect rewards to be received.

Motivation for indulging in activities is lowered if the reward system is badly designed or implemented. For instance, undesirable rewards or rewards whose value or utility is perceived as insignificant in comparison to the effort put in to earn them are actually standing in the way of stimulation. Thus, it is recommended that there exists a fine balance between effort and expected outcome. The rewards should be meaningful and motivating, in direct proportion to the difficulty of the activities. All desire to indulge in an activity stems, after all, from the hope or promise of reward.

## **3) The Hawthorne effect**

Henry A. Landsberger came up with this theory in 1950. The German born sociologist describes a tendency of individuals to perform better under the impression of being observed. The experiment he conducted came up with the conclusion that the subjects were motivated by the attention they received from the observing researchers.

Thus, leaving the learners with the impression that they are being watched and taken note of, will trigger a psychological response that will subconsciously enable them to perform better on tasks. Naturally, digital platforms for learning constantly gather data on the progress of the users and offer real-time feedback responses. Thus, in one way or another, the learners are given the

impression that they receive special attention which inflates their sense of importance and, in consequence, the desire to make a good impression.

#### **4) The incentive theory**

Obviously, this theory postulates that individual actions are motivated by the desire for rewards. To be more explicit, it is about the desire for external incentives. Motivation is considered to be binary-driven, by intrinsic and extrinsic forces. The Incentive Theory focuses in extrinsic motivators. To better explain through an example, a mental exercise is required: why is a student motivated to study and work hard? Is it because he knows that it is good for his mind and his future or is he motivated by grades and diplomas and medals? Peer recognition, although not physical per se, is still an external incentive. Job satisfaction is the same. Being paid is another one.

The incentive theory proposers that positively perceived actions are rewarded and, thus, more desirable than negatively perceived actions. This is rather obvious, and one might argue that humans who knowingly and willingly, and, worst of all, continuously engage in activities that trigger negative response, do not make the norm in society. Therefore, I believe that this theory is the basis of game environment incentives like points and badges and can be exploited to engineer the behavior of the gamers.

#### **5) Goal-setting theory**

This theory states that goals affect performance. Edwin A. Locke is an American psychologist who realized that settling for clear and ambitious objectives increases performance. He also came up with clarity, challenge, commitment, feedback and task complexity as principals which should guide goal-creation.

Thus, specific goals allow for a greater probability of reaching them, than poorly sketched objective. Knowing what to search for is half the work. Setting up a deadline for completion helps in getting organized. Challenges must have a certain level of hardship which should stimulate activity. Commitment to the cause must be constant and conscious. Feedback can allow you to review your progress and work out the problem areas which you might recognize. The complexity of the task involved in goal completion asks for an equal response. In other words, it requires a bigger investment in terms of time.

So, according to this theory, the goals in eLearning in general, and especially in gamification should respect these five principles, in order for them to be adequate. The individualization and

customization principles found in eLearning allow for a smoother learning curve, according to each individual's personal goals and capabilities.

## **2.4 Examples of successful implementation in recruitment and retention**

### **1) Google**

For the past 15 years, Google has had a contest called 'Google Code Jam', which offered monetary prizes of up to 50.000\$ in order to attract potential employees of high status. The best performers naturally gained the chance of working for Google.

### **2) Formapost**

This post office had been suffering due to employee retention. In response, it designed a gaming environment in which the players could get to experience a simulation of the working environment. The drop-out rate was significantly lowered, from 25% to just 8%, after this experiment. As a side consequence, potential employees were better prepared for the interviews and for being assimilated, had a better understanding of the environment and more realistic expectations and they also asked better questions, which helped them improve their learning.

### **3) SIE (The External Information Service in Romania)**

SIE created a small game on their website in which you could show off your flair for being a spy. The player would be given a mission, inside a simulation, which was made sure to offer a captivating experience. It gave specific feedback on the qualities or lack of, thereof, of the candidate. The interest for the organization grew. SIE also now had data about the best 'players' on the job market, who also knew more about this potential employer.

### **4) UK Government Communications Headquarters**

This institution designed the intriguing "Crack the code" game, in which the participants are literally asked to break into codes by using cryptography. This was done in order to achieve a better selection of the candidates, by basically assigning them a work related task to solve, before further collaboration could take place. The candidates also had a better perception about the job experience would be, what is required of them, what are the areas in which they needed to improve and if they fit the profile for the job description.

### **5) Domino's Pizza Mogul**

Domino's is one of the most popular pizza brands and they created a game in which customers could actually earn money as prizes for their performance inside this game, aside from just having fun. The game allowed the player to create his own custom pizzas. The best ideas were rewarded with cash and could also land them a job, if the recipe was outstanding. This also helped further promote brand awareness and it showed potential employees that Domino's must be a fun place to work, most suitable for open, innovative, creative characters, who love their pizzas.

### **6) Umbel**

Umbel is a startup company which activates in the field of Big Data. They came up with the idea of creating a coding game in which the code that the player, the candidate for employment, writes advances him in the recruitment process.

### **7) Knack**

This is a talent platform used all over the world, in over a hundred nations, offering predictive analysis for enterprises. Businesses can personally target their potential hiring segment of the population, just as they would reach out to their customers, bringing out only the highest potential and the best matches. It tests for technical skill, social ability, problem solving, motivation, attention span, perseverance, etc.

According to the website Jobvite, 65% of interviewed recruiters, when asked about their issues, pointed out towards a lack of proper candidates as the most troublesome.

Businesses must steal the talent before the competitors reach them. With gamification being implemented in recruitment, we've witnessed an improvement in identifying the potential employees. First off, the technique establishes contact and creates a relationship between the company and the person. Then, familiarity takes place. Good relationships blossom and the fruits ripen. Gamification in recruiting defines personal profiles based on different segmentation criteria such as: location, socio-demographic, behavioral, geographic, psychological, educational, etc. Large multinational corporations might benefit the most. The user of gamification becomes trained in a way that suits corporate interests by inducing a specific behavioral pattern.

The rise of data science as the most influential breakthrough of the contemporary economy has enabled companies to effectively map out in ever greater detail the profile of the persons and organizations it interacts with. There are subtle and not so subtle ways to collect data on the



subjects of the statistical analysis. The fact remains that big data, massive amounts of input streaming into corporate servers, does exist, and it is indeed a big deal. Pun intended, it serves to extract the means by which analysts working for the company can then transpose into information. Information tells a story to those who know how to ask the right questions. Age, location, education, past job experiences, these are information found on the good old CV's, Letters of motivation? Those are used in order to humanize the candidate, to get a better glimpse into his personality. Gamification tells you a lot more than that. By recording peculiar data such as response time to challenges and controls, time spent gaming, the number of attempts, the manner in which puzzles are solved, you gain insight in the candidate's (or employee's) way of thinking. You can design challenges that, for example, let you estimate the IQ or seamlessly determine a personality type, associate it and rank it in regards to intelligence types. For example, some people understand images better, while others' memory and learning capacity is dependent to sound or touch. Spatial intelligence is better suited towards creative jobs, but it can also tell the recruiter about how best to individualize your e-learning training experience.

## Chapter 3: Virtual and augmented realities

“If learners think it looks bad, you may have lost a good percentage of the battle in getting them to pay attention.” – Patti Shank

“Why shouldn’t people be able to teleport wherever they want?” - Palmer Luckey

“Since we cannot change reality, let us change the eyes which see reality.” - Nikos Kazantzakis

AR vs. VR Side by side comparison

VR = Real Inputs + Virtual World

AR = Virtual Layer + Real World

AR and VR allow the experimentation of being taught without being displaced from the environment. They are suited to the domain of eLearning due to the requirement of offering powerful individual assistance to individuals.

### Cognitive Theory of Multimedia Learning by Mayer

Main assumptions:

1. The main channels for processing the information are the auditory and the visual channel.
2. These channels have limited capacity.
3. Learning should ideally be an active process.
4. Learners assimilate information better by associating words with images.

Mayer believes that the inputs received from our sensory organs are mixed and processed inside our brains and take the form of complex logical structures. Mayer also notes the power of integrating new inputs with prior existing knowledge of a given subject.

### **3.1 Augmented reality (AR)**

Augmented reality makes use of computer vision, object recognition and 3D graphics to permit a real-time vision of the real-life world, which is then overlaid by digital information, known as augmentations. These augmentations stimulate a different array of senses (generally auditory, visual, haptic). The digital layer can cover up elements of reality or add to the environment. Either way, a condition for the correct implementation of AR is the feeling of immersion. In contrast to Virtual Reality or VR, which is a completely simulated environment, AR merely alters the perception of the real world, in order to achieve certain outcomes.

The first AR system was created in 1992 by the US Air Force, at their Armstrong Laboratory. Although initially exploited in the entertainment business, private organizations now look to AR as a potential candidate for learning, knowledge sharing, distance meetings and other domains.

#### **The hardware**

AR requires sensors, processors, displays and inputs. Usually, AR is achieved through eyeglasses sets or head-mounted displays (HMD). Handheld devices are also suited for AR. Contact lenses designed for AR are currently in development. There also exists what is known as Virtual Retinal Display (VRD), which projects a raster display directly on the retina, generating high contrast, bright, clear graphics. Furthermore, there exist a number of other types of VR displays which are in development or readily available on the commercial market. The translucent augmentations are displayed through the HUD (heads up display). This display enables the overlaying of computer generated information without hindering the user's normal focus on reality.

#### **Application domains**

Archaeology, Architecture, Astronomy, Broadcast, Commerce, Education, Emergency situations, Flight training, Industrial design, Medicine, Military operations, Music, Navigation, Retail, Video games, Spatial immersion and interaction, Social media, The visual arts, Tourism, Translations

#### **Education**

Augmentations are superimposed over real life environments in order to enrich curriculums. Written educational materials can contain certain markings (such as Data Matrix or QR codes). When scanned with an AR system, these markings trigger a response from the system which, in turn, displays digital information to the learners. The digital layer can be interacted with,

transforming students into active participants in the learning process, as opposed to traditional teaching methods, where the recipient of the information is a passive ‘sponge’, sucking up the information without any authentic implication.

- Interactivity
- Portable and cheap learning materials
- Higher level of information retention
- Encouragement of curious behavior

## **3.2 Virtual reality (VR)**

VR has become a buzzword, due to the recent advancements in technology. It’s getting cheaper, more compact and comfortable and more sophisticated. It is known as a computer-generated simulation in which the user becomes fully immersed and actual reality is completely replaced by the virtual layer.

### **Virtual scenarios**

Scenarification is a buzz word. The term can be defined as the practice of turning teaching into virtual scenarios. This practice is especially useful in situations where a high degree of immersion is required but the actual, real-life experience of the scenario is impractical due to various reasons, ranging from danger to budgetary constraints, to even impossibility.

### **Virtual trips**

Graphically intense immersive experiences can and will become increasingly widespread as their potential for practical use will be enhanced by the advancement of technology. These trips can break the barriers put up by temporal and spatial limitations. The learner can travel to other places (real world places or simulations), to other periods in time (past, future). Present day, real-world environments are much easier to bring to the virtual world, and cheaper as well, as today we have the capacity to film in 360 degrees.

### **Virtual classrooms**

Generally, the closest you can get to having classroom experiences with eLearning is through synchronous or asynchronous formats. VR can get past the limitations of these formats, where the

interaction takes place through e-mails, discussion boards and spreadsheets. The learners can now star in the same virtual classroom as their instructor and their fellow colleagues, wherever they may actually be in the physical world. The truly extraordinary thing about these classes is not that they virtually connect people at a distance.

## Chapter 4: Scientific research

### 4.1 An overview of the situation of IT&C in the EU-28

The goal of this research was to study the existing infrastructure in the EU that would support the implementation of eLearning. Thus, the study focuses on two main categories (entities): households and individuals and enterprises. Here we have some information about how persons and businesses interact with the world-wide-web, cloud computing, browsers, mobile devices and how this data would impact the decision of choosing to invest in eLearning. Also, the situation of IT&C specialists is important to reaching conclusions. Of particular interest is the situation of Romania, related to the rest of the EU-28, because I wished to figure out if our country is suited for this type of learning paradigm and if it is profitable to do so in the current context.

#### 4.1.1 Internet connections

##### Households and individuals

*Appendix 1: Internet access and broadband internet connections of households [EU-28, 2007-2016, % of total households]*

In the EU, internet access of households and broadband connections follow a similar trend, with the later gaining more turf at the end of the 2007-2016 period. While 11 years ago, just over half of households had access to the internet and around 40% had broadband connections, in 2016 the situation has been significantly improved: around 8 out of 10 households surf the world-wide-web.

*Appendix 2: Frequency of internet use [2016, % of individuals aged 16 to 74]*

In regards to the frequency of internet use amongst individuals, a 2016 study shows us that more than three quarters of people, on average, use the internet in the EU-28. Just under 75% are daily users. Romania seems to have the lowest number of daily internet users in the whole EU and comes in just second last, with an insignificant advantage over the dead last country, Bulgaria, both of them gravitating around the 60% mark. Out of this percentage, only around 40% of the total

population is connected on a daily basis. Out the number of people in Romania who are considered internet users, that represents just 60%. The rest just use the internet at least once a week, or have only used it in the last three months. Interestingly, the Nordic countries (Denmark, Finland, Sweden, Iceland and Norway) have almost all of their population connected to the internet, with Denmark being the most on-line out of the EU.

## **Enterprises**

### *Appendix 3: Proportion of enterprises having access to the internet [2010 & 2015]*

Enterprises, of course, are much more dependent on the web. Thus, the percentages were already relatively high back in 2010: almost 95% of companies had internet access and 5 years later, that percentage just got much closer to 100%. In Serbia, absolutely all enterprises were connected in 2015.

### *Appendix 4: Enterprises connecting to the internet via fixed broadband & enterprises having a website [EU-28, 2011-2017] + Speed of internet connection*

There has been a steady yearly increase of companies owning a website, from 69% in 2011 to just under 80% in 2017. Also, the corporate internet connection through fixed broadband access has risen from 86% to 92% over the six years.

The use of low internet speed connections ( $\geq 2\text{Mb/s} < 10\text{Mb/s}$ ) has been drastically lowered, from almost 50% in 2011 to around 23% in 2017. On the flip side, high speed internet connections have witnessed a steady rise in popularity.

### *Appendix 5: The enterprises' presence on the internet [2017, % of enterprises]*

A study from 2017 gives us some insight about the European companies' presence on the internet.

The EU-28 averages 77% of companies owning a website, 45% being on social networks, 14% having blogs or microblogs, 16% using multimedia content sharing, just 5% using wiki-based knowledge sharing tools, 44% having both a website and a social media account, 26% using only one type of social media, 21% being on more than one social media platform and 47% use at least one type of social media.

In Romania, just 45% of companies own a website, which is by far the lowest standard in Europe. Romania also ranks lower than the average in all other categories. Yet again, there is no surprise

that the Nordic countries make the top of the list. Most impressive, 96% of Finnish, 95% of Danish and 91% of Swedish companies own a website.

