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Geassocieerde Faculteit Toegepaste Taalkunde

Apps for mobile language learning:
A market research into English language learning apps.

Kim Bracke

Scriptie voorgedragen tot het bekomen van de graad van

Master in de meertalige communicatie

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1 INTRODUCTION

Surveying the directions in mobile device technologies and management, Van der Meulen (2012) predicts that over one billion smart devices, i.e. smartphones and tablets, will be purchased in 2013. Carolina Milanesi, research vice president at Gartner, believes that "two-thirds of the mobile workforce will own a smartphone, and 40 per cent of the workforce will be mobile by 2016" (Van der Meulen 2012). The prevalence of mobile technology in today's society and the wave of technological innovations poses new challenges to tertiary education leaders who are to position their institutions for the twenty-first century. As the knowledge economy and ubiquitous communications technologies have precipitated significant societal changes and demands for new intellectual skills, they must provide practices that are "congruent with the needs and demands of this new knowledge society" (Garrison & Vaughan 2008: ix).

Building on Blended Learning Theory, Garrison & Vaughan (2008: xi) argue that new communications technologies offer great potential to support "intense, varied and continuous engagement in the learning process". Garrison & Vaughan (2008: x) define Blended Learning as "a coherent design approach that openly assesses and integrates the strengths of face-to-face and online learning to address worthwhile educational goals". It is therefore emerging as an appropriate "organizing concept in transforming teaching and learning while preserving the core values of higher education" (Garrison & Vaughan 2008: 143). Blended Learning Theory proposes an answer to Kuh et. al. (2005: 12), who assert that deep and meaningful learning experiences are best supported by "actively engaged learners". Garrison & Vaughan (2008: ix) question whether traditional approaches alone are to achieve the high levels of learning promised. They doubt whether those who have grown up with interactive technology are still comfortable with the information transmission approach of large lectures (Garrison & Vaughan 2008: ix). Blended Learning initially focussed on e-learning tools, however, mobile devices with enhanced capabilities offer new learning possibilities yet to be explored in depth by high school educators.

Churches et al. (2011: xiv) believe that mobile devices provide a "cost-efficient alternative" to traditional e-learning tools such as desktop laboratories and pods of laptops as they are becoming "more powerful, portable, affordable and accessible". With a large majority of students possessing ubiquitous digital devices, Knight et al. (2012: 30) herald a "mobile learning revolution". For students, the wealth of mobile devices, iTextbooks, cloud-based documents and education apps fosters "greater personalisation, collaboration, creativity and engagement in the learning process" (Knight et al. 2012: 30). Churches et al. (2011: xiv) confirm that the "power of mobility" has begun to play a significant role in the 21st-century classroom as students themselves start to bring "powerful computers with Internet connectivity, real-time communication tools, cameras, audio recorders, media players, and productivity tools".

As mobile learning (m-learning) has become an interesting research field in education, the question arises how and to what extent mobile devices such as smartphones and tablet devices may support learning and teaching practices in higher education. In order to identify the role m-learning plays in higher education institutions today, chapter 2 of this dissertation presents a status quaestionis which surveys the literature on m-learning in the academic context. It will explore current perceptions on m-learning and focus on how mobile devices are to contribute to learning English as second language. The goal is to identify which mobile devices are most suitable learning aids to higher education students and to provide a theoretical basis for the development and the introduction of pedagogically viable m-learning tools.

Furthermore, section 2.2 discusses mobile application software for educational purposes and introduces useful terminology needed to understand the growing appetite for education apps. Therefore, the mobile operating system (OS) market will be surveyed and discussed. As this dissertation aims at designing an education app for Dutch first-year undergraduates at University College Ghent, it will look into the possibilities different mobile OS-systems offer for the development of apps. The discussion will be concluded with a comparison between native, web and hybrid apps in order to determine which type of app is most suitable for the development of education apps.

Chapter 3 presents a market research which explores the present situation of education apps for English language learning on the app-market worldwide and in Flanders in particular. A closer look at pedagogically useful m-learning resources is needed as Sweeney et al. (2012: 3) found "a potential chasm between language learning app developers who lack knowledge of pedagogy on the one hand and language teachers who know about pedagogy but have little knowledge of mobile learning and app development on the other". Therefore, main features and developments will be assessed and particular issues will be dealt with.

Finally, this dissertation proposes an English irregular verb app design relevant to second language learners in Flemish higher education (cf. chapter 4). As the app is to foster an engaged and pedagogically useful learning experience which meets the needs and demands of students raised in the digital age, language learning preferences amongst first-year undergraduates need to be explored as well. Relevant data will be provided by a large-scale survey conducted by Steel (2012) and an additional small-scale survey conducted amongst Dutch first-year undergraduates at University College Ghent. The design case is to provide an empirical framework for further language learning app designs.

2 APPS FOR ENGLISH LANGUAGE LEARNING

The objective of this chapter is to introduce the terms ‘m-learning’ and ‘apps’.

First, m-learning will be discussed by means of a comparison of several different interpretations of m-learning and a clear distinction between m-learning and e-learning is made (cf. 2.1.1). I will argue why higher education is an appropriate venue for m-learning (cf. 2.1.2) and look into the benefits and disadvantages of m-learning (cf. 2.1.3). In order to decide which mobile devices are most suitable for instructional m-learning models in higher education, the key features of mobile devices will be briefly discussed in 2.1.4. As tablet computing is becoming more common in higher education institutions, the discussion on m-learning will be concluded with a brief discussion on the subject (cf.2.1.6).

Secondly, this dissertation will look closer into mobile application software, abbreviated to apps. New trends in m-learning, such as tablet computing, have considerably impacted the mobile OS-market. After an introductory chapter (cf. 2.2.1) on useful terminology associated with apps, I will therefore discuss the main providers of mobile apps on the market today (cf. 2.2.2) and briefly survey the history of app development (cf. 2.2.3). In addition, the distinct features, limitations and advantages of hybrid apps over the conventional native and web programmes will be discussed (cf. 2.2.4). Finally, this dissertation will focus on apps for English language learning (cf. 2.2.5) so as to introduce chapter 3, which represents a market research into English language learning apps on the market today.

2.1 M-learning for educational purposes

2.1.1 Introduction

Recent developments in communications and wireless technologies have resulted in mobile devices becoming widely available, more convenient and less expensive (Wu et al. 2012: 817). New features and applications appeal to digital natives as well as to educators and researchers. Technological advances have prompted educators to research on m-learning, i.e. mobile learning.

M-learning is often associated with electronic learning (e-learning) and computer-assisted language learning (CALL), which emerged in the late 80s and in the 90s. Since then, the increasing availability of portable and wireless devices have been changing the landscape of technology-supported learning (Hashemi et al. 2011: 2477). M-learning can be seen as an extension of e-learning. For example, according to Hashemi et al. (2011: 2478), m-learning can be defined as “exploiting ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning”. Sharma et al. (2004) further point out that e-learning “usually occurs in classroom, [at] home or [in] labs by sitting in front of a computer” whilst

m-learning "allows learning to occur in travelling with mobile devices" (cited by Lam et al. 2010: 309).

Although the field of mobile learning has grown significantly, m-learning still lacks an agreed definition. Winters (2006: 5) identifies four perspectives on m-learning. First, m-learning can be viewed as "an extension of e-learning" and placed on "the e-learning spectrum of portability" (Winters 2006: 5). According to Winters (2006: 5), a second perspective is to consider how m-learning is placed amongst different forms or styles of learning, other than the traditional classroom-based learning. Winters (2006: 5) applies the term formal learning to refer to "face-to-face learning in a stereotypical lecture".

Furthermore, he distinguishes between a techno-centric and a learner-centred perspective on mobile learning. From the techno-centric perspective, mobile learning is viewed as "learning using mobile devices, such as personal digital assistants (PDAs), mobile phones, tablet devices, and notebook devices", whereas the more student-centred perspective focusses on "the mobility of students" rather than on technological aspects (Winters 2006: 5). Adopting a learner-centred approach to design learning activities for m-learning, Huang et al. (2012: 11) interpret learner-centeredness to mean that "priority should be given to the act of learning and the needs of individual learners in order to make learning effective and to promote the highest levels of motivation and achievement".

Most researchers tend to stress such a learner-centred approach to define m-learning. Kukulska-Hulme (2008: 273), for instance, points out that m-learning differs from e-learning in its use of "personal, portable devices that enable new ways of learning, emphasizing continuity or spontaneity of access and interaction across different contexts of use". Taylor (2006: 26) adds the "overall context of contemporary society" which he characterises as "a mobile age". Similarly, Vavoula (2005) feels m-learning fits with "the unique work style requirements of the mobile workforce" (cited by Huang et al. 2012: 12).

From the pedagogical point of view, Hutchison (2008) confirms that m-learning is designed to cater for the needs of "the learners [who] are continually on the move" and Patokorpi et al. (2007) see m-learning as a supplement for e-learning in terms of "bringing yet a new dimension to technology enhanced education by giving learners expedient, immediate, reusable, persistent, personalised and situated learning experiences anchored in their real surroundings" (cited by Huang et al. 2012: 11).

To conclude, this dissertation will adopt Huang et al.'s (2012: 11) definition of m-learning as follows:

> […] any kind of learning that takes place in an informal setting of non-fixed and non-prescheduled times and locations through the interaction with both the virtual and the physical worlds on mobile devices in a personalised, collaborative, and blended manner as well as in a formal setting, where individual inquiry and collaboration are enhanced through the use of mobile technologies.

This is the only definition which does not see m-learning as an isolated activity but rather a blended one as it embraces m-learning in both informal and formal settings. Looi (2010: 155) found that m-learning research which focus on either formal or informal settings "fail to examine the integrated and synergetic effects of linking these two contexts of learning". Instead, by utilising "affordances" of mobile technology, i.e. their specific enabling features, he proposes "a seamless learning environment which encourages students to learn in naturalistic settings for developing context-specific competences" (Looi 2010: 156).

2.1.2 Mobile learning in higher education

Emerging mobile technologies and new applications facilitate communication, collaboration, sharing and learning in settings unbounded by time and location. According to Looi et al. (2010: 155) students spend more time in such informal settings than in formal classroom settings. The ubiquity of mobile devices on college campuses makes Cheon et al. (2012: 1055) believe that higher education is "a particularly appropriate venue for the integration of student-centred m-learning". Traxler (2007: 18) confirms that higher education students may be "ready to adopt m-learning sooner than K-12 students because more college students have their own mobile devices".

As mobile technologies are being widely applied in different fields of business, a growing number of tertiary educational institutions are integrating m-learning in their learning programmes. For example, the Harvard Medical School (HMS) which has issued personal digital assistants (PDAs) to their medical students in order to "facilitate learning and improve communication amongst mobile groups of students and faculty" (Sybase 2010). The faculty introduced the use of PDAs in face-to-face lessons through the mobile application "MyCourses" (Sybase 2010). According to the associate dean, Dr Halamka, this new blended learning programme enables students to "focus on learning, wherever is most comfortable and convenient for them" (Sybase 2010). Similarly, the University of Western Sydney (EWS) has moved to a blended learning environment for all degrees (Whibley 2012). The university believes that mobile devices are important to support its new IT-enhanced learning and teaching model (Whibley 2012).

Surveying successful implementation examples of teaching and learning with mobile devices in tertiary education institutions, Lam et al. (2010: 312) believe that m-learning "enhances learning experience in terms of student interest and engagement". Karchmer-Klein et al. (2012: 288) add that mobile devices encourage students to "use the capabilities technology affords them" and to "develop rich, dynamic, forward-thinking presentations of their knowledge". According to Johnson et al. (2012: 17), mobile technologies and applications affect the way students in higher education learn and have "considerable potential for our focus areas of education". Affordances found in mobile devices include

the easy transfer of their work from mobile to desktop environments, the autocorrect features whilst note-taking, instant learning assessment and more "in-person courses with incorporated online elements" (Johnson et al. 2012: 17).

In spite of the evident potential of mobile devices with enhanced capabilities, higher education leaders have not yet explored their possibilities in depth. Cheon et al. (2012: 1054), who investigated college students' positive perceptions towards m-learning in higher education, found that it will be hard to "shift a pedagogical culture to a mobile format" because learning with mobile devices involves "the orchestration of students, instructors, content, and institutions". Similarly, Boyatt et al. (2012: 182) argue that "any shift from a teacher-led learning environment to learner-driven exploration of knowledge" will encounter issues including "finding suitable material, adapting material for the user and supporting users to guide their own learning". In order to explore m-learning's potential in higher education, a closer look into its benefits and limitations is needed.

2.1.3 Benefits and limitations of m-learning

According to Wang et al. (2009: 524), m-learning has been gradually considered an effective way to support student-centred learning because it can make learning "more flexible, personalised and collaborative". Students can learn anytime, anywhere, on any device and share their experiences with peers (Want et al. 2009: 524). Similarly, Cheung (2010: 90) attributes the successful adoption of m-learning to three factors, namely "technological feasibility of mobile learning, learners' needs of flexible learning, and pedagogical benefits". Kukulska-Hulme (2010: 5) adds that "learners carrying personal tools which can be used for both learning and communication, means that mobile technology acts as a catalyst for an inquiry into learner preferences, skills and study behaviours".

Cheon et al. (2012) distinguish three types of learning approaches which can be supported by mobile devices, including individualised learning, situated learning and collaborative learning. First, they interpret individualised learning to mean that students can learn "at their own speed and according to their personal learning needs" (Cheon et al. 2012: 1055). Secondly, situated learning is realised as students use mobile devices to "learn within a real context" (Cheon et al. 2012: 1055). Thirdly, m-learning enables collaborative learning when "students use mobile devices to easily interact and communicate with other students" (Cheon et al. 2012: 1055). The app design described in chapter 4 attempts to create both an individualised and collaborative learning environment. For example, learners can personalise their learning experiences by creating their own lists of difficult verbs that they can revise anywhere, anytime. The collaborative aspect consists in sharing their results online and/or challenge their fellow students in the game-play mode.

From an educational point of view, Looi et al. (2010: 156) note that the portability and versatility of mobile devices have significant potential in promoting "a pedagogical shift from didactic teacher-centred to participatory student-centred learning". The mobility and connectivity of technological tools enable students to become "an active participant, not a passive receiver in learning activities" (Looi et al. 2010: 156). Similarly, Kukulska-Hulme (2010: 12) predicts that "learners will increasingly lead the way by sourcing and producing their own resources and software tools". Cheung (2012: 89) confirms that "mobile learning essentially enhances the learning effectiveness, allows more flexibility in time and physical location for learning, and encourages active learning and collaborative learning". He summarises the benefits of m-learning as follows:

> "In brief, mobile learning transforms the learning process and changes the ways of learning, creates new opportunities beyond the traditional classroom, offers flexibility and mobility in learning, expands learning experience in terms of time and place, facilitates communications and interactions among teachers, students and course administrators as well as encourages the mode of collaborative learning" (Cheung 2012: 90).

