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SCRUM VALUES AND PRINCIPLES: DESIGN OF A MULTIMEDIA ENVIRONMENT FOR THE STUDY PROGRAMME ENGLISH IN ELECTRICAL ENGINEERING AND INFORMATICS

VÝZNAM A PRINCIPY METODIKY SCRUM: NÁVRH MULTIMEDIÁLNÍHO PROSTŘEDÍ
PRO STUDIJNÍ PROGRAM ANGLIČTINA V ELEKTROTECHNICE A INFORMATICE

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RECOMMENDED LITERATURE:

- 1) Schwaber, K., & Sutherland, J. (2020). The Scrum guide. Denver: Scrum Alliance.
- 2) Sutherland, J. (2014). Scrum. The art of doing twice the work in half the time. New York: Crown Business.
- 3) Pham, A., & Pham, A. V. (2012). Scrum in action. Agile software project management and development. Boston: Cengage Learning.

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Abstract

This bachelor's thesis aims to provide a theoretical framework for the application of the Agile method, namely Scrum, into the English Language Teaching process. Besides, the thesis contains a practical part that serves as an illustrative example of such an implementation presented for demonstration purposes in an environment of a lightweight management software named Trello. The Content and Language Integrated Learning approach is used to assist in the accomplishment of the objectives set in the thesis. Provided that CLIL is a dual-focused method, the Trello board comprises the materials of the subject Electrical Engineering taught in the English in Electrical Engineering and Informatics study programme at the Faculty of Electrical Engineering and Communications at Brno University of Technology. Therefore, the practical part combines both a professional subject and linguistically oriented materials.

Key words

Scrum, eduScrum, Trello, CLIL, e-learning, distance learning, Duolingo, Memrise

Abstrakt

Tato bakalářská práce si klade za cíl připravit teoretický rámec pro aplikaci agilní metody, konkrétně Scrumu, do procesu výuky anglického jazyka. Kromě toho práce obsahuje praktickou část, která je poskytuje ilustrativní příklad takové implementace prezentované pro demonstrační účely v prostředí odlehčeného a snadno ovladatelného manažerského softwaru Trello. K dosažení cílů stanovených v bakalářské práci je využita metoda integrované výuky předmětu a cizího jazyka (Content and Language Integrated Learning - CLIL). Vzhledem k tomu, že CLIL je duálně zaměřená metoda, Trello board obsahuje materiály předmětu Elektrotechnika vyučovaného ve studijním programu Angličtina v elektrotechnice a informatice na Fakultě elektrotechniky a komunikačních technologií Vysokého učení technického v Brně. Praktická část proto kombinuje jak odborný předmět, tak lingvisticky zaměřené materiály.

Klíčová slova

Scrum, eduScrum, Trello, metoda integrované výuky předmětu a cizího jazyka, e-learning, distanční výuka, Duolingo, Memrise

Rozšířený abstrakt

Tato bakalářská práce si klade za cíl připravit teoretický rámec pro aplikaci agilní metody, konkrétně Scrumu, do procesu výuky anglického jazyka. Kromě toho práce obsahuje praktickou část, která je příkladem takové implementace prezentované pro demonstrační účely v prostředí odlehčeného a snadno ovladatelného manažerského softwaru Trello. K dosažení cílů stanovených v bakalářské práci je využita metoda integrované výuky předmětu a cizího jazyka (Content and Language Integrated Learning - CLIL). Vzhledem k tomu, že CLIL je duálně zaměřená metoda, Trello board obsahuje materiály předmětu Elektrotechnika vyučovaného ve studijním programu Angličtina v elektrotechnice a informatice na Fakultě elektrotechniky a komunikačních technologií Vysokého učení technického v Brně. Praktická část proto kombinuje jak odborný předmět, tak lingvisticky zaměřené materiály.

První kapitola teoretické části práce je zaměřena výhradně na vymezení koncepce Scrumu. Alternativně k agilnímu původu, principy a hodnoty odlišují Scrum od mnoha technik a nástrojů projektového řízení. Důležitým aspektem je, že první kapitola poskytuje návod ve formě jednotlivých kroků, jak nastavit rutinu Scrumu při vývoji komplexního produktu v jakékoli oblasti. Na základě literární rešerše tvůrců Scrumu a členů agilních komunit diskutuje možné výhody a nevýhody. Hlavní výtka aplikace Scrumu je spojena se složitostí absolutního přechodu na metodiku, kdy je tým již zvyklý na jiný model řízení.

Podobné omezení je charakteristické pro postupy eduScrum, které jsou nastíněny ve druhé kapitole práce. Rostoucí popularita Agile ve vzdělávání vedla k tomu, že se eduScrum oddělil od Scrumu a vytvořil samostatný výklenek. Přehled současného stavu poznání ukázal případy aplikace eduScrum ve výuce angličtiny pro specifické účely. Studie s různými designy výzkumných metod znázorněné v této kapitole prokázaly efektivitu implementace eduScrum v procesu učení, což vedlo k tomu, že studenti různých zemí dosáhli vyšší úrovně pokročilosti anglického jazyka. Kromě toho kapitola porovnává metody ESP a CLIL se závěrem, že kurikulum ESP je postaveno na osnovách CLIL. Toto zjištění poskytlo další motivaci pro vytvoření příkladu CLIL aplikace Scrumu.

Ve třetí kapitole autor hodnotí aktuální stav distančního vzdělávání a jeho vývoj od posledních dvou desetiletí dvacátého století. Pro účely prokázání tvrzení, že existuje pozitivní korelace mezi rostoucím trendem trhu online vzdělávání a cenovou dostupností zařízení schopných reprodukovat multimediální obsah, obsahuje kapitola výsledky dotazníkového průzkumu mezi studenty Vysokého učení technického v Brně. Dále je představena platforma a mobilní aplikace dvou lídrů segmentu online jazykového vzdělávání. Duolingo a Memrise byly oba testovány, aby bylo zjištěno, jestli je možné integrovat principy eduScrum pro potenciální uplatnění jeho konceptu. Kromě sledování toho, jak společnosti přistupují ke struktuře učebních materiálů a pozitivnímu posílení vzdělávacích zkušeností uživatelů, byl pro každou z nich vypracován obchodní model.

Čtvrtá kapitola slouží k představení prostředí zvoleného pro grafickou alokaci výukových materiálů a pomáhá s náročnými problémy plánování. Trello je primárně kolaborativní nástroj pro správu, který pomáhá sofistikované organizaci vývoje produktů. Paralelně s ostatními konkurenty, jako jsou Jira, Asana a Clickup, může snadno realizovat nastavení metod založených na Kanban pro organizaci pracovního procesu. Kromě toho kapitola uvádí a vysvětluje nezbytnou sadu funkcí potřebných pro pochopení, jak používat praktickou část práce, i když je grafické uživatelské rozhraní Trello poměrně intuitivní.

Poslední pátá kapitola zobrazuje demonstrační verzi aktuální praxe eduScrumu. Trello board, která představuje týdenní iterační cyklus, obsahuje výukové materiály v angličtině pro předmět Elektrotechnika vyučovaný na Fakultě elektrotechniky a komunikačních technologií VUT v Brně. Vzhledem k tomu, že je kurz orientován na česky mluvící studenty, slouží akademická disciplína účelu metody CLIL kombinované s úkoly z anglického jazyka. Příklady úloh mají za cíl prohloubit slovní zásobu, gramatiku, komunikační a prezentační dovednosti prostřednictvím obsahu přednášky elektrotechnického předmětu. Popis procedur naznačuje pořadí, ve kterém jsou implementovány principy Scrumu diskutované ve druhé kapitole.

Cíl práce byl úspěšně splněn. Návrh multimediálního prostředí pro studijní program Angličtina v elektrotechnice a informatice je uveden v páté kapitole, obsah na desce Trello však slouží pouze pro demonstrační účely. Prvním důvodem je složitost postupu interakce se sylabem již akreditovaných vysokoškolských předmětů nebo vytváření nového sylabu. Vytvoření dvojího kurikula bude navíc vyžadovat jak akademickou disciplínu, tak znalost

anglického jazyka na úrovni, která odpovídá úrovni lektora. To jsou hlavní omezení, která stojí v cestě obecné aplikaci takového přístupu. Nicméně podle mých vlastních zkušeností a dalších podobných výzkumů, které se pokoušely využít postupy Scrumu, byly zjištěny pozitivní tendence v osvojování anglického jazyka a růstu motivace studentů.

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Prohlášení

Prohlašuji, že bakalářská práce na téma *Význam a principy metodiky Scrum: návrh multimediálního prostředí pro studijní program Angličtina v elektrotechnice a informatice* jsem vypracoval samostatně pod vedením vedoucí bakalářské práce a s použitím odborné literatury a dalších informačních zdrojů, které jsou všechny citovány v práci a uvedeny v seznamu literatury na konci práce.

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V Brně dne

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Sergey Borovskiy

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Introduction

The existence of a universal set of instructions oriented towards the recipient to learn a specific theory and apply it in practice in a short period of time is what every educational program should attempt to achieve. Besides bringing countless tragical cases, the coronavirus pandemic has globally assessed the readiness of both students and teachers leaving no choice but to dive into the world of non-traditional remote education. Increasing English learning online is exemplified by its rapid growth in demand, especially in regions of Asia and Latin America. The fact of the English language being the international standard in a computer-based environment is another driver for the online language learning market expansion.

Similar to how railways impacted the world's transportation system fifteen decades ago, Agile methods shape the future of education. Originated from the world of software development, Agile in learning, Scrum, and eduScrum have a great deal to offer to both teachers and students in any academic discipline or work-related training. The accommodation through detailed planning and self-organisation is the underlying Agile principle that aids its applicants to maintain motivation, confront increasing volumes of information and catch up with fast-changing trends in a competitive field.

Therefore, the question arises: is it possible to learn two disciplines simultaneously so that the content of one builds on another and vice versa? According to my personal observations, Scrum application in English tutoring through the content of a student's professional associations allows for advancement from A2 to B2 level of language proficiency according to the Common European Framework of Languages (CEFR) in a few months. To validate personal experience and assumptions, the thesis provides a theoretical framework of Scrum principles and values implemented for the study programme English in Electrical Engineering and Informatics at the Brno University of Technology. The result of the thesis comprises the theoretical and practical parts, where the practical part represents a design of a multimedia environment for the subject Electrical Engineering taught in English to Czech-speaking students.

The first part of the thesis is divided into four chapters and is mainly dedicated to Scrum evaluation. The principles and values differentiate Scrum from numerous project

management techniques and tools. Most importantly, the first chapter provides step-by-step guidance on how to set the Scrum routine in developing a complex product. The second chapter refers to a niche called eduScrum which appeared due to the growth of Scrum application in learning popularity. Several instances of successful eduScrum practices are presented in the second chapter. In addition, the first two chapters discuss possible advantages and disadvantages and how to address them.

The third chapter reviews the state-of-the-art of the most popular multimedia e-learning platforms that focus on English language teaching and learning. Apart from evolution of the distance learning, two software products of the online-based English learning market leaders, Duolingo and Memrise were tested. The examination of the existing solution functionality and structure of the learning syllabus serves the purpose of inspiration when dealing with the design of the practical part of the thesis.

The final chapter of the theoretical part describes the freemium software management tool, Trello that is chosen for the demonstration of the practical part. The introduction of core actions including an intuitive graphical interface proves Trello to be a lightweight and user-friendly system assisting in high-planning issues. These features make Trello an attractive alternative for the practical part environment selection.

1 Scrum

This chapter is devoted to understanding what Scrum is, how, and why it appeared. There are various definitions by multiple Certified Scrum Masters, Scrum Product Owners, and other Scrum Professionals. However, the world standard explanation belongs to Scrum's originators, Ken Schwaber and Jeff Sutherland. Before diving into the Scrum notion presented by its originators, it is crucial to mention that Scrum is a specific subset of the Agile niche of any project development process. Therefore, it is logical to outline what Agile is as well.

According to the collaborative effort of the Project Management Institute (PMI) and Agile Alliance (a global non-profit organisation), the appearance of 'agile,' as the blanket term covering a variety of frameworks and methodologies, is associated with the publication of the *Agile Manifesto* or the *Manifesto for Agile Software Development* published by the group of authorities in the software industry in 2001.



Figure 1. The *Agile Manifesto*. Reprinted from <http://agilemanifesto.org/>.