*Appendix 6: Internet services provided by enterprises, based on their size [EU-28, 2012 & 2016, % of enterprises]*

Another very interesting study offers insight into the type of internet services provided by enterprises, based on their relative size, by studying the evolution between 2012 and 2016. For the year 2016, 97% of enterprises in the EU-28 provided internet connection. 100% had been achieved at the time by several countries: Denmark, Lithuania, the Netherlands and Finland. Romania is the least connected, with just 84% and up from 79% in 2012. The next lowest percentage is 91% (Bulgaria and Croatia), well over Romania. For 2016, Romania also has the least broadband connections, with just 80%, relative to the EU average of 94%. 100% of Lithuanian, Finnish and Dutch enterprises offer broadband connection.

#### 4.1.2 Internet connection speed

*Appendix 7: Enterprises considering the speed of their fixed internet connection to be sufficient, by enterprise size [2017, % of enterprises using a fixed broadband connection]*

Generally, the trend states that large enterprises are more satisfied with their fixed internet connection's speed. In Sweden, Romania (92%) and the Czech Republic, the level of satisfaction with internet speed is the same for both groups. The situation in Bulgaria, Lithuania, Cyprus, Belgium and Slovakia shows us that SME companies are even more satisfied than their larger counterparts. The EU-28 average shows that 83% of SME and 89% of large enterprises are satisfied with their internet speeds, situating Romania above average.

Rank	Country	Average connection speed (Mb/S)	Rank	Country	Average peak connection speed (Mb/s)
1	South Korea	28.6	1	Singapore	184.5
2	Switzerland	23.5	2	Hong Kong	129.5



3	Sweden	22.5	3	South Korea	121
4	Hong Kong	21.9	4	Qatar	107.9
5	Norway	21.7	5	Thailand	106.6
6	Finland	20.5	6	Israel	99.1
7	Singapore	20.3	7	Sweden	95.3
8	Japan	20.2	<b>8</b>	<b>Romania</b>	<b>95</b>
9	Denmark	20.1	9	Taiwan	94.7
10	USA	18.7	10	Japan	94.5

*Table 2, world's top internet speed rankings: Author's own contribution, adapted from Wikipedia [Q1 2017]*

Regarding its infrastructure, Romania consistently ranks amongst the first countries in the world in terms of internet connection speed and quality, alongside incredibly advanced countries such as those from Eastern Asia and Northern Europe.

<b>Country</b>	<b>Average connection speed</b>	<b>Average peak connection speed</b>	<b>Above 4Mbit/s</b>	<b>Above 10Mbit/s</b>	<b>Above 15Mbit/s</b>
<b>Romania</b>	13.1	72.9	94%	57%	27%
<b>World ranking</b>	11	6	3	5	11

*Table 3, Romania in the global rankings: Author's own contribution, adapted from Wikipedia [Q3 2015]*

### 4.1.3 IT&C workforce

*Appendix 8: Enterprises that recruited or tried to recruit ICT specialists with and without difficulties in filling vacancies [2016, % of enterprises]*

Romania is at the bottom of the chart, in terms of hard-to-fill ICT specialist vacancies, with just 1% of enterprises. The rest of the 3% of enterprises had no hard-to-fill vacancies. This means that Romania has lots of highly trained specialists in the tech sector.

*Appendix 9: Proportion of ICT specialists in total workforce [2016, %]*

Two of the Nordic countries make up the top of the total ICT specialists bar chart. Almost 7% of their workforce are tech professionals. Romania has just 2% ICT specialists, ranking second last, just over Greece's 1.5% and almost two times lower than the EU-28's 2016 average. The tech companies in Romania have often been cited to express concern over their growing demand and lack of offer of IT specialists.

### 4.1.4 Social networking

#### Households and individuals

*Appendix 10: Individuals who used the internet for participation in social networking [2016, % of individuals aged 16 to 74]*

Danes are also the first in the EU-28 when it comes to the population's participation social networking. In 2016, three fourths of Denmark was on social media. The other Nordic countries do very well, yet again. Sweden is just a few percentages short of Denmark but Norway is situated at just over 75% and around 80% of Icelanders were using social networks in 2014. Unsurprisingly, Romania comes at the bottom of the list, ranking 25<sup>th</sup> with approximately 45% of its population being connected in 2016. Interestingly, the Italians and French, although not limited by internet connection or devices, rank lower than Romanians, presumably being just less interested in the digital and more involved in real life connections with other humans. On total average, over half of the EU's population have social network accounts, which is fairly high.

## Enterprises

### *Appendix 11: Enterprises using social media by purpose of use [EU-28, 2013 & 2017, % of total enterprises]*

In the four year gap between 2013 and 2017, the percentage of enterprises who use social media, for whatever purpose, has generally suffered dramatic growth. The number of companies who use social media for developing the enterprise's image or to market the products has nearly doubled, from 22% to 40%. The same can be said about those who use it to communicate with the customers, from 15% in 2013 to 27% in 2017. The most impressive rise comes in the purpose of recruiting employees, where the rise is almost 150%, from 9% to 23%.

For internal socialization such as exchanging views, opinions or knowledge, it seems that just 9% made use of social media in 2013, with a sensible growth of just 3% for 2017. In the case of involving customers in the development and innovation and for the purpose of collaborating with business partners, the situation is the same: 9% in 2013 and 12% four years later.

### *Appendix 12: Enterprises using social media by purpose of use and size of enterprise [EU-28, 2017, % of enterprises using social media]*

As expected, the larger the enterprise, the greater their involvement in social media. For all six purposes, the leaders are the large companies, followed up by medium and small enterprises, in this order, without exception. Although these percentages are generally very close to each other, larger gaps can be seen in the purposes of employee recruitment (45% vs. 59% vs. 72%) and communication within the enterprise (27% vs. 32% vs. 41%). This means, that most enterprises choose to use social media for image and marketing and customer service but mostly just the bigger companies use it for recruitment of internal information sharing, due to the intricacies of different corporate environments.

### *Appendix 13: Enterprises using social media by type of social media [EU-28, 2013 & 2017, % of enterprises]*

A study conducted between 2013 and 2017 shows the evolution of corporate use of social media. The use of social networks, multimedia content-sharing and blogs have risen from 28% to 45%,

from 11% to 16% and from 10% to 14%. The use of wiki-based knowledge sharing tools has witnessed a decline from 6% in 2013 to just 5% in 2017.

*Appendix 14: Enterprises using social media by type of social media [EU-28, 2013 & 2017, % of total enterprises]*

Regarding the type of social media exploited by enterprises, there are four categories: social networks, multimedia content-sharing, blogs and wiki-based. We can see an increase, from 2013 to 2017, in the first three categories, with only the wiki bases knowledge sharing tools suffering a 1% decrease, from 6% down to just 5% of total enterprises choosing to invest in them. Social media, on the other hand, has seen the most impressive grown, with 45% of companies being invested in it in 2017, which is 18% higher than in 2013. The employment of multimedia content-sharing websites and blogs/microblogs have suffered a 5% (up to 16% in 2017) and respectively a 4% (up to 14% in 2017) increase.

*Appendix 15: Enterprises using social networks [2013 & 2017, % of total enterprises]*

The situation in the EU-28 presents itself like this: in 2013, just 28% of companies used social networks, while in 2017, the figure was 45%. Performing lower than the EU-28 average, Romania is the fourth last in the ranking, although the growth in social networking use was one of most spectacular doubling up from 17% to 34% in 2017. The countries where the businesses were already heavily relying on social networks back in 2013 have seen lower rates of growth, which means that the least best ranked Member States are trying to catch up to the trend set in the West. The most heavily social networking enterprises are in Malta, with almost three quarters using it.

#### **4.1.5 Cloud computing**

*Appendix 16: Use of cloud computing services in enterprises [2016, %]*

In 2016, in Romania, only 7% of enterprises used cloud computing, which is again standing out as the last place in Europe. Out of these companies who did use the technology, 68% used it to store emails, 52% for storing files, 51% for storing the database, 37% for office software, 43% for financial or accounting software, 19% for CRM and 27% for computing power. The EU-28 averages for these figures are 21%, 65%, 62%, 44%, 41%, 32%, 27% and 21%. There are also

other countries where cloud computing unpopular amongst enterprises, such as: Bulgaria (7%), Greece (9%), Latvia (8%), Poland (8%), Macedonia (7%). The former Viking countries are the most cloud tech savvy. Finland, Sweden, Denmark and Norway have the most users, with 57%, 48%, 42% and 40% respectively.

*Appendix 17: Factors limiting enterprises from using cloud computing services by size class  
[EU-28, 2014, % of enterprises using cloud]*

Among the reasons why some enterprises choose to be reluctant or stay away completely from using the services of cloud computing, the most prominent are the risk of a security breach (6 out of ten large enterprises and 4 out of 10 small and medium companies), uncertainty about legislation and uncertainty about the location of data. The only reasons where small and medium enterprises are more reluctant than large companies are the costs (marginal difference) and insufficient knowledge. It seems that larger businesses face more complications and are more fearful of misuse of their personal data, while small and medium

#### **4.1.6 Devices**

- 25% of global internet pages are accessed through mobile devices.
- In 2015, smartphones accounted for 90% of global device purchases.
- 62% of emails are read on smartphones or tablets.
- A report from Towards Maturity, 47% of enterprises use mobile devices for learning, with the (then) projected market potential of 12.2\$ bn. in 2017.
- Videos are said to make up 80% of internet traffic by 2019 (CISCO's VNI Forecast and Methodology, 2015 – 2020)
- According to Gartner, BYOD (Bring Your Own Device) will rise in popularity in 2017.
- Smart wearable devices, such as smart-watches, are said to boom by 2020, when they are expected to reach a global sale of 411 million units valued at 34\$ bn. (CCS Insight)
- The global app revenue is expected to reach 80.6\$ bn. by 2020. (Global market intelligence from Newzoo)

## Households and individuals

*Appendix 18: Individuals who used a portable computer or handheld device with internet access, away from home/work [2012 & 2016, % of individuals aged 16 to 74]*

When it comes to the use of handheld mobile devices, the Nordic countries are again in the top of the rankings. Denmark is, yet again, first place. Romania is third last in 2016, with almost half of the population using a smartphone, tablet or laptop away from home or work. In 2013 it had the lowest percentage of users in the EU. For both years, it was way under the EU average.

## Enterprises

*Appendix 19: Obstacles preventing or limiting the use of portable devices that allowed a mobile connection to the internet [EU-28, 2012, % of enterprises]*

Enterprises also use portable devices that allow mobile internet connection. Tough, a study from 2012 shows there are sometimes obstacles preventing their use and the reasons are different, depending on the businesses' size. In the EU28, half of companies reported no issues but almost a third had at least one obstacle. Among these issues, the companies reported connectivity problems, high costs for subscription or use, technical obstacles or high costs for integration, security risks and others. Interestingly, the situation shows that it is mostly the large enterprises that face such issues, followed by medium sized companies and, lastly, the small businesses face the least issues with mobile connectivity.

*Appendix 20: Internet services provided by enterprises, based on their size [EU-28, 2012 & 2016, % of enterprises]*

In 2016, 69% of the total enterprises (43% in Romania, just 2% over Bulgaria) also offered portable devices to employees, in order for them to stay connected (small – 66%, medium – 83% and large – 94%). In Denmark and Finland, absolutely all of the large businesses achieved this feat. Here, Romania ranks just 2% over Bulgaria's 75%. Needless to say, small and medium size businesses in our country had been well below average, at 38% (equal to BG) and 59% (5% over BG) respectively.

#### **4.1.7 Internet use behavior**

*Appendix 21: Proportion of individuals who did not provide any personal information over the internet [2016, % of individuals who used the internet within the last year]*

Romania does rank first in a chart, but it is in regards to the proportion of individuals who did not provide any personal information over the internet. The data comes from the year of 2016 and this time, the Romanians have almost three times the EU-28 average. All the other countries come after Romania, at 50% or below, in contrast to our country's 70%. It seems that in those countries who were least connected, the people were the most reluctant to share information. Naturally, the situation is mirrored in this case and the western Member States indulge in much more sharing of personal data. In any case, just over a quarter of European citizens, on average, chose to provide said information, which means that people are generally reluctant and suspicious of what becomes of it, which is not necessarily a bad behavior per se, but it might be bad for businesses who reach out to people by targeting them with individualized ads and offers.

*Appendix 22: Use of cookies and browser settings [2016, % of individuals who used the internet within the last year]*

Regarding the use of cookies and browser settings, a study from 2016 tries to evaluate the EU-28's situation, by segmenting individuals into two groups: the proportion of individuals who know what cookies are and that they can be used to trace their movements in the internet and the proportion of individuals who have never changed the setting in their internet browsers to prevent or limit the amount of cookies. Romania ranks last for category A1. Less than 40% know about cookies. For category B, between 10% and 15% of Romanian internet users have never changed their browser settings. Both percentages are fairly low, compared to the EU-28 averages of which gravitate around 70% and 35% respectively.

## **4.2 An overview of the worldwide situation of eLearning**

In the case of eLearning and AR/VR and gamification, in particular, the study will follow global data to establish existing and developing trends. With the effects of globalization and with Europe creating or following most of the modern trends, we can extrapolate from here. The research focuses on market value, market growth over the years, student behavior and preferences and

technologies employed. The study of existing time series and their subsequent forecasted trends will give us a glimpse of what is to become of these industries.

*Appendix 23: Share of global eLearning market [2014 & 2022 (forecasted), millions of \$]*

The eLearning market is expected to rise by 78.44 billion \$ from 2014 to 2022. That is an increase of 47.43%, which will almost double the already impressive size of this market.

*Appendix 24: Worldwide self-paced eLearning market revenue [forecasted 2016-2021, \$ bn.]*

Year	2016	2017	2018	2019	2020	2021
Revenue (billion \$)	46.67	45.82	43.84	40.67	36.7	33.5
Nominal (billion \$)		-0.85	-1.98	-3.17	-3.97	-3.2
%		-1.82%	-4.32%	-7.23%	-9.76%	-8.71

Table 4: Author's own findings, adapted from Appendix 24

The worldwide self- paced eLearning market revenues are expected to suffer constant decrease between 2016 and 2021.

*Appendix 25: Share of individuals to purchase eLearning materials online in Great Britain  
[2017, by age & gender]*

There is no gender bias here, as men are only 1% higher in purchasing eLearning materials online. The interest for these materials rises with age and reaches its peak somewhere between 35 and 44 years old, the segment where the workforce has the most active individuals. Then it naturally declines, as building up new skills becomes less important and/or necessary, slowly reaching retirement age. This is why people aged 65+ only scored 1%.



#### *Appendix 26: Number of eLearning companies in Europe [2012]*

A study from 2012 shows the number of eLearning companies in Europe, in each surveyed country. France, the UK and Germany dominate the rankings, with Romania, Finland and Slovakia being last in line for multimedia internet learning enterprises. Romania makes up just over 10% of the leader France's eLearning companies. With 2768 total companies, the average (excluding the category "Other") is of 197.71. By direct comparison, Romania's 76 companies are 38.44% lower than the average.

#### *Appendix 27: Share of global students who have taken an online course in the past year [2013 to 2015]*

The percentage of students, worldwide, who have taken online courses between 2013 and 2015 has seen a rising trend, albeit the differences are quite low (1% and 2% progression), leading to just under 50% in 2015.

#### *Appendix 28: Share of students who have interacted with MOOC and CBE in the past year [April 2015]*

Research from 2015 that 9% of global students participated in Massive Open Online Courses (MOOC) in the past year. 11% had earned a competency-based badge. Nearly a fifth of respondents said that they had used their digital badge on a resume.