Evaluating the effectiveness of m-learning, Wu et al. (2012: 818) found that most research showed positive effectiveness. For example, research by Al-Fahad (2009: 117) confirmed that m-learning could improve retention amongst undergraduate M.D. students and Baya'a & Dahar (2009: 12) found that students responded positively to the use of mobile phones in learning mathematics. Highlighting students' positive attitude towards mobile devices, Looi et al. (2010: 163) believe that m-learning might trigger an important change in student value and character, which can "gauge students as lifelong learners and persons-to-be".

Besides benefits, previous studies showed some limitations as well. Cheon et al. (2012) name three main limitations, including technical, psychological and pedagogical limitations. First, the small screens with low resolution display, inadequate memory, slow network speeds, and lack of standardisation and comparability are regarded as technical limitations (Cheon et al. 2012: 1055). Secondly, users' psychological limitations include students' inclination to "use mobile devices for hedonic uses such as texting with friends, listening to music and checking social network services, rather than for instructional purposes" (Cheon et al. 2012: 1055). Lastly, Cheon et al. (2012: 1055) note that using mobile devices in class may "hinder student concentration and interrupt class progress", which is considered a pedagogical limitation of m-learning.

Nevertheless, Cheon et al. (2012: 1062) add that emerging technologies could resolve the technical limitations found in mobile devices, such as lower resolutions, network speed, and platform comparability, making them useful in many learning activities. Cheung (2012: 93) addresses some of these activities, including reading e-books and course materials, viewing video-taped lectures, doing assignments, browsing the Internet for learning resources, communication with teachers and/or

students in e-mails, chatting in discussion forums, and social networking. According to Cheung (2010: 89), students have become adapted to m-learning with the advent of new mobile devices benefitting from "sophisticated functional features and user-friendly interfaces". The authors conclude that instructional design models are needed which consider both advantages and limitations of mobile devices (Cheon et al. 2012: 1055).

2.1.4 Mobile devices for learning purposes: key features

In order to examine the effectiveness of m-learning, a closer look into the key features of mobile devices which can be used for learning purposes is needed. Cheung (2012: 91) defines mobile devices as "small and hand-held computing devices with a display screen, touchpad or keyboard input". They usually have a weight of less than 2kg, most of them have access to the Internet through Wifi or 3G/4G broadband networks and typical functional features are web browser, e-mail, e-book reader and other application tools (Cheung 2012: 91). Lam et al. (2010: 310) use the term personal digital assistant (PDA) to describe any mobile device which "stores digital information and supports internet access, wireless network access and handwriting input". A PDA allows access to e-mail, web content and plays video and audio files (Lam et al. 2010: 310).

Listing different affordances in choosing a mobile device for school-based research, Looi et al. (2010: 164) provide a framework for assessment in a m-learning environment. These affordances include platform operating system, form factor (weight, size and screen resolution), mobility ('paperback book' mobility versus 'pocket size' mobility), connectivity (Wifi, Bluetooth, 3G/4G broadband), applications, telephony support, battery, durability, cost, support by the supplier, features (camera, pen-based input, keyboard, user-friendly interface, voice or audio) and memory storage (Looi 2010: 164, cf. Appendix I). On the basis of these functional features, Cheung (2012: 91) categorises mobile devices into notebook devices, tablet devices and smartphones.

According to Cheung (2012: 91), a notebook device has a screen display of 9-inch to 15-inch width, a keyboard with a touchpad or a pointing stick, and its battery life is usually less than five hours. Notebook devices use the conventional PC processors, a traditional magnetic hard disk, and their operating systems and application software and tools are identical to those used in desktop PCs (Cheung 2012: 91). Tablet devices have a screen display of 7-inch to 11-inch width, touch-screen based navigation, a virtual keyboard, their battery life is about five to ten hours and they work on specific operating systems such as Android, Windows Phone OS and iOS (Cheung 2012: 91). Although tablets require different processors from those in desktop PCs, Cheung (2010: 91) notes that many tablet devices can run typical PC application software and tools. Lastly, he defines smartphones as "mobile phones which provide computing, processing and communication functions" (Cheung

2010: 91). A smartphone has a screen display of less than 7-inch width, supports touchscreen-based navigation, has a virtual keyboard and its battery life is about ten hours (Cheung 2010: 91).

The key features of mobile devices are summarised in the table below:

	Notebook	**Tablet**	**Smartphone**
Screen	9-inch to 15-inch width	7-inch to 11-inch width	less than 7-inch width
Navigation	Keyboard	touch screen virtual keyboard	touch screen virtual keyboard
Battery life	less than 5 hours	5 to 10 hours	About 10 hours
Software	- PC processors - traditional magnetic hard disk - operating systems (OS) and application software and tools similar to those used in desktops	- different processors - mobile OS - can run typical PC application software and tools	- mobile OS

Table 1: Key features mobile devices (Cheung 2010: 91).

Smartphones and tablets benefit from their light-weight and longer battery lives. Smartphones, however, do not support more sophisticated software and tools, and they are perceived as less convenient to view comprehensive webpages and in typing and note-taking (Cheung 2010: 92). According to Cheung (2010: 92) tablet devices running on conventional PC operating systems and notebook devices offer clear advantages in terms of functional features. Furthermore, notebook devices have larger storage capacity, whereas tablet devices and smartphones use solid-state memory with smaller storage capacity (Cheung 2010: 92).

With today's technological advancements in iProducts, Android devices and Windows Phone 8 products, limited features and expandability are no longer valid arguments against m-learning. Godwin-Jones (2011: 2) notes that almost all smartphones and tablets today benefit from "high-resolution screens, a responsive touch screen, voice recognition, faster 3G or 4G cellular connectivity and enhanced built-in storage with flash memory". Godwin-Jones (2010: 3) further argues that the functionality of current smartphones "available anytime, anyplace" provides "tremendous opportunities for educational use". Not only do hardware enhancements promote m-learning, new opportunities arise from mobile application development as well (Godwin-Jones 2010: 3).

2.1.5 Mobile devices for learning purposes: tablet computing

Surveying the use of mobile devices in learning activities, Cheung (2010: 96) found that the conventional notebook devices are most preferred in all learning activities. Though benefitting from a "sufficiently large screen display and easy-to-use navigation tools, smartphone devices are not yet widely used for learning" (Cheung 2010: 96). Improved network speed (3G or 4G) and the successful release of the iPad in April 2010, however, have prompted the belief that "it is [the] iPad, and similar [tablets] that will follow, which will truly change and revolutionise the world of language learning and teaching in the coming years" (Ireland et al. 2010: 35).

First, tablets' touch technology is recognised as an important advantage over notebook devices. Exploring the impact of the iPad and the iPhone on education, Nooriafshar (2012: 2) notes Apple's touch technology, i.e. tap, pinch and draw capabilities using fingers on iPad and iPhone, creates "a more natural interface between the user and the machine". Similarly, Johnson et al. (2012: 14) state that the tablet's touch technology allows the user "to interact with the device in completely new ways that are so intuitive and simple they require no manuals".

Other hardware advantages include their high-quality screens and expanded features. Tablets already serve as high-quality video players with instant access to social networks and digital readers for books, magazines, and newspapers (Johnson et al. 2012: 15). In addition, new technologies such as smart pens are believed to further expand the tablet's educational potential. Smart pens allow the learner to write on paper and at the same time utilise the computing power of the device (Nooriafshar 2012: 5). For language learning, for example, the learner can write words on special dot paper and the pen will translate, display and pronounce the word (Nooriafshar 2012: 5).

In addition to these hardware features, Nooriafshar (2012: 3) believes that the desire to explore the tablet's potential in learning and teaching results from the wide variety and availability of mobile device applications, abbreviated to apps. Hundreds of thousands of specialised apps are available to extend the functionality of tablets, most of which include location awareness, network connections, and other built-in sensors (Johnson et al. 2013: 16). Apps range from games to e-books and productivity apps which allow for taking and sharing notes, creating to-do lists, organising academic schedules, etc. According to Bloomberg (2013), digital textbook apps in particular offer "extended educational uses in tablet computing".

In order to reduce textbook costs, a growing number of educational institutions have adopted digital textbooks available on tablets (Bloomberg 2013). Key tablet manufacturers Samsung and Apple now provide educational textbook content for their tablet devices and are working with global learning companies, including Houghton Mifflin Harcourt, EverFi and Pearson (Bloomberg 2013, Rismiller 2013). Reynolds (2011) believes that digital textbook sales will surpass 25 per cent of combined new

textbook sales for the higher education and career education markets in the US over the next five years. According to Nooriafshar (2012: 5), digital textbooks allow text to become more powerful and appealing in terms of learning. EverFi's learning platform, for instance, leverages "adaptive and engaging technologies, including 3D gaming, simulation, social networking, and virtual worlds" (Sykes 2013).

As tablets offer rich, full-featured, game-based learning apps, Johnson et al. (2013: 20) link the success of tablet computing for learning purposes to the growing interest of gamification in education. Game-like environments transform tasks into challenges and reward people for dedication and efficiency through leader boards, rewards and badges (Johnson et al. 2013: 20). As game-based learning has proven to stimulate productivity and creative inquiry amongst learners, a growing number of educators is involved in designing effective game frameworks that transform learning experience (Johnson et al. 2013: 20). According to Johnson et al. (2013: 20), tablet computing further expands opportunities for game-play in education as it allows participants to engage "any time from any place".

Before exploring the gamut of education apps on the market today (cf. 2.2), the following section will briefly discuss how tablet computing is currently influencing higher education.

2.1.6 Tablet computing in higher education

Johnson et al. (2012: 14) believe that tablets are "ideal learning tools for sharing content, videos, images, and presentations" as they are "easy for anyone to use, visually compelling, and highly portable". With significantly larger screens and richer user interfaces than their smartphone predecessors, tablets are promoted by higher educationalists as well (Johnson et al. 2012, 2013). At the iPad's launch in April 2010, Tracy Futhey of Duke University was quite optimistic about iPad's potential in higher education when she commented that "the iPad is going to herald a revolution in mashing up text, video, course materials [and] students input" (Fry 2010).

In January 2012, Apple revealed that 1,000 universities and colleges around the world are using iTunes U, i.e. the platform which distributes free lectures, videos, books, and podcasts from learning institutions (Siegler 2012). According to Apple, iTunes U had seen over 700 million downloads by the end of 2012 (Siegler 2012). In the past two years, more colleges and universities have launched one-to-one pilot programmes which provide every student on the campus with their own tablet, each of which is pre-loaded with course materials, digital textbooks, and other helpful resources (Johnson et al. 2013: 17).

At Plymouth University in the UK, for instance, art students are using the iPad and an illustration app, called Brushes, to produce drawings that can be played back as video (Stillwell 2012). In a pilot

programme at Yale University's Department of Biology, instructors share images from their digital microscopes with students' iPads through a mobile app (Ngim 2013). At Virginia Commonwealth University, the Department of Mass Communications provides iPads for its students so that they can create multimedia news stories from happenings on the campus and surrounding community (Porter 2012). For foreign language students, the iPad project at Northwestern University is to enhance Chinese language learning (Paolelli 2012). Students who are studying introductory Chinese are offered iPad apps enabling them to look up word definitions, hear native-speaker pronunciation, as well as helping them to write characters correctly (Paolelli 2012).

Not only Apple is promoting tablet technology in higher education. The Seton Hall University, for instance, recently became the first university in the US to adopt Windows 8 PC tablets (Twal 2012). The university believes that they are enabling "quicker access to information, deeper engagement, and greater flexibility" by having "a combination of tablet mobility with the functionality of a computer" (Twal 2012). At HAMK University of Applied Sciences in Finland, educators have developed creative ways for integrating Samsung Galaxy tablets into the curriculum through the MobiLearn project (Johnson et al. 2013: 18, Salmia 2013), and for special needs students, Vanderbilt University graduate students are designing an Android app that enables visually impaired students to learn maths aided by vibrations and audio feedback to feel and hear shapes and diagrams (Salisbury 2012). According to Chitika (2013), the growing market share of Google Nexus, Samsung Galaxy, and Barnes & Nobile Nook tablets are to endanger Apple's 81 per cent dominance on the tablet market in 2013. Nevertheless, iPad remains the most popular device employed in current pilot studies.

For parents concerned with the high cost of a tablet, some schools introduced a leasing programme. The Sint-Jozef institution of commerce (Hamme, Belgium), for instance, where students can loan out an iPad for €115 ($148) per school year with the possibility to keep the iPad after three years of enrolment (Doan 2012). At Amritapuri University, students and teachers are using a $35 (€27) tablet, called Aakash, to provide a low-cost alternative to their students (Amritapuri 2012). The growing competition on the tablet market is believed to severely reduce costs in the future (Johnson et al. 2013: 21). In its report on the future of the tablet market, Van der Meulen (2012) confirms that purchases of tablets by businesses will triple by 2016, making smart devices "truly pervasive in every aspect of an employee's life".

Pilot studies are currently being conducted in order to investigate learning outcomes with tablets. One of the most recent pilot studies is called "The iPad Project" (Lys 2012). The project, led by German professor Franziska Lys, started in fall 2011 and is to run until fall 2013 (Lys 2012). Lys (2012) states that an overall learning objective of the iPad project is to help the college and individual instructors to investigate and to gain experience in the use and integration of new tablet technologies for interactive language learning/teaching. During the project, students' reactions to the new technology will be

measured by means of a post-course questionnaire and report (Lys 2012). Although the positive learning outcomes of tablet computing still need to be confirmed, Van der Meulen (2012) concludes that tablets will be "the key accelerators to mobility in higher education".

2.2 The growing appetite for apps

2.2.1 Introduction

In its annual vote for word of the year, the American Dialect Society voted *app* as word of the year for 2010 (Metcalf 2011). The society defines applications, abbreviated to apps, as "software programs for a computer or phone operating system" (Metcalf 2011). It is this type of mobile application that this dissertation will be focussing on, i.e. "software applications designed to run on smartphones, tablet computers and other mobile devices" covering numerous fields such as "languages, arts, music, science, mathematics and statistics" (Nooriafshar 2012: 3).

Mobile applications run on a mobile operating system (OS), which Merriam-Webster defines as "a software that controls the operation of a computer and directs the processing of programmes, as by assigning storage space in memory and controlling input and output functions". A mobile OS runs on smartphones and tablets and allows other computer software to be installed for Web browsing, e-mail, music, video, and other applications (Britannica). Most smartphone/tablet manufacturers license an operating system, such as Microsoft Corporation's Windows Phone OS, Symbian OS, Google's Android OS, or Palm OS. Research in Motion's BlackBerry and Apple Inc.'s iPhone, however, have their own proprietary systems (Britannica).