As illustrated in Figure 1, the ‘agile’ definition is a set of combinations of values and principles applied or implemented in product development. Since ‘agile’ has spread into many industries ranging from software development and product design to teaching and law, many started using the notion in the collocation with the technique, approach, and methodology depending on the application situation. Similar collocations, this time with the word Scrum, will often appear further in this thesis.

1.1 Scrum Origins

Even though Scrum is under the authority of the Agile Alliance, its history commended several decades earlier. According to Takeuchi and Nonaka (1986), a Scrum term was first borrowed from the rugby game formation and this way coined into the product development terminology. Similar to the term Scrum used in rugby, in the product development, it illustrates a process of a restart of the teamwork by introducing a new organisational structure perception. Several corporate companies practise a working process transition from several teams contributing to a single product development separately to the situation when teams are aware of each other’s progress and struggles which allowed closer cooperation hence more efficient performance. Later, Ken Schwaber and Jeff Sutherland summarised all their knowledge and experience in the attempt of outlining a fresh lightweight methodology at the request of the Object Management Group (OMG). As a result, their findings were published by Schwaber (1995). However, the definition of Scrum mentioned in the first paragraph of this chapter was formulated by Schwaber and Sutherland (2017, p. 3) and it is as follows: “A framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value.”

1.2 Scrum Methodology

Theoretically, Scrum is based on the empiricism that is combined with the constant and iterative examination of following the major principles throughout the working activity. According to Schwaber and Sutherland (2017), the major principles are transparency, inspection, and adaptation. Further in the guide, each term is defined. By the term *transparency*, Schwaber and Sutherland (2017) mean straightforward role distribution in the Scrum Team and a unified definition of “done” between the Development Team and an inspection party. *Inspection* is a procedure that assures that the Scrum Team does not deviate from the course agreed on at the beginning of an iteration, nevertheless, it should not disrupt

the project workflow so that the team does not lose their focus on the main objectives. Should the deviation happen, an *adaptation* is required to minimise further aberrations and introduce a satisfactory adjustment judged upon an Inspector's opinion (given by an Inspector). Besides, these three terms, Schwaber and Sutherland (2017) describe a cycle of events, Sprint Planning, Daily Scrum, Sprint Review, and Scrum Retrospective important for a team's effective and long-lasting functioning that will be explained in Chapter Scrum Events

Pham and Pham (2012) suggest that a complete transfer to Scrum in the product development world would be utopian yet possible to achieve unless all the corporates give up the current ancestral organisational structures such as quality assurance, Pre-production, and Project Management.

In practice, Scrum deployment represents a cross-functional team that comprises a Scrum Master, a Product Owner, and a Development Team with the satisfactory set of skills required to deliver a product (Pham & Pham, 2012). Schwaber and Sutherland (2017) state that the Product Owner's responsibility orientates towards maximising the increment output devised by the Development Team along each of the Scrum Sprint. The Development Team possesses certain characteristics, such as:

- group of self-organised individuals;
- individual's specialised knowledge or progress belongs and is a part of the whole team;
- focus on the work performed by an individual during the Sprint, never its academic achievements or titles;
- hierarchy absence within the team.

A Scrum Master contributes to the team by ensuring each member is acquainted with and adheres to the Scrum Theory, its principles, and values. In other words, a Scrum Master is a servant-leader whose interactions with either the Product Owner or the Development Team leads to a product total value increase

1.2.1 Scrum Events

The way a Scrum Team interacts within is prescribed by Scrum events mentioned above. Schwaber and Sutherland (2017) specify that Scrum events aimed to support and encourage

Scrum Values within the Scrum Team through regular and time-limited sessions. Such disciplinary proceedings do secure sufficient but not excessive time resources for each Scrum Role to fulfil its functions. The time allowed is strictly fixed and cannot be extended or reduced unless the purpose of the meeting is achieved. During a productive meeting in Scrum, transparency value is reached while each Scrum Team member contributes to inspection and adaptation procedures by sharing their thoughts and solutions on the ongoing matter without distractions and time losses. The importance of time efficiency at the meetings is highlighted by Dignan (2019, January 10) in the way that professionals in the United States spend two hours weekly participating in ineffective meetings resulting in a negative profit for the enterprises.

1.2.1.1 Scrum Sprint

Schwaber and Sutherland (2017) believe that one of the most essential Scrum events is the Scrum Sprint, or the Sprint, that represents, as a rule, a one-month period, under certain circumstances less, depending on the product developed, during which a consistent, ready to go product increment is designed. Progress is then reviewed and based on the conclusions drawn, goals for the new Sprint are set, initiating the next iteration.

The Sprint comprises the Sprint Planning, Daily Scrums, the development work, the Sprint Review, and the Sprint Retrospective stages. Fundamental features of the Sprint are, as follows:

- Once a primary goal is stated it must remain unchanged until the end of the iteration.
- A flexible plan of actions that guides the Scrum Team.
- Executed work summarized in the form of a product increment (Schwaber & Sutherland, 2017).

By following these three principles, as the Scrum Alliance (2017) notes, Sprint enables transparent inspection and adaptation procedures that are required for a guaranteed progression. Thus, in case of failure to accomplish a primary goal, due to a time-box of one month, the risk of unnecessary costs, such as working hours and monetary resources, are minimised to one calendar month, respectively. The Sprint is rarely terminated before its estimated ending, nevertheless if so, the only authority capable of it is the Product Owner. It

is uncommon and costly, thus dramatic changes within company objectives may be responsible for this premature cancellation.

1.2.1.2 Sprint Planning

Equivalently to the other Scrum events presented by Schwaber and Sutherland (2017), Sprint Planning is strictly time-boxed. The time the Scrum Master must ensure the Scrum Team devotes to the Sprint Planning is restricted to eight hours at the maximum per Sprint. The result of the Sprint Planning meeting is a cooperative effort of the whole Scrum Team, including the Development Team's vision on accomplishing tasks given by the Product Owner and their execution estimation in the time domain. Alternatively, as suggested by Scrum Alliance (2017), the Scrum Team agrees on the Sprint Goal that will be pursued along the Sprint converting it into the product increment.

The Development Team's estimation of work done consists of the list of items split into units of one day for a regular inspection reason. Under no pressure from either the Product Owner or the Scrum Master, the Development Team decides on the deadlines and amount of work to be delivered during both Sprint Planning and Sprint itself. There is an option to renegotiate the conditions all agreed to, should the Development Team realise that it is assigned to an unreasonably high or low workload.

It is expected that the Development Team is conscious of and able to provide a detailed explanation at the request of each step of the Sprint's Minimum Viable Product (MVP) creation, so that it is clear to both the Product Owner and the Scrum Master, although they might not and are not obliged to grasp the professional jargon of the Development Team. One might even think it facilitates teamwork when several departments with different backgrounds and ranges of focus are involved in product development. This is achieved when general terminology is used so that specific matters are explained in simple words, and understandable to non-professionals.

1.2.1.3 Daily Scrum

Schwaber and Sutherland (2017) comment that the Daily Scrum's turn is limited to fifteen minutes per working day. Unconditional presence at the meeting is anticipated from the Development Team and Scrum Master. While the meeting lasts, the Development Team's

responsibility is to maintain a positive trend, compared to that of the previous twenty-four hours, towards delivering the product increment over the Sprint. For discipline and complexity avoidance reasons Daily Scrums happen at the same time every day. With the help of synergic interactions and regular inspection of the collective progress, the Development Team exerts control on the forecast of the performance of the planned item. Should they assume a delay of an item delivery or a possibility of failure, an immediate adaptation is applied directed to optimise a problem causing factor. The Scrum Master's function lies in the field of coaching the flexibility, team communication, structure of the meeting, and respecting the fifteen-minute timeframe. Due to this approach, external influences or distractions from the working process have no chances to disrupt the advancement towards the Sprint Goal.

An abridged version of the Daily Scrum agendas stems from three principal questions that the Development Team's members should find answers to:

- How did I contribute yesterday to the Sprint Goal catalysation?
- How will I contribute today?
- Is there any obstacle that decelerates the progress?

After the above-mentioned issues are discussed, the Scrum Team proceeds to the actual realisation of the product increment that will be reviewed in twenty-four hours at the next Daily Scrum (Scrum Alliance, 2017).

1.2.1.4 Sprint Review

Schwaber and Sutherland (2017) explain that the Sprint Review duration counts four hours per month-long Sprint, and it is considered an informal meeting at which the Scrum Team summarises all changes made to the increment and hypothesises on the further steps focused on product value increase.

As described in the previous events, the Scrum Master monitors everyone complies with the time rules and is aware of the meeting purpose. The Sprint Review procedure involves the following characteristics:

- The Product Owner invites key stakeholders to demonstrate what has been done according to the plan.

- In case of any struggle within the Sprint, the Product Owner explains the nature of it and how it was addressed.
- The Development Team presents physical increment and replies to queries, if there are any raised.
- The Product Owner then gives a picture showing whether the product is delivered on time, or there is a postponement expected.
- Participants of the event prioritise future acts aimed at the product value increase during the subsequent Sprint.
- Recursion review of the time, budget, and external enterprise's objectives to study concordance with the current perception of these (Schwaber & Sutherland, 2017).

By the end of the Sprint Planning, each individual who anyhow engages with the product development possesses a sound vision of the product's future, current state, and critical manipulations done with the increment following the transparency maxim. Some might highlight that in case of deviating from the course set, the Scrum Team may quickly regroup its forces and retransform the product towards its value increase after the Sprint Review. The final phase of the Sprint cycle consequently emanates from the Sprint Review and is termed Sprint Retrospective.

1.2.1.5 Sprint Retrospective

The Sprint Retrospective is sometimes associated with the generally known phenomenon of learning from errors the one committed. Schwaber and Sutherland (2017) describe that during a maximum three-hour meeting, the Scrum Master promotes a positive and productive attitude towards teaching other team members to communicate what can be improved not only in the working process and tools but also in the relationships between people. In fact, the Scrum Master encourages the team with their own example of sharing feelings about either successful areas or those requiring improvement of the Sprint cooperation.

As a result, the Scrum Team formulates a list of improvements and a way to implement them in future Sprints. The Sprint Retrospective is another opportunity to employ the inspection and adaptation procedures which allows to receive more extensive feedback and prevents

conflict situations together with inefficient allocation of resources within the Scrum Team operation.

1.2.2 Scrum Artifacts

In the following sub-chapter, the Scrum Artifacts will be defined and outlined. The Scrum Alliance (2017) establish three fundamental devices aimed to assist the Scrum Team to achieve transparency, conduct inspections, and fulfil adaption. Chapter 1.2.1 indicates that Scrum functions in a routine of strictly time-limited iterations that substitute each other in an unchanged sequence.

Finally, the tools that help follow the routine and ensure the realisation of the three principles are called Scrum Artifacts. Schwaber and Sutherland (2017) agree on three of these artifacts:

- Product Backlog;
- Sprint Backlog;
- Increment.

In the following sub-chapters, each will be described and evaluated in detail.

1.2.2.1 Product Backlog

This chapter is devoted to the Product Backlog artifact explanation and the approach that should be employed while building it. Schwaber and Sutherland (2017) identify the Product Backlog by its content representing an order of all actions that are needed to be taken to develop a product. Reis (2009, August 3) recommends beginning with modelling the minimum viable product. The MVP is a version of the product that requires the least possible effort from the team; however, it possesses features of a working product.

The most significant advantage of such an approach is that it shows all team members the necessary steps to deliver a product without focus dissipation and less relevant parts of the product development discussions. On the other hand, Kozik (2020, July 6) points out a disadvantage of the MVP strategy in terms of time invested before a final part of the plan is communicated. In addition, Kozik (2020, July 6) emphasises that one should not confuse the minimal product with the minimum viable product. The difference is demonstrated in Figure 2.



Figure 2. The correct way to Build a Minimum Viable Product.
Reprinted from Kozik (2020).

Returning to the Product Backlog, the Scrum Team member that has responsibility for any manipulation with and within it is the Product Owner. The Scrum Alliance (2017) state that the Product Backlog is subjected to constant changes, so it is dynamic. The rate of change, as well as its vector, is positively correlated with that of the environment the product will be applied to. Each action listed in the Product Backlog whether it portrays a function, an improvement, or a task must comprise a description, an estimated date of delivery, and value. Naturally, with more feedback received product gains in value, whereas the Product Backlog becomes larger. As Sutherland (2014) claims, Scrum corporations prefer a “waterfall” model of product development shown in Figure 3 where the precedent team hands in their contribution to the product without further involvement in the production. On the contrary, the Product Backlog is universal and accessible to all Scrum Teams at any time of the cooperation.