#### *Appendix 29: Global student awareness of MOOC [April 2015]*

Out of the 9% that had undertaken a MOOC, more than half (5% of respondents) had successfully completed it. 17% of respondents were aware of what MOOC are but had not taken one. This means that 26% of students surveyed knew about MOOC, leaving the rest of the three quarters completely ignorant about it.

"We need to bring learning to people instead of people to learning." – Elliot Masie

#### *Appendix 30: Global student preferences for online assignments and activities [April 2015]*

When it comes to online assignments and activities, students do have certain preferences. Research from April 2015 segments these preferences. Paper/assignment submission, a traditional education evaluation method, was the least preferred activity, scoring only 9%. Quizzes and tests were the

most appreciated, being the choice of 33% of respondents, which is exactly a third of the total. A quarter of students responded that they preferred traditional homework. This was followed up by doing assignments (12%) and discussions and group work (11%), showing a preference for individuality and quick assessment methods, not requiring a lot of free time to complete.

*Appendix 31: Percentage of students worldwide interested in personalized messages and notifications about academic resources [April 2015]*

Another study from 2015 proposed to delve into the subject of the level of worldwide student's interest in personalized messages and notifications regarding academic resources. The findings are more than conclusive: most students (over 82% over all categories) desire personalized communication being thrown at them. The lowest percentage shows a lower interest in feedback about performance that makes comparisons to other students. This means that competition is least motivating for academic performance. On the other end of the spectrum, 10% higher in fact, comes the preference for personalized messages regarding degree progression. This is closely (89%) followed up by real-time notifications about individual progress. This might mean that people are more interested in self-progression than competing with others.

## 4.3 An overview of the worldwide situation of AR and VR

*Appendix 32: Forecasted shipments of VR and AR headsets worldwide [2015-2022, millions of units]*

A truly spectacular boom of AR and VR headset sales is expected to happen in the near future.

Year	2015	2016	2017	2018	2021	2022
Shipments (millions)	0.7	10	9.6	12.4	59.2	68.9
Nominal		9.3	-0.4	2.8	46.8	9.7

<b>(billion \$)</b>						
<b>%</b>		1328%	-4%	29.16%	377%	16.38%
<b>factorial</b>		14.28	0.96	1.29	4.77	1.16

*Table 5: Author's own findings about AR/VR sales, adapted from Appendix 32*

In 2016, the number of headsets sold was 14.28 times higher than the previous year, followed by a minor 4% decline in 2017 and expected to rise by nearly a quarter this year. The industry sales is expected to be almost five times higher in 2021 than in 2018, over a three year gap.

## 4.4 An overview of the worldwide situation of gamification

### 4.4.1 The market

*Appendix 33: Global value of gamification market [2015 and 2020 (forecasted), \$ bn.]*

The global value of gamification market in 2015 was situated at \$1.65bn. This figure is expected to rise to \$11.1bn. in 2020, which means a 672% increase, nearly seven times higher.

*Appendix 34: Value of the education gamification market worldwide [2015 and 2020 (forecasted), \$ millions]*

Further studying the gamification for education global market, its 2015 value was set at just 93.04 million \$. This is just 0.05638 of the 2015 total gamification market, or 5.6%. Doing the exact same calculation for the forecasted year of 2020, we can see that the education gamification comprises just little over 0.0001 or 0.01% of the total gamification market. So, this segment is not, as of yet, considered to gain more ground in this industry, but rather shrink in comparison to gamification's other, more profitable uses such as marketing and customer retention. Although, we must keep in mind that even is something is not profitable, that does not mean it is not valuable. The forecasted market value of educational gamification is expected to reach 1249.59 million \$, which represents a 13.43 times increase from its 2015 value.

## 4.4.2 Mobile games

*Appendix 35: Mobile games revenue worldwide [2013 to 2017, \$ bn.]*

Year	2013	2014	2015	2016	2017
Revenue (billion \$)	17.6	24.5	30.1	35.6	40.6
Nominal rise (billion \$)		6.9	5.6	5.5	5
% rise		39%	23%	18%	14%

*Table 6: Author's own findings, adapted from Appendix 35*

The mobile games revenues are steadily growing each year, but the annual growth rate is declining. Thus, the market will most probably reach a saturation point, after which it will decline or perhaps plummet with the rise of new technologies (such as AR, VR).

## 4.4.3 Platforms

*Appendix 36: The most popular mobile internet activities according to internet users worldwide  
[S1 of 2017, by device]*

A study from 2017 shows the most popular mobile internet activities according to internet users worldwide, with smartphones heavily leading in absolutely all categories. This clearly shows a preference for portability.

*Appendix 37: Percentage of students worldwide wanting their instructors to use student's devices  
in class as learning tools [as of April 2015]*

Nearly six in ten students desired their instructors to let them use their personal laptops. Four in ten students also wanted to be able to use their portable hand-held smartphones and tablets in class.

*Appendix 38: Self-paced eLearning products revenue in the US by buyer segments [2016-2021]*

The table from this appendix is very interesting, as it presents to us the distribution of the self-paced eLearning products in the US, based on the buyer's segments: consumers, the federal government, the state and local government, Prek-12 academic, higher education and, finally, corporations and businesses.

Totally, the revenues are expected to fall each year and for almost all buyer segments. Although starting off as leaders of the market in 2016, corporations and businesses are expected to spend 2 billion dollars less on self-paced eLearning in 2021, as compared to the year 2016, which represents the most dramatic forecasted loss of revenue out of the six categories. This would put the initially second place, higher education, as the biggest spender of 2021. Consumers make up so little of this chart that by 2021 their involvement will be totally insignificant.

So, while the market is mostly owned by corporations and schools, these two combined make up around 75% of the total market revenues, well beyond governmental or consumer spending.

## Conclusions

Currently, around 80% of households in the EU have internet connection, with more than three quarters of individuals being regular internet users, most of them surfing the world-wide-web on a daily basis. Currently, almost all of the EU businesses are connected to the web. On average, eight out of ten EU companies have their own website. 94% of companies have a fixed broadband connection. Less than 25% use low speed internet connections. Almost half of the companies are also present on social networks. Just 5% of them use wiki-based knowledge sharing tools. 97% of companies offer internet connection in the workplace. 89% of large enterprises are satisfied with the internet speed they have. The proportion of IT&C specialists in the total EU-28 workforce is somewhere around 4%. Over half of Europeans aged 16 to 74 are on social networks. There are several reasons why companies choose to be present on social networks. Using it for recruitment is one of them and here, we've seen an impressive 150% rise between 9% and 23% between the years 2013 and 2017. Sadly, just 12% use it to exchange information between employees. The bigger the company, the greater its involvement in social media. 72% of them use it for recruitment, as opposed to just 45% of small companies. 41% of big companies use it for communication, as opposed to just 27% of small enterprises. Out of the reasons which keep companies reluctant to use the cloud, the most prominent are legislation and data security issues, with big companies expressing the most concern. Almost 70% of enterprises in Europe offer portable devices with internet connection to their employees.

Only four out of ten Romanians use the internet daily, or 60% of its total internet users. Just 45% of Romanian companies own a website. 84% of them offer internet connection in the workplace. 20% do not have broadband connections. The businesses' level of satisfaction with the internet connection speed is above the EU average, at 92% (for big enterprises). Regarding how easy it is for Romanian companies to fill vacant IT&C positions with specialists, only 1% reported difficulties and 3% had no issues with finding new people. Almost half the EU-28 average, Romania employs just 2% tech specialists in its total workforce. It is to be noted that Romania is also confronted with an exodus of talent, which would have made this figure to probably be higher, had it not been for massive migration. There is ever growing demand for new persons. Just 45% of Romanians use social networks. In Romania, the use of cloud by enterprises is three times smaller than the EU-28 average of 21%. A mere 43% of Romanian firms offer portable mobile devices to their employees. 77% of big enterprises act this way. Seven out of ten Romanians avoid

providing their information over the web. Four out of ten Romanian internet users don't know about cookies Up to 15% of Romanians never change their browser settings.

Based on all of these statistics, we can sadly conclude that Romania is not even competing in the IT&C sector in Europe. It is just struggling to barely find its place in the modern world. Connectivity and knowledge about the internet and technology is extremely low, relative to the western, central and Nordic countries, thus making Romania an unsuitable candidate for eLearning, because of poor infrastructure. Although, is speculated smartly, this might present as an advantage, because the market is not saturated. Innovation is possible and the country is evolving, even though it is lagging. This means that lower than average standards can be applied on its local markets and that market penetration is easier, competition-wise, albeit it might face other practical issues. Knowledge and practical understanding about devices and the internet is pretty much basic and probably restricted to the younger generations, although there is no data to support this theory or to more exactly explore the phenomenon.

The eLearning market is expected to reach a value which is nearly 50% more than the global market value measured back in 2014. Self-paced eLearning market value is expected to witness yearly decrease. Men and women share an equal interest in eLearning, with greater prevalence for middle-aged individuals, with interest sharply decreasing with age, most probably being correlated to their career choices, necessities and aspirations. Regarding the number of eLearning companies in the Eu-28, Romania scores almost half way below the average, and having just 10% of the leading member state, France's specialized enterprises. Around half of all students worldwide have taken up online courses and the numbers are growing, but only 1%-2% on a yearly basis. Less than 10% of students participated in MOOC (around three quarters had no idea about MOOC) and just 11% had earned CBE. Out of these, 20% found their badge to be useful in their resumes. Students also showed a preference for completing quizzes and working individually. Nine out of ten students considered notifications and personalized feedback messages about individual progress to be highly important. Comparison to their peers was undesirable.

Gamification is a big industry, expected to be seven times more valuable globally in 2020 than in 2015. That's seven times more in less than five years, which is more than double each year. On the other hand, gamification for educational purposes is not one of the main application, being forecasted at just around 0.0.1% of the 2020's total global gamification markets. Interestingly tough, the specific forecasted value of educational gamification in 2020 is almost 13.5 times higher than in 2015. So, although it might not account for much in the gamification segment, its growth

is nearly two times more impressive than that of the gamification global market itself. Related to this, with a steady but easily declining rate of growth, the mobile games worldwide revenue is still strong in the face of alternate realities. Smartphones are the most used mobile platform, for any type of activity, revealing a human preference for convenience through portability. 60% of students desired to be able to use their own devices in the classroom. The AR and VR industry is expected to blow up in the near future, witnessing rapid development and will probably, sometime soon, take over the mobile platform industry.

So, did the study answer my initial questions? Well, partially...For businesses, a blend of eLearning and traditional training would be the best of both worlds. Being in the century of the internet and gadgets, eLearning is actually the new way of learning and all businesses should benefit from its advantages, especially saving up on costs. It also benefits the employees, by providing them with more interactive, fun, individualized and convenient experiences. It can also give that extra edge recruiters, by enabling applicants to get training and knowledge about the company before their actual recruitment and by enabling the HR department to create better profiling, which in turn translates into greater accuracy. Only the best and most desirable workers that fit the job profile are selected. Competitive advantage can be obtained, especially in markets where eLearning is still not so commonplace. eLearning is a big business. It's making big money, on a global scale. Companies are supplying other organizations such as private businesses, governments, public and private schools, with software and consultancy for eLearning. The current infrastructure has enabled this phenomenon to take place: the Internet and mobile devices. Now, new and exciting things are going on: the future is here in the form of virtual and augmented realities. These are already used for learning, but think of the possibilities when they will become commonplace.

“One thing's for sure: It's a to-go industry that's ready for pickup. Pass the hot sauce!” (E-Learning Enchilada to Go, By Abernathy, Donna J.)



### **Statutory Declaration**

I declare that I have authored this thesis independently, that I have not used other than the declared sources / resources and that I have explicitly marked all material which has been quoted either literally or by content from the used sources.

.....

Date

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Signature

# **Bibliography**

## **Books**

1. “Rules of play” - Katie Salen and Eric Zimmerman (2004)
2. “Gamify: How Gamification Motivates People to Do Extraordinary Things”– Biran Burke (2014)
3. “Actionable Gamification: Beyond Points, Badges, and Leaderboards” - Yu-Kai Chou (2015)

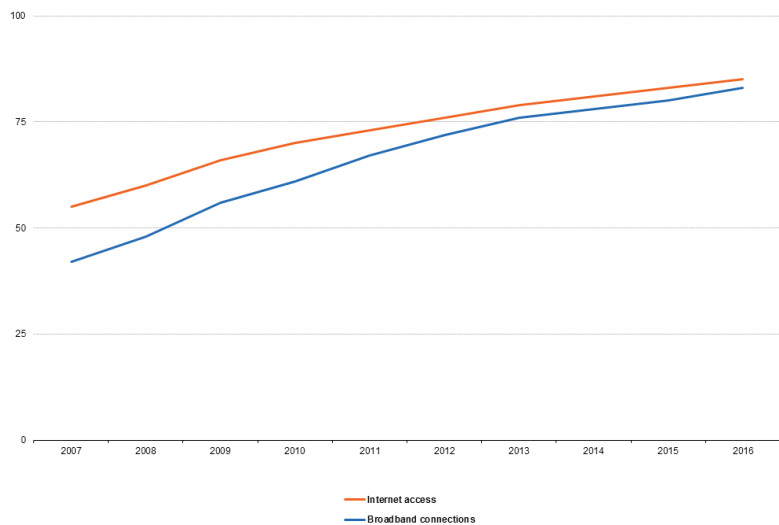
## **Academic studies**

4. “Successful E-Learning in Corporations” - Edward T. Chen (University of Massachusetts, 2008)
5. “E-Learning and the Changing Face of Corporate Training and Development”- Max Zornada (University of Adelaide Australia, 2005)
6. “Comparing the Effectiveness of Traditional and Active Learning Methods in Business Statistics: Convergence to the Mean” - David Weltman and Mary Whiteside (The University of Texas at Arlington, 2007)

## **Websites**

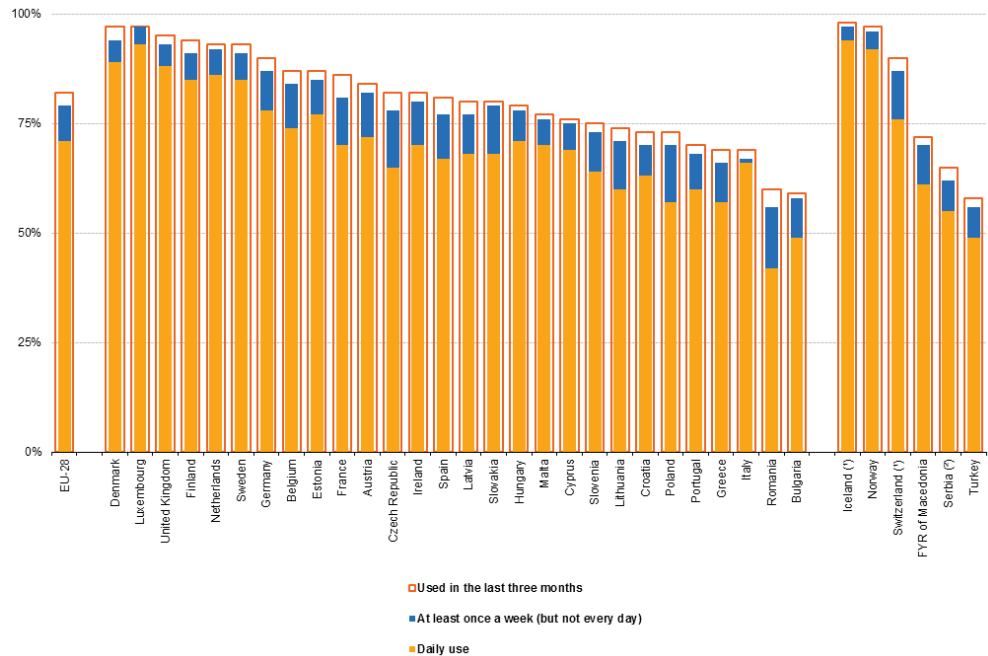
7. [www.wikipedia.com](http://www.wikipedia.com)
8. [www.elearning.ro](http://www.elearning.ro)
9. [www.elearningindustry.com](http://www.elearningindustry.com)
10. [www.elogiclearning.com](http://www.elogiclearning.com)
11. [www.romania-insider.com](http://www.romania-insider.com)
12. [www.fastmetrics.com](http://www.fastmetrics.com)
13. [www.newzoo.com](http://www.newzoo.com)
14. [www.cisco.com](http://www.cisco.com)
15. [www.ccsinsight.com](http://www.ccsinsight.com)