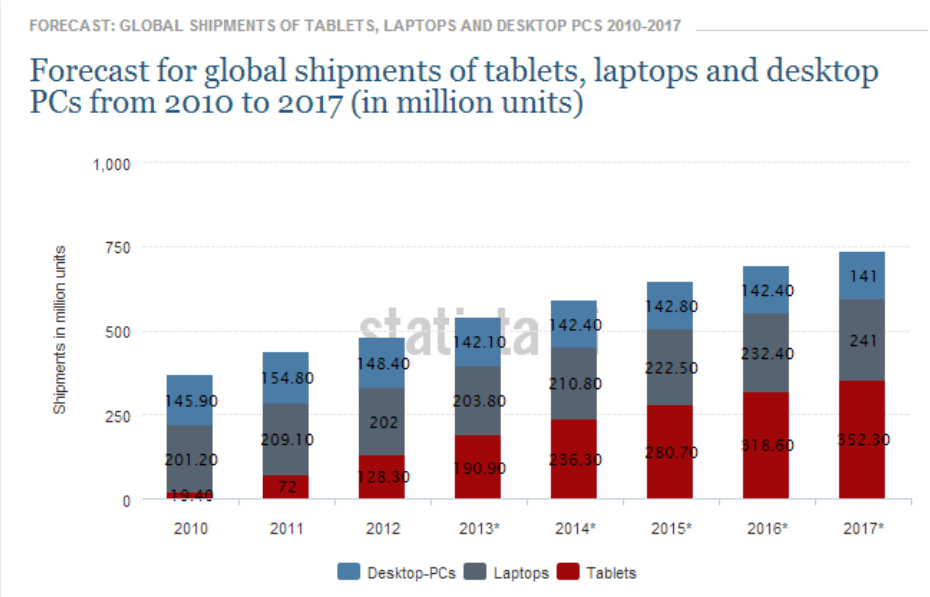
Apart from Symbian OS and Palm OS, these OSs are the key mobile vendors and operating systems on the market today (Van der Meulen 2012). They provide mobile apps through app stores, namely the Apple App Store, Google Play, BlackBerry App World and Windows Phone Hub. Apps can be downloaded from these stores to a target device, such as an iPhone, Android phone, BlackBerry, or Windows Phone. The growing popularity of apps is evident from ABI's mobile application market research, which found that mobile application storefronts have collectively distributed 81 billion smartphone and tablet apps as of end-September 2012, 89 per cent of which were downloaded from native storefronts that come with the device's operating system (ABI 2012).

In the following chapters, the most promising mobile OSs on the market today will be discussed (cf. 2.2.2) as well as issues related to developing for mobile delivery (cf. 2.2.3; 2.2.4). The aim is to determine which OS and development tools are most suitable for the development of an education app for Dutch first-year undergraduates at University College Ghent.

2.2.2 Evolutions on the mobile OS market today

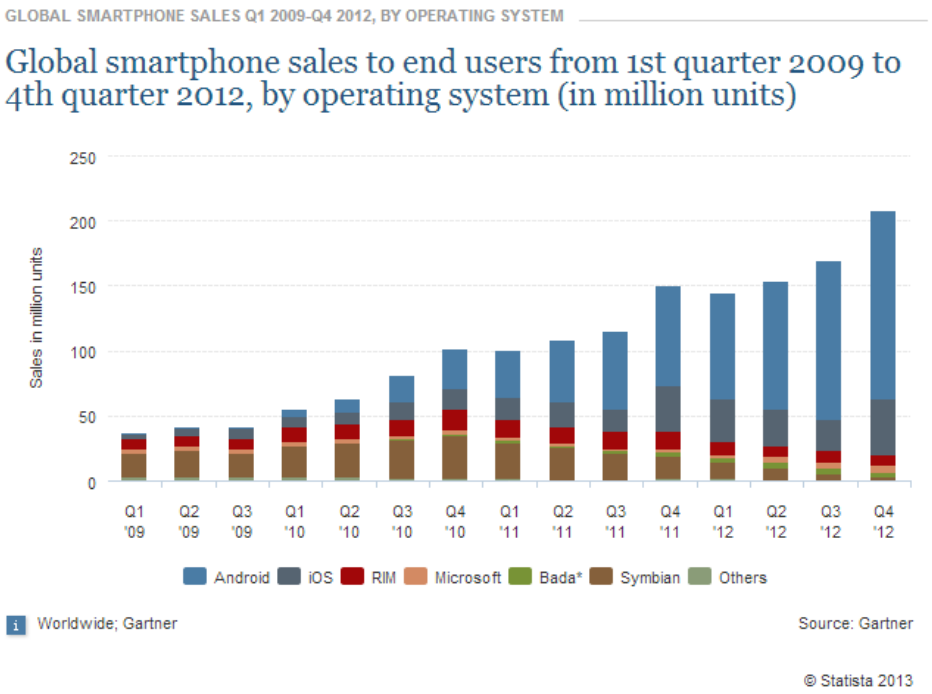
Surveying the directions in mobile device technologies and management, Van der Meulen (2012) predicts that over one billion smart devices, i.e. smartphones and tablets, will be purchased in 2013. Carolina Milanesi, research vice president at Gartner, believes that "two-thirds of the mobile workforce will own a smartphone, and 40 per cent of the workforce will be mobile by 2016" (Van der Meulen 2012). Figures by IDC confirm the imminent prevalence of mobile devices by 2016 (IDC 2013). Furthermore, IDC (2013) believes that tablets will become "an extension of PCs just like notebooks were for desktops over 20 years ago". Figure 1 displays global shipment figures for tablets, laptops and desktop PCs from 2010 to 2012 and offers a forecast until 2017 (Statista 2013a). In 2010, around 19 million tablets were sold worldwide and this figure is believed to increase to 280.7 million by 2015 (Statista 2013a).

Figure 1: Forecast for global shipments of tablets, laptops and desktop PCs from 2010 to 2017 (in million units) (Statista 2013a).



On the smartphone market, sales have quadrupled over the last four years (Statista 2013c, see Figure 2). Figure 2 shows global smartphone sales to end users broken down by operating system from the first quarter of 2009 to the fourth quarter of 2012 (Statista 2013c). The statistics are based on research by Van der Meulen et al. (2013), who note that the fourth quarter of 2012 saw record smartphone sales of 207.7 million units, up 38.3 per cent from the same period last year. Furthermore, Van der Meulen et al. (2013) predict that worldwide smartphone sales to end users will be close to one billion units in 2013.

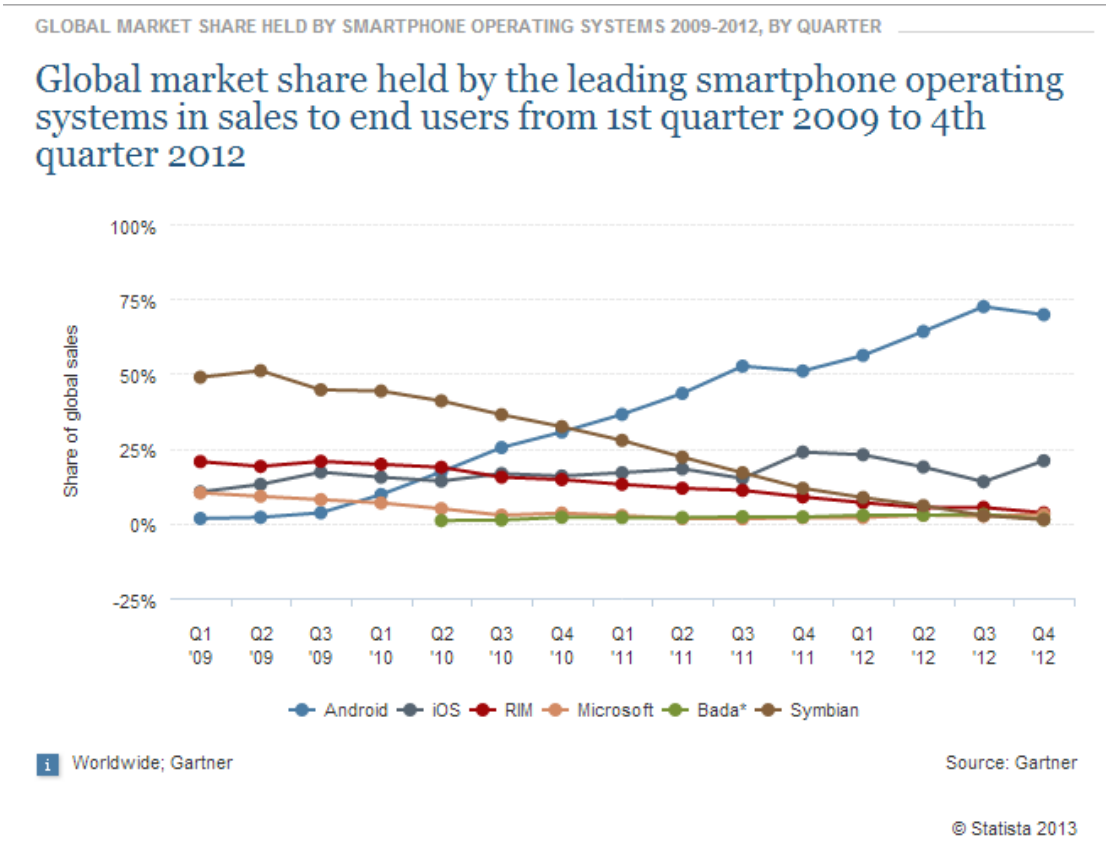
Figure 2: Global smartphone sales to end users from 1st quarter 2009 to 4th quarter 2012, by operating system (in million units) (Statista 2013c).



Figures from research firm IDC show that the overall smartphone market worldwide is dominated by Google's Android and Apple's iOS mobile platforms, which together held approximately 90 per cent of the global market share in the third quarter of 2012 (IDC 2012, cf. Appendix II). According to IDC (2012), Google-developed Android is on three-quarters of all smartphones worldwide, followed by Apple's iOS, which represents 14.9 per cent of the global smartphone market. The top six smartphone operating systems are ranked as follows: Android, iOS, BlackBerry, Symbian, Windows Phone 7, Linux (IDC 2012). According to IDC (2012), Nokia's defunct Symbian platform declined the most in share (77 per cent) and will be surpassed by Microsoft's Windows Phone OS.

Similar figures were found by Van der Meulen et al. (2013, cf. Appendix III), who note that Android held more than 50 per cent of the OS market in the fourth quarter of 2012, widening the gap with Apple's iOS. The release of the new Windows Phone 8-powered smartphones have placed Windows Phone on the fourth place (Van der Meulen et al. 2013). Anshul Gupta, principal research analyst at Gartner, predicts that "2013 will be the year of the rise of the third ecosystem as the battle between the new BlackBerry10 and Widows Phone intensifies" (Van der Meulen et al. 2013). Figure 3 shows the evolution of global market share held by the leading smartphone OSs in sales to end users over the last four years, spearheaded by Google's Android (Statista 2013b).

Figure 3: Global market share held by the leading smartphone operating systems in sales to end users from 1st quarter 2009 to 4th quarter 2012 (Statista 2013b).



According to Mr Gupta, alternative operating systems such as Tisen, Firefox, Ubuntu and Jolla will try to position themselves as profitable alternatives to Android's growth (Van der Meulen et al. 2013). The entry of new players and the dominance of Chinese manufacturers are believed to "increase competition, lower profitability and scatter market share" (Goasduff et al. 2012). Following these economic predictions and the rapid pace of innovation, mobile devices are likely to become affordable to all students, making the imminent introduction of mobile devices in education sound more probable.

As Android and iOS-based devices are expected to continue to increase their presence in the enterprise (Van der Meulen 2012), both operating systems will be regarded as the most appropriate venues for the introduction of education apps in higher education. Following the release of Windows 8 Pro tablets with full Windows, Kendrick (2013) argues that Windows Phone will become increasingly popular amongst mobile workers. As the possibility of a full-Windows application on tablets looks very promising, Microsoft Phone will be considered an appropriate venue for the development of an education app as well.

2.2.3 Developing for mobile delivery

2.2.3.1 iOS

The first device to be marketed as a smartphone was the touchscreen Ericsson R380 Smartphone (Wikipedia 2013c). Released in 2000, it ran on Symbian OS, the first modern mobile OS, which combined a PDA with a mobile phone (Bowman 2000). In April of the same year, RIM launched the BlackBerry 957, the first BlackBerry smartphone which featured multimedia functionalities and allowed users to access, create, share and act upon information instantly (Evans 2000). In 2002, Microsoft followed this new trend and introduced its first Windows CE smartphones, followed by Nokia smartphones which ran on Palm OS (Wikipedia 2013c). It was not until 2007 that Apple Inc. introduced its iPhone, one of the first mobile phones to use a multi-touch interface (Block 2007).

According to Miller (2013), Apple's iPhone reinvented the smartphone market by making apps commonplace. Together with its mobile operating system (iPhone iOS), Apple introduced some significant software enhancements, such as a more powerful processor, more internal (RAM) memory, and faster Internet connectivity provided by Mobile Safari (Godwin-Jones 2011: 3). However, when iPhone entered the smartphone market, critics argued that it offered only few truly new features (Britannica). According to Britannica, iPhone's appeal was not only "its incorporation of intuitive software and a simplified, appealing interface", but also "the capacity to accommodate new user-selected software". In other words, the ability to download mobile applications.

In 2008, Apple created Apple App Store, a curated environment for distributing new apps (Godwin-Jones 2011: 3). In order to add functionality to the iPhone, Apple initially encouraged developers to create web apps, i.e. "HTML-based programs which used JavaScript and CSS to provide interactivity" (Godwin-Jones 2011: 3). As these web apps needed a network connection to run properly and such connectivity cannot always be guaranteed (Godwin-Jones 2008: 5), Apple later announced it would allow third-party native applications for the iPhone (Godwin-Jones 2011: 3). Therefore, the company built a Software Development Kit (SDK) into its programming environment, called Objective-C (Godwin-Jones 2011: 3).

In order to make the distinction between a web app and a native app clear, we will adopt Cavazza's (2011) definitions of a native app and a dedicated web app as follows:

Native app	"A mobile application coded with a specific programming language (ObjectiveC for iOS, Java for Android). These mobile applications are fast, reliable, and powerful but are tied to a mobile platform. That means you must duplicate them using the appropriate programming language in order to target another mobile platform. Nearly all games are native apps" (Cavazza: 2011).

Web app	"A mobile web site tailored to a specific platform or form factor, like the LinkedIn web app which was designed for Android and iOS, but not for other smartphones or feature phones" (Cavazza: 2011).

Table 2: Web app versus native app (Cavazza: 2011).