As a result of regular inspections and adaptations, the Product Backlog items are often modified. Those alterations might impact the item description, meaning the latest information is taken into consideration, delivery estimation, and priority order. As a rule, items from the higher hierarchical order concentrate more information so that Scrum Team fully perceives its objectives within the item, whereas those from the lower orders might include minimum content. Primarily, before an item transit to the Sprint Backlog from the

Product backlog the Product Owner together with the Development Team reassures the item will be delivered within the length of the Sprint which, as stated in Chapter 1.2.1.1, usually lasts one month. Schwaber and Sutherland (2017) claim that the Scrum Team secures the maximum extent of the transparency principle, one of the three major Scrum features. Before moving on to the next chapter about the Sprint Backlog, it is worth mentioning that provided the Product Owner is responsible for the Product Backlog, it is the Development Team's jurisdiction to contemplate approximal dates for each item delivery (Schwaber & Sutherland, 2017).

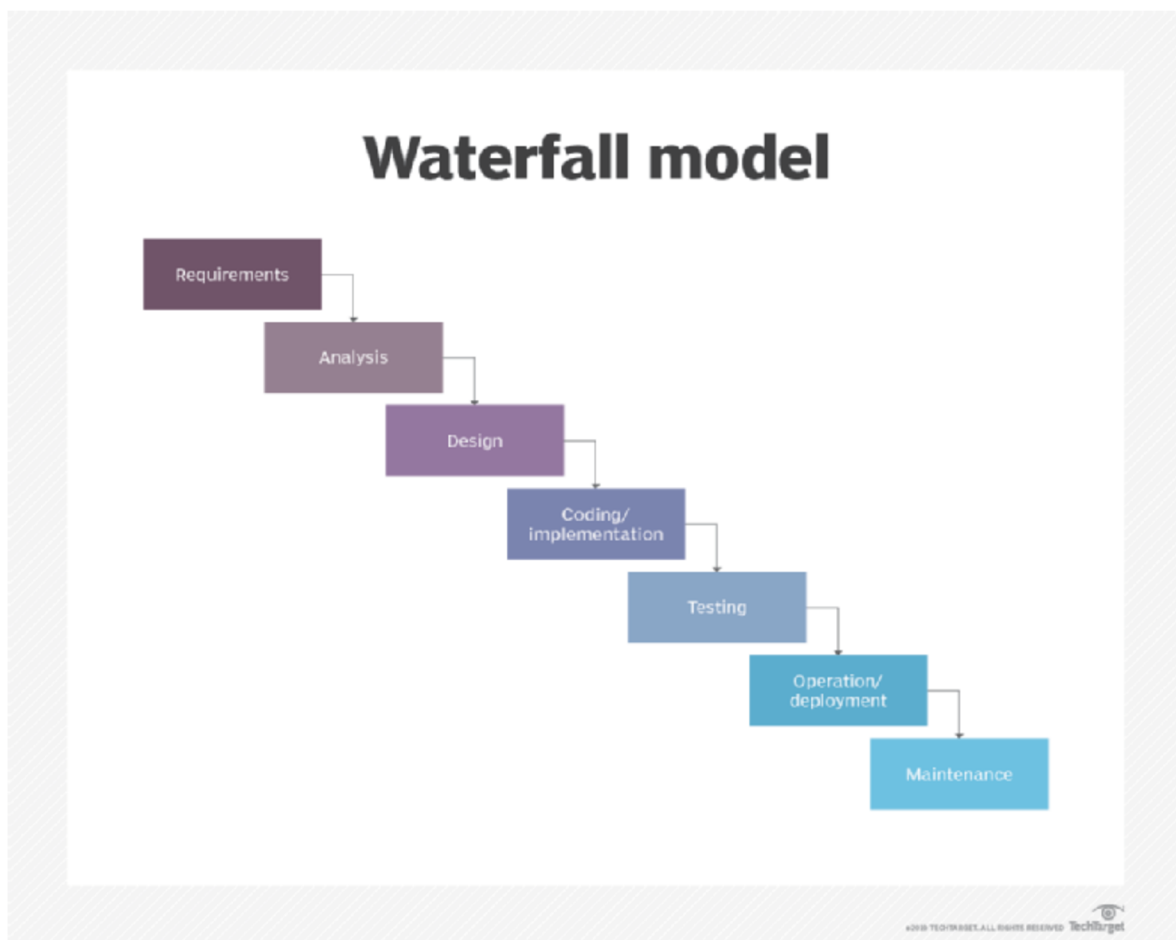


Figure 3. Waterfall model. Reprinted from Lewis (2019, February 1).

1.2.2.2 Sprint Backlog

This chapter focuses on the difference between the Product Backlog and the Sprint Backlog. Furthermore, Scrum Alliance (2017) embarks upon the specific use of the Sprint Backlog and its correct review. At first, Schwaber and Sutherland (2017) view the Sprint Backlog as a separate step that includes two procedures. A procedure number one designates items

selected within the Product Backlog to be transferred to the Sprint Backlog. The second procedure reminds the same sequence of actions that were initiated in the Product Backlog, notably the Scrum Team discusses and agrees upon items of the product development to be delivered by the end of the Sprint. Consequently, the Scrum Team attempts to deliver all the items chosen, hence achieving Sprint Goals.

The sharpest distinction is that Development Team is granted the authority to customise the Sprint Backlog, propose a solution to deliver an item, and predict the order of items accomplished as opposed to the Sprint Backlog, where the Product Owner is empowered to coordinate items and order of their execution. For that reason, when an item is defined as done the Development Team updates the Sprint Backlog. In case of an item carrying supervacaneous data is not needed anymore, the Development Team might remove or archive it. In pursuance of not violating the transparency maxim, each action performed within the Sprint Backlog is visible to the rest of the Scrum Team. To summarise the sub-chapter, the Sprint Backlog is the real-time system that demonstrates how the Development Team produces the Increment (Schwaber and Sutherland 2017).

1.2.2.3 Increment

The Increment is the summation of all the items that first originated in the Product Backlog, consequently relocated to the Sprint Backlogs, and finally were completed by the Development Team transforming into the final product. Despite the Product Owner's opinion about the readiness of the Increment to be released, it must incorporate a feature of being functional (Schwaber & Sutherland, 2017).

1.3 Advantages and Disadvantages of Scrum

The final sub-chapter dedicated to Scrum will formulate an analysis of benefits that Scrum implementation might bring. As one of the Scrum originators, Sutherland (2014), declares, Scrum is possible to implement into any endeavour. One might outline the first advantage that any group of people can reap benefits by learning how to use Scrum and apply it. Sutherland (2014) provides a surprising example of Dutch Ashram College (secondary education) using Scrum techniques to deliver complex school projects. Earlier, Sutherland (2014) found out that children working in groups as the Scrum Team improved both teamwork and personal skills such as planning, versatility, and punctuality. Besides, he was

informed that the average mark of pupils who used Scrum grew by 10 %. However, Shallow (2021, February 20) believes there is no surprise that a group of people with proper planning performs better. He points out another drawback related to Scrum – the more team members there are – the more Scrum loses its efficiency. The key in Scrum is team communication, logically with additional members time to express thoughts for everyone lessens. With an experienced team and the Scrum Master, this minus can be eliminated, since each member is aware of its role and function (Indeed Career Guide, 2021, June 3). Keita (2021, July 17) lists further advantages, such as efficient utilisation of time and financial resources, simplification of the tracking progress process, and accommodation to changes effortlessly.

On the other hand, Keita (2021, July 17) claims it is complicated for enterprises to switch to Scrum and implement it correctly by giving up traditional methods of product development, which require enormous resources. Lastly, by reviewing experts' opinions, it is obvious that Scrum suits best developing a complicated product. Moreover, the Scrum Master that helps to implement Scrum Values into the working process must be certified to make sure the methodology is followed appropriately and there will be no mistakes. Thus, if these conditions underlie product development, it will be possible to avoid the obstacles mentioned above.

1.4 Conclusion Drawn

Summarising the main outcomes of the chapters above, Scrum is strongly associated with Agile sharing the same origin. Scrum is a modern trend that replaces the existing techniques used in project management. Scrum methodology is applicable if its transparency, inspection, and adaptation principles are followed. Perhaps, the Scrum implementation area is potentially limited with the number of projects only. Originated in the software development industry, nowadays, Scrum assists in law and teaching. Nonetheless, Scrum is not easy to switch to. It requires constant improvement and discipline from each member of the Scrum Team following the cycle of Scrum Events. Despite multiple challenges on the way to mastering Scrum, continuous determination to enhance in accordance with the methodology might considerably ease any complex product development.

2 Current State of Knowledge of the Use of Scrum in Teaching and Learning English

The chapter aims to continue immersion into Scrum application, specifically its use in the sphere of education providing insights from the perspective of both students and teachers. The growing popularity of Agile, Scrum, and Agile in teaching resulted in the emergence of the eduScrum term. Thus, the chapter contains examples of eduScrum practices in English Language Teaching (ELT) classrooms including those organised in concordance with the higher educational institution curriculum. The following concepts such as English for specific purposes (ESP), English as a Second Language (ESL), and Content and Language Integrated Learning (CLIL) will be explained within the eduScrum examples.

2.1 Agile in Teaching

As it was mentioned in Chapter 1, Agile appeared in the software development industry, and Peha (2011, June 18) claims that “we in education have much to learn from the world of software development and that Agile gives us a well-reasoned, well-researched methodology from which we derive effective practice”. One of the reasons for that is the fact that students know how to study continuously and succeed in learning autonomy (Lazorenko & Krasnenko, 2020. Hardy-Gould (2013, January 29) affirms that

learner autonomy is when students take control and responsibility for their own learning, both in terms of what they learn and how they learn it. It takes as its starting point the idea that students are capable of self-direction and are able to develop an independent, proactive approach to their studies.

Forster (2017, March 20) agrees that learner independence can be accomplished with the help of Agile methodologies. Subsequently, Peha (2011, June 18) formulates twelve principles of agile schools:

- 1) The highest priority is to satisfy the needs of students through early and continuous delivery of meaningful learning.
- 2) Changing requirements are even useful in the late stages of the learning process. Changes are necessary for students as well as for teachers.
- 3) Cycles of meaningful learning should be experienced frequently, from a couple of days to a couple of weeks, with a preference to the shorter timescale.

- 4) Educational institutions, students, and a teacher should work together daily to make meaningful learning possible for all participants of this process.
- 5) Motivated professionals should work on an educational project. Giving them the environment and support they need and trust them to get the job done.
- 6) Face-to-face conversation is the most efficient and effective method of conveying information to and within a team.
- 7) Meaningful learning is the primary measure of progress.
- 8) The educational process promotes sustainability. It is of paramount importance to maintain a constant pace indefinitely.
- 9) Continuous attention to technical excellence and good design enhances adaptability.
- 10) Simplicity – the art of maximising the amount of work not done – is essential.
- 11) The best ideas and initiatives emerge from self-organising teams.
- 12) At regular intervals, teams reflect on how to become more effective, then modify their behaviour accordingly.

It is worth noting that the principles above are closely aligned with the Agile Manifesto presented in Chapter 1. According to the enthusiasts of the organisation Agile in Education, Wijnands and Stolze (2019, p. 96), the main objective of such an approach is to concentrate on the student's personality development.

2.2 EduScrum

The same year as the twelve principles were introduced the term “eduScrum” appeared (Lazorenko & Krasnenko, 2020). The creators and founders of eduScrum, Wijnands & Stolze (2019), believe that giving ownership and responsibility for their own learning process makes students become more independent and enjoy the studying experience more. Reston and Lima (2018, p. 332) report four major steps of the Scrum framework diagram for education:

- Think (the teacher defines the product backlog);
- Design (in each sprint, a subset of the backlog activities is selected);
- Do (during the sprint, the teams solve the problems of the sprint backlog); and
- Deliver (a product of sprint, reports of the solutions are delivered).

In eduScrum therefore, the teacher can be viewed as a Product owner (see Chapter 1.2) since the function requires knowing what the output should be by the end of each iteration;

Wijnands & Stolze (2019, p. 96) continue that teachers' responsibility is to inspire and motivate the student by determining the "Why" behind the studying process. Nonetheless, the obligation of "How" to achieve the set goals falls to the students.