*Appendix 1: Internet access and broadband internet connections of households [EU-28, 2007-2016, % of total households]*



Source: Eurostat (online data codes: isoc\_d\_in\_h and isoc\_d\_it\_h)

*Appendix 2: Frequency of internet use [2016, % of individuals aged 16 to 74]*

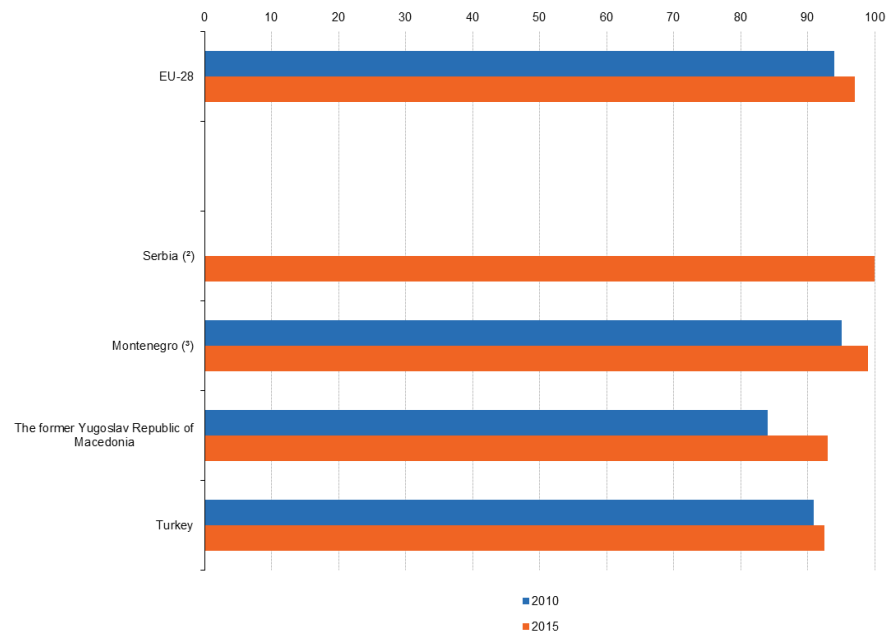


(\*) 2014.

(\*) 2015.

Source: Eurostat (online data codes: isoc\_ci\_ifp\_iu and isoc\_ci\_ifp\_fu)

### Appendix 3: Proportion of enterprises having access to the internet [2010 & 2015]



(\*) Enterprises with 10 or more persons employed, excluding financial and insurance activities (NACE Rev. 2 Section K). Albania, Bosnia and Herzegovina and Kosovo\*: not available.

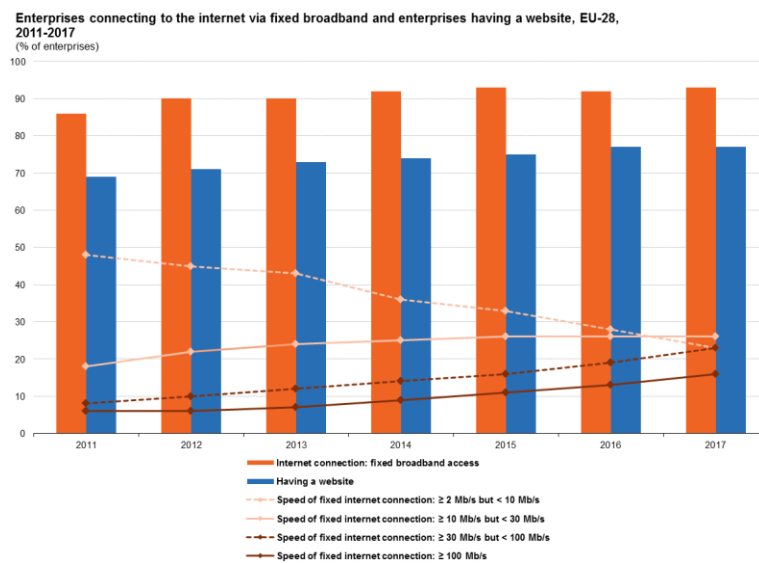
(\*) 2010: not available.

(\*) 2011 instead of 2010. Estimates.

(\*) This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: isoc\_ci\_in\_en2)

### Appendix 4: Enterprises connecting to the internet via fixed broadband & enterprises having a website [EU-28, 2011-2017] + Speed of internet connection



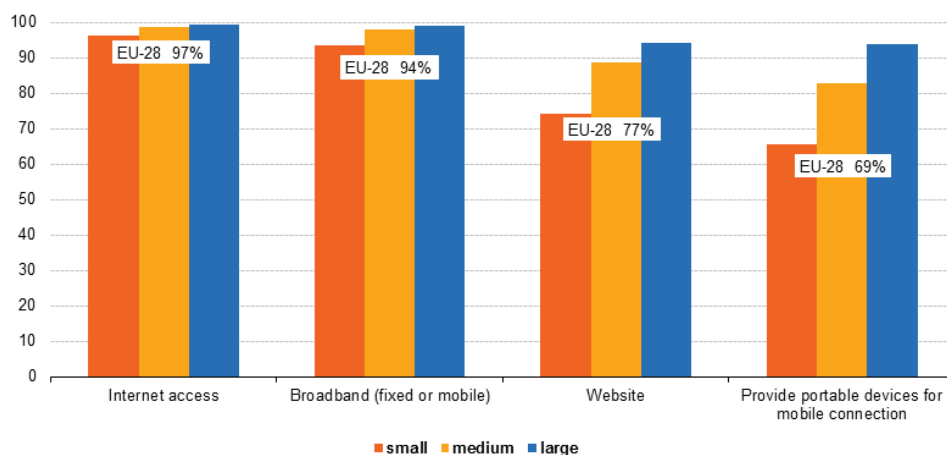
Source: Eurostat (online data codes: isoc\_ci\_en2 and isoc\_ciweb)

*Appendix 5: The enterprises' presence on the internet [2017, % of enterprises]*

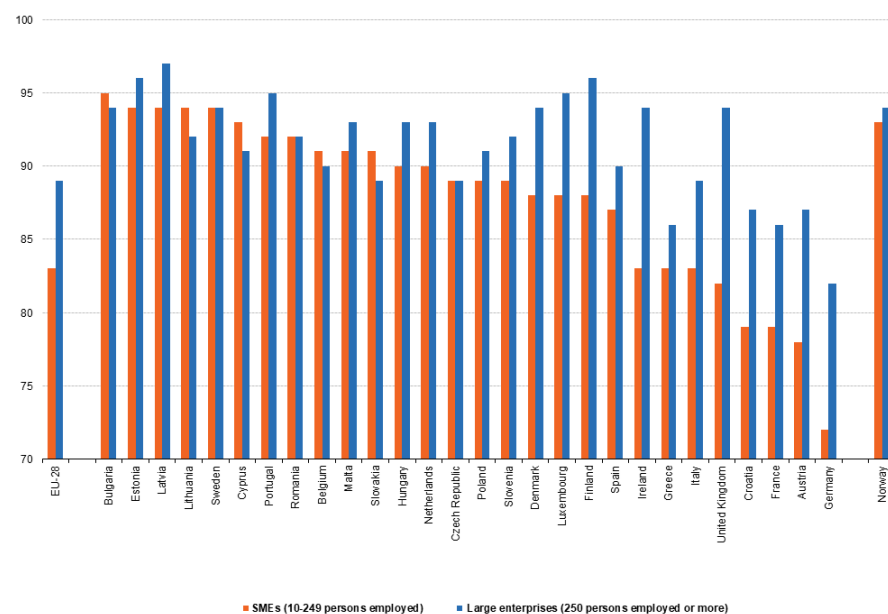
	Website	Social networks	Enterprise blog or microblogs	Multimedia content-sharing websites	Wiki-based knowledge-sharing tools	Website and social media	Use only one type of social media (*)	Use two or more types of social media (*)	Use at least one type of social media (*)
EU-28	77	45	14	16	5	44	26	21	47
Belgium	83	57	17	17	7	53	34	24	58
Bulgaria	51	34	4	7	3	26	25	9	34
Czech Republic	83	34	7	11	4	35	23	13	36
Denmark	95	67	12	25	5	67	39	29	68
Germany	87	40	7	14	7	43	29	16	45
Estonia	78	39	7	11	5	38	27	13	40
Ireland	74	67	32	23	6	58	32	36	68
Greece	65	49	13	15	3	43	29	21	50
Spain	77	49	21	23	5	48	23	28	51
France	67	39	12	11	4	35	25	16	41
Croatia	71	41	7	13	7	39	28	16	45
Italy	72	42	8	16	3	39	27	17	44
Cyprus	73	65	28	27	5	56	30	37	67
Latvia	63	29	9	9	3	28	17	13	30
Lithuania	78	47	10	17	12	45	30	20	50
Luxembourg	82	52	13	15	9	51	33	20	54
Hungary	69	36	5	13	5	34	23	15	38
Malta	81	73	15	21	5	67	47	27	74
Netherlands	86	66	29	29	7	66	29	39	68
Austria	86	51	10	18	6	50	32	21	53
Poland	67	26	5	9	2	26	18	10	27
Portugal	65	45	7	15	3	46	30	16	46
Romania	45	34	5	7	3	25	26	9	35
Slovenia	83	45	7	17	2	45	29	18	47
Slovakia	79	35	8	14	6	35	22	17	39
Finland	96	61	17	24	6	62	34	29	63
Sweden	91	63	14	20	8	63	40	25	65
United Kingdom	84	60	42	19	5	60	21	42	63
Iceland	82	77	16	17	3	63	56	23	79
Norway	80	71	11	15	5	62	52	20	72
Turkey	73	44	17	16	5	46	24	22	46

(\*) Differences between the last column and the sum of the previous two columns are due to rounding.

*Appendix 6: Internet services provided by enterprises, based on their size [EU-28, 2012 & 2016, % of enterprises]*

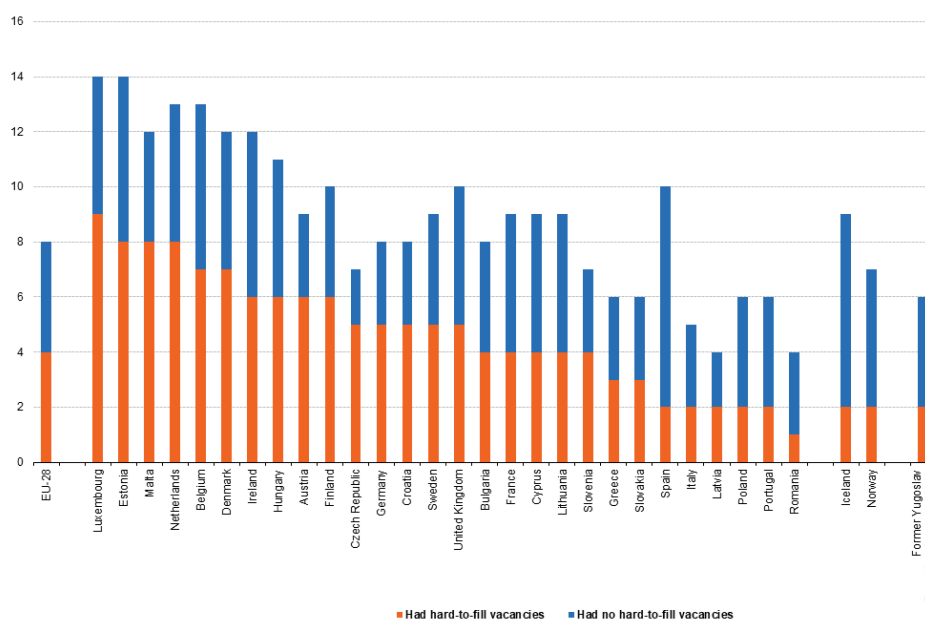


*Appendix 7: Enterprises considering the speed of their fixed internet connection to be sufficient, by enterprise size [2017, % of enterprises using a fixed broadband connection]*



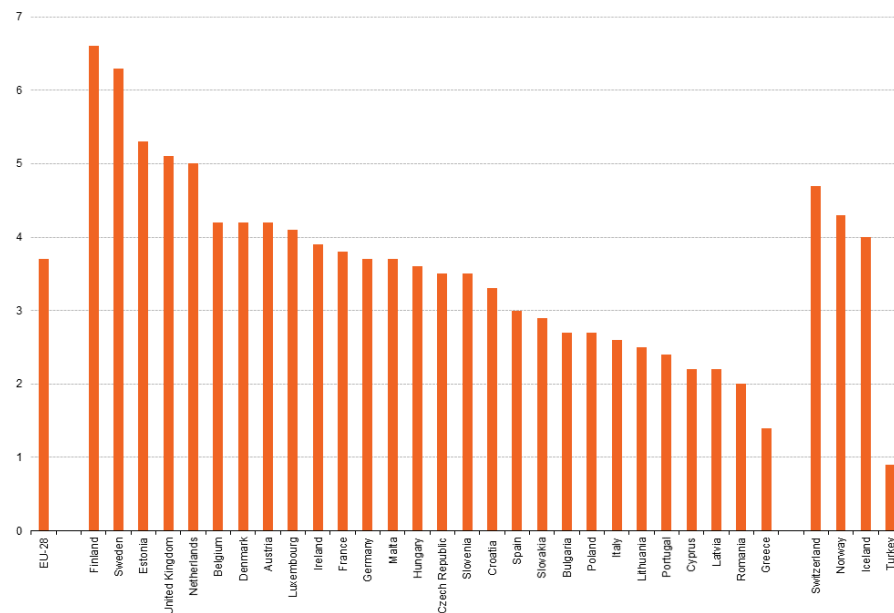
Note: ranked on the average for all enterprises (SMEs and large enterprises).  
Source: Eurostat (online data code: isoc\_o\_it\_en2)

*Appendix 8: Enterprises that recruited or tried to recruit ICT specialists with and without difficulties in filling vacancies [2016, % of enterprises]*



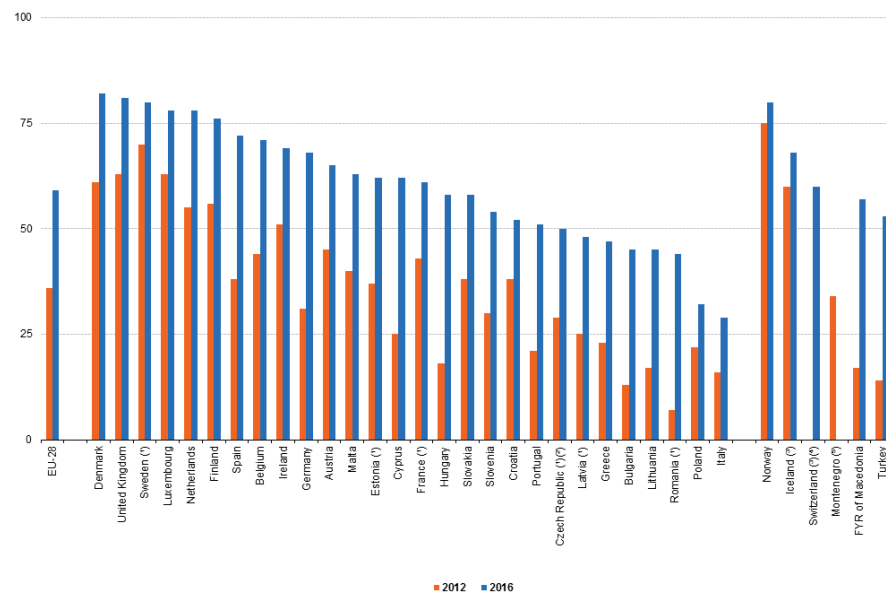
(\*) 2015.  
Source: Eurostat (online data code: isoc\_ske\_ltrcn2)

### Appendix 9: Proportion of ICT specialists in total workforce [2016, %]



Source: Eurostat (online data code: isoc\_sks\_itspt)

### Appendix 10: Individuals who used the internet for participation in social networking [2016, % of individuals aged 16 to 74]



Note: defined as using the internet away from home or work on portable computers or handheld devices via mobile phone networks or wireless connections.