Godwin-Jones (2011: 5) points out that native apps obliges developers to "create an app using an approach consistent with the device's programming environment if they want to take "full advantage of the hardware and OS capabilities of the device". Consequently, iApps can only be developed using the rather complicated Objective-C programming environment and Apple's XCode developers' tool. Such apps, however, will not run on other smartphone environments which use different programming environments, "all mutually incompatible" (Godwin-Jones 2011: 5). Up until today, Apple's strictly curated environment makes iOS apps available exclusively from the Apple App Store.

On 13th Mai 2013, Apple[1] announced that there have been close to 50 billion downloads from the App Store, with almost half of them occurring in 2012 (Jones 2013). Apple's App Store is believed to have generated over $9 billion in revenue in 2012, or a 33 per cent increase from 2011's $6.9 billion and just over five per cent of total company revenue (Jones 2013). Apple's App Store's success is confirmed by the Yankee Group, which determined that a quarter of U.S. consumers used the App Store in the last quarter of 2012 (Armitage 2013). Furthermore, the Yankee Group recently published a study that projects App Store revenue through 2016 (Armitage 2013). The report estimates that "App Store revenue will increase about 40 per cent in 2013 to $12.9 billion, 26 per cent in 2014 to $16.2 billion, 22 per cent in 2015 to $19.8 billion and 13 per cent in 2016 to $22.4 billion" (Armitage 2013).

Recently, however, Apple has been victim of jailbreak software which root access to the iOS that runs on Apple devices, including the iPad, iPhone and iPod Touch (Greenberg 2013). According to Janssen (2013), Apple jailbreaking "frees the device from dependence on Apple as the exclusive source of applications, allowing users to install third-party apps unavailable at the official App Store". This new hacking trend undermines the company's closed business model and could make the company adopt an open source approach similar to Android (Greenberg 2013). As Google's Android OS has gained "significantly in both users and number of apps", Godwin-Jones (2011: 4) predicts that Android apps will soon surpass those for Apple devices.

2.2.3.2 Android

According to Godwin-Jones (2008: 6), phones running on Android feature "advanced capabilities which encourage third-party applications". In contrast to Apple's iOS, Android does not run on a single phone offered by a particular company (Godwin-Jones 2008: 6). Unveiled in 2007, Android is

[1] http://www.apple.com/benl/

an open-source software platform which was originated by a group of companies known as the Open Handset Alliance, led by Google (Android 2012a). Today, many mobile device manufacturers run the Linux-based operating system, including Samsung, Sony Ericsson, LG, Dell, Huawei, Fujitsu Toshiba, Motorola, Panasonic, Acer, Asus, NEC, Kyocera, and others.

Android's open-source approach contrasts with Apple's curated environment. As opposed to free software, open-source software is interpreted to mean that organisations can share resources and products that "each contributor can tailor and customise" (Android 2012a). Android's open-source code "Apache License" and permissive licensing allow the software to be "freely modified and distributed by device manufacturers, wireless carriers and enthusiast developers using Android's Software Development Kit (SDK)" (Android 2012b). Its third-party applications are written in a customised version of the Java programming language and can be acquired by users either through an app store, such as Google Play or the Amazon Appstore (Godwin-Jones 2011:5), or by downloading and installing the application's APK file from a third-party site (Wikipedia 2013a).

The Play Store application allows users to "browse, download and update apps published by Google and third-party developers, and is pre-installed on devices that comply with Google's compatibility requirements" (Android 2012b). In order to take part in the shared ecosystem of Android apps, developers must comply with the Compatibility Program which defines technical details and provides tools (Android 2012b). Godwin-Jones (2008: 6) notes that Android developers face one big challenge, namely handset compatibility: whereas Apple controls both hardware and software, Android developers ignore the features of the phone for which they are developing applications (Godwin-Jones 2008: 6).

2.2.3.3 Windows Phone

Initially, Microsoft offered basic mobile application delivery under the brand "Windows Mobile" (Amprimoz 2011). According to Godwin-Jones (2008: 6), the selling point for Windows Mobile was "principally the integration between desktop and mobile applications, particularly in the area of email synchronisation and mobile access to MS Office documents". In 2010, the Windows Mobile platform was succeeded by Windows Phone, which Aaron Woodman, the director of Mobile Communications Business, defines as "a series of proprietary mobile operating systems developed by Microsoft" (Koh 2010).

In 2011, Microsoft CEO Steve Ballmer announced that Windows Phone was to become "a new global mobile ecosystem", suggesting competition with Android and iOS (Microsoft 2011). Its latest release, Windows Phone 8 OS, is integrated with third-party services and Microsoft services such as Office Hub, and "sets minimum requirements for the hardware on which it runs" (Buchanan 2010). Today, Windows Phone is supported by Nokia and HTC devices (Microsoft). According to Miles (2012),

Windows Phone 8's new hardware gives Windows Phone the ability to better compete with Google and Apple smartphones, in contrast to Windows Phone 7 and 7.5, which were often criticised for "a lack of high-end hardware support".

Similar to Android, applications may be developed by third parties using Windows Phone's SDK. Third-party applications and games for Windows Phone are based on XNA or a WP7 specific version of Silverlight (Microsoft). Furthermore, Windows Phone Developer Tools, which run only on Windows Vista SP2 and later, are offered as an extension (Microsoft). Apps can be written in several codes, including "native code with Visual C++, writing code in Tcl-Tk with eTcl, GCC using CeGCC., Python using PythonCE, or server-side code that can be deployed using Internet Explorer Mobile or a mobile client on a user's device" (Wikipedia 2013c).

Applications can be acquired through the Windows Phone Hub, which digitally distributes music, video content, podcasts, and third-party applications to Windows Phone handsets. The store is accessible through the Zune Software client or the Windows Phone Hub on devices (Microsoft). The App Hub is designed to provide development tools and support for third-party application developers (Microsoft). In order for an application to appear in the Windows Phone Hub, it must be submitted to Microsoft for approval and meet the standardisation criteria (Microsoft). Microsoft takes 30 per cent of the revenue if the developer would decide to make his/her applications payable (Microsoft). Therefore, developers have to reach a set sales figure (Microsoft).

The three operating systems discussed above are summarised in the table below:

	iOS	**Android**	**Windows Phone**
Owner	Apple	Google	Microsoft
Initial release	29th June 2007	23rd September 2008	8th November 2010
Runs on	Apple devices only	Samsung, Sony Ericsson, LG, Dell, Huawei, Fujitsu Toshiba, Motorola, Panasonic, Acer, Asus, NEC, Kyocera, etc.	Nokia and HTC devices
Programmed in	Obj-C, C, C++	Java (some C, C++)	C#, VB.NET, etc.
Developer tools	Xcode	Android SDK	Visual Studio, Windows Phone Development Tools
License	Proprietary EULA	Apache License 2.0	Commercial Proprietary Software

App stores	Apple iTunes	Google Play Store	Windows Phone Hub
Source model	Closed source	Open source	Closed source
Issues	- iOS apps are incompatible with other smartphones - complicated development programming (Obj.-C)	- handset compatibility	- handset compatibility
Latest version	19th March 2013: iOS 6.1.3	11th February 2013: 4.2.2 Jelly Bean	20th December 2012: Windows Phone 8 OS

Table 3: Developing for mobile delivery, a summary.

2.2.4 Developing apps for language learning: native app, web app or hybrid app

As tablets and their numerous education apps face imminent widespread adoption, higher education institutions are equipping students with the skills to develop content for them. Rasmussen College[2] (USA), for example, was one of the first colleges to offer app development programmes (McHugh 2011). Other colleges in the USA at which students can obtain an Associate's Degree on the subject include Olin College[3], MIT[4], San Diego State University[5] and Stanford[6] (McHugh 2011). Not only in the USA has app development become a popular career path, colleges in the Netherlands and in Belgium have included iPad programming and app development in their programmes as well. Colleges offering degrees on the subject include Erasmus University College Brussels[7], Xios[8] and Katho[9].

Study programme director at Eindhoven University of Technology, Marloes van Lierop, sees a degree in app development as "a real opportunity in an era where computer science influences everything". Godwin-Jones (2011: 5) confirms that app development is progressing "at a feverish pace", and that app developers are in high demand. Although all of the different smartphone software companies make development tools available to anyone (Godwin-Jones 2011: 5), Jan Deruyck, business developer at "In the Pocket", stresses that an app degree is indispensable if one were to develop high-quality native apps. For simple app development, however, skilled developers can use such online development tools, most of which are free and run on Windows, Linux or Macintosh devices, except for iOS development which is Mac OS only (Godwin-Jones 2011: 5).

[2] http://www.rasmussen.edu/degrees/technology/software-application-development/
[3] http://mobdev.olin.edu/2010/mobdev.html
[4] http://people.csail.mit.edu/hal/mobile-apps-fall-08/
[5] http://www.ces.sdsu.edu/Pages/Engine.aspx?id=752
[6] http://www.stanford.edu/class/cs193p/cgi-bin/drupal/
[7] http://www.erasmushogeschool.be/en/english
[8] http://www.xios.be/HoofdMenu/Opleidingen/Professionelebachelor/Toegepasteinformatica/tabid/579/language/nl-BE/Default.aspx
[9] http://www.katho.be/page.aspx?smid=269

For language learning purposes, however, Godwin-Jones (2011: 5) argues that native app development "may not be the best choice". A first issue is market fragmentation (Castledine et al. 2012: 2). As different programming environments are mutually incompatible, Godwin-Jones (2011: 5) notes that there is "little carryover from developing an app in one environment to re-creating that app for a different platform", pushing developers to decide which platform to target first. Depending on students' user base, education apps should then be developed in several versions, such as iOS version, Android version, Blackberry version and Windows Phone version in order to be viable for educational use (Godwin-Jones 2011: 5). Furthermore, native app development requires that the developer knows how to work with a programming language such as Objective-C or Java (Godwin-Jones 2011: 5).

Godwin-Jones (2011: 5) proposes creating a web app as a first alternative to developing native apps, because it "involves using more familiar and easier-to-learn scripting languages such as HTML, JavaScript and CSS rather than programming languages". A web app, however, should not be confused with a web site: "whereas web applications are for performing tasks, websites are for consuming information" (Castledine et al. 2012: 10). As web apps run in the phone's browser, Hird (2011) notes two advantages of web apps over native apps. First, the same base code can be used to support all devices, including iPhone, Android, Blackberry and Microsoft phones (Hird 2011). Secondly, web apps are capable of working across all devices and ensuring "cross-platform compatibility" (Hird 2011). Similarly, Godwin-Jones (2011: 6) argues that web apps could allow students to use the app "both from desktop browsers and [different] mobile devices", which is not possible with native apps. Furthermore, the design can be similar to built-in apps as most smartphone operators offer a web kit allowing developers to use relatively new HTML/CSS tags (Godwin-Jones 2011: 6, cf. 2.2.3).

Besides advantages over native apps, both authors found some disadvantages as well. According to Godwin-Jones (2011: 6), users might experience slower execution speed and a lower-quality user interface (UI). Moreover, web apps have limited access to the device's hardware, such as its camera, audio player or GPS (Godwin-Jones 2011: 6). Hird (2011) notes that web apps require internet connection, whereas native apps do not need any connection to be used. Finally, web apps cannot be purchased in app stores (Hird 2011). In contrast to native apps, web apps can only be obtained through a web server (Godwin-Jones 2011: 6).

In order to tackle disadvantages of both native and web app, a hybrid app could be created, i.e. "a native app with embedded HTML" (Hird 2011). As hybrid apps are web apps which have been ported to the native environment of the smartphone, they have "all the benefits of native apps whilst ensuring longevity associated with well-established web technologies" (Hird 2011). Similar to native apps, hybrid apps can access a device's hardware features and be distributed through the app store (Hird 2011). For example, the Facebook app which can be downloaded from the app store and has all

features of a native app, but which requires updates from the web to function (Hird 2011). For the development of hybrid apps, Godwin-Jones (2011: 6) recommends using jQuery Mobile which facilitates creating parts of a web app such as navigation, form elements, and page transition effects without having to write the JavaScript.

From a marketing point of view, Castledine et al. (2012: 6) argue that there is an "undeniable marketing advantage" to creating a web-native hybrid app as it is capable to appear in a well-known app store. Castledine et al. (2012: 6) argue that such stores serve as popular forums to promote any app "in the middle of a user's home screen". In addition, the various application marketplaces "bring customers" and offer "a potentially lucrative outlet for the app". The advantages and disadvantages of native, web and hybrid app development are summarised by Kaminitz (2011) as follows:

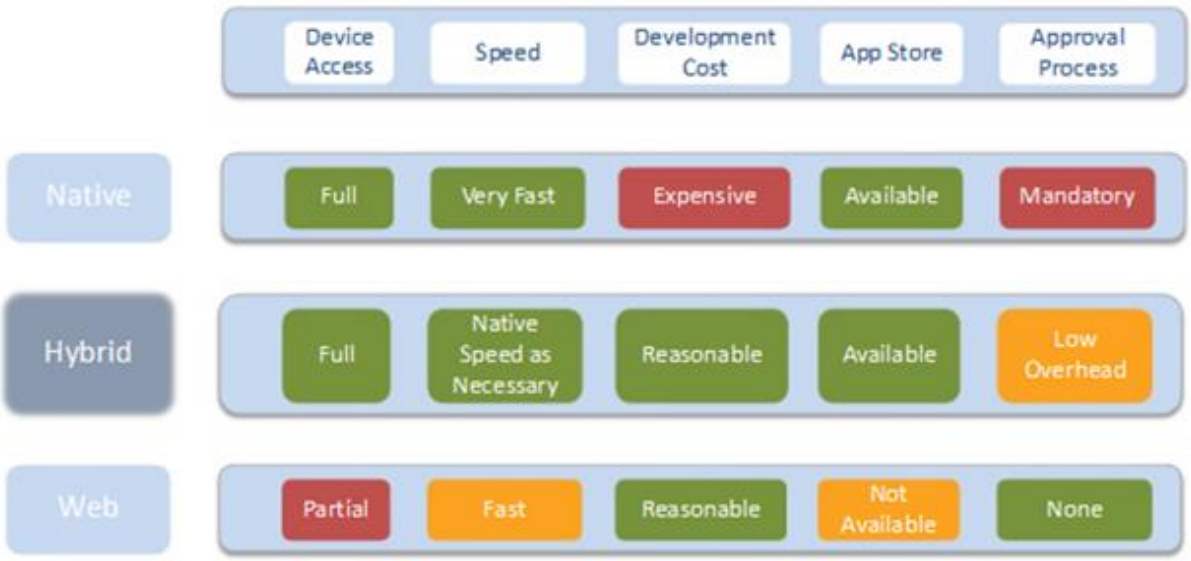


Figure 4: Native, hybrid or web app development? Advantages and disadvantages (Kaminitz: 2011).