Ferreira and Martins (2016) point out that eduScrum is based on dividing students into small groups (and so does Scrum, see Chapter 1.2.1). They also note that eduScrum officiates stand-up (an equivalent of Daily Scrum), sprint review, and sprint retrospective ceremonies. Long and Porter (1985, p. 207) notice that working in groups under careful instruction may be an "attractive alternative to a teacher-led method". Besides, Taqi and Nowreya (2014) support the idea of group work boosting the motivation and pleasure during the education amongst students. Apart from that, Wichadee (2007) claims that student cooperation during learning results in higher performance. Forster (2017, March 20) concludes that Scrum teams ought to expect excellent results from themselves instead of relying on the teacher.

2.3 Examples of Scrum Practices in Teaching

The purpose of this subchapter is to present cases when Scrum methods were applied in teaching. Paasivaara (2014) believes that Scrum can be used to teach university students. Therefore, some of the cases described below involve Scrum interaction between university teachers and their students.

2.3.1 Scrum Reading Project

Forster (2017, March 20) depicts the attempt of applying Scrum methods in the reading project for EFL students of Japanese origin. With the help of qualitative and quantitative types of research, it was found that Scrum wise approach may enhance the students' confidence in reading English books and influence such a metric parameter as a word count.

From the organisation perspective, students were split into groups of three or four forming a Scrum team. The teacher helped to nominate a Scrum master, so-called planning leader, and set a specific mentality in each team. Provided that the project was about reading, the mentality focused on the following goals: "Read a lot, enjoy reading a lot, and succeed at reading a lot". Scrum teams determined a week-long iteration of their Sprints meeting at the end of it and reviewed the progress.

Using the Scrum Board with a view to collaborative tracking of the progress, students used sticky notes with the information of books to read, the order of reading books, word count, and the reading speed of each team member. During the Scrum meeting, the sticky notes are moved to a respective column depending on whether planned activities, the number of read books, were completed, or not (Forster, 2017, March 20).

As Shallow (2021) points out (see Chapter 1.4), the success of the Scrum application, in this case, can be explained by proper planning. Besides, one might contribute to the limitation that the increased reading speed develops with regular practice, but not due to the Scrum methodology choice.

2.3.2 Use of Scrum in European Universities

Lazorenko and Krasnenko (2020) state that some research on Agile in an academic environment has been conducted, although the case of application of Agile methods at the ESP classroom experiences limited analysis. One might propose an argument supporting the thesis above that the actual implementation of the methodology takes a great deal of time. Perhaps, due to how relatively new the industry is, researchers might not have had enough time to deliver high-quality works.

Jurado-Navas and Munoz-Luna (2017) notice the advantages that Scrum application conferred the English Studies course into at the University of Malaga. They add that students developed self-sufficiency as well as “coexistence in heterogeneous human groups” (2017, p. 1). This suggests that the methodology encourages the multifaceted growth of the student’s personality.

Lazorenko and Krasnenko (2020, p. 251) were “the first to implement and evaluate Agile learning in the Ukrainian tertiary education, mainly to teach ESP at Cybernetics and IT Faculties”. A mixed-method research design was applied in the study, meaning that students were split into control (continued traditional education), and experimental (Scrum was applied into the educational process) groups. The quantitative results were gathered in the format of surveys conducted before and after the research. The findings of the study are based on the comparison of the pre- and post-test assessments of students’ language proficiency. Researchers introduced a special variable for measuring the efficiency of Scrum application and concluded that students from the experimental group showed nearly three

times better performance on the post-test assessment than that of the control group. This proves that Scrum implementation can improve participants' not only soft skills but hard ones as well, not to mention motivation growth and ability to adapt to a rapidly changing environment.

Course organisation included four steps that are planning, processing, presentation making, analysis and assessment. In this research, planning differs from the classical concept of Sprint planning outlined in Chapter 1.2.1.2. Here, it refers to the preparation or transition to starting employment of Scrum. During this stage, students split into small groups and Scrum roles are assigned the same way as it is described in Chapter 1.2. The processing stage stands for Scrum routine, stand-ups, sprints, and scrums, during which the team plans future work, covers the English course materials, and reviews both the progress and students' feedback respectively. By the end of each sprint, teams demonstrate their "work in different forms (reports, multimedia presentations, posters" (Lazorenko & Krasnenko, 2020, p. 249). Finally, in the analysis and assessment step, researchers provided evaluation based on specific criteria on how students had managed the project and delivered the presentation. Students likewise completed the survey on the eduScrum application attempt.

2.3.4 CLIL or ESP

The need for this chapter arises from the fact that examples of the use of Scrum in ELT were proposed in ESP classrooms, whereas this bachelor thesis undertakes the demonstration of Scrum application in the CLIL method.

Coyle, Hood and Marsh (2013, p. 1) define CLIL as

a dual-focused educational approach in which an additional language is used for the learning and teaching of both content and language. That is, in the teaching and learning process, there is a focus not only on content, and not only on language. Each is interwoven, even if the emphasis is greater on one or the other at a given time.

Kasper (1997) investigated whether 'content-based' materials may have any impact on ESL students. He created two groups of students. One group was assigned an additional content-based reading instruction, while the other remained without specific relation to any topic.

Basturkmen (2010, p. 10) summarised the findings of the study, language acquisition is more efficient when students obtain knowledge “through sophisticated linguistic input”.

ESP is concerned “with needs analysis, text analysis, and preparing learners to communicate effectively in the tasks prescribed by their study or work situation” (Dudley-Evans & St John, 1998, p. 1). Nunan (2004 p. 7) refers to ESP as “a subcomponent of language teaching, with its own approaches to curriculum development”. Considering the above, both CLIL and ESP share a homogeneous system built on ELT by means of the specific content. Even though it may seem that the two are similar, Master (1997) states that the concepts should not be compared because the ESP domain borrows that of content-based instruction (CBI, the North American equivalent to CLIL). Moreover, Dudley-Evans and St John (1998) mention an ESP drawback, a lack of theoretical fundamentals, whereas the CLIL method avoids it with the help of the dualistic philosophy filling the gaps with the other subject learning materials.

2.4 Conclusion Drawn

The chapter provided findings of positive impact on students’ advancement in language acquisition when Scrum principles were entangled in the learning process. Such a use of Agile methods caused Scrum to branch out into a separate niche, eduScrum. A distinguishing characteristic of eduScrum is its continuous focus on students’ personality development apart from accomplishing school or university assignments. Besides, a teacher is also a member of the team with the function of Product Owner. This approach might eliminate negative experiences that some experience in a student-teacher relationship. Despite the clear advantages of eduScrum practice, the disadvantages are the remnants of those of Scrum that are time-consuming switch to the methodology and the criticism of positive results explanation with the discipline factor. Having stated that eduScrum is a relatively new domain judging by the year it was founded in, a wide horizon is opened for potential research and studies of its application.

The final part of the chapter evaluated different approaches to ELT. ESP was outlined, since the Scrum practices described in the examples were applied to the ESP classrooms. The goal of ESP is to acquire learners’ language level proficiency based on their needs associated with the academic or professional field without an emphasis on the specific subject because the subject matter or content is a means to learn the professional language and skills such as

reading, listening, speaking, and writing. Unlike ESP, CLIL encompasses both language-related materials and the content of the academic discipline. It was depicted that ESP is a substantial part of the CLIL domain, hence the two concepts are incomparable. Provided that ESP is the CLIL subset, Scrum framework implementation might be even more sophisticated in the case of content-based learning. As of 2022, entering CLIL and Scrum together into the search field on researchgate.net does not show any research containing the two notions simultaneously. Thus, the practical part of the thesis employing Scrum principles through the CLIL method might contribute to future studies on the matter. Limitations associated with the CLIL method relate to the inability to concentrate equally on both language and discipline learning at the same time. One or the other prevails at a time.

3 Current E-learning Platforms for Learning English

In this chapter, two e-learning platforms and the term e-learning as such will be evaluated. The major checkpoints of distance learning development that led to its contemporary state will be mentioned as well. The importance of reviewing existing software solutions for online-based English learning will be an example of how to structure linguistic assignments in the practical part of the thesis.

3.1 Definition and History of E-Learning

Formerly, Khan (2010, p. 42) defines e-learning as “an innovative approach for delivering electronically mediated, well-designed, learner-centred, and interactive learning environments to anyone, anyplace, anytime by utilizing the Internet and digital technologies in concert with instructional design principles”. In other words, nowadays, an e-learning platform comprises hardware that is used by learners to run software illustrating a structured theoretical framework. One of the first real-time distance learning examples that transmitted both audio signals and graphic images is known to be Cyclops developed at the Open University in Great Britain in 1983 (McConnell & Sharples, 1983). Basically, Cyclops represented a teleconference at which the lecturer could draw graphs and diagrams on one of the television screens with the help of the light-sensitive pen. Furthermore, the distance learning activity was accompanied by the simultaneous commentary produced by the telephone speakers (Howe & McConnell, 1983).

The necessity to develop Cyclops arose from the fact that telephone tutorials that were widely applied before the 1980s are often inefficient when it comes to teaching science-based subjects. The problem lies in the difficulty to communicate information to the students through charts, graphs, and diagrams during the learning sessions (Robinson, 1982). While in the 1980s telecommunication industries, television and computers were employed separately, the last decade of the twentieth century is remarkable for all these technologies converged together (McGreal, 1994). Kentor (2015) reasonably notices that in the late 1990s there has been a rapid advancement of online distance learning when set in opposition to that of the 1980s.

Not long after World Wide Web (Web) became accessible to a wider community in 1991, the University of Phoenix was amongst pioneers in offering online courses via CompuServe

Information Service. This served as an example for both non-profit and for-profit institutions to explore educational alternatives (Carlson & Carnevale, 2001, December 2014). Rudestam and Schoenholz-Read (2002) affirm that business organisations were actively implementing computer exploitation for training newly hired workers. This endorses the statement that the schooling system and the corporate arena overlap in online-based education. It is worth mentioning that personal computers experienced a considerable decrease in their size and prices in the 1980s that resulted in the Internet and web-based distance education becoming affordable and available to a larger range of people (Corbeil & Corbeil, 2015). In favour of providing an example of a price drop of personal computers, IBM 5100 Portable Computer retailed for \$8975 (the inflation-adjusted price of \$44970) in 1975, whereas its antecedent of the year 1981, IBM Personal Computer 5150, cost \$1565 (the inflation-adjusted price of \$4332) (Comen, Sauter & Stebbins, 2016, April 15).

3.2 Modern E-learning Market Overview

The following sub-chapter explains the main drivers that led to the current trends of the online-based education market. In addition to the brief e-learning market segmentation, I conducted a one-question survey (see Figure 4) to determine the average price of the device students of the Faculty of Electrical Engineering and Communication (FEEC) at the Brno University of Technology (BUT) mainly use for studying purposes.

Average prices of the students' PC

Students at the Faculty of Electrical Engineering and Communication

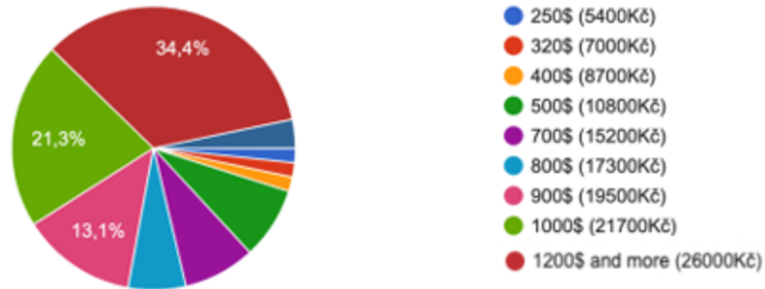
Choose the approximate price of the device you mainly exploit for studying purposes

- 250\$ (5400Kč)
- 320\$ (7000Kč)
- 400\$ (8700Kč)
- 500\$ (10800Kč)
- 700\$ (15200Kč)
- 800\$ (17300Kč)
- 900\$ (19500Kč)
- 1000\$ (21700Kč)
- 1200\$ and more (26000Kč)

Figure 4. A question from the survey.

Figure 5 illustrates the students' responses at two different stages to achieve better consistency in the survey analysis. The upper diagram shows the result of the survey when there were 61 respondents, and the lower diagram shows the responses of 107 participants, respectively. The main conclusion needed for the thesis at this point is that as of January 24, 2022, approximately 60 % of BUT students at FEEC invest a thousand dollars or less in the gadget chosen to assist in their studying.