(\*) Break in series.

(\*) 2013 instead of 2012.

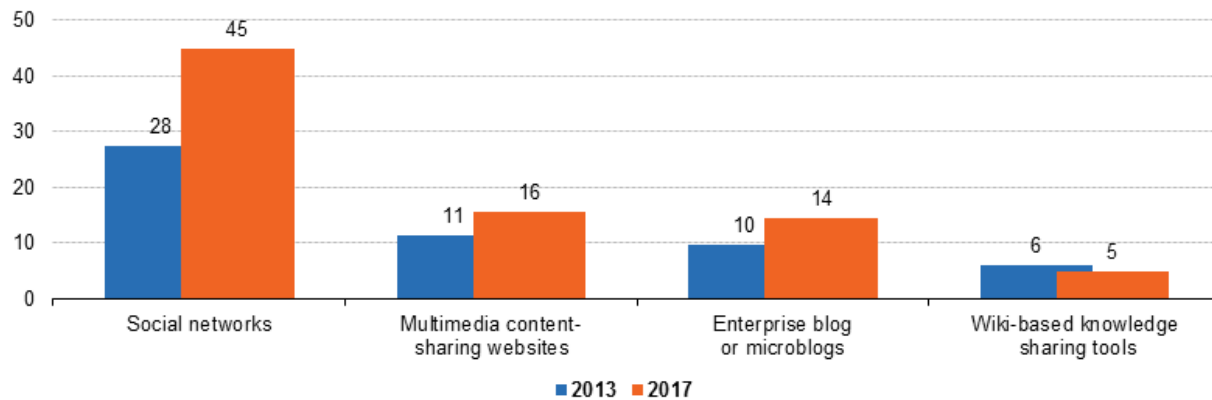
(\*) 2014 instead of 2016.

(\*) 2012: not available.

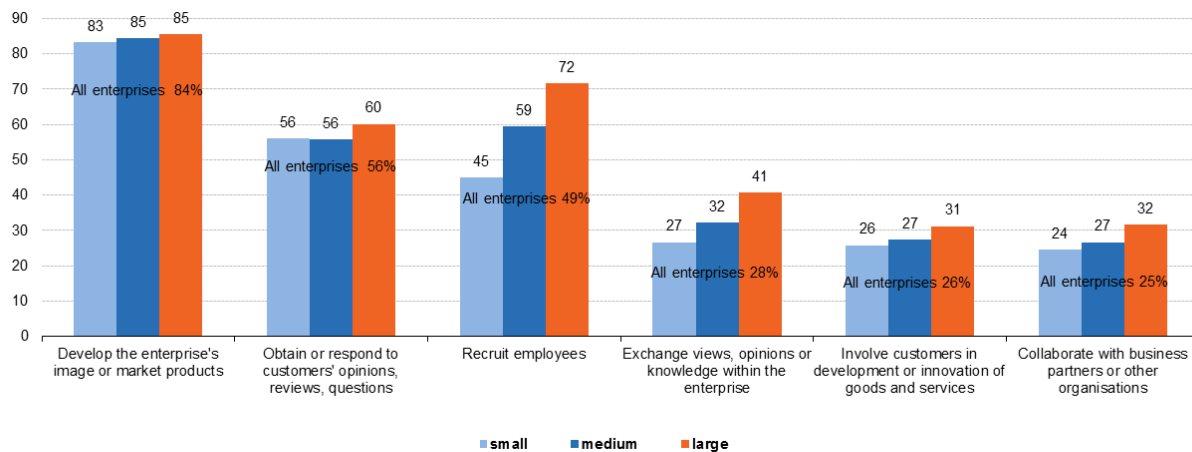
(\*) 2016: not available.

Source: Eurostat (online data code: isoc\_d\_im\_i)

*Appendix 11: Enterprises using social media by purpose of use [EU-28, 2013 & 2017, % of total enterprises]*

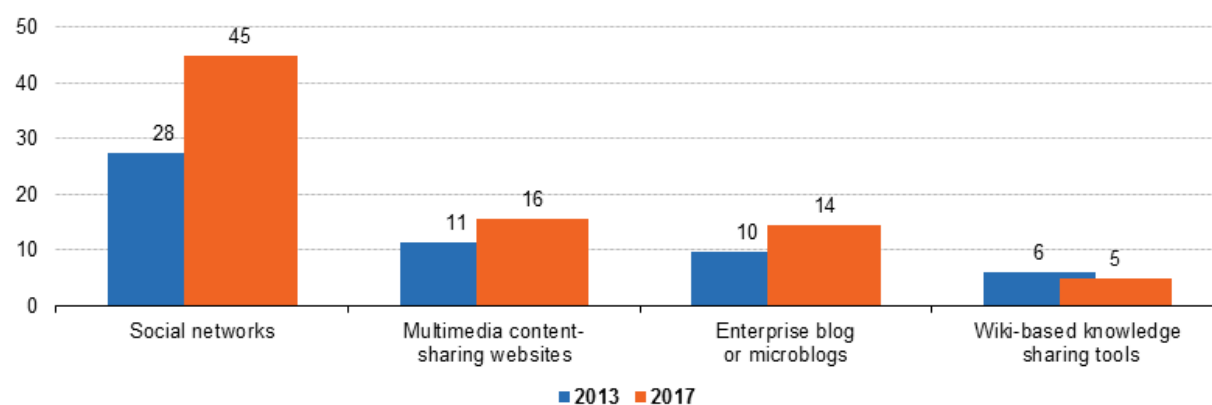


*Appendix 12: Enterprises using social media by purpose of use and size of enterprise [EU-28, 2017, % of enterprises using social media]*

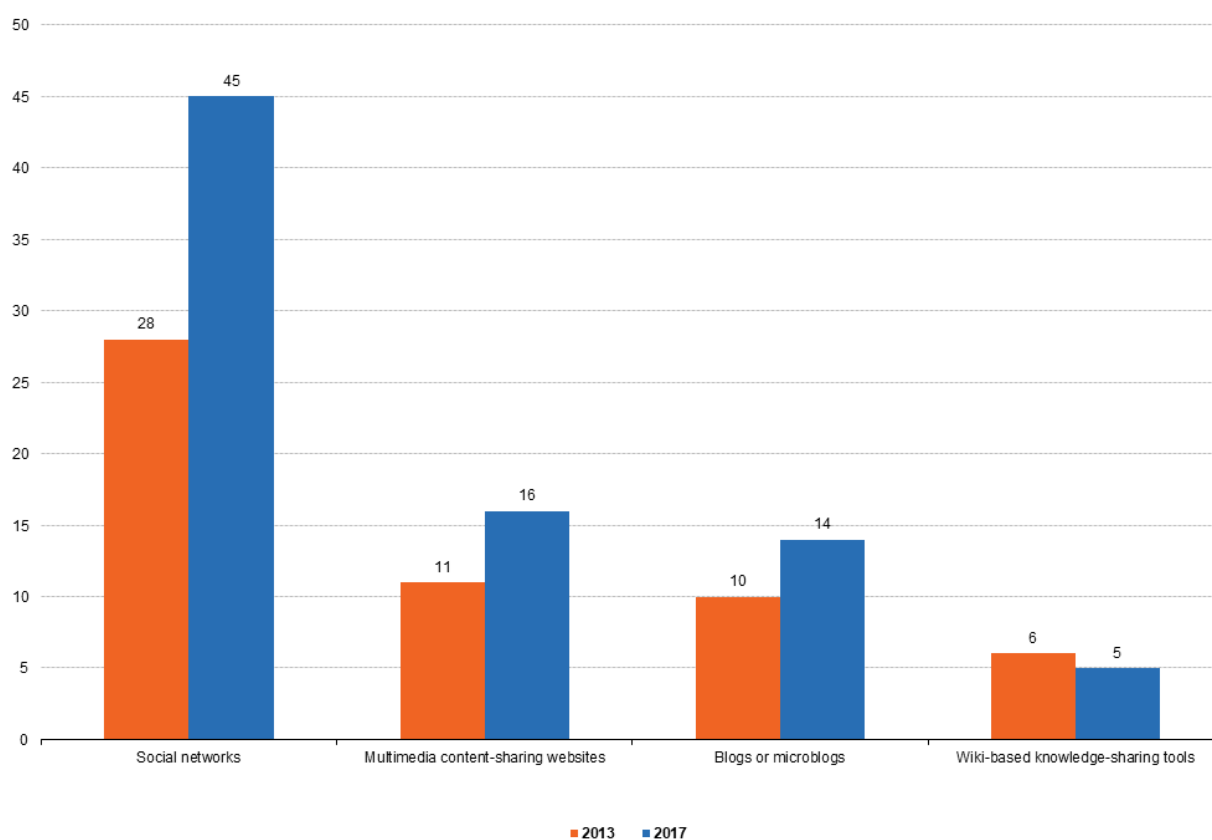




*Appendix 13: Enterprises using social media by type of social media [EU-28, 2013 & 2017, % of enterprises]*

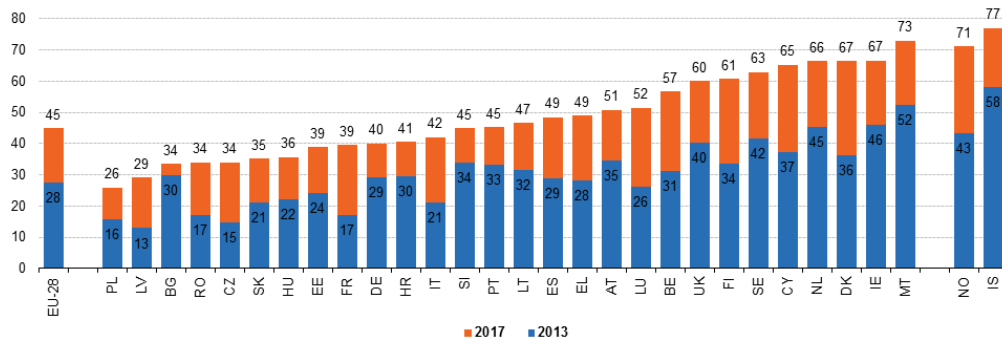


*Appendix 14: Enterprises using social media by type of social media [EU-28, 2013 & 2017, % of total enterprises]*



Source: Eurostat (online data code: isoc\_cismt)

*Appendix 15: Enterprises using social networks [2013 & 2017, % of total enterprises]*