Furthermore, it is noteworthy that emerging multiplatform tools might offer another compromise between native and web apps. Multiplatform tools available on the market today offer both HTML5 and native code generation options (Jones 2012). According to Jones (2012), these tools might evolve in platform-independent application development (AD) tools which could "substantially reduce the cost of maintaining multiple platform versions of the same application". The market for such tools, however, is still "immature and volatile" so that "write once, run anywhere" remains an illusion for sophisticated applications (Jones 2012).

To conclude, Hird (2011) states that the decision to invest in an app or in a mobile website depends on the target audience and the functionality of the app (cf. Appendix IV). In his graph, Hird (2011) visualises an inherent trade-off between user experience and cost on the one hand, and time-to-market

for the development of an application on the other. Native apps, for example, offer the best user experience but require a higher cost and a longer time-to-market period whereas web apps' lower cost and shorter time-to-market period weaken the quality of the user experience. Similarly, Castledine et al. (2012: 3) define the choice between a native and web app as "a delicate balancing act", though, the authors argue that they are in favour of trading user experience for web familiarity, development speed, and platform flexibility as it is difficult to manage the native apps' platform fragmentation.

For the introduction of an education app in higher education, Jan Deruyck, business developer at "In the Pocket", believes that web and/or hybrid apps are most suitable. Their main advantage over native apps is their ability to run on different mobile operating systems, which allows students possessing a smartphone to access education apps regardless of the mobile operating system their phones are running on. As for web apps, they are faster to develop, do not require approval by OS developers, and can be easily downloaded online. Hybrid apps do require approval by OS developers but benefit from their availability through app stores and lack of development limitations. Although Castledine et al. (2012: 3) argue that the limited quality of the user experience is not necessarily an issue in web app development, the choice between a web app and hybrid app for the development of my irregular verb app proposal should be made in consultation with the app's developers (cf. 4.3).

2.2.5 Apps for English Language Learning

With the advent of the iTunes App Store in 2008, a large number of applications were developed for the iPhone, from "games and utilities to instant messaging and word processing" (Godwin-Jones 2008: 5). At the time, however, Godwin Jones (2008: 5) noted that only few apps for language learning had been released, including dictionaries, phrase books, and flash cards. According to Godwin-Jones (2008: 5), the popularity of these few language reference and practice apps resulted from the simplified presentation needed for mobile phones. Furthermore, most apps took advantage of the iPhone's advanced network connectivity (3G) to link desktop and mobile databases (Godwin-Jones 2008: 5). "Powerset", for example, offered "an interesting alternative to regular access to Wikipedia, featuring an easy to navigate search" (Godwin-Jones 2008: 5).

Three years later, Godwin-Jones (2011: 4) notes that "newer hardware and software have allowed for enhanced functionality". For example, phrasebooks can now "hold much more content, including video as well as audio, and integrate with online sites" and vocabulary development programmes have become "more sophisticated and powerful" (Godwin-Jones 2011: 4). In his discussion on mobile apps for language learning, Godwin-Jones (2011: 4) has investigated several blogs listing and reviewing apps for language learning purposes, such as Claire Bradin Siskin's list[10], HRC Blog[11] and Learnosity

[10] http://www.edvista.com/claire/pres/smartphones/

Blog[12]. As not all apps listed were of the highest quality, he briefly discusses the best and most popular developers of language apps including Wordreference[13] for dictionary apps, Quizlet[14] for vocabulary flash cards, Conjugation Nation[15] for drilling verb forms, Babbel[16] and hello-hello[17] for "free apps which sync mobile and desktop versions" (Godwin-Jones 2011: 4).

Besides apps explicitly developed for educational purposes, Godwin-Jones (2011: 5) distinguishes a special category of apps for language learning which have benefitted from enhancements in app development, called the "repurposed apps", i.e. "general purpose apps that could be used in language learning, including voice search, voice e-mail, postcard creation, audio recording, and children games". Android's Talk to Me and Apple's SIRI are current examples of speech recognition apps which could be used in language courses. Experimenting with SIRI for language learning, Nooriafshar (2012: 4) switched the language option of SIRI from English to French and concluded that "one can establish a limited but quite natural conversation with the system".

As most apps are accessible in English, they could all serve as effective English learning tools. For example, the free "World Book: This Day in History"[18] iPad app could be used as an introduction to American or British history. It is an interactive multimedia calendar which displays historical events and background information for the current day or any selected day, along with related media, such as photos, illustrations, music and speeches. Whilst exploring history in an interactive way, students implicitly learn English. Similarly, the Mathematics, Science and Creativity apps in the App store[19] could be used to engage students in exploring these subjects whilst improving their English reading and listening skills in an implicit manner. Furthermore, the dictionary apps under "Reference, Productivity and Collaboration" in the iTunes Store could serve as helpful study aids in English classes.

This dissertation, however, focusses exclusively on apps specifically aimed at learning English as foreign language. Today, a growing number of iPhone and Android apps dedicated to language learning are available in the iTunes Store and on Google Play. Testing the capabilities of several of these apps for different languages, Nooriafshar (2012: 3) notes that there is "an abundance of powerful, useful and effective language learning apps available on the market today". The author of ipodteacher.blogspot.be started a list of English Language Acquisition (ELA) apps drawn from the iTunes Store. She discusses their main features and some possible classroom usages. Last updated on 18th May 2012, the list comprises over two hundred ELA-apps grouped into the following categories:

[11] http://www.blogs.princeton.edu/hrc/language-technology/
[12] http://www.learnosity.com/blog/index.cfm/Mobile-Applications-for-Language-Learning
[13] http://www.wordreference.com.en.softonic.com/iphone
[14] http://www.quizlet.com/mobile
[15] http://www.conjugationnation.com
[16] http://lp.babbel.com/d/ENG_index.html?l2=ENG
[17] http://www.hello-hello.com/index_home.php
[18] iTunes Store
[19] https://ssl.apple.com/education/apps/

vocabulary/early learning, grammar/sentence structure, storytelling/writing, sight words/spelling, drawing apps and miscellaneous. As new apps with incredible language learning potential are being created every day, a complete list of useful ELA-apps is almost impossible to achieve.

Although a growing number of education apps are available on the Web today, only little research has been conducted into the development of English language learning apps and their affordances to higher education students. Storz et al. (2011: 2) note that there have been many "small-scale experiments that aim to develop one or two specific skills such as vocabulary, listening comprehension, reading comprehension, or speaking and listening" but they point out that the language learning community has not yet massively taken up mobile application technologies and their potential to redraw higher education. In order for the language community to do so, Godwin-Jones (2011: 8) expresses the need for "research on learners' actual use and learning outcomes".

Sweeney et al. (2012: 9) confirm that mobile learning affordances are "greatly under-exploited in education, particularly in language learning". The authors found a potential chasm between "language learning app developers who lack knowledge of pedagogy on the one hand and language teachers who know about pedagogy but have little knowledge of mobile learning and app development on the other" (Sweeney et al. 2012: 2). Sweeney et al. (2012: 2) argue that developers, entrepreneurs, teachers and linguists should work together in order to create "good quality mobile learning apps which are commercially viable, technically feasible and pedagogically useful".

Therefore, chapter 3 explores the present situation of English language learning apps available on the app-market worldwide and in Flanders in particular.

3 LANGUAGE LEARNING APPS ON THE MARKET WORLDWIDE V. IN FLANDERS

3.1 Objective

Section 2.2.5 concluded that developers, entrepreneurs, teachers and linguists should work together in order to create "good quality mobile learning apps which are commercially viable, technically feasible and pedagogically useful" (Sweeney et al. 2012: 2). In order to introduce such language learning apps to their students, teachers are required to have pedagogically useful checklists to help them evaluate these language learning apps. Outlining a language learning app design framework, Sweeney et al. (2012: 13) provide such checklists and discuss affordances of some apparent design principles and practices found in English vocabulary apps, including interactivity, personalisation, gamification, and the social aspect (Sweeney et al. 2012: 10). Their research, however, is limited to language learning apps which are aimed to acquire English vocabulary. The question arises whether the same principles and practices are to be found in language learning apps which do not focus on vocabulary.

Therefore, this chapter will survey English grammar learning apps on the market today. The quality and features of these apps will be evaluated on the basis of Sweeney et al.'s (2012: 13) checklists for good quality language learning apps. English grammar, however, is a large study field covering several topics. The grammar guide "English Practical Usage" by Michael Swan, for example, covers over twenty topics, including nouns, pronouns, determiners, adjectives, adverbs, comparisons, prepositions and conjunctions. As it is impossible for a low-budget language learning app to offer a full coverage of all grammar topics, this dissertation focusses on apps for the training of English irregular verbs. Such a narrow focus is recommended by Castledine et al. (2012: 28), who argue that any mobile app should "focus primarily on one or two simple tasks their users want to accomplish because their main goal is still to provide learning on the go".

3.2 Research methodology

A market research is to offer a qualitative overview of the most common features now available in apps for English irregular verb training. As Google's Android, Apple's iOS and Microsoft's Windows Phone mobile platforms are believed to further dominate the mobile OS market (cf. 2.2.2), app development for those operating systems will be indispensable for the creation of any education app. Therefore, all irregular verb apps were drawn from these three most popular app stores. Since tablet computing is gaining in popularity in higher education institutions as well (cf. 2.1.6), all irregular verb apps surveyed are available on smartphone, tablet, or both.

3.2.1 Categorising apps: app styles and user interface

There are different ways of categorising language learning apps. From a programming or app design perspective, Sweeney et al. (2012: 2) distinguish three app styles. The first category consists of "utility apps", which have one single function. This category comprises mostly quick look-up apps, such as dictionary apps. The authors argue that there should be more functionalities available to the learner if the app is to encourage learners to acquire vocabulary (Sweeney et al. 2012: 2). Therefore, developers could draw on the second category, called "productivity apps". Such apps offer the learner "sufficient practice" and dispose of "a wide range of functionalities available to the learner to support this aim" (Sweeney et al. 2012: 2). According to Sweeney et al. (2012: 2), a last category consists of "immersive apps", i.e. apps which are used to "play games, view media and perform specialised tasks" and which offer "a full-screen, visually-rich environment that [is] focused on the content and the user's experience with that content". As for an immersive app, Apple (2012: 25) states that "people expect to enter a unique world filled with rich, beautiful graphics and innovative interactions".

Furthermore, it is noteworthy that a good immersive app benefits from a well-developed user interface (UI) (Sweeney et al. 2012: 3). Techterms (2009) defines a UI as "the means in which a person controls a software application or hardware device". According to Nielsen (2011), a good UI provides a "user-friendly" experience, allowing the user to "interact with the software or hardware in a natural and intuitive way". Furthermore, Nielsen (2011) ascribes the success of the smartphone to this usability, which offers "efficiency and memorability". Therefore, Sweeney et al. (2012: 3) argue that the UI should not be "the finishing off but the starting point of the design of the hardware, software as well as content".

The three app styles and their definitions are resumed in the table below:

Utility apps	- Look-up function; - no practice mode;
Productivity apps	- offer sufficient practice; - more fully featured (with a range of connected functionalities).
Immersive apps	- Used to play games, view media and perform specialised tasks; - offer a full-screen, visually-rich environment which is focused on the content and the user's experience with that content.

Table 4: App styles and definitions (Sweeney 2012: 2).

3.2.2 Categorising apps: dedicated and non-dedicated language learning apps

Most app stores categorise apps according to their usage purpose. Sweeney et al. (2012: 3) distinguish two main categories for language learning, namely non-dedicated and dedicated apps. The productivity category available in most app stores, for example, resorts under the former category (Sweeney et al. 2012: 3). Sweeney et al. (2012: 3) found that many apps in this category are of "potential benefit for language learning, though, not specifically created for this end", including mind-mapping, note-taking and word-processing apps. Most of these apps are also productivity apps in style (Sweeney et al. 2012: 3). General education and creativity tools are considered non-dedicated apps for language learning as well (Sweeney 2012: 3). Most of these apps take an immersive approach to traditional reading and learning exercises and are intended to be engaging and relevant for in-class use (Sweeney 2012: 3).

This dissertation, however, will focus on dedicated apps, i.e. "apps specifically aimed at learning English as Foreign Language (EFL)" (Sweeney et al. 2012: 3). Sweeney et al. (2012: 4) subdivide this category into dictionaries, vocabulary skills, EAP and exam practice, reading skills, ELT readers, grammar, listening skills, writing skills, course book apps and teacher resources. They note, however, many overlaps between them and stress that these categories are by no means mutually exclusive (Sweeney 2012: 4). In the iTunes App Store, dedicated apps resort under two main categories: whereas reading and writing as well as grammar apps resort under the category "English Language Arts", the "Language Development" category helps with "studying English as second language or learning any new languages" and allows learners to find apps for reading, writing, speaking, understanding, and building vocabulary[20]. Apps on verbs are to be found under the former category.

Finally, it is noteworthy that around 90 per cent of language learning apps are based on existing content (Sweeney et al. 2012: 9). These apps are created by publishing houses offering their content in app format and range from well-known dictionaries, such as Longman and Merriam-Webster dictionaries, to popular grammar books, such as Raymond Murphy's "English Grammar in Use". Sweeney et al. (2012: 9) confirm that using existing content is "potentially quicker and reduces the risk of failure in a new medium, particularly if the original product has been successful and has a recognised brand". However, the authors found some shortcomings in re-developing existing content as well. For instance, the content may be unsuited to mobile language learning or the publisher may lack copyright permissions to republish digitally (Sweeney et al. 2012: 9). In order to avoid complex and expensive negotiations with copyright owners, this dissertation will focus on developing an entirely new English language learning app.

[20] https://www.ssl.apple.com/education/apps/

3.3 Data

3.3.1 Introduction

This dissertation surveys the features of dedicated English language learning apps which are primarily intended for self-study but could be introduced into a higher-education curriculum as well. All data were drawn from the three most popular app stores, namely iTunes App Store, Google Play and Windows Phone Hub. As with all technology-related tools, the world of apps is constantly changing and new apps with incredible learning potential are being created every day. Therefore, apps profiled during the research are only indicative of what was available at the time this dissertation was written. In order to unveil differences between the app market worldwide and in Flanders in particular, all stores were consulted in their English and Dutch versions.

On its website[21], Apple lists a wide range of education apps, which can be downloaded from the iTunes App Store. Visitors can choose between education apps for iPad on the one hand and for iPod and iPhone on the other. Most apps, however, are available on all devices. Apps on verbs are to be found in the grammar collection under the category "English Language Arts". When clicking on this category, users are directed to the iTunes Store, in which the grammar apps can be downloaded. Besides apps, the store offers downloadable grammar books, audiobooks, video tutorials, courses, lecture notes, songs, podcasts and podcast episodes. In the store, the query "English Verbs" results in some 284 apps available on both iPhone and iPad, including verb dictionaries, verb and vocabulary apps, phrasal verb apps, verb tenses apps, irregular verb apps, but also a large number of grammar and part-of-speech apps. This survey is narrowed down to English irregular verb apps, some 68 apps of which are available in the iTunes Store.