Choose the approximate price of the device you mainly exploit for studying purposes



Choose the approximate price of the device you mainly exploit for studying purposes

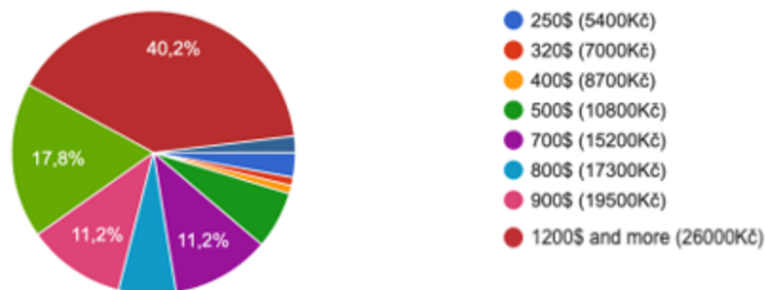


Figure 5. Google forms responses statistics.

This finding is another proof of the trend that technology able to reproduce multimedia content becomes more affordable to the masses. As it was mentioned in the last chapter this trend is one of the drivers for the online-based learning market growth. As of 2020, the global e-learning market was worth \$197 billion (Khan, Yogendra, & Kumar, 2021). Corbeil and Corbeil (2015) notice that the biggest distinction from previous decades was brought when mobile e-learning appeared. MarketsandMarkets (2015) value the global mobile learning market at \$7.98 billion. Besides, global mobile learning was predicted to grow by 36.3 % annually over a five-year period. Wadhvani and Gankar (2020) list the growing demand for online English courses in Asia and Latin America regions as one of the e-learning market growth drivers. Meticulous Research (2020) numbers Rosetta Stone Inc., Memrise, Duolingo Inc., and Babbel among the leading participants in the online language learning industry.

3.3 Duolingo

Teske (2017) defines Duolingo as an online language-learning platform. Botero, Questier, Cincinnato, He and Zhu (2018) mention that the Duolingo app is free of charge. It is available for phones and computers running on Android or iOS operating systems. Kunthara (2019, December 4) informs that Duolingo surpassed thirty million users and became a company with the evaluation of more than a billion dollars. Botero et al. (2018) add that Duolingo is the most popular language application.

3.3.1 Duolingo in Practice

For the Duolingo testing, it was decided to download an app from the App store. First, the app determines the language the future student wants to study. Furthermore, the user chooses the language on which the learning will rely. Next, Duolingo collects data on the reasons that encouraged to start learning the chosen language, and the current level of its proficiency. Meanwhile, users are shown the course overview, as illustrated in Figure 6, where they are introduced to the quantitative parameters of the content.

After the number of minutes per day, students ready to devote to the app as indicated, may complete test questions to identify their level in case of previous experience in studying this language. Alternatively, students may proceed directly to their first round of exercises. In the beginning, the range of types of exercises incorporates choosing the corresponding picture to the word meaning, transcribing the computer voice pronunciation of sounds, matching translation pairs, and translating phrases.

Further lessons involve users' interaction with the microphone to assess their oral skills in the target language as well as affirmative, negative, and interrogative sentences formulation in various tenses.

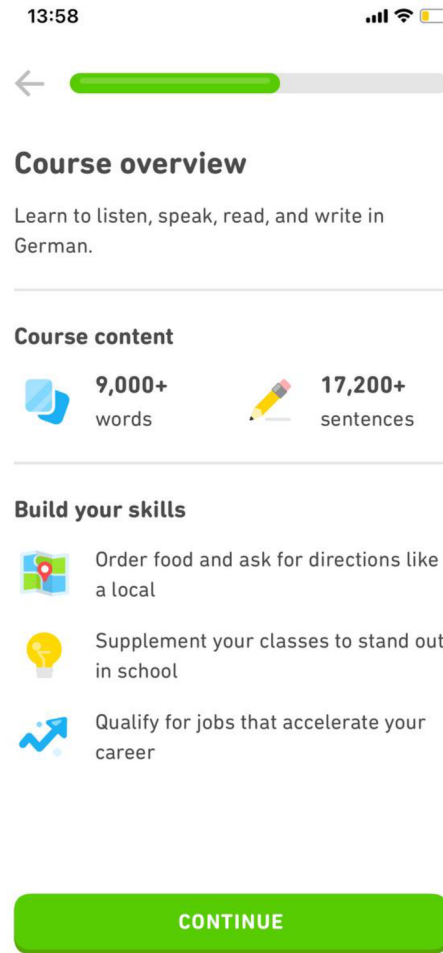


Figure 6. Course overview GUI of Duolingo. Reprinted from the Duolingo mobile app.

Once the first set of tasks is finished, the user can visualise the whole combination of the units Duolingo offers for the particular language. Course progression is organised as a downward passage meaning the first unit is located at the top of the structure, whereas the last unit of the course is at the bottom. Making a mistake causes the learner to lose a ‘heart’. The user that acquired a paid version benefits from the advertisement absence and an unlimited number of hearts.

Free of charge version supplies an account with a heart every five hours until the maximum number of hearts is reached. There are other ways to obtain hearts, for instance, by completing special exercises. Another way is to exchange some of the internal currency that the student earns completing exercises or purchases in the app.

3.3.2 Motivation in Duolingo

By means of notifications, the app constantly reminds users of the goals they set in the app. At the end of every learning activity, Duolingo distributes the experience points. The points refer to the extent to which the learner progressed in the language. Every following language the user decides to learn generates separate points. As of 2022, Duolingo encourages learners to compete with other users of the platform in a league, a weekly leaderboard in other terms. Depending on the points earned by completing sessions and units, competitors advance towards leading positions. Duolingo implemented a hierarchical concept in a league mechanism, therefore collecting more points will promote students to the leagues of higher ranking. Moreover, the app supports and popularises the idea of daily learning by assigning extra rewards.

3.4 Memrise

Memrise app serves as a vocabulary memorizing tool with elements of gamification applying its “automatic spaced-repetition system (SRS)” (Fathil, Alipour, & Saeedian, 2019, p. 34). They define Memrise as a freemium app, regarding its business model. This suggests that some of the features mentioned in Chapter 2.4.1.3 as well as advertisement deactivation become functional after users upgrade their accounts to a premium paid version. Esmaeili and Shahrokhi (2020) inform that Memrise offers not only language learning courses but also courses for other subjects.

3.4.1 Memrise in Practice

Unlike the Duolingo app, the Memrise platform is reviewed on the computer using the web version. The first procedure each user undergoes is the identification of the preferred language of the website and the choice of the language the one wishes to learn. Next, potential online students define their current language proficiency, complete registration on the website and proceed to the course selection. Depending on the language users decide to learn and the proficiency they stated earlier, Memrise offers a respective course.

3.4.1.1 Learn New Words Session

At the beginning of each unit of the course, the user is introduced to the *Learn New Words* session. It is based on the repetitive principle of a piece of vocabulary Memrise supposes for the user to be unknown and important for memorising. The repetition is executed in listening,

reading, or writing formats. Usually, a student sees a video of a person pronouncing a word or a phrase and its spelling in both languages chosen. Thus, students build an association with the help of the language that they already speak. When students wish to continue, in the next task they can listen to the pronunciation of the word and try to recognise it among incorrect alternatives by clicking on the box with the word. The further task requires a student to spell the played word without any additional hint. Another task that may appear in the case of memorizing an expression is to organize the words it comprises in the correct order. Per one session, there are several words or phrases that emerge randomly within one of the abovementioned types of exercise. While clicking and typing correct answers during the session, a student can watch the progression bar that signals how the session is close to an end. The more mistakes users do, the further the progression bar is from the finish meaning the more times the same tasks recur. This is one of the ways Memrise approaches students' motivation to complete exercises correctly. There are several people saying the same phrases letting the listener get used to a different gender, intonation, speed, and age group pronunciation.

3.4.1.2 Classic Review and Speed Review Sessions

The free version presents two other sessions called *Classic Review* and *Speed Review*. Task pops up and its accomplishment is indifferent from the last chapter session. Both sessions concentrate on the content that the learner is already familiar with. The most perceptible distinction is noted during the *Speed Review* activity. Memrise increases the extent of gamification by setting a time limit for each exercise. If the user responds incorrectly (no response within the given time limit is considered incorrect), one of the three 'hearts' symbolising an opportunity to make a mistake disappears. In other terms, losing three hearts prevents the student from successful session ending.

3.4.1.3 Memrise Interface

By clicking on the course, Memrise brings the user to the progress overview. The upper bar illustrates the up-to-date number of words students covered. Below this bar, there is a list of sub-courses that include a specific category of vocabulary. Some of them are available using the app only. Each sub-course allows for immediate inspection of its content, a list of vocabulary it assists to memorise. To the right of the course structure students have an opportunity to observe other users' progress in terms of points. Moreover, students can

compare their progress with the help of points obtained over a week, a month, and all-time periods (see Figure 7).

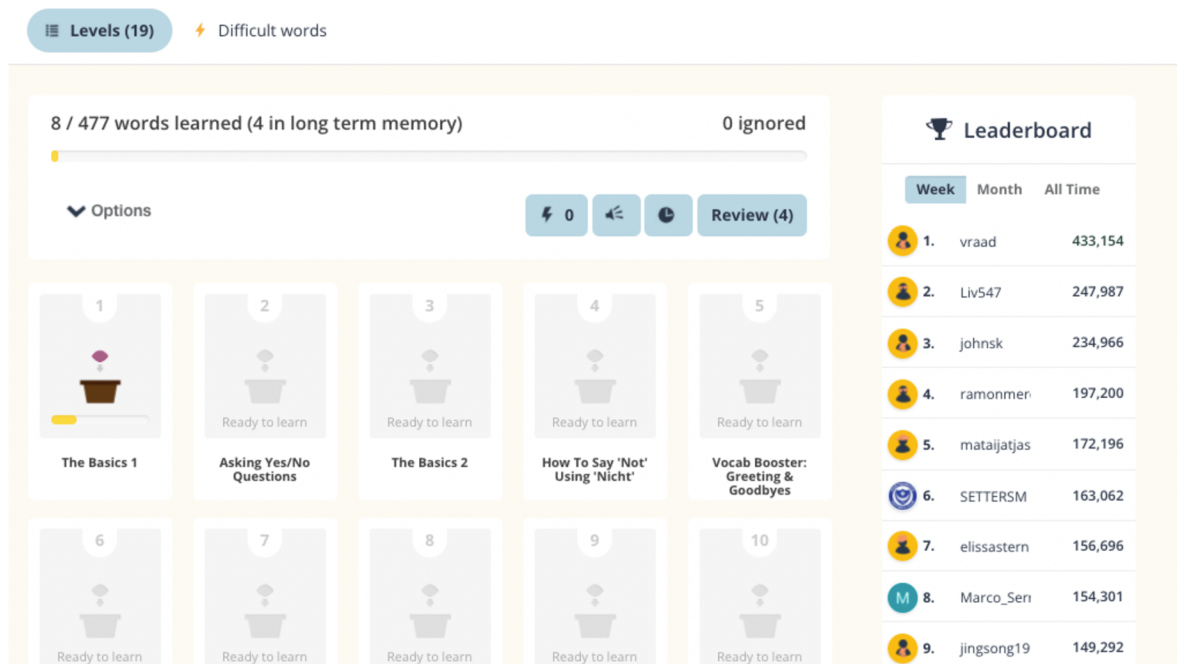


Figure 7. GUI of Memrise. Reprinted from <https://www.memrise.com/>.

Figure 8 shows the interface after the sub-course session completion. It is possible to detect the exact number of points awarded for the activity accomplishment. Besides, in the other window, Memrise provides the vocabulary the learner was introduced to specifically during this activity. The last window displays current week leaders based on received points (see Figure 7). Below the windows, six icons stand for various sessions. Three of them are already outlined in Chapter 2.4.1.1 and Chapter 2.4.1.2. The other three, namely *Difficult Words*, *Listening Skills*, and *Learn with Locals* are accessible through the paid subscription.



Figure 8. GUI of Memrise. Reprinted from <https://www.memrise.com/>.

3.4 Conclusion Drawn

Contemporary e-learning platforms offer a delivery and a way of interacting with various multimedia content for educational purposes. The market for online-based education, especially English learning platforms, is growing as well as the affordability of digital devices able to reproduce the content. The market leaders of Duolingo and Memrise have spent many labour resources and time to make their platforms user-friendly and efficient in terms of meaningful education. Due to the absence of such resources within this bachelor's thesis, the practical part will use Trello, freemium lightweight software, to perform similar core concepts of functionality as Duolingo and Memrise.