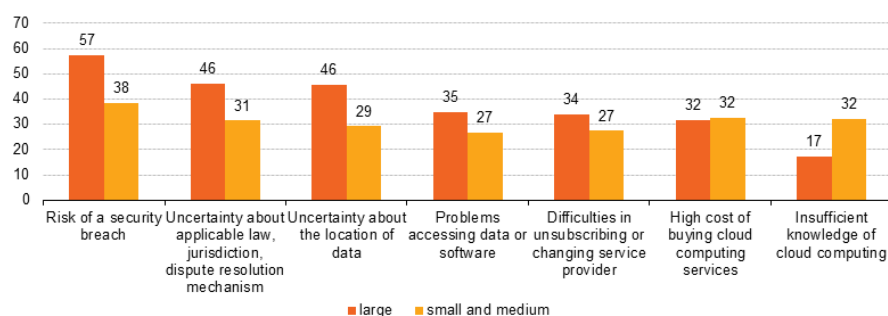
Only countries with data for both years

*Appendix 16: Use of cloud computing services in enterprises [2016, %]*

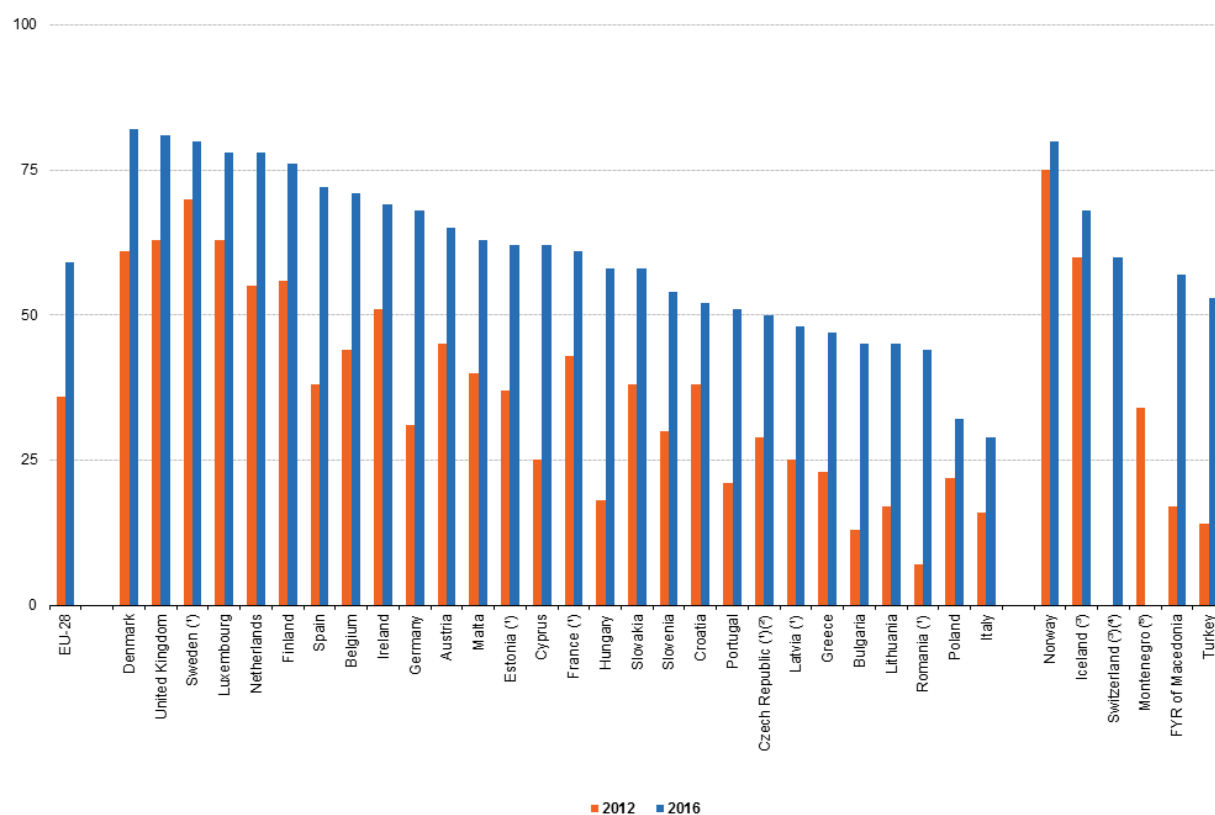
	Use of cloud computing	E-mail	Storage of files	Hosting the enterprise's database(s)	Office software	Financial or accounting software applications	CRM software applications	Computing power for enterprise's own software
	% enterprises	% enterprises using the cloud						
EU28	21	65	62	44	41	32	27	21
Belgium	28	57	66	47	47	47	33	28
Bulgaria	7	65	58	57	44	30	20	17
Czech Republic	18	76	49	31	40	31	22	21
Denmark	42	68	70	52	49	45	33	33
Germany	16	49	63	33	31	26	18	19
Estonia	23	64	53	25	45	53	17	25
Ireland	36	70	75	46	48	35	30	21
Greece	9	68	58	45	50	18	23	27
Spain	18	69	69	59	39	27	29	29
France	17	61	69	55	36	28	29	18
Croatia	23	76	56	47	50	45	15	23
Italy	22	85	41	39	35	19	19	10
Cyprus	15	72	72	33	52	26	29	18
Latvia	8	68	53	49	33	38	23	25
Lithuania	17	74	56	53	38	45	26	36
Luxembourg	19	64	69	51	47	30	28	24
Hungary	12	69	54	37	49	34	26	22
Malta	28	73	64	38	48	20	21	19
Netherlands	35	59	64	65	48	55	40	20
Austria	17	55	61	36	36	25	26	24
Poland	8	69	57	43	37	28	26	19
Portugal	18	76	62	37	45	32	26	34
Romania	7	68	52	51	37	43	19	27
Slovenia	22	61	49	37	48	33	23	22
Slovakia	18	82	48	35	50	45	18	23
Finland	57	74	63	45	51	46	34	14
Sweden	48	66	68	45	44	44	28	24
United Kingdom	35	62	69	41	49	35	31	24
Norway	40	70	71	64	54	53	39	31
FYR of Macedonia	7	71	56	54	47	39	22	25
Turkey	10	.	.	.	.	.	.	.

Turkey: data for subquestions not available.

*Appendix 17: Factors limiting enterprises from using cloud computing services by size class*  
*[EU-28, 2014, % of enterprises using cloud]*



*Appendix 18: Individuals who used a portable computer or handheld device with internet access, away from home/work [2012 & 2016, % of individuals aged 16 to 74]*



Note: defined as using the internet away from home or work on portable computers or handheld devices via mobile phone networks or wireless connections.

(\*) Break in series.

(\*) 2013 instead of 2012.

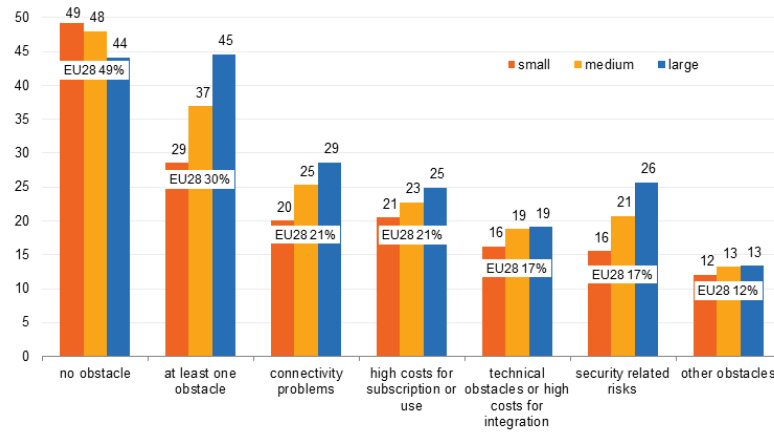
(\*) 2014 instead of 2016.

(\*) 2012: not available.

(\*) 2016: not available.

Source: Eurostat (online data code: isoc\_ci\_im\_i)

*Appendix 19: Obstacles preventing or limiting the use of portable devices that allowed a mobile connection to the internet [EU-28, 2012, % of enterprises]*

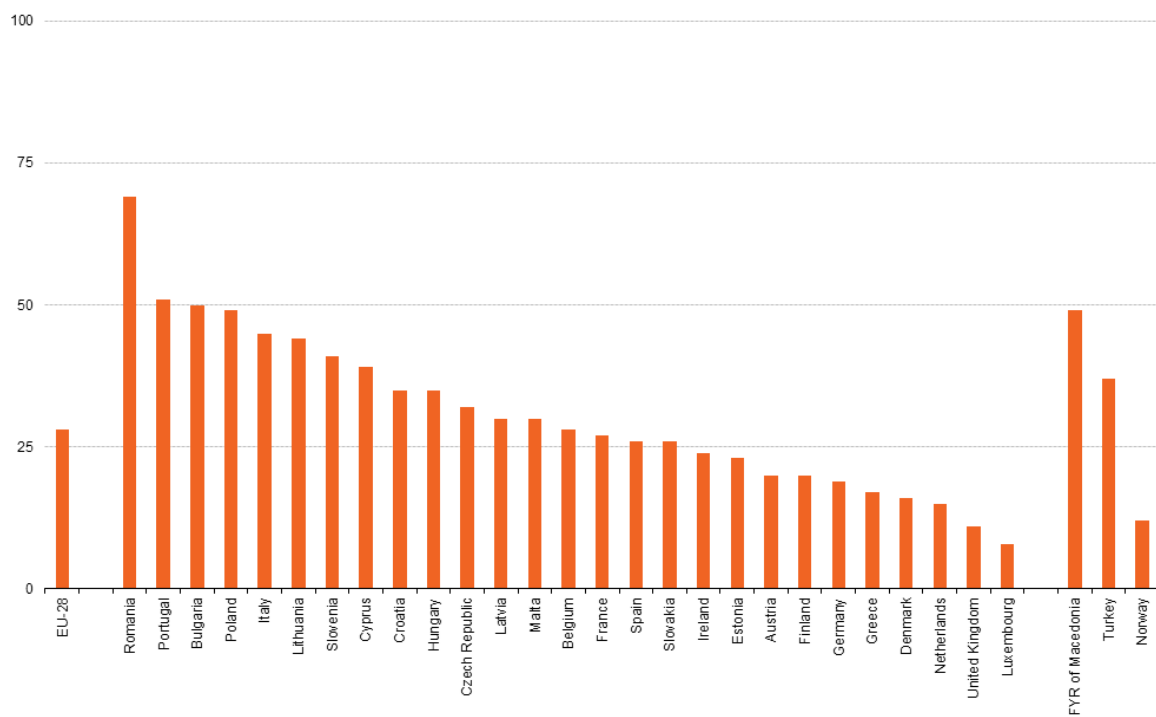


*Appendix 20: Internet services provided by enterprises, based on their size [EU-28, 2012 & 2016, % of enterprises]*

	Internet access		Broadband connection (fixed or mobile)		Provide portable devices to persons employed for mobile connection, 2016			
	2012	2016	2012	2016	all enterprises	small	medium	large
EU-28	95	97	92	94	69	66	83	94
Belgium	97	99	94	97	80	78	92	96
Bulgaria	87	91	79	78	41	38	54	75
Czech Republic	97	98	92	98	77	73	92	99
Denmark	99	100	93	99	92	91	98	100
Germany	97	98	91	95	67	63	82	94
Estonia	96	96	96	95	75	73	84	96
Ireland	94	99	90	98	71	67	85	97
Greece	91	88	80	85	48	45	67	87
Spain	96	98	96	97	76	73	88	94
France	99	99	98	96	72	69	88	97
Croatia	96	91	90	90	83	80	95	97
Italy	96	98	94	94	65	62	85	95
Cyprus	95	96	95	96	60	58	70	91
Latvia	91	97	88	97	66	64	76	88
Lithuania	100	100	99	100	81	79	90	95
Luxembourg	98	100	96	97	79	76	90	96
Hungary	89	92	87	92	66	64	79	92
Malta	95	96	95	95	73	69	84	87
Netherlands	100	100	98	100	69	66	82	93
Austria	98	99	91	98	76	73	93	98
Poland	93	94	82	93	65	61	81	97
Portugal	95	98	91	96	71	69	84	96
Romania	79	84	.	80	43	38	59	77
Slovenia	98	99	98	99	78	75	90	98
Slovakia	98	97	92	92	74	71	84	94
Finland	100	100	100	100	94	93	98	100
Sweden	98	99	97	97	85	84	91	98
United Kingdom	94	95	93	94	68	65	80	93
Iceland	99	.	99	.	.	.	.	.
Norway	97	98	89	93	85	84	96	96
FYR of Macedonia	88	94	87	94	69	68	74	84
Turkey	.	94	.	93	56	54	60	81

Iceland: no survey in 2016. Turkey: no survey in 2012.

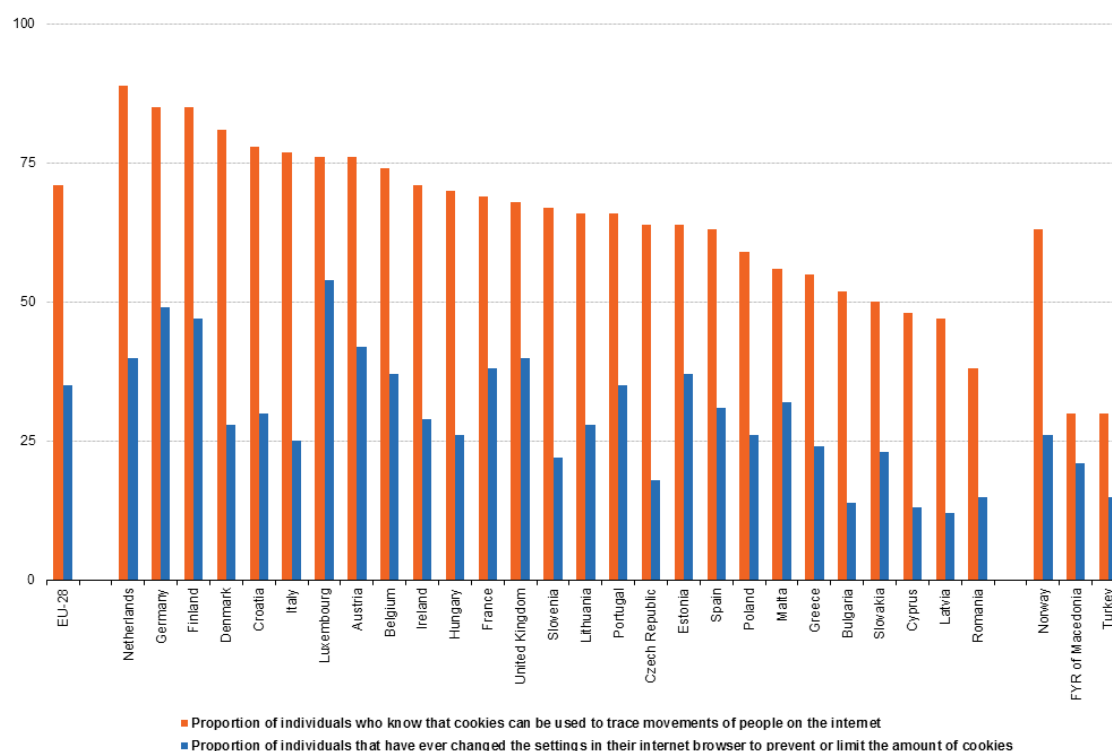
*Appendix 21: Proportion of individuals who did not provide any personal information over the internet [2016, % of individuals who used the internet within the last year]*



Note: Sweden: not available.

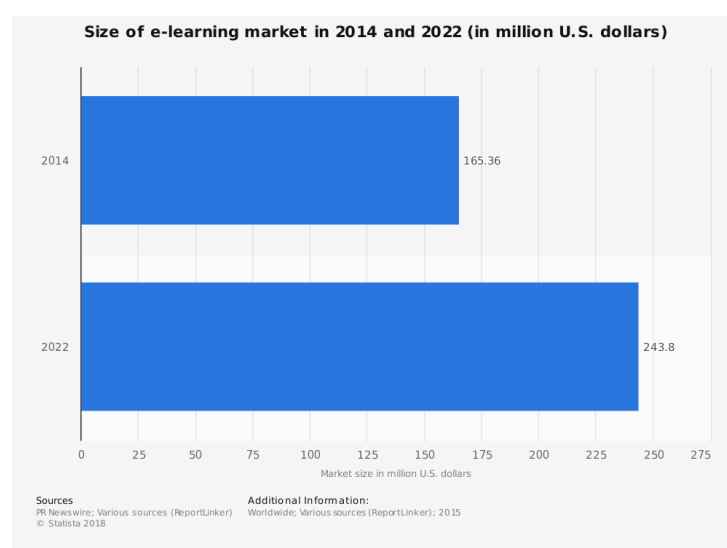
Source: Eurostat (online data code: isoc\_cisci\_prv)

*Appendix 22: Use of cookies and browser settings [2016, % of individuals who used the internet within the last year]*