In the Google Play Store[22], the query "English irregular verbs" results in 41 hits, whereas only five apps on English irregular verbs were found in the Windows Phone Hub[23]. In the latter, the same query without quotation marks results in another fourteen more applications, twelve of which are meant to train Spanish verbs and vocabulary. There is no significant difference in the amount of apps available via the Dutch and English versions of all three app stores. In the Dutch version of the Google Play Store, some app descriptions are given in Dutch. These apps, however, are not targeted at Dutch learners as none of them are developed by Dutch companies nor do they offer Dutch translations. Apps specifically aimed at Dutch learners are not available in any of the stores, not even when entering the Dutch query "Engelse sterke werkwoorden" in their Dutch versions. Consequently, all

[21] http://www.ssl.apple.com/education/apps/
[22] https://www.play.google.com/store/search?q=%22English+irregular+verbs%22&c=apps
[23] Dutch version: http://www.windowsphone.com/nl-be/search?q=%22English+irregular+verbs%22
English version: http://www.windowsphone.com/en-us/search?q=English+irregular+verbs

apps discussed below are drawn from the English versions of the three stores after having entered the query “English irregular verbs”.

The worldwide app market is surveyed by means of a table including irregular verb apps which could be downloaded from the three app stores on Friday 22nd, Saturday 23th February 2013 and Monday 1st April (cf. Appendix VI). From the 68, 41 and five irregular verb apps found on iTunes, Google Play and in the Windows Phone Hub respectively, only 71 are tabled. All Spanish irregular verb apps which are developed for English learners were not tabled as they are irrelevant to our discussion on English irregular verb apps. On Google Play, we found one Polish app which was not available in English neither. Furthermore, we eliminated a Thai and a Catalan dictionary app and three vocabulary training apps, which do not belong to the irregular verb category. In the iTunes Store, some fifteen apps did not focus primarily on irregular verb training neither.

All apps are resorted under the three app styles discussed in section 3.2.1. The table covers app name, operating system (OS), basic functions and features, devices on which they are available and price (cf. Appendix VI). Many of the apps selected are for free or available in both low/no-cost and premium forms. The abbreviation “FE” figures next to the price of apps which are available in a free edition. Free editions lack several features that are only available in full edition. None of the apps selected exceeded the cost of $4.99 (€3.99).

As the best way to learn about an application is to play with it, all free apps were subjected to personal experience tests during the evaluation process. Although apps from all three stores are accompanied by star-based user ratings (one to five stars), these figures were not taken into account during the evaluation as their quality is doubtful. According to the Russian data analysis firm and app studio, Empatika, app store reviews do not provide reliable information (Etherington 2012). Analysing sentiment in online app reviews, the firm found that around 70 per cent of reviews have written content which does not match their star ratings (Etherington 2012). In addition, app reviewers amongst the top apps tend to share only positive things (Etherington 2012).

Therefore, a qualitative approach is necessary to ensure a more reliable evaluation of the user interface as well as to detect defunct applications. These personal remarks were added to the table next to app description (cf. Appendix VI). Finally, the quality of the language learning apps were rated according to Sweeney et al.’s (2012: 13) checklists for pedagogically viable language learning apps.

3.3.2 Checklists for a learning app design framework

Sweeney et al. (2012: 13) argue that any app design framework needs to reflect “the diversity of contexts and opportunities in mobile language learning”. To this effect, they propose two checklists.

The first one is a simple app feature checklist which allows teachers and developers to review and create "pedagogically viable language learning apps" (Sweeney et al. 2012: 13). The list contains seven requirements for a language learning app to fulfil and is resumed in the table below:

	Requirements language learning app
1.	☑ Allows for personalisation;
2.	☑ provides visible progress indicators;
3.	☑ covers relevant language;
4.	☑ covers more than one skill;
5.	☑ maximises exposure to target language (i.e. minimal translation);
6.	☑ appropriate for the device in terms of content, activity and user interface;
7.	☑ encourages learning behaviours which correspond to what we know about general mobile-enabled behavior patterns, including social and gamification aspects.

Table 5: Requirements language learning app, from Sweeney et al. (2012: 13).

From a mobile learning point of view, Sweeney et al. (2012: 13) propose a second checklist which is to ensure that apps are developed to "facilitate some of the known benefits of mobile learning quoted by Traxler in the JISC Mobile Learning Infokit (JISC 2010)". On the basis of this list of "tangible benefits", the authors argue that an app should be able to fulfil at least one third (four out of twelve) of the following criteria/benefits:

	Requirements language learning app from a mobile learning perspective
1.	☑ Fits into the lives of learners (allow for productive 'dead' time);
2.	☑ is portable to allow anywhere, anytime learning;
3.	☑ allows for immediate communication (including speech and data-sharing);
4.	☑ allows access to learning by those in dispersed communities and isolated situations;
5.	☑ offers contextualisation through location-aware features, such as GPS;
6.	☑ allows for the delivery of bite-sized e-learning resources;
7.	☑ takes advantage of peer-to-peer networks making learning more student-centred;
8.	☑ promotes active learning;
9.	☑ enables new learning environments;
10.	☑ increases accessibility for learners with special educational needs;
11.	☑ encourages reflection in close proximity to the learning event;
12.	☑ reduces technical barriers to e-learning.

Table 6: Requirements language learning app from a mobile learning perspective (Sweeney et al. 2012: 13).

All irregular verb apps tabled in Appendix VI were found to fulfil at least the following requirements: they allow for productive 'dead' time (1), they are portable to allow anywhere, anytime learning (2), they allow access to learning by those in dispersed communities and isolated situations as they do not require internet access (4), they enable new learning environments (9), and they increase accessibility for learners with special educational needs (10). Not all apps promote active learning (8) as only productivity with gamification aspects allow for a practice mode. Only few apps take advantage of peer-to-peer networks (7) and/or allow for immediate communication (3) as they offer social aspects, such as data-sharing on social network sites. Furthermore, none of them offer contextualisation through location-aware features, such as GPS (5). Whether the application encourages reflection in close proximity to the learning event (11), largely depends on the learner's motivation and personal preferences and is, therefore, difficult to evaluate during this research.

The pedagogical viability of irregular verb apps will be mainly evaluated on the basis of Sweeney et al.'s (2012:13) simple feature checklist (cf. Table 5). As those design features relevant to irregular verb apps will be discussed, a number of productivity functions offered by irregular verb apps in particular were added to the simple feature checklist (cf. Table 7), including search bar, verb definition, sample sentences and mixed verb option. These functions are not mentioned in the simple feature checklist (cf. Table 5) but are regarded as important evaluation criteria for the development of a pedagogically viable irregular verb learning app. Furthermore, requirement four, which outlines that a viable language learning app should contain relevant language, will be interpreted to mean that the irregular verb app is to offer a useful list of the most common irregular verbs. The social aspect includes data-sharing via e-mail or on peer-to-peer environments such as Facebook, Twitter, LinkedIn, etc.

To conclude, all evaluation criteria for the development of viable irregular verb apps are resumed in the table below:

	Requirements irregular verb learning app
1.	☑ Allows for personalisation;
2.	☑ provides visible progress indicators;
3.	☑ covers relevant language;
4.	☑ covers more than one skill;
5.	☑ maximises exposure to target language (i.e. minimal translation);
6.	☑ appropriate for the device in terms of content, activity and user interface;
7.	☑ encourages learning behaviours which correspond to what we know about general mobile-enabled behaviour patterns, including social and gamification aspects;
8.	☑ disposes of a search bar;
9.	☑ offers verb definition so that the learner clearly understands verb meaning;

10.	☑ offers sample sentences in order to contextualise the verb meaning;
11.	☑ offers a mixed verb option so that the learner learns to distinguish between regular and irregular verb conjugations.

Table 7: Requirements irregular verb learning app.

3.4 Discussion

In total, 22 utility apps and 48 productivity apps were found in all three stores (cf. Appendix VI). Only one app can be considered a truly immersive app (cf. 71), offering a visually-rich environment with original game-play possibilities. The app was found in the iTunes store and is downloadable for $0.99 (€0.77). Besides flash cards to practice English irregular verbs and their translations into German, Russian and Spanish, it integrates an interactive quiz on countries, capitals and flags, which allows learners to test and share their general knowledge. Users can contribute questions, which can be uploaded worldwide. Furthermore, it allows to import your own content from Google Docs or public content from Quizlet.com. Finally, statistic results track learning progress and record test outcomes, allowing learners to see how many verbs they have learned on a day or in a given period of time.

All irregular verb apps were found to be appropriate for the device in terms of content, activity and user interface (cf. Appendix VII). For utility apps, both smartphones and tablets offer a sufficient large screen to display irregular verb lists. Furthermore, the touch technology offers a natural interface between the learner and the device as learners can easily browse through the list by moving their fingers over the screen. Mobile devices are also most suitable for productivity apps, most of which offer simple exercises, such as fill-in-the-gap exercises, quizzes and drill exercises. Most of them focus primarily on irregular verb training and benefit from a simple user interface which does not require a manual for usage. It should be noted, however, that some free apps suffer from advertisements which block part of the screen and, consequently, hamper the learning experience. The app "Irregular English Verbs" (cf. 10), for instance, contains advertisements from Google in the English version and from Telenet in the Dutch one. The advertisements only disappear when upgrading to the paid version.

As not all developers mention how many irregular verbs feature in their applications, it is difficult to determine whether the application provides relevant language. Most lists range from 20 (cf. 67) to 620 English irregular verbs (cf. 3 and 16), but none of the developers mention the source of their irregular verb lists. In addition, it is not explicitly mentioned whether the lists are based on British or American English. Only "The Language Wheel" (cf. 20) distinguishes between American and British English by indicating "AE" an "BE" respectively next to the verb. For the development of a viable irregular verb app aimed at Dutch first-year undergraduates at University College Ghent, Wolters' or Van Dale's irregular verb lists, containing some 189 basic irregular verbs, could be considered most suitable

sources (cf. Appendix V). Using Wolters' irregular verb list as a benchmark, I will regard all lists under approximately 189 irregular verbs as irrelevant to irregular verb learning.

The following sections will look into the utility and productivity category separately and discuss the most and less common features found in apps on English irregular verbs. Appendix VII summarises all features found in each app separately.

3.4.1.1 Utility Apps

From all three app stores, a total of 22 utility apps are tabled in Appendix VI. Utility apps provide lists of irregular verbs without offering a practice mode. They are generally described as "dictionary apps" by their developers. Besides their simple look-up function, however, most of them offer some extra functionalities, including word pronunciation, translator and user edit options.

Only seven out of 22 apps did not feature a search bar (cf. 2, 5, 11, 12, 13, 14, 22). Some of these apps lack a search bar because they do not provide a conventional irregular verb list. For instance, "Irregular Verb Dictionary" (cf. 5), which offers 370 irregular verb songs. "English Irregular Verbs 250" (cf. 18) provides more than a conventional irregular verb list by allowing the learner to choose between three categories of listing, including 'All Verbs', 'Level', and 'Pattern'. Level categories order verbs according to their importance, whereas pattern categories classify verbs according to their conjugation patterns.

Most apps lack sample sentences and verb definitions, making it difficult for learners to fully understand the meaning of the given irregular verbs. Counterexamples include apps 3, 4, 12, 16, 17 and 18. The app "I&P English Verbs" (cf. 21) offers verb definition and sample sentences as well but requires internet connection to browse to the www.thefreedictionary.com web page. To see the list itself, however, no internet connection is needed. Although it does not give any definitions or examples, "Pic-English Irregular Verbs" (cf. 14) can be considered an exception as well. This app does not give a list of irregular verbs but 120 drawings with their base forms instead, allowing learners to derive verb meanings from images.

Other functionalities found in utility apps include word pronunciation and an integrated translator. Ten out of 22 utility apps benefit from a word pronunciation option. Only "English Irregular Verbs 250" (cf. 18) offers phonetic descriptions instead. Apps which feature word pronunciation allow learners to practice their English pronunciation skills and avoid pronunciation problems, which could occur in some verb spellings, such as "arisen" [ə'rizn], "bear" [beə], "dreamt" [dremt], "read" [red]. Only "620 English Irregular Verbs" (cf. 3, 16) offers translations into Dutch. Other apps with an integrated

translator (cf. 3, 8, 9, 13, 16, 19) feature translations into several languages, including German, French, Spanish, Catalan, Russian and Portuguese.

Furthermore, apps 2, 4, 9, 17 and 19 offer a personalised learning experience by allowing learners to build their own verb lists or to edit their original lists. "Irregular Verbs in Use" (cf. 17), for instance, allows learners to define words in a built-in dictionary. Besides the possibility to build personalised lists, "Do Did Done Lite: English IV Revision" (cf. 9) offers an automatic reading of its revision list, which allows users to study 'on the go'. Another feature worth mentioning is the native speech engine integrated in "Irregular Verbs in Use" (cf. 17) as it is capable of repeating the users' entries.

3.4.1.2 Productivity Apps

From all three app stores, a total of 46 productivity apps are tabled in Appendix VI. Productivity apps offer sufficient practice and are generally equipped with a wider range of functionalities than utility apps. Most irregular verb apps contain both a reference list and a practice mode, which allows learners to revise before starting irregular verb practice. Fifteen out of 46 apps, however, do not feature an irregular verb list, including apps 23, 28, 30, 31, 32, 33, 34, 43, 44, 52, 60, 61, 63, 64 and 70. Some offer special listing features, "Irregular Verbs Dragunkin Pro" (cf. 25), for instance, classifies irregular verbs according to their similarities. Similarly, "A List of Verbs" (cf. 57) contains an elaborate look-up page which groups verbs by their conjugation patterns and "iVerb" (cf. 58) allows learners to use a cloud interface to look up irregular verbs. The app "290 English Irregular Verbs" (cf. 56) offers both an alphabetic and configurable classification, including ascending, descending or random order.

Productivity apps benefit from a gamification aspect as they all contain a practice mode and provide learning outcomes. Irregular verb training offered by these apps can be divided into three groups of exercises. A first group consists of multiple-choice quizzes in which the learner has to select the right verb form out of several answer possibilities. A second group includes drill exercises in which the learner has to give the right verb form or in which several verb forms are left out. Finally, a third group consists of fill-in-the-gap exercises in which the correct verb form needs to be placed in a sentence. Only three apps (cf. 46, 53, 67) offer the latter category of exercises. The app "English Irregular Verbs" (cf. 67), for example, aims at a young target audience and only includes twenty irregular verbs, each of which is accompanied with a picture and a fill-in-the-gap exercise.