4 Trello Environment

This chapter introduces Trello as a cloud-based software development tool. Besides describing the fundamental functionality of the project management system, essential aspects applied in the organization of studying materials for the electrical engineering courses will be outlined.

4.1 Trello Core Concepts

Landing Page Generation Software (2014) denotes Trello as a “lightweight system for visually defining and tracking the progress of projects”. The initial mission of the Fog Creek Software company, which is now known as Glitch, was to develop a prototype that addresses difficulties in high-level planning (Trello, 2019). Lomas (2014) states that options for the application of “the visual organising software” range from company realignment plans to housekeeping to-do lists. She continues that the underlying component of the platform is represented by visual boards. The boards are the graphical overview of the project, whereas the cards distributed in the lists stand for a uniform part of the project (Landing Page Generation Software, 2014). The source underlines the importance of understanding Kanban which is translated from Japanese as a “signboard” for a rewarding experience with Trello.

Kanban method has been applied to the Toyota production system for over a three-decade period (Ohno & Bodek, 1988, p. 50). Similar to the Scrum Product Backlog described in Chapter 1.2.2.1, Ohno and Bodek (1998, p. 50) explain that Kanban “carries information vertically and laterally” so that other teams in Toyota and its partners may track record of changes in production. Another distinctive characteristic of Kanban that supports the simplicity of the method sticks to the use of three lists within which cards whirl. The lists are closely related to those of Scrum Artifacts mentioned in Chapter 1.2.2. Table 1 shows the relation of the respective Scrum Artifact to its equivalent in Kanban. Such a resemblance allows for as successful as Kanban adoption of Scrum Values in a project by means of the Trello environment.

Table 1. *Scrum Artifacts equivalence to Kanban lists.*

Kanban	Scrum Artifacts
Backlog	Product Backlog
Doing	Sprint Backlog
Done	Increment

Note: The author’s own interpretation.

4.2 Trello Functionality

The aim of this sub-chapter is to familiarise the reader with the main features of the platform needed to interact with the content of the practical part of the thesis. A special attention will be paid to the visual aspect of Trello, since it is one of the key advantages when compared to a number of alternatives (Suster, 2012).

After Trello was acquired by Atlassian in 2017, many features were added including workspaces. According to Atlassian. (2022, June 8), the Trello workspace is meant for the collaborative work of a team on a maximum of 10 boards possible to create in a free version. Figure 9 occurs when the workspace is created, and the name was assigned to the board. Besides, the board comprises columns called lists that hold cards. As it was mentioned earlier in this chapter there are various purposes to employ Trello, it is not a rule to implement Scrum or Kanban methodologies. This board specifically serves for note structuring. In other words, each card holds a piece of knowledge that reveals its content when clicked on.

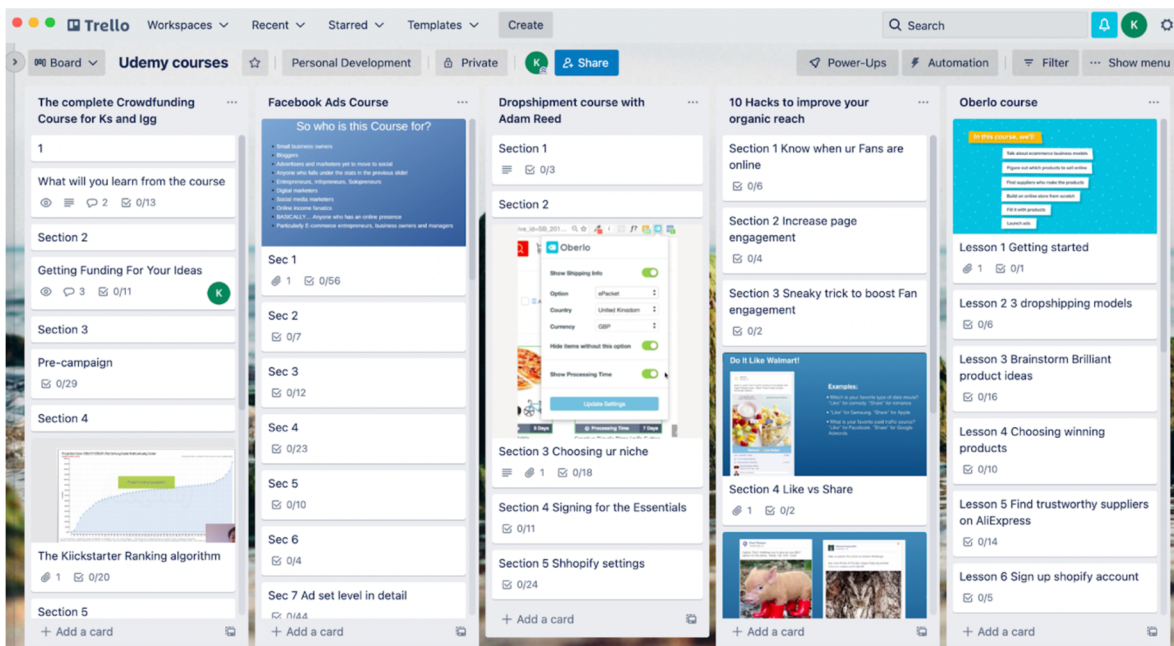


Figure 9. GUI of Trello, Workspace – Personal Development, Board – Udemy courses.

Reprinted from Trello desktop app.

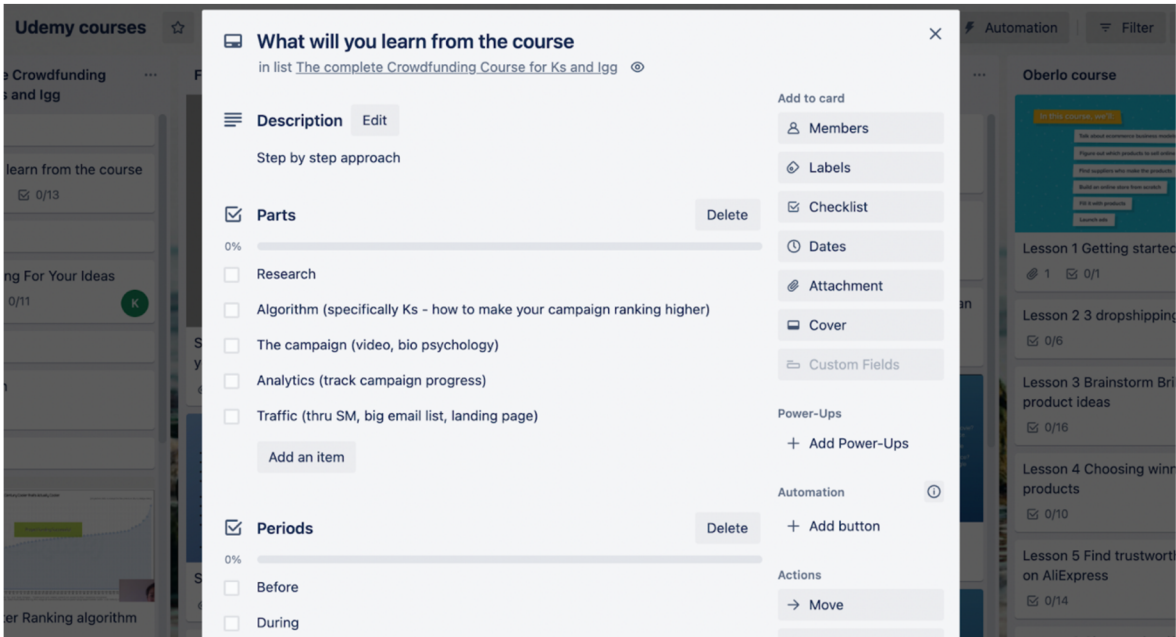


Figure 10. GUI of Trello, Board – Udemy courses, Card. Reprinted from Trello desktop app.

Figure 10 shows the frontend part of the Trello application when the user chooses to click on the card. A set of card actions, which are sufficient for the practical part demonstration purposes, is provided in Table 2. It should be noted that interpretations of possible actions may be adjusted according to the approach the user decides on when interacting with the tool. The meanings provided in Table 2 are believed to facilitate the promotion of Scrum Values in the case of the practical part of the thesis.

Table 2. Interpretation of essential Trello card actions.

Action name	Meaning
Add a more detailed description	Write the main body text of the card
Add a comment	Write a text visible at the bottom of the card. Allows for members' communication about the card
Save Dates	Set a deadline by when the card is to be delivered. Cards with sooner due date have higher priority
Add Checklist	Create a to-do list in case the card is of a high complexity
Add Attachment	Attach multimedia content to a card

Note: The author's own interpretation.

Obviously, Trello offers more functions, but there is no need to elaborate on them for the purposes of the thesis. On the other hand, it is worth noting that software members might want to link their Trello and email accounts to receive notifications about upcoming deadlines and actions of other members registered on the board. Additionally, the Trello application is accessible from both desktop and mobile devices (Husney, 2014, November 24).

4.3 Conclusion Drawn

The chapter focuses on defining Trello as a collaborative management tool that stores information in the cloud. Apart from summarising the core functions of the application, there is a discussion on a similarity between Kanban and Scrum methodologies. Considering functionality, each user or team may formulate their own approach to the software exploitation. However, Kanban forms the basis of the methods that “many software development teams have adopted” (Landing Page Generation Software, 2014). Scrum is not an exception; therefore, the chapter provides further information on the origins of Scrum and confirms the feasibility of the idea to combine such a methodology with the Trello framework. Another point to be mentioned, Trello has many competitors according to Best Trello Alternatives & Competitors for 2022 (2022, February 24), such as Asana, Jira, ClickUp, etc. The choice to use the Trello environment is based on my personal preference and positive experience with the app in the past.

5 Practical Application of Scrum in the Subject Electrical Engineering

This chapter describes the demonstration of a one-week cycle of a learning plan for the subject Electrical Engineering taught at the Faculty of Electrical Engineering and Communications at Brno University of Technology.

Figure 11 represents a Trello board created for the purposes of graphical allocation of learning materials. According to the traditions of Kanban-based methodology, the board contains the following lists, Project backlog, Sprint to do, In progress, Review and Done. Each will be elaborated during the illustration of an iteration.

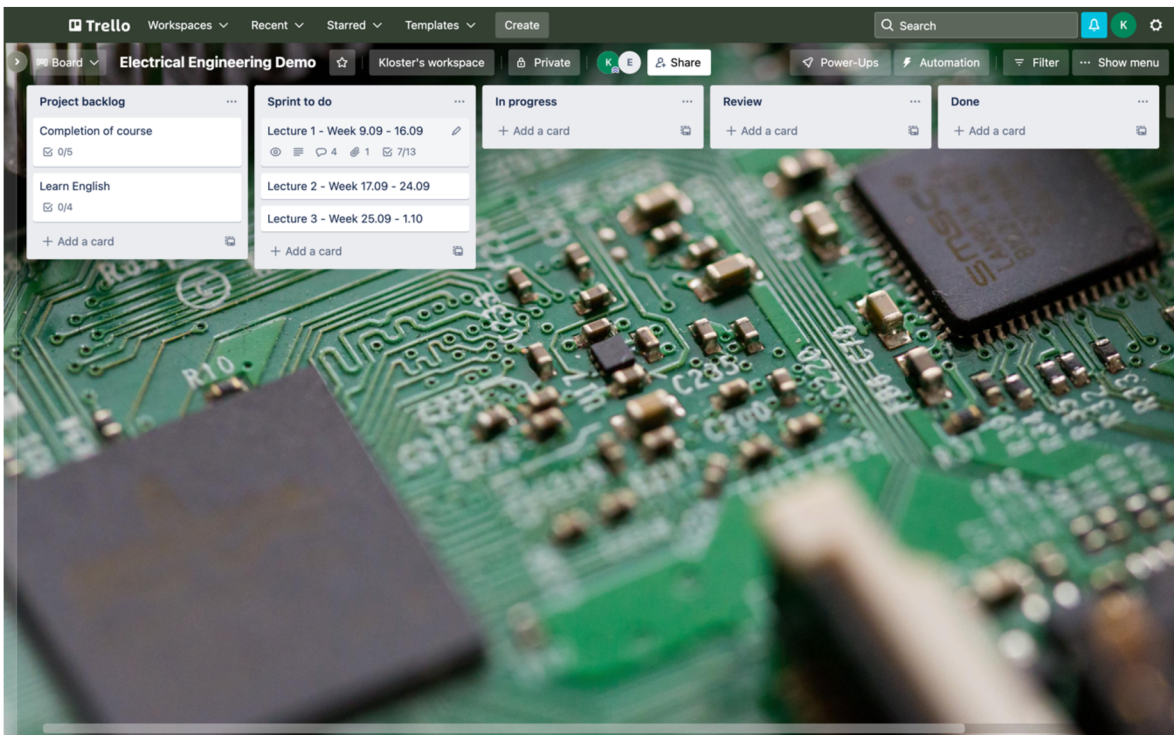


Figure 11. GUI of Trello, Board – Electrical Engineering Demo. Reprinted from Trello desktop app.