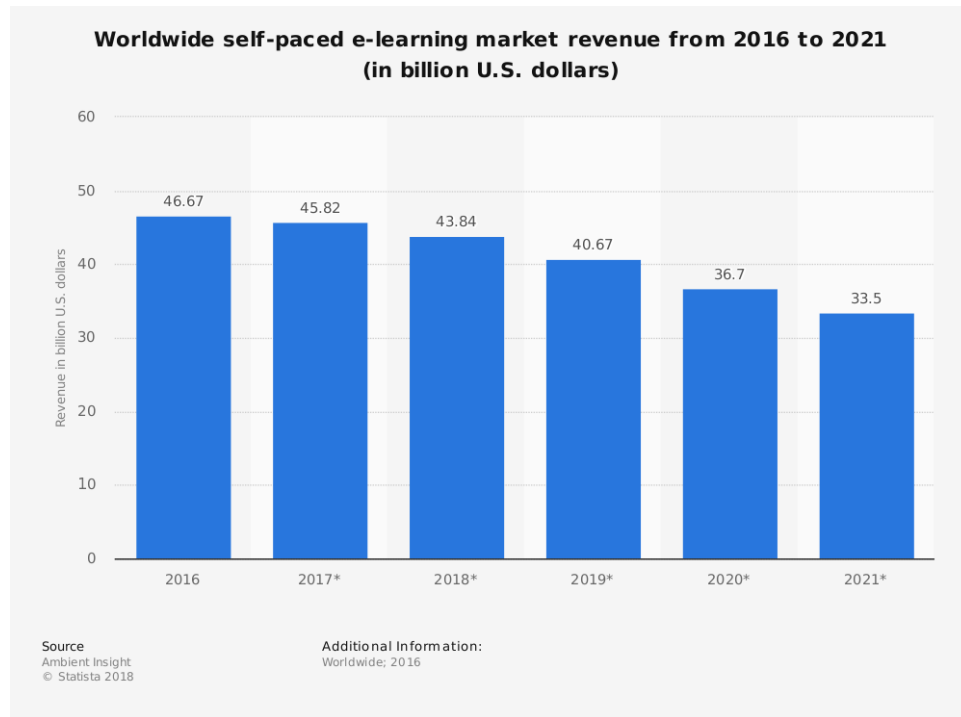


Note: Sweden: not available.  
 Source: Eurostat (online data code: isoc\_cisci\_prv)

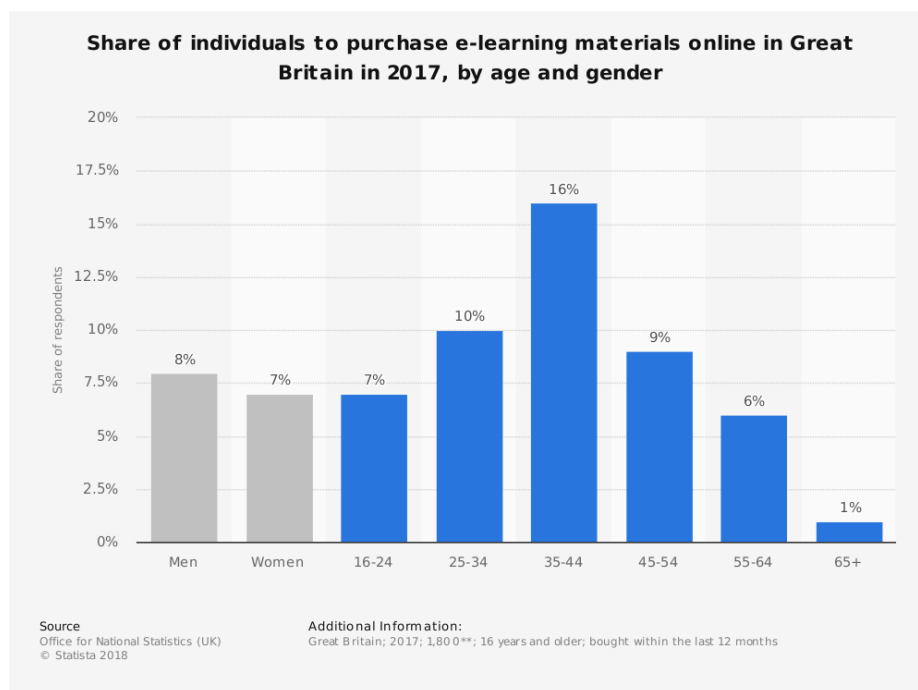
*Appendix 23: Share of global eLearning market [2014 & 2022 (forecasted), millions of \$]*



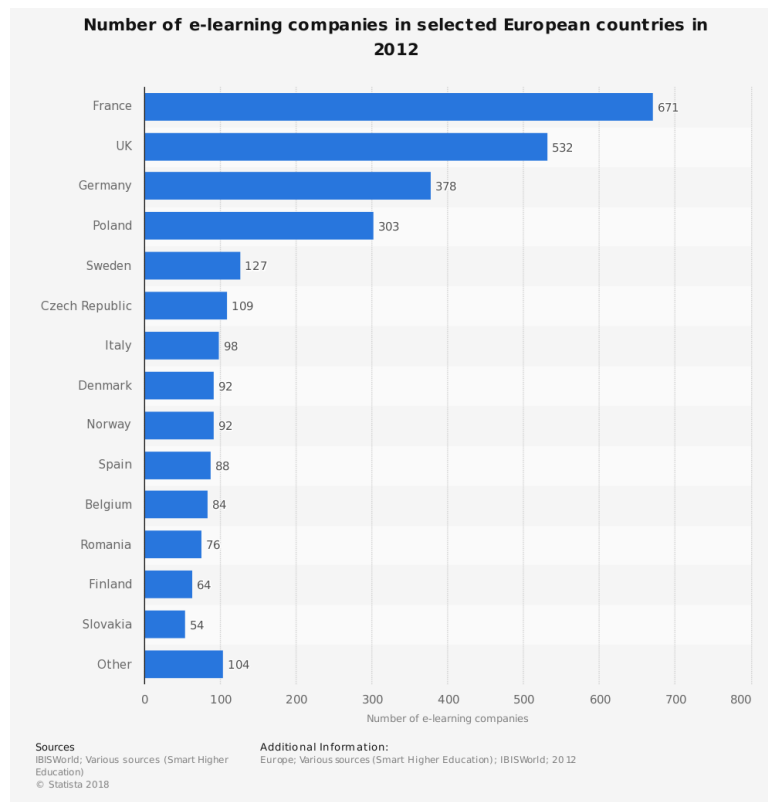
*Appendix 24: Worldwide self-paced eLearning market revenue [forecasted 2016-2021, \$ bn.]*



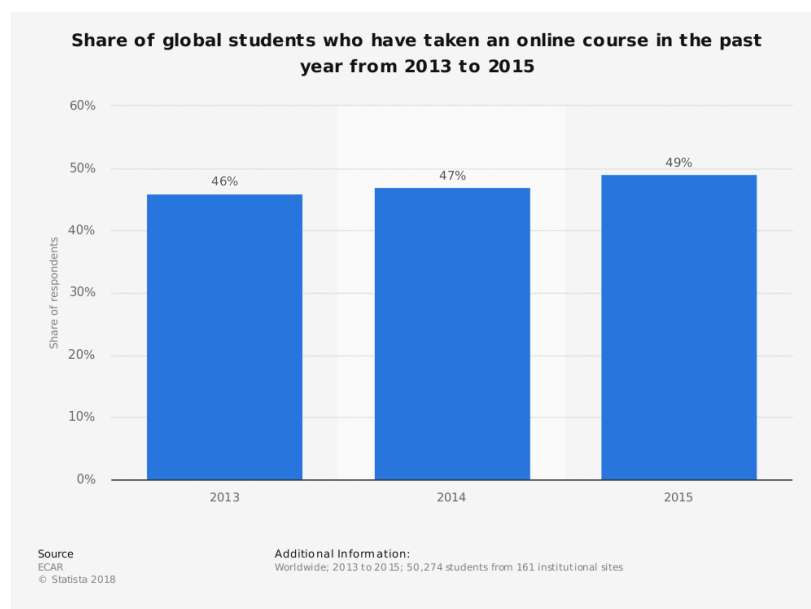
*Appendix 25: Share of individuals to purchase eLearning materials online in Great Britain [2017, by age & gender]*



## Appendix 26: Number of eLearning companies in Europe [2012]

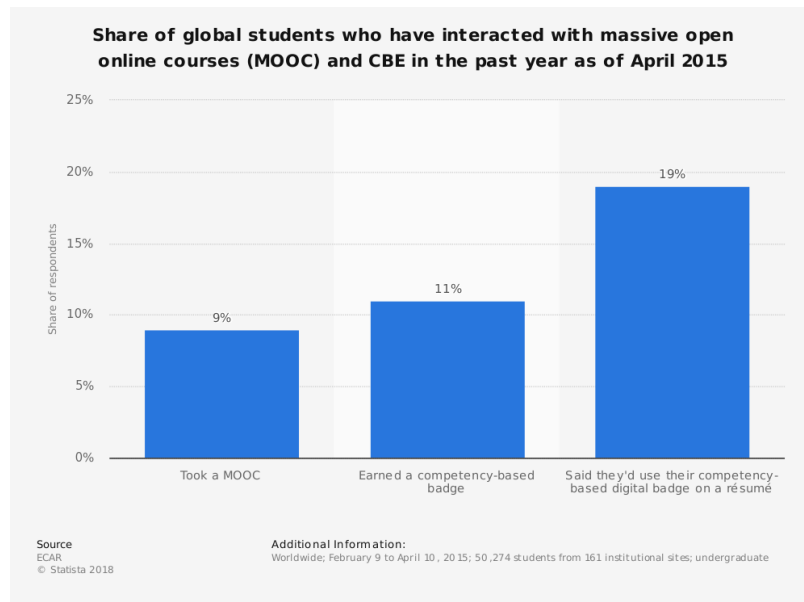


## Appendix 27: Share of global students who have taken an online course in the past year [2013 to 2015]

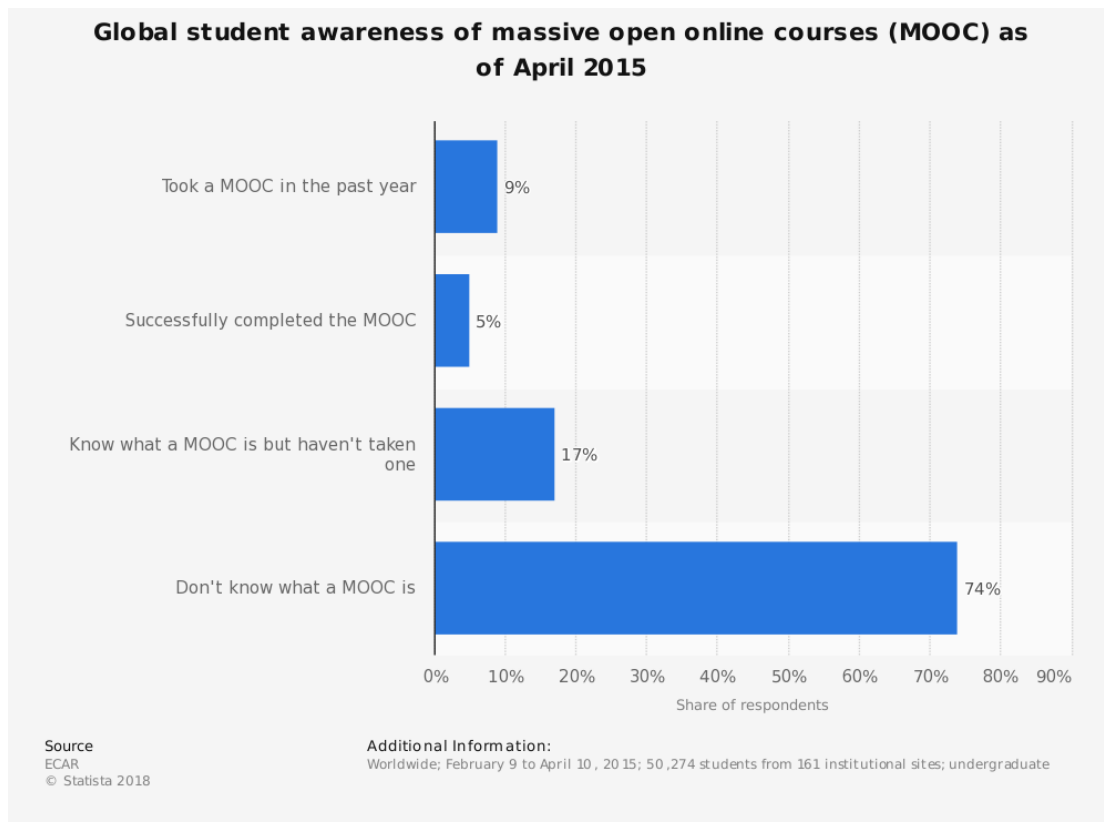




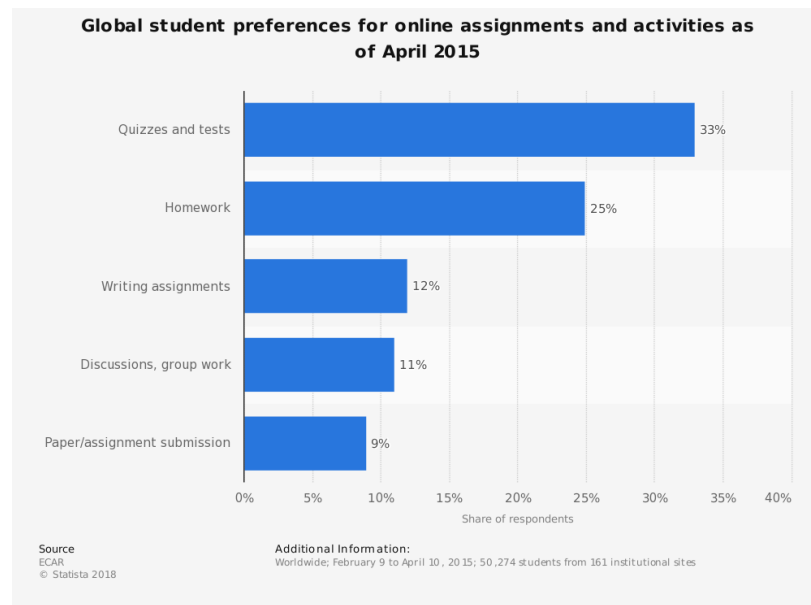
*Appendix 28: Share of students who have interacted with MOOC and CBE in the past year  
[April 2015]*



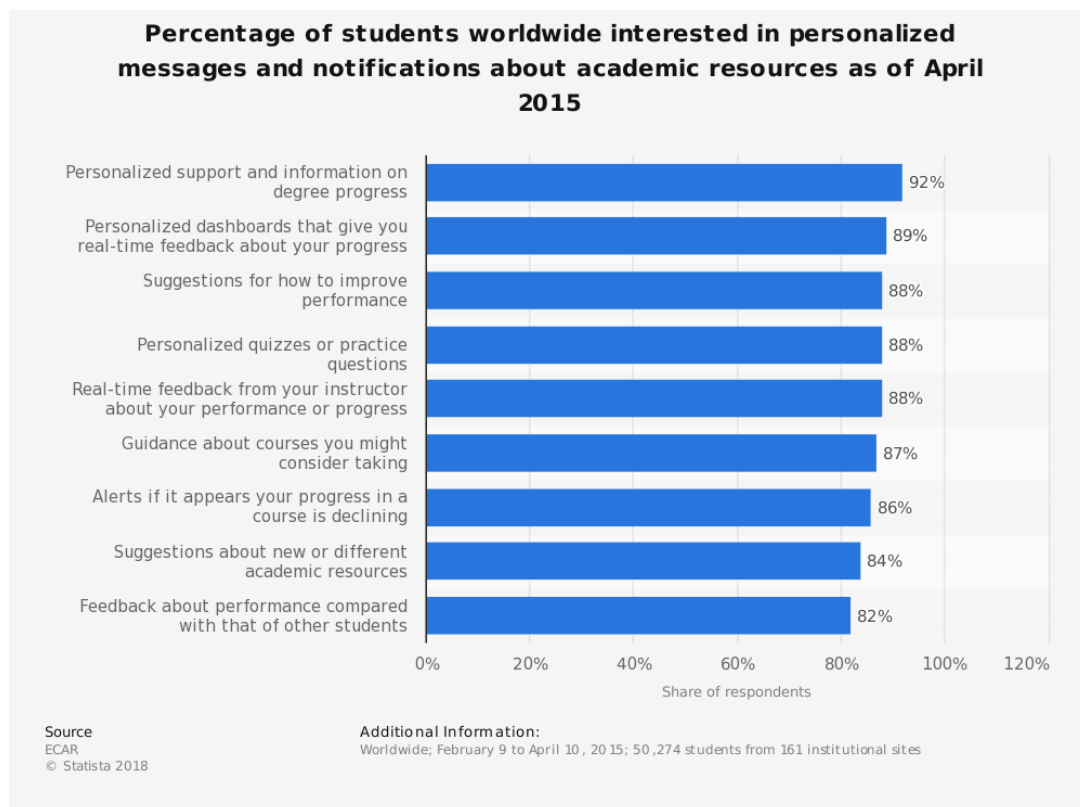
*Appendix 29: Global student awareness of MOOC [April 2015]*