Out of 46 productivity apps, 22 apps belong to the first group of quizzes whereas only eighteen apps offer drill exercises. Only "Irregular-Verbs" (cf. 46) includes all three types of exercises, which are classified into three categories, namely "association test", "memory test" and "fill in the gap". A special type of exercise is offered by the app "English Verb Master" (cf. 60), which contains two different types of exercises. In the first one, the learner has to build a sentence with a given subject,

verb and modifier, whereas the second exercise involves determining the meaning of a given sentence. Only eleven out of 46 productivity apps feature levels of difficulty, the French app "Verbes Irréguliers en Anglais" (cf. 37), for instance, offers a test mode in three different levels, called "elementary", "intermediate" and "advanced". The advanced level includes all available English verbs, whereas the elementary level is limited to the most common verbs.

Only five apps offer original gameplay, including apps 23, 32, 49, 65 and 70. The free app "English Irregular Verbs" (cf. 23) is a simple game in which the learner needs to unlock two out of three chests by using the right key with the correct verb form. When the learner has slid the verb form into the chest, a colourful parrot reads the three word forms so as to offer the correct pronunciation. In "Verbs Game" (cf. 49), learners have to give the specified form of the verb whilst the verb is falling down. If they are wrong, the word is crashed into letters and falls down on the playing field. The game is over when the fallen letters fill the entire playing field. In the Spanish app "Ingles EnTuldioma – Verbos Irregulares en Pasado – Básico" (cf. 65), learners risk to lose a life for every mistake they have made. They have to gain points in order to attain the next level. Similarly, the app "Ticwow English Grammar" (cf. 70) contains various complexity levels and encourages learners to develop automatic skills by playing the popular game "tic-tac-toe", a.k.a. "noughts and crosses".

A last game-play app worth mentioning is "English Irregular Verbs" (cf. 32), in which learners can choose between three levels: irregular verbs, mixed verbs and advanced verbs. Level one offers an audio clue to the correct answer. As the correct sentence is dictated, learners simply have to slide the correct verb form into the sentence. In level two, there is no such audio clue and irregular verbs are mixed with regular ones. Similarly, learners have to correctly identify the verb as either regular or irregular in the advanced level when selecting the correct conjugation form for both past tense and past participle.

In all productivity apps, learning results are given either on the exercise screen itself or on a separate screen. Only eight out of 46 apps feature a visible progress indicator which tracks learning progress, including apps 27, 40, 41, 45, 49, 57, 59 and 60. The app "Go-Went-Gone" (cf. 41), for example, shows test results and learning progress by means of statistics. Similarly, "A List of Verbs" (cf. 57) records the average time for accomplishing each irregular verb test and lists all verbs the learner has failed to conjugate. The app "Verbitonic" (cf. 59) even offers statistics which show all levels accomplished, number of words in each level, percentage of level completion, number of correct answers, and all incorrect answers.

Similar to utility apps, some productivity apps feature word pronunciation, an integrated translator and user edit options. Seventeen out of 46 apps benefit from word pronunciation whilst twenty productivity apps offer an integrated translator. In accordance with utility apps, the most common languages covered are German, French, Spanish, Catalan, Russian and Portuguese. Other languages

found in productivity apps include Italian, Romanian, Ukrainian, Thai, Chinese, Czech, Greek, Japanese, Korean, Polish, Turkish and Arabic. Only one app offers translations into Dutch, namely "Irregular Verbs Dragunkin Pro" (cf. 25), in which only the Dutch verb form is given so that the learner has to give all three English verb forms.

Personalisation of the learning experience is offered through bookmarking your errors (29, 47, 53, 59, 69), highlighting your favourite verbs (37, 48, 54), creating your own list of difficult verbs (26, 27, 40), selecting the verbs you want to practice (23, 30, 36, 38, 42), or through note-taking (61). Six out of 46 apps (33, 38, 41, 54, 70, 71) allow to share results on social network sites or to mail them to peers. Meeting the third requirement on Sweeney et al.'s (2012:13) second checklist (see Table 6), these apps allow for a collaborative learning experience.

3.4.1.3 Conclusion

To conclude, Appendix VII resumes all features found in irregular verb apps and indicates for each app which features it covers. All features dealt with are similar to features found in vocabulary learning apps by Sweeney et al. (2012: 10). Vocabulary apps, however, generally cover more often an integrated dictionary and offer more translation exercises.

Remarkably, a large number of irregular verb apps allow to acquire more than one skill. Most of these apps have word pronunciation and a translator: apps benefitting from word pronunciation allow learners to practice pronunciation skills, whereas apps offering an integrated translator allow learners to enrich their English vocabulary. Apps featuring all English tenses with grammatical information are considered to offer more than one skill as well, including apps 20, 30 and 60. Whereas the utility app "The Language Wheel" (cf. 20) only provides grammatical information about when to use a given tense without any practice, the productivity app "Irregular Verb Quiz" (cf. 30) only provides exercises without any grammatical help. The app "English Verb Master" (cf. 60) offers both.

Nevertheless, none of the apps offer all features, not even the immersive app (cf. 71) as it lacks example sentences, verb meaning, a mixed verb option and a progress indicator. Furthermore, none of the apps were specifically aimed at Dutch language learners and Dutch translations were only scarcely available in some apps. As all irregular verb apps currently available on the market fail to meet my requirements for a pedagogically viable language learning app (see Table 7), I endorse Sweeney et al.'s (2012: 2) viewpoint for developers, entrepreneurs, teachers and linguists to work together in order to improve the quality of mobile learning apps so that they truly realise their potential to become "commercially viable, technically feasible and pedagogically useful".

4 DESIGN CASE: IRREGULAR VERB APP

In this final chapter, I will propose a design for a pedagogically viable and technically feasible irregular verb app aimed at Dutch first-year undergraduates at University College Ghent.

From a learner-centred m-learning point of view (cf. 2.1.1), education apps should meet the needs and demands of students raised in a digital age. Therefore, section 4.1 will discuss language learning preferences amongst the target audience, i.e. Dutch first-year undergraduates interested in learning English. Relevant data will be provided by a large-scale survey conducted by Steel (2012) and an additional small-scale survey conducted amongst Dutch first-year undergraduates at University College Ghent. As discussed in section 2.2.4, education apps are preferably available in a web or hybrid app format so that all students possessing a smartphone can access it regardless of the mobile operating system their phones are running on. Therefore, development details particular to creating web and hybrid apps will be taken into account as well.

Finally, the proposed design framework will be justified on the basis of market-research findings (cf. chapter 3) and questionnaire outcomes. As both language learning preferences and technical development details will be taken into account, the design case can be considered both pedagogically viable and technically feasible.

4.1 Language learning preferences

Developing web apps for mobile delivery, Castledine et al. (2012: 6) highlight the importance of gaining insight into "what people are seeking in a mobile context" before starting the development of any mobile app. Whatever the product or service, it is important to "develop an app which meets the users' demands" (Castledine 2012: 6). Therefore, a study into students' own use of mobile apps and their perspectives on how these apps can benefit their language learning experiences is indispensable.

In order to provide insight into student perspective on the benefits of using mobile apps for foreign language learning, Caroline Steel (2012), professor at the University of Queensland, studied how 465 language learners used mobile apps to profit from their available learning time outside of class. Her project, called 'The beliefs and experiences of language students in their early years of transition to university-level study', was conducted at an Australian university from May to August 2011 (Steel 2012: 2). During an online survey, students were asked to identify the technologies they used to support their language learning inside and outside the class, then to rank the top three technologies that they regarded as most beneficial to their language learning when used outside their formal class settings, and finally participants were prompted to type qualitative comments on the learning benefits they perceived from their top three technologies (Steel 2012: 2).

During the qualitative analysis, 331 (56%) students reported using mobile apps to support their university learning, whilst 134 (23%) students ranked mobile applications in their top three technologies (Steel 2012: 2). The themes reported by the latter category of 134 students during the qualitative analysis describe: (a) the ways students used mobile apps to maximise time, location and opportunity to fit language learning into their daily lives, as well as (b) the specific learning benefits students perceived through their use of mobile apps for language learning (Steel 2012: 2). Under the first category (a), the most important factors for students include flexibility, portability, easy-to-use user interfaces, being able to learn-on-the-go, and convenience of using their apps to gain time efficiencies (Steel 2012: 3).

Many students were found to have a variety of language apps on their mobile devices, approximately six to eight apps on average (Steel 2012: 3). Vocabulary apps were most frequently mentioned (70%) in the student data and were regarded as "highly beneficial to students' learning" (Steel 2012: 3). Amongst the many benefits on language learning apps reported, students particularly valued the opportunity to "intellectually connect with the language beyond the classroom" and to be able to "work at their own pace rather than the class pace" (Steel 2012: 3). Furthermore, students are convinced that mobile apps are most beneficial to language learning as they bring "more exposure and engagement with the language than just the time spent in the classroom" (Steel 2012: 4).

Language apps that students were familiar with were perceived as "very beneficial" when offering flashcards and games that could be personalised to assist targeted vocabulary acquisition (Steel 2012: 3). Consequently, an irregular verb app should take into account gamification and personalisation of the learning experience. Another popular language app category consists of apps which offer multiple functions in an integrated and seamless way, such as grammar apps which offer mobile versions of language dictionaries, translators and verb conjugators (Steel 2012: 3). As translation and dictionary options were considered indispensable to language learning apps, they will be regarded as important features for an irregular verb app as well.

Steel (2012: 4) concludes that teachers need to be more aware of the language apps their students are using and how they are using it in order to provide "some guidance and recommendations on how their learning benefits could be extended". Teachers should also be aware of their students' language learning preferences (Steel 2012: 4). In order to gain insight into learning preferences for irregular verbs in particular, a small-scale questionnaire amongst Dutch first-year graduates at University College Ghent was conducted (cf. Appendix VIII). All students indicated that they used the irregular verb list provided in class to study their irregular verbs, mostly by hiding columns to practice. Only eight out of eleven students make supplementary exercises, four of which indicated making them online whilst two students reported to have practiced their irregular verb forms via a mobile application.

All students indicated that they find irregular verb conjugation a difficult study area. When asked what they find particularly difficult about irregular verbs, 63 per cent answered they did not know in which context to use the irregular verb and 50 per cent claimed not to recognise verbs as irregular ones. The most beneficial exercises to practice irregular verbs were perceived to be drill exercises in which only the Dutch base form is given and context-related, fill-in-the-gap exercises. Finally, they were asked against which conjugation pairs they often make mistakes. The students indicated verb forms ending on "-ung" or "-ang" as the most difficult to memorise. Furthermore, they often confuse "lie" (tell a lie[24]), "lie" (to be or remain in a flat position on a surface[25]) and "lay", and "rise" and "raise". None of the students claimed that they never make mistakes against irregular verbs.

4.2 Developing for mobile devices: web and hybrid app development

When designing for the mobile space, developers face making the inevitable choice between building a native, a hybrid or a web app (Castledine et al. 2012: 2). As discussed in 2.2.4, web and hybrid apps offer considerable development advantages over native apps. Castledine et al. (2012: 3) endorse web apps' limited performance capabilities over native apps but note that a simple web app which does not require high-resolution 3D graphics nor a lot of number crunching is able to "provide a good user experience nonetheless". Although the proposed framework is designed to suit native, hybrid as well as web app formats, Jan Deruyck, business developer at "In the Pocket", believes that web apps and hybrid apps are most suitable for the introduction of an education app in a first-year undergraduate curriculum at University College Ghent.

Their main advantage over native apps is their ability to run on different mobile operating systems. From an educational point of view, this allows students possessing a smartphone to access education apps regardless of the mobile operating system their phones are running on (cf. 2.2.4). Whereas native apps are optimised specifically for the device and platform they are running on, web apps rely on the web browser's rendering and JavaScript engines (Castledine et al. 2012: 3). For iOS, Android, BlackBerry, Symbian, and webOS, the browser engine of choice is the open-source web-kit project, i.e. the same engine that powers Safari and Google Chrome, whilst Windows Phone 8 requires a version of Internet Explorer 7 or 9. As the latter only targets Windows Phone devices, it can be considered the less appropriate browser engine for the development of any education app.

Instead, Castledine et al. (2012: 10) propose two better alternatives, namely Sencha Touch and the jQuery Mobile projects, which provide cross-platform development frameworks for mobile purposes, allowing hybrid app development. Whereas Sencha Touch uses the all-JavaScript with better

[24] http://www.merriam-webster.com/thesaurus/lie
[25] http://www.merriam-webster.com/thesaurus/lie

performance, jQuery Mobile chooses the more user-friendly approach of progressive enhancement as its apps are built in plain HTML (Castledine et al. 2012: 10). Similarly, Godwin-Jones (2011: 6) recommends using jQuery Mobile as it facilitates creating parts of a web app such as navigation, form elements, and page transition effects without having to write the JavaScript.

In their book on creating web apps for mobile devices, Castledine et al. (2012: 21) stress the importance of the user interface (UI). They list some UI conventions to create delightful, intuitive, and unique interfaces for their users, including low cognitive load, accelerometers, device rotation and the most appropriate touch gestures (Castledine et al. 2012: 21). Castledine et al. (2012: 27), however, note that developers should start simple and decide on a set of core features before thinking about lay-out and adding supplementary features which do not directly serve the app's purpose.

Bearing their advice in mind, I will now propose a design which meets both language learning preferences (cf. 4.1) and market research findings (cf. chapter 3). Although I argue that web and hybrid apps are the best options for the development and introduction of education apps in higher education, it should be noted that a web app might fail to implement all proposed user options due to its development limitations. Therefore, further research will be needed to confirm whether the design is technically feasible for the creation of a web app in particular.

4.3 Design case

Following Wang et al. (2009: 525), the design case is based on the "Mobile Learning Centre"-software developed by LearnEasy Soft Co.ltd, the first company to provide m-learning websites in China. The software is aimed at vocabulary learning applications but can easily be adapted to irregular verb applications. It is most suitable to represent a set of core features by its simplicity and completeness: first, it represents an easy-to-use interface as it distinguishes only four modules and eleven simple sub modules, and secondly, it features most requirements for viable language learning apps as listed by Sweeney et al. (2012: 13, see Table 7), including visible progress indicators, gamification aspect, translator, appropriateness for the device in terms of content and activity, sufficient practice and a revise mode. Figure 5 represents the Mobile Learning Centre structure as adopted by Wang et al. (2009: 526).