Let us assume that Scrum is integrated into the syllabus of the subject Electrical Engineering taught in English at a Czech university. Moreover, the objective of the course is to teach both electrical engineering and English likewise a dual-focused approach, namely CLIL (see Chapter 2.3.4). Therefore, the course requirements are filled into the cards of the Project backlog list (see Figure 11).

As is outlined in Chapter 1.2.1.3, the work planned for each iteration is harmonised in the Sprint to do list (see Figure 12). In Figure 12, it is also possible to see that the first Scrum Sprint started because the card named Lecture 1 moved from the Sprint to do list (see Figure 11) to the In progress list. The name of the card includes the starting and ending points as if the syllabus of the subject Electrical Engineering was split into weekly modules. Each module corresponds with a one-week sprint.

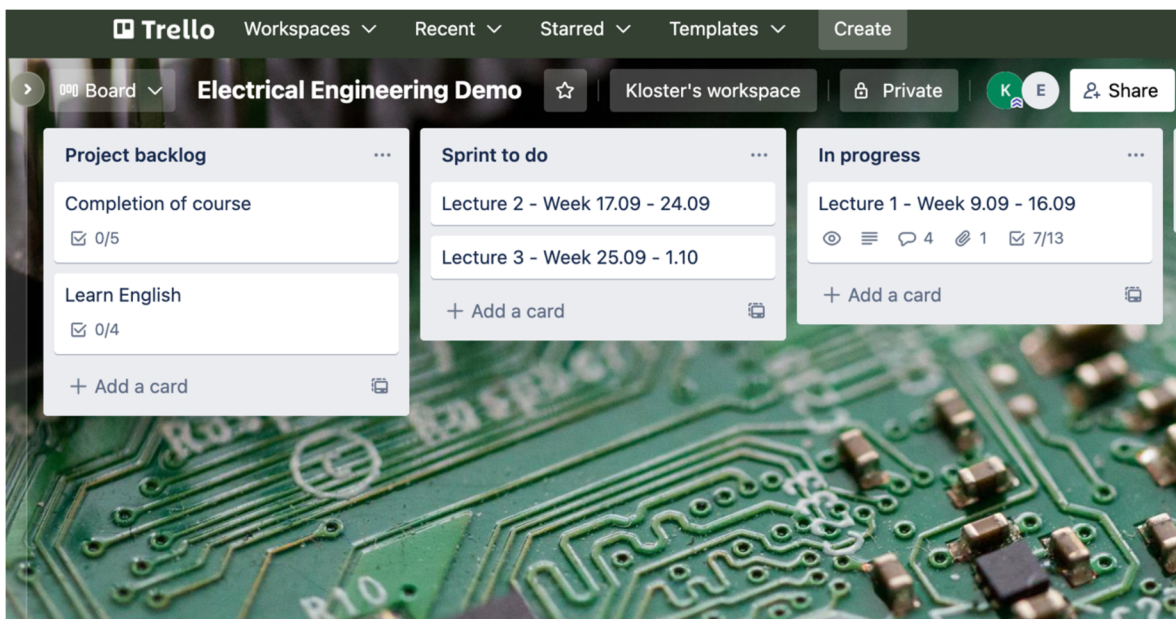


Figure 12. GUI of Trello, Board – Electrical Engineering Demo, Lecture 1 In progress.

Reprinted from Trello desktop app.

Once the card reaches the In progress column the Product Owner (see Chapter 1.2), the teacher, in the case of eduScrum, provides a description of the card (see Table 2). The demonstration version description expresses general instructions on the content of the sprint (see Figure 13).

Trello functionality allows for uploading content in various formats (see Chapter 4.2). Figure 13 shows the pdf presentation with electrical engineering materials in English. Below the attachment, there is a checklist (see Chapter 4.2) stating the sections of the first sprint lecture.

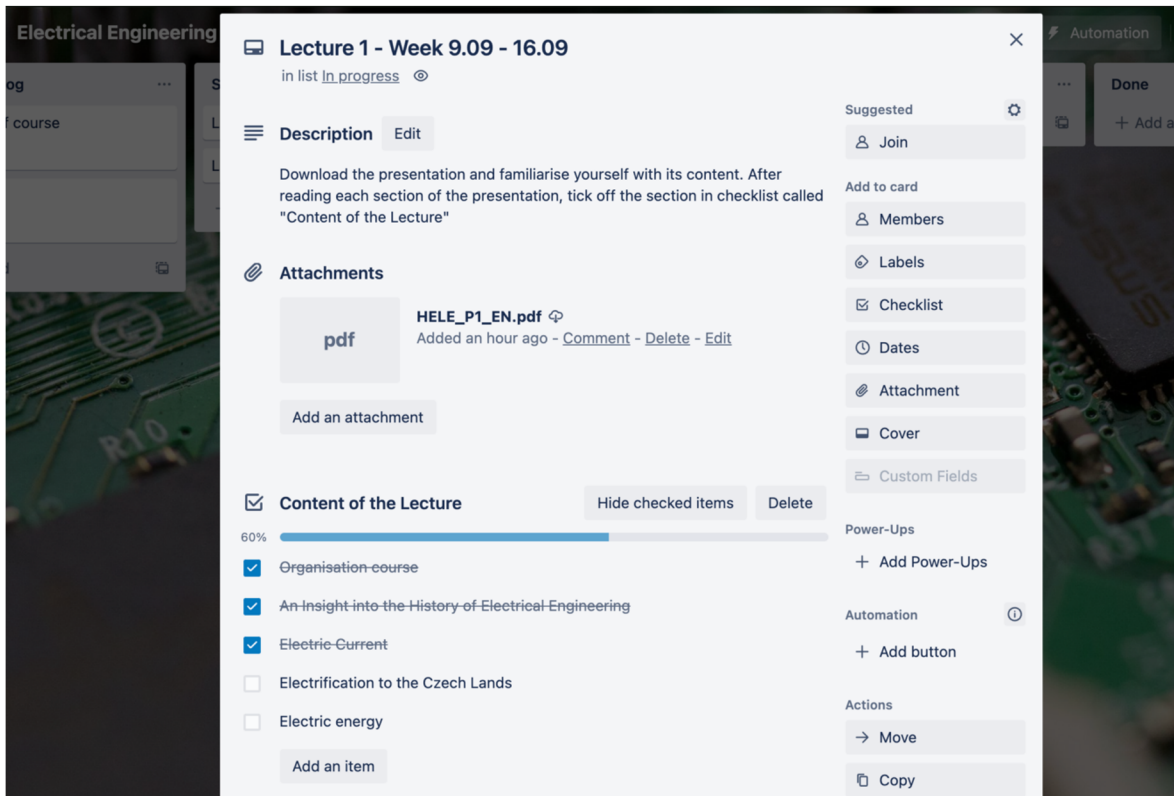


Figure 13. GUI of Trello, Board – Electrical Engineering Demo, Lecture 1 card. Reprinted from Trello desktop app.

Figure 14 shows further checklists that are possible to digitally cross off. The Done exercises checklist displays the progress of the student when accomplishing assignments provided by the teacher. Similarly, the teacher’s progress in reviewing the student’s tasks can be tracked in the Teacher’s assessment checklist.

Figure 15 represents the assignments provided in the comment section (see Table 2). The demonstration version comprises linguistic tasks that are based on the content of the academic presentation. Each task (see Appendix) is oriented towards developing a separate aspect of the English language. Let us assume that the course aims to improve students’ technical vocabulary, communication, grammar, and presentational skills through the English medium. Students have an option to complete their exercises within the card by replying to the comment with the task. Thus, the teacher can correct or comment on the student’s work in the same place where the task and lecture materials are. Some might think that this facilitates the process of reviewing students’ work.

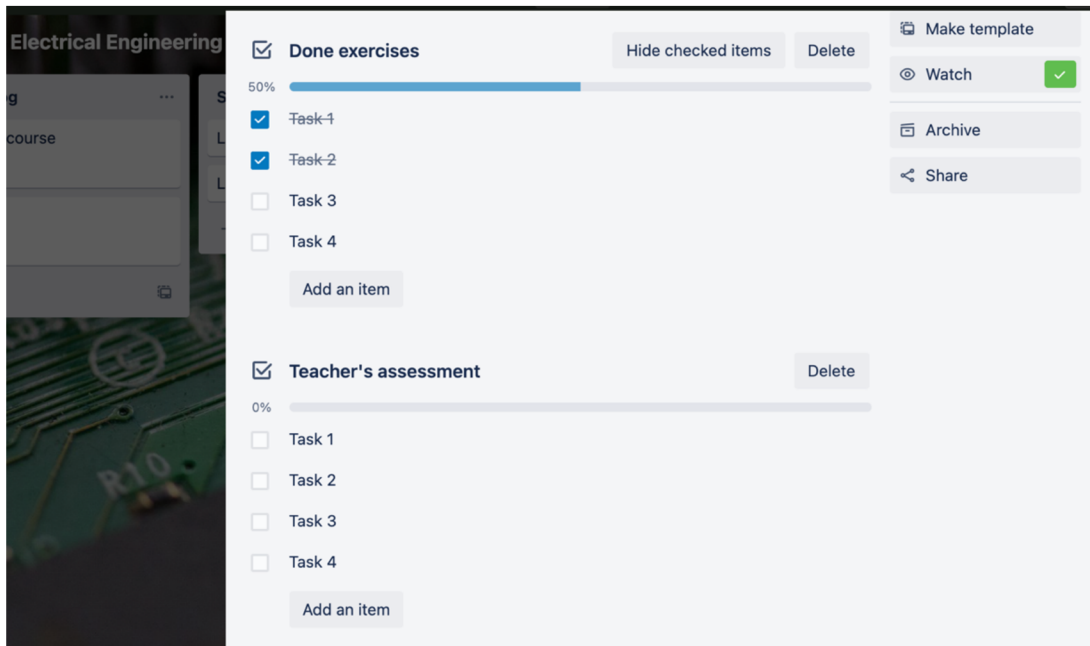


Figure 14. GUI of Trello, Board – Electrical Engineering Demo, Lecture 1 Checklists.
Reprinted from Trello desktop app.

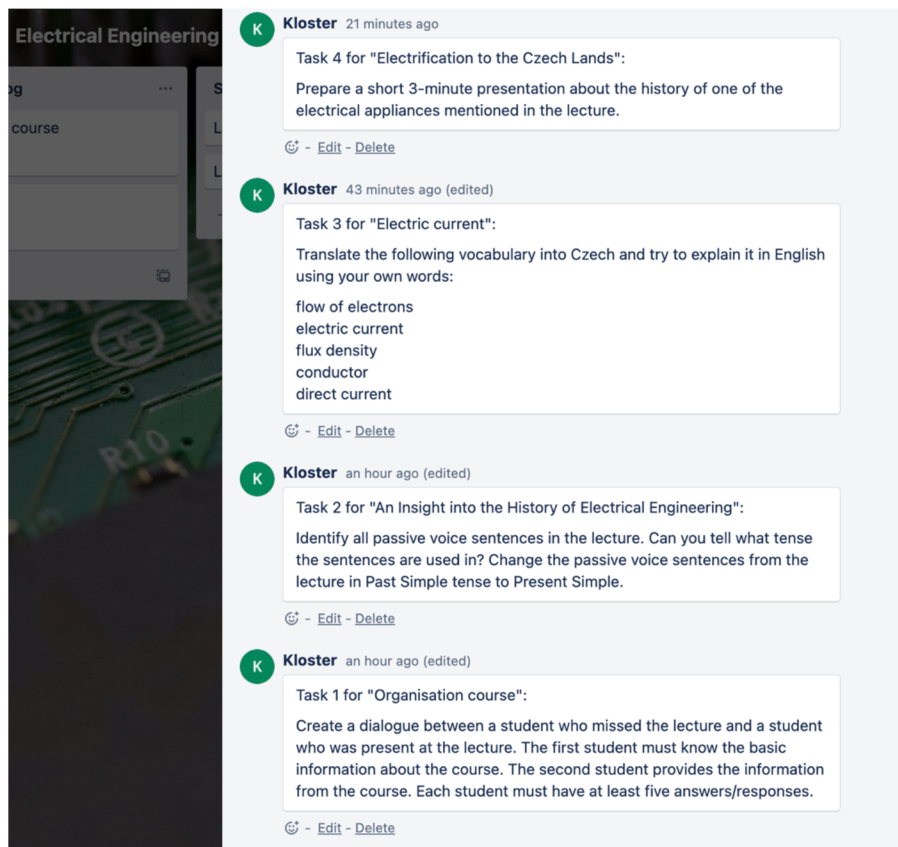


Figure 15. GUI of Trello, Board – Electrical Engineering Demo, Lecture 1 Comments.
Reprinted from Trello desktop app.