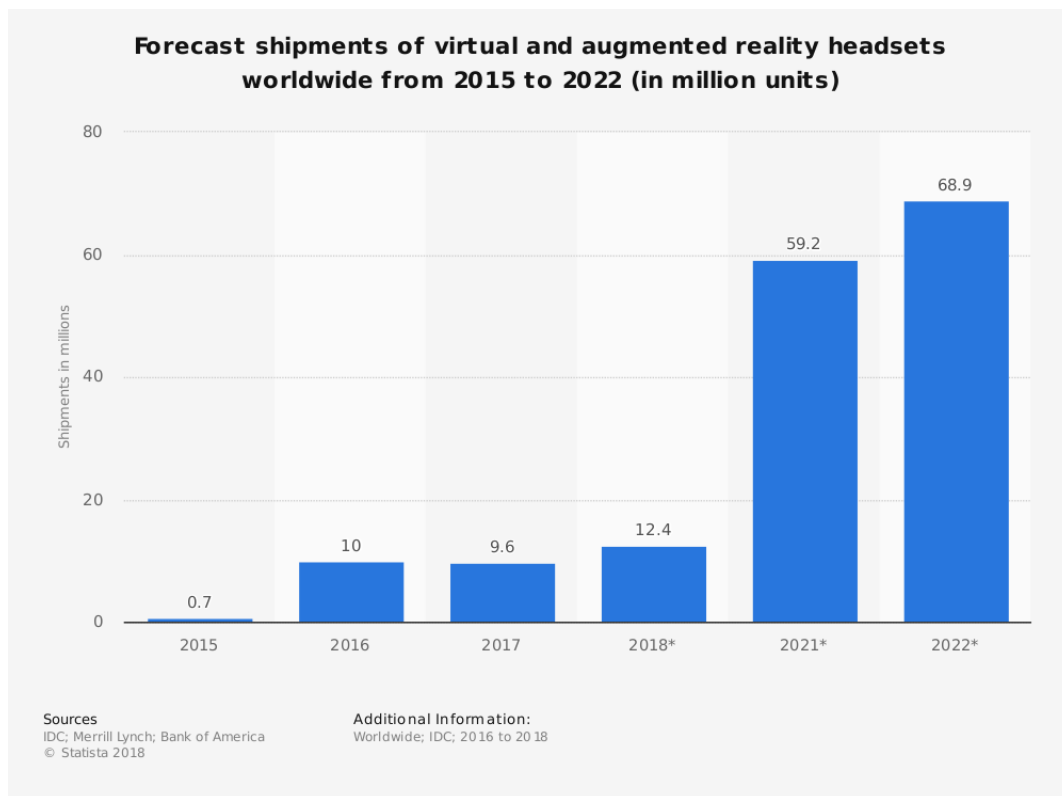
*Appendix 30: Global student preferences for online assignments and activities [April 2015]*



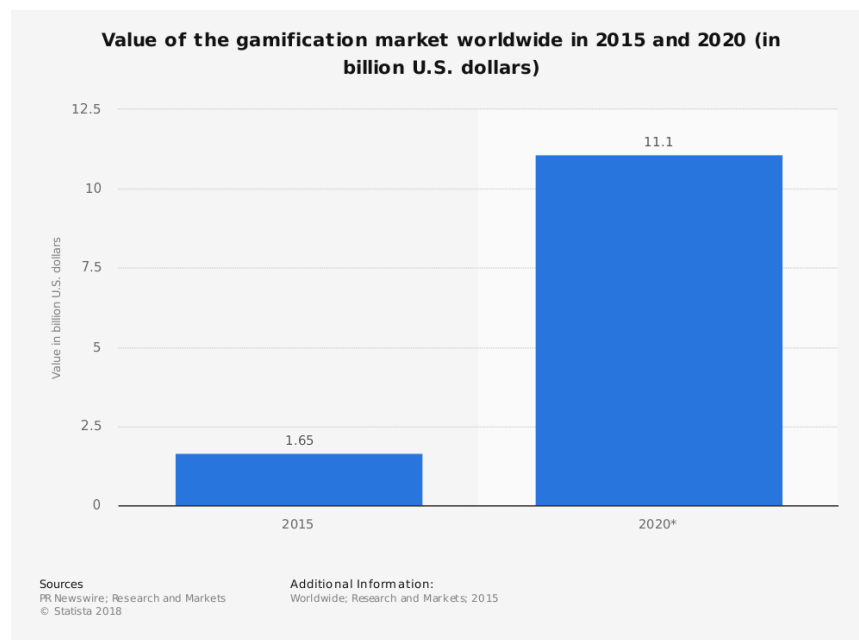
*Appendix 31: Percentage of students worldwide interested in personalized messages and notifications about academic resources [April 2015]*



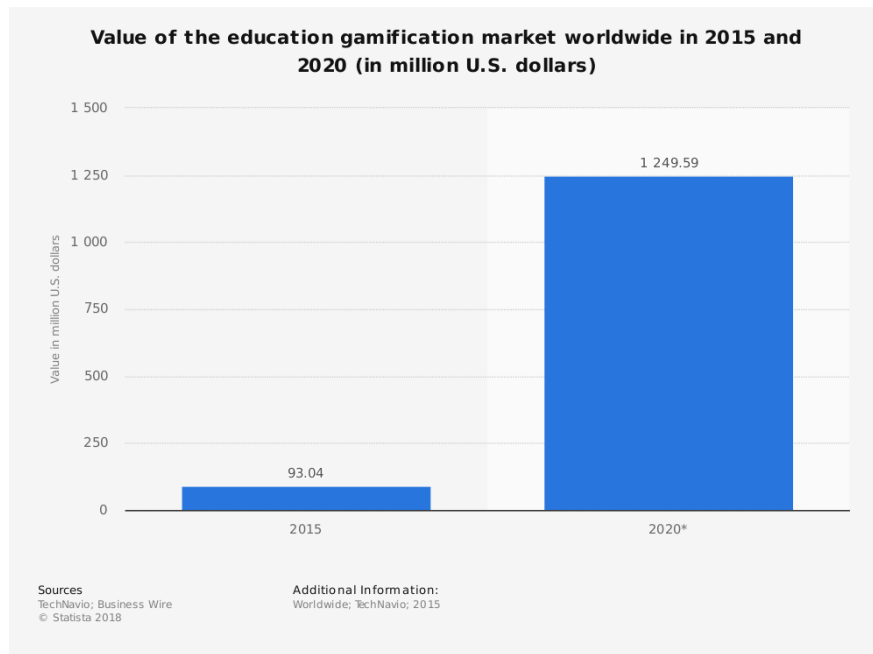
*Appendix 32: Forecasted shipments of VR and AR headsets worldwide [2015-2022, millions of units]*



*Appendix 33: Global value of gamification market [2015 and 2020 (forecasted), \$ bn.]*

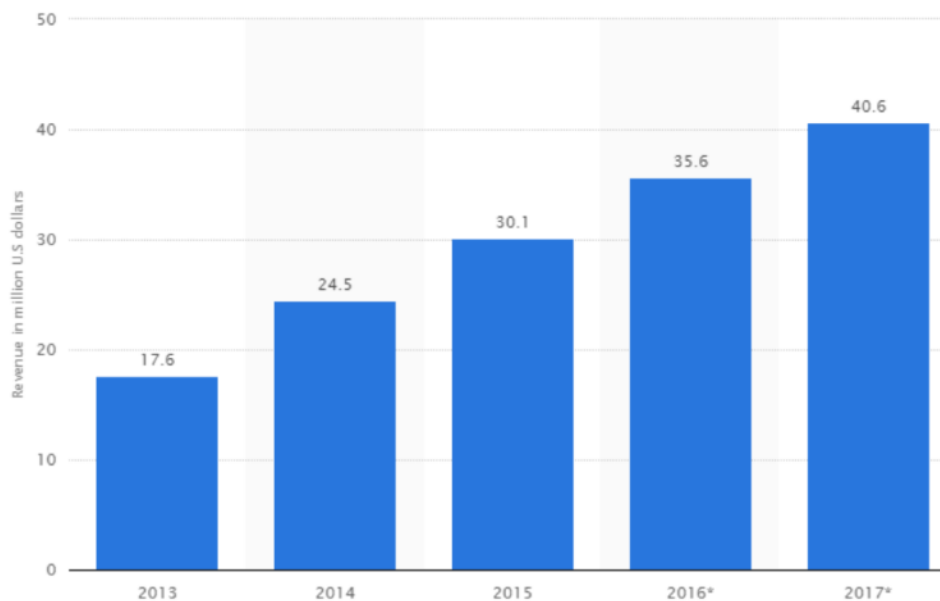


*Appendix 34: Value of the education gamification market worldwide [2015 and 2020 (forecasted), \$ millions]*

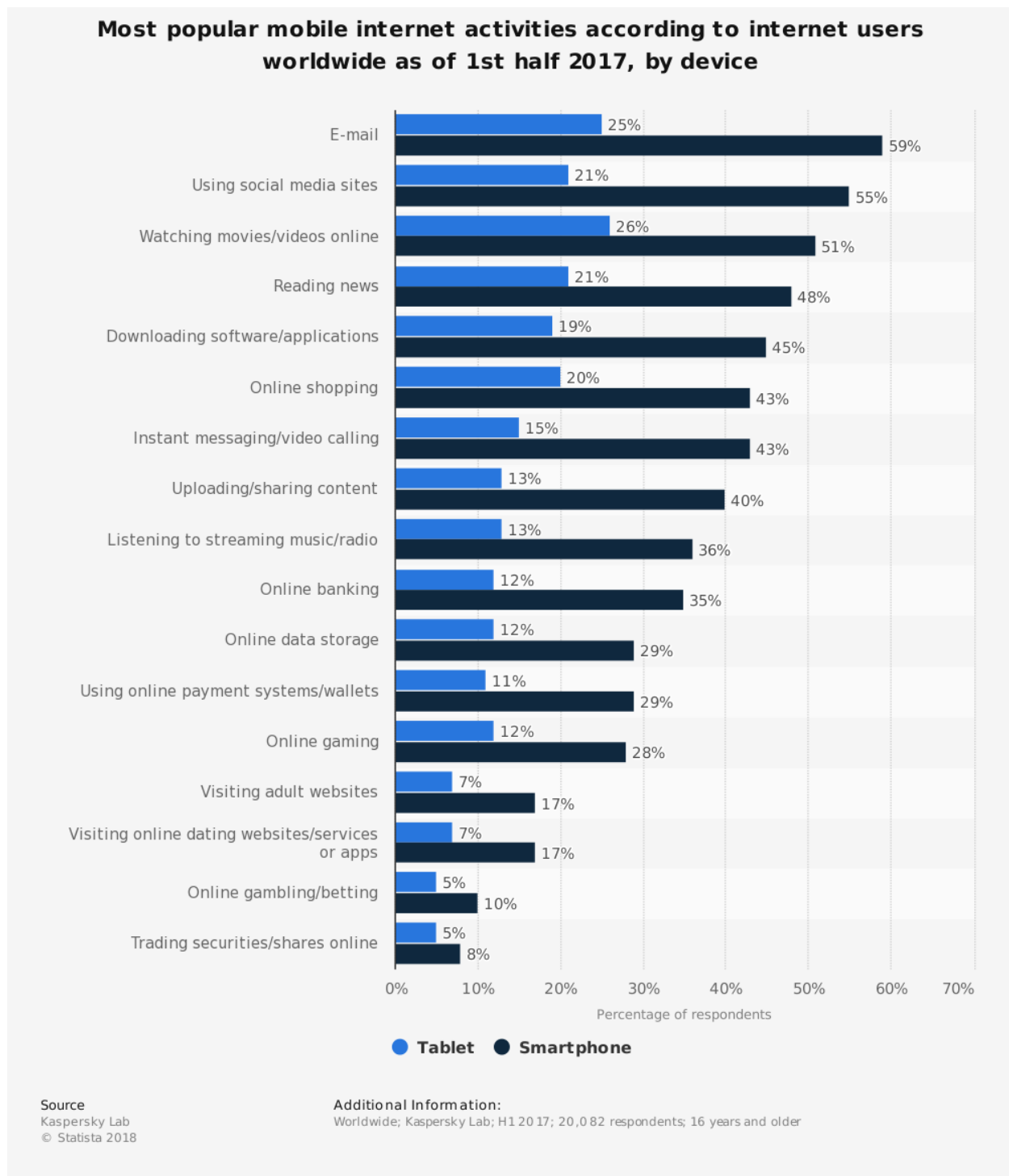


*Appendix 35: Mobile games revenue worldwide [2013 to 2017, \$ bn.]*

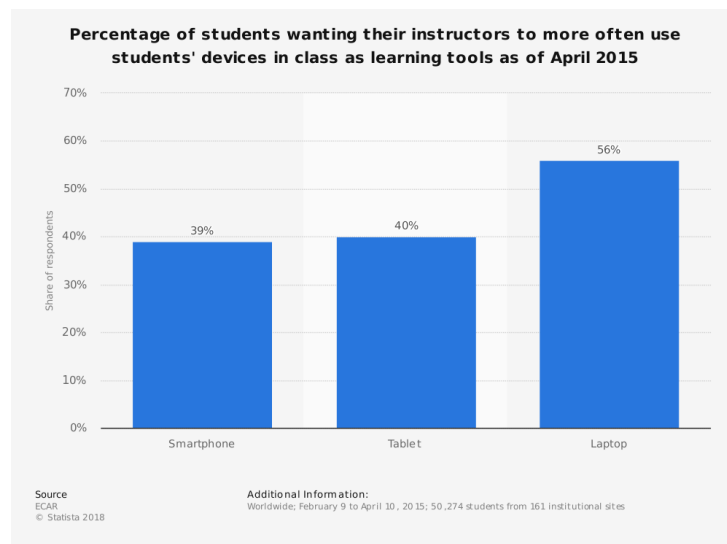
## Mobile games revenue worldwide from 2013 to 2017



*Appendix 36: The most popular mobile internet activities according to internet users worldwide  
[S1 of 2017, by device]*



*Appendix 37: Percentage of students worldwide wanting their instructors to use student's devices in class as learning tools [as of April 2015]*



*Appendix 38: Self-paced eLearning products revenue in the US by buyer segments [2016-2021]*