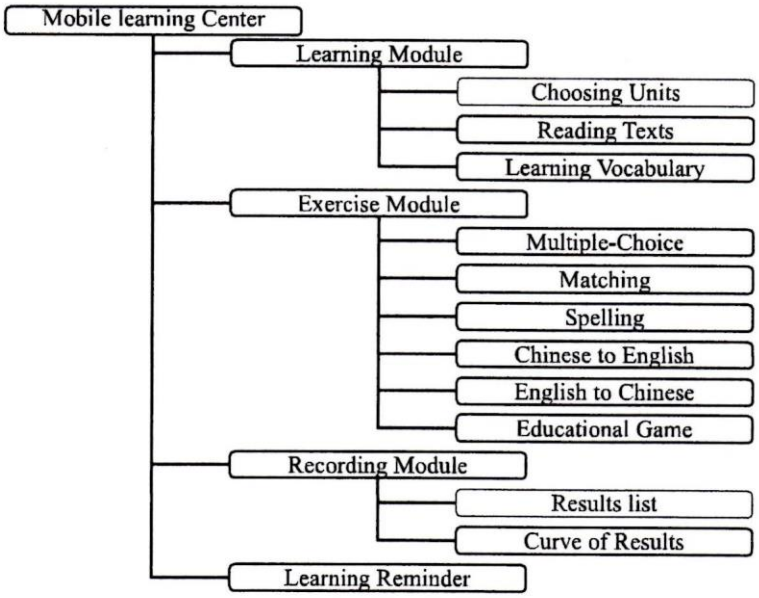


Figure 5: Structure of Mobile Learning Centre software (Wang et al. 2009: 526).

The learning module contains vocabulary units, a reading text as well as a "learning vocabulary"-mode and could easily be adapted to meet learning preferences for irregular verb training amongst first-year undergraduates as summarised in section 4.1. First, the units could be replaced by levels of difficulty, ranging from beginner and intermediate to advanced, in order to provide a more personalised learning experience. As students reported to need a revise mode, the reading texts could be replaced by an irregular verb list. It could be an even more beneficial revise aid if students were able to hide panels in order to practice. Only one irregular verb app discussed in chapter 3 provided this option, namely the Android app "English irregular verbs" (1, cf. Appendix VI).

For the irregular verb list, Wolters' or Van Dale's irregular verb lists are considered to be most suitable sources for the development of an educational irregular verb app aimed at Dutch first-year undergraduates at University College Ghent. Appendix V presents Wolter's irregular verb list containing 189 irregular verbs. Irregular verbs which have regular verb forms as well are indicated by the abbreviation 'R' and accompanied by an example sentence if the regular form holds a different meaning. Furthermore, phonetic transcription is provided for verbs which might cause pronunciation difficulties to Dutch students and a distinction between American and British English is made. The list does not contain derived verb forms which have similar conjugation forms as their ground form, such as a*rise*, a*wake*, etc. (Gerritsen et al. 1990). Derived verb forms which have different conjugation forms than their ground form, however, are listed, including for*bid* and for*get* (Gerritsen et al. 1990).

As 63 per cent of the students indicated having difficulties in placing the irregular verbs in context, users should be allowed to click on the base form to get supplementary information, such as verb definition and sample sentences. Finally, the "learning vocabulary"-mode could contain drill exercises on irregular verbs. The most preferred drills were reported to be only showing the Dutch base form, but students should be able to choose between several drills. Furthermore, it would be beneficial if students were able to personalise their drills, for instance, by selecting difficult irregular verbs which have to occur more regularly in their drills so that they can focus on their personal difficulties. It would be even more beneficial if this process were automatised: the app should be able to derive the users difficulties from the statistics generated in the recording module, which tracks the most common mistakes.

The exercise module could offer the most popular exercises to practice irregular verbs as reported by first-year undergraduates in section 4.1, mainly context-related exercises and quizzes. As the small-scale survey in learning preferences indicated that some students found it difficult to distinguish irregular verb forms from regular forms, a mixed verb option should be possible as well. Translation exercises are considered unnecessary as verb translations are already provided in the irregular verb list under module one. In chapter 3, only one app featured a visually-rich environment with original game-play possibilities and could therefore be regarded as an immersive app (71, cf. Appendix VI). In order to stand out of the bulk of irregular verb apps available today, our pedagogically viable irregular verb app should contain an easy-to-use and visually attractive game.

We view the popular Facebook game Ruzzle[26] as an attractive game-play function for an irregular verb app. Ruzzle is a well-known and easy-to-use word puzzle in which the user has to find as many words as possible in two minutes. The same principle could be applied to irregular verb training by letting the user find irregular verb forms instead of random words. Users have to complete as many levels as possible and are rewarded with points each time they attain a higher level. Furthermore, Ruzzle benefits from a social aspect as users are able to share their results on their social media profiles on Facebook and Twitter and/or can challenge their counterparts. Although considered as an important requirement for collaborative mobile learning by Sweeney et al. (2012: 13), a similar social aspect was only present in six apps surveyed under chapter 3, namely apps 33, 38, 41, 54, 70, 71 (cf. Appendix VI).

It should be noted, however, that MAG Interactive holds the intellectual property of Ruzzle so that a development license will be required if the app were to embrace features similar to the Ruzzle game. In its "terms of use"[27] the company states that "all rights, title and interest in and to all materials that are part of the App (including, but not limited to, designs, text, graphics, pictures, video, information,

[26] http://www.ruzzle-game.com/
[27] http://www.ruzzle-game.com/terms.html

applications, software, music, sound and other files, and their selection and arrangement), except for "User Content", collectively referred to as the "App Materials", are owned by MAG Interactive and/or its third-party licensors", which implies that users cannot "acquire any ownership rights whatsoever by downloading App Materials", nor "modify, copy, distribute, frame, reproduce, republish, download, scrape, display, post, transmit, or sell in any form or by any means, in whole or in part, or otherwise exploit the App Materials without MAG Interactive's express prior written permission".

Finally, the Mobile Learning Centre features a recording module and a learning reminder. Conducting empirical research into mobile learning preferences, Wang et al. (2009: 529) found that learners expect education apps to provide an analysis column which tracks their progress so that they can revise at any time their personal difficulties. As discussed in 2.1.5, Johnson et al. (2013: 20) confirm that game-based learning, in which the learning environment transforms tasks into challenges and which rewards people for dedication and efficiency through leader boards, rewards and badges, has proven to "stimulate productivity and creative inquiry among learners". Therefore, a results list and a curve of results to track learning progress are indispensable to a viable irregular verb app. Furthermore, a learning reminder prompts learners to revise and practice their most common mistakes more regularly until they have obtained full mastery of all irregular verb forms and their meanings. Figure 6 shows the Mobile Learning Centre-software adapted to my proposal for an immersive irregular verb app.

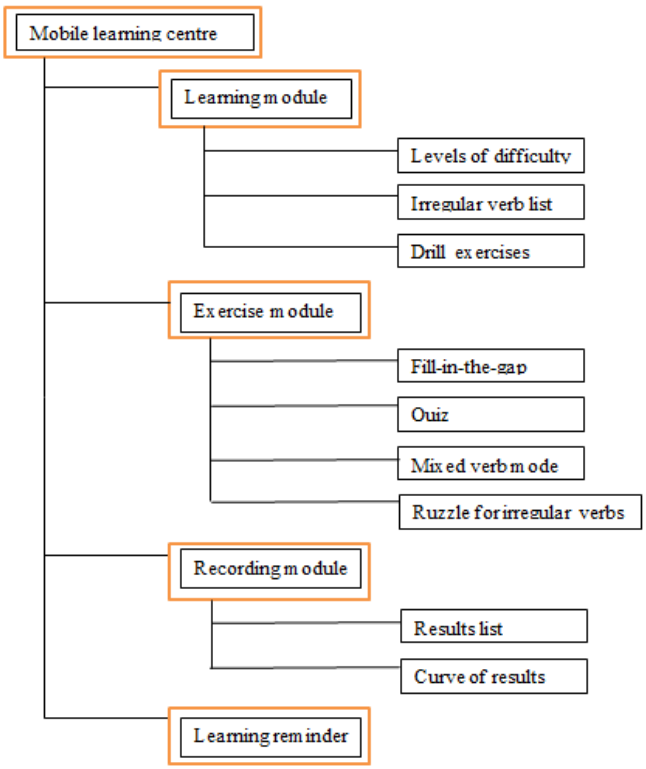


Figure 6: Proposed Structure of Mobile Learning Centre software for an irregular verb app.

To conclude, the design embraces all but two features found in all irregular verb apps (cf. Appendix VII), namely a search bar to look-up irregular verb forms in the verb list, verb definition, sample sentences, a translator, personalisation options, a social aspect, progress indicators, relevant language drawn from Wolters' irregular verb list, a mixed verb option and it allows to train more than one skill as users have to translate verb forms and place them in the right context. A word pronunciation and speech engine option were not considered indispensable to irregular verb training by the target audience and were, therefore, left out of the design case. As the revise mode contains phonetic transcription and first-year undergraduates who major in English are believed to have sufficient knowledge of phonetic transcription, a word pronunciation option is regarded as superfluous. It could be argued, however, that students from other disciplines who have not followed any phonetic course do benefit from a word pronunciation option. If the app were to be marketed to a larger public, a phonetic transcription option would, therefore, be regarded as an interesting asset.

Further research will be needed to evaluate the actual effectiveness and students' appraisal of the proposed app design. Therefore, it is necessary for the app to be developed in a web app or hybrid app format so that all students can easily access the irregular verb app regardless of the operating system their smartphones are running on. As mentioned in section 4.2, further research will have to confirm whether the design is technically feasible for the creation of a web app in particular. For the actual development of the app, I have contacted Mr Joeri Van Steen, lecturer in informatics at University College Ghent, who suggested having the proposed irregular verb app design developed by his last-year undergraduates at the department of informatics as part of an assignment project (cf. Appendix IX).

The app could also be designed by a mobile agency that centres around software development and web technology. I have contacted Jan Deruyck, business developer at "In the Pocket", with regard to app development for educational purposes. Mr Deruyck confirmed that a web or hybrid app would be most suitable for the development of my design proposal and added that his agency would be interested in creating the app in collaboration with University College Ghent. As I could not confirm any concrete development plans, Mr Deruyck could not yet give me information about development prices.

5 CONCLUSION

This dissertation argues that mobile devices with enhanced capabilities offer new learning possibilities which meet the needs and demands of the 21st-century digital natives. The prevalence of mobile technology in today's society and the wave of technological innovations herald a "mobile learning evolution" in which busy university students can "maximise their task-on-task wherever and whenever there is time and opportunity to learn" (Steel 2012: 1). As foreign language mastery requires frequent informal practice and in-class language practice time is often limited, mobile devices and their applications hold potential affordances for language learners as well (Kukulska-Hulme 2009: 157).

From a blended learning point of view, mobile devices were found to provide a "cost-efficient alternative" to traditional e-learning tools, such as desktop laboratories and pods of laptops, as they are becoming "more powerful, portable, affordable and accessible" (Churches et al. 2011: xiv). For students, the wealth of mobile devices, iTextbooks, cloud-based documents and education apps fosters "greater personalisation, collaboration, creativity and engagement in the learning process" (Knight et al. 2012: 30). As most researchers focus on such a learner-centred perspective on m-learning, this dissertation adopted a similar learner-centred approach that sees m-learning as a blended activity, encouraging students to "learn in naturalistic, informal settings" (Looi 2010: 156).

The ubiquity of mobile devices on college campuses makes Cheon et al. (2012: 1055) believe that higher education is "a particularly appropriate venue for the integration of student-centred m-learning". As mobile technologies are being widely applied in different fields of business, a growing number of tertiary education institutions were found to integrate m-learning in their learning programmes. Although many successful implementation examples of teaching and learning with mobile devices in tertiary education were identified, it was noted that a large majority of higher educators have not yet widely explored the wealth of m-learning possibilities in depth. Sweeney et al. (2012: 9) confirm that m- learning affordances are "greatly under-exploited in education, particularly in language learning". Surveying the capabilities and limitations of m-learning in education, Cheon et al. (2012: 1054) argue that it will be hard to "shift a pedagogical culture to a mobile format" because learning with mobile devices involves "the orchestration of students, instructors, content, and institutions".

Although the positive learning outcomes of tablet computing still need to be confirmed, Van der Meulen (2012) believes that tablets in particular will be "the key accelerators to mobility in higher education". Surveying evolutions on the mobile OS market today, smart devices and tablets are believed to imminently prevail over desktop PCs (cf. Figure 1). As mobile devices are likely to become affordable to all students and m-learning affordances are endorsed by several researchers, I believe that mobile devices might face imminent adoption in higher education as well. Therefore,

pedagogically viable and technically feasible m-learning tools, such as educational mobile applications, are needed.

In order to provide such m-learning tools for learning English as Foreign Language (EFL), chapter 3 presented a market research into the present situation of EFL apps available on the app-market worldwide. The research was to show to what extent a set of dedicated EFL apps meets Sweeney et al.'s (2012:13) requirements for a pedagogically viable language learning app (cf. Table 5). Although Sweeney et al. (2012) mainly concentrate on vocabulary learning, their language learning app design framework could easily be extended to all areas in EFL. I was particularly interested in evaluating the quality and features of English grammar learning apps as this large study field in EFL is still underexploited in app research. Since it is unlikely for a low-budget language learning app to successfully offer a full coverage of all grammar topics, this dissertation focussed on app designs for the training of English irregular verbs. Such a narrow focus is recommended by Castledine et al. (2012: 28), who argue that any mobile app should "focus primarily on one or two simple tasks their users want to accomplish" because their main goal is still to provide learning 'on the go'.

As Google's Android, Apple's iOS and Microsoft's Windows Phone mobile platforms are believed to further dominate the mobile OS market (cf. Appendix II), app development for those operating systems will be indispensable for the creation of any education app. Therefore, all English irregular verb apps were drawn from these three most popular app stores. Only native apps, however, are available through app stores so that the discussion on app quality excluded web and hybrid apps. Although native apps potentially offer a better user interface, web and hybrid apps are believed to be most suitable for the development of an educational language learning app as they provide easy-to-use and cross-platform development frameworks. Similar to Sweeney et al. (2012), all native irregular verb apps were categorised according to their app styles, viz. utility, productivity and immersive apps. Whereas the latter category consists of apps used to play games, view media and perform specialised tasks, the first category is limited to apps featuring a simple look-up function. The most common exercises found in productivity apps were simple exercises, such as fill-in-the-gap exercises, quizzes and drill exercises.

In total, 22 utility apps, 48 productivity apps and only one immersive app were found (cf. Appendix VI). Most apps were available for free and none of the apps selected exceeded the cost of $4.99 (€3.99). All apps were subjected to personal experience tests in order to exclude defunct applications and ensure a more reliable evaluation of the user interface. In general, mobile devices were believed to be most suitable for irregular verb training 'on the go' as all apps surveyed benefit from a simple user interface