After the student's completion of the activities planned for the sprint the Lecture 1 card moves to the Review list (see Figure 16). Trello notifies the teacher about the student's progress. The teacher then reviews the work performed by the student.

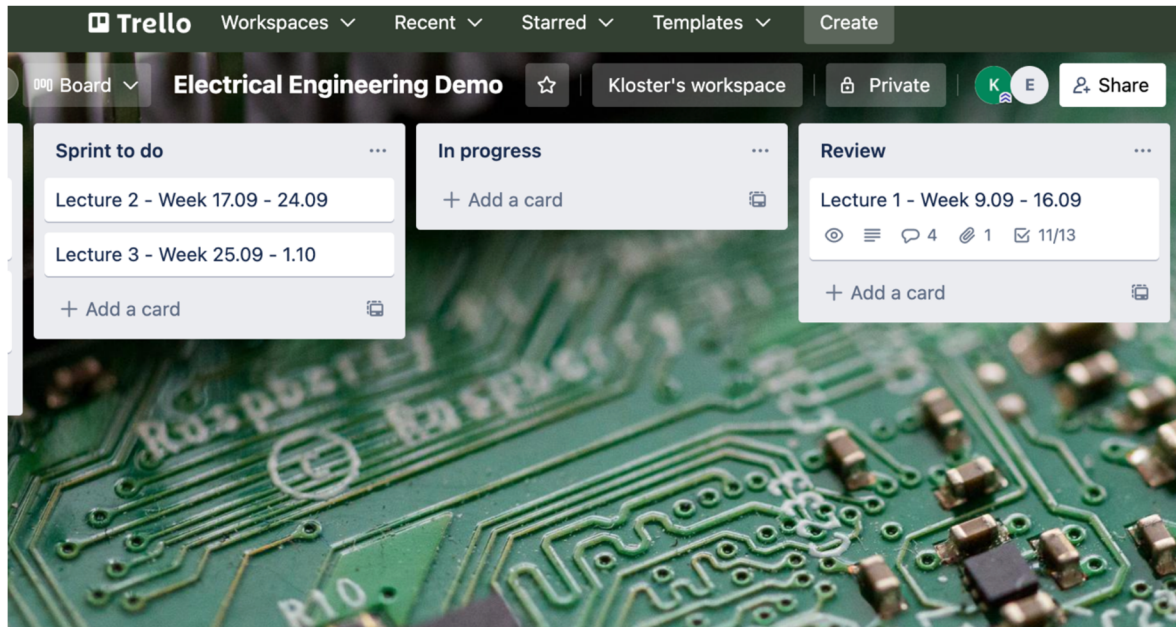


Figure 16. GUI of Trello, Board – Electrical Engineering Demo, Lecture 1 in Review.
Reprinted from Trello desktop app.

Based on the student's performance the teacher puts digital ticks against the completed activity (see Figure 17). It is worth mentioning that some of the tasks could be assessed personally only, therefore the course syllabus must address respective necessities. Scrum, in chapter 1.2.1.3, describes daily meetings that could assist with continuous advancement in terms of project objectives. The same principle may be applied in the demonstration version.

When both the teacher and the student complete planned activities in the card, the one-week sprint finishes, and the card is transferred to the Done list. The Done list serves the purpose for a further retrieval of the content when a student needs to revise the materials to meet course requirements, a test and examination, for instance.

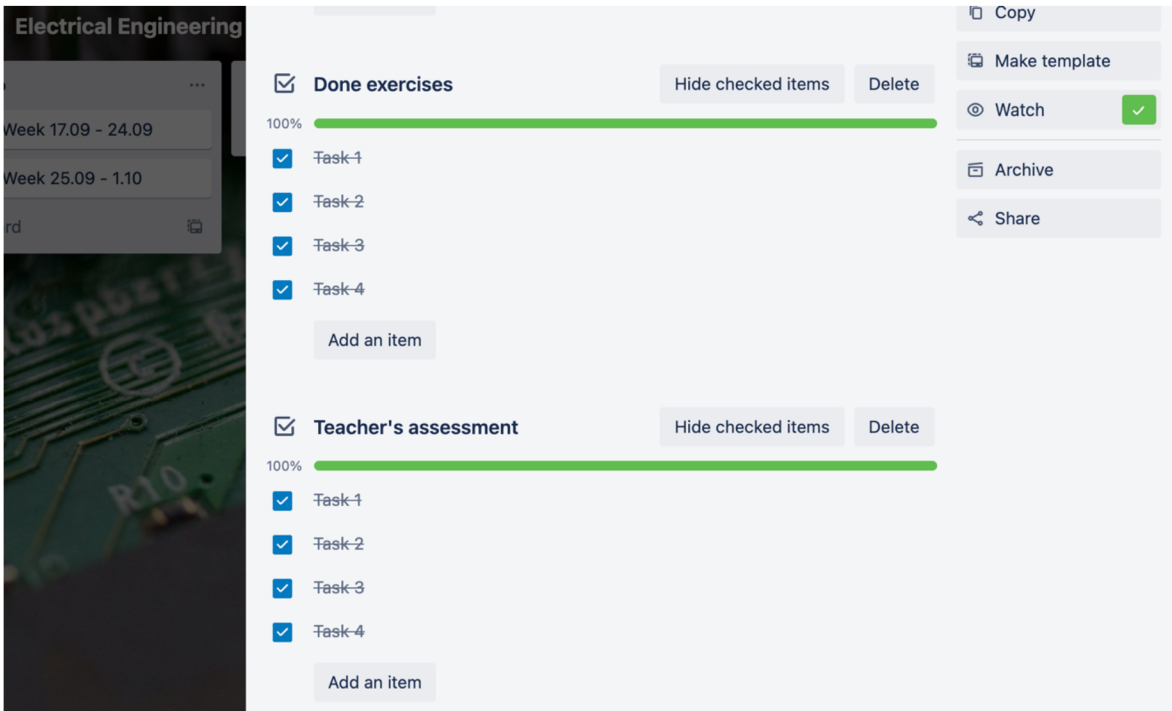


Figure 17. GUI of Trello, Board – Electrical Engineering Demo, Lecture 1 Reviewed Checklists. Reprinted from Trello desktop app.

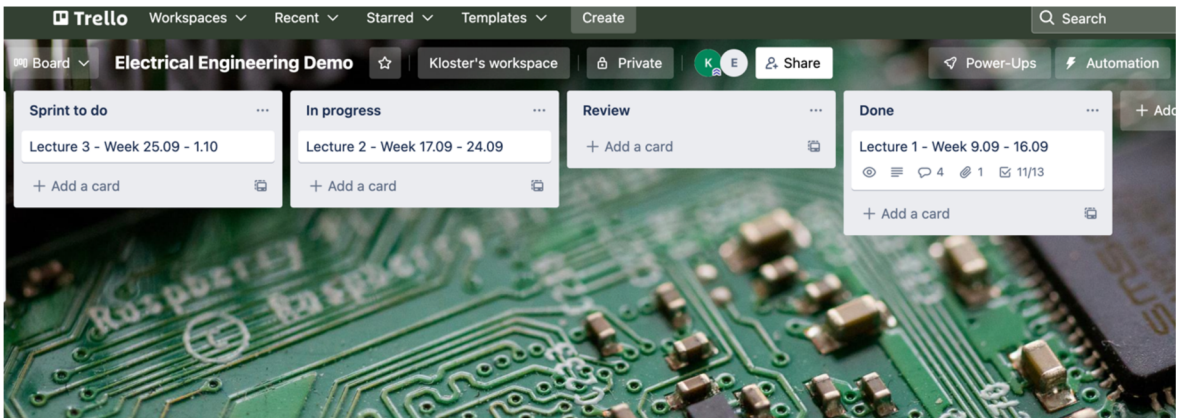


Figure 18. GUI of Trello, Board – Electrical Engineering Demo, Lecture 1 Done. Reprinted from Trello desktop app.

The end of the sprint automatically activates the beginning of the next one. At this point, the card named Lecture 2 is shifted to the In progress list concluding the cycle (see Figure 18). The procedure above is the first checkpoint in designing a multimedia platform for the study programme English in electrical engineering and informatics.

Conclusion

The aim of the thesis was to provide a theoretical framework of Scrum principles and values and, consequently to design a multimedia environment for the study programme English in Electrical Engineering and Informatics. The theoretical part of the thesis discussed Scrum, the predecessor of eduScrum, and its application in the development of a sophisticated project. Besides, it reviewed the state-of-the-art of the most popular multimedia e-learning platforms that focus on English language learning and described the first-hand experience of using software products developed by two leaders of the market segment that is Duolingo and Memrise. The fourth chapter of the theoretical part dealt with Trello software as an illustrative example of possible employment. Features like a user-friendly interface, freemium business model, and lightweight system made Trello an attractive software management tool alternative for designing the multimedia platform within its framework. Finally, the fifth chapter presents a manual on how eduScrum practice can be implemented in the subject Electrical Engineering in combination with the English language assignments.

First, the Scrum- and eduScrum-related works by its inventors and enthusiastic figures were carefully studied. It was found that Scrum is expanding the area of application. Primarily, the cases of Scrum implementation in teaching and learning were depicted in the thesis. The quality of literature research provided in the chapters on Scrum was limited to a small number of sources, however, the reason for that is due to referring to its founders and pioneers. On the contrary, eduScrum chapters allowed for deep literature research because each case illustrated a different approach. Interestingly, all the studies coincided in finding positive tendencies in students' advancement after integrating eduScrum into education. Besides, the chapter comprised a comparison of ESP and CLIL methods concluding that ESP is a domain of the CLIL syllabus. There was no study found that integrates the CLIL method combination with Agile. Therefore, the practical part of the thesis can be considered as the first checkpoint to creating content-based instruction for the subject Electrical Engineering through the means of the English language and respective exercises presented in Appendix.

Second, the e-learning market overview has indicated its worth and a growing segment of mobile language learning. Brief literature research and survey were conducted to prove the fact that computer technologies became more accessible and affordable when compared to

those of three decades ago. This suggests that it can be considered one of the factors that positively correlates with the developing e-learning industry. Furthermore, Duolingo and Memrise language learning programs were tested and outlined. However, it is important to mention that the third chapter of the thesis lacks a subchapter focused on advantages and disadvantages to complete the comparison of Duolingo and Memrise.

The last two chapters described an environment and a procedure for Scrum application for the study programme English in Electrical Engineering and Informatics respectively. Thus, the aim of the thesis has been accomplished, since the digital system was adapted to a demonstration version of the electrical engineering scenario of learning English. The limitation of the practical part lies in the fact that one cycle was illustrated only. Nevertheless, this limitation is compensated for a deep analysis of Scrum, eduScrum, and online-based English learning industries that was important to address before approaching the practical part. Therefore, it is possible to concentrate more on preparing materials for both linguistic and academic disciplines and assess practically the efficiency of students' response to the combined approach in future research on the matter.

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Appendix

Task 1 for “Organisation course”:

Create a dialogue between a student who missed the lecture and a student who was present at the lecture. The first student must know the basic information about the course. The second student provides the information from the course. Each student must have at least five answers/responses.

Task 2 for “An Insight into the History of Electrical Engineering”:

Identify all passive voice sentences in the lecture. Can you tell what tense the sentences are used in? Change the passive voice sentences from the lecture in Past Simple tense to Present Simple.

Task 3 for “Electric Current”:

Translate the following vocabulary into Czech and try to explain it in English using your own words:

flow of electrons

electric current

flux density

conductor

direct current

Task 4 for “Electrification to the Czech Lands”:

Prepare a short 3-minute presentation about the history of one of the electrical appliances mentioned in the lecture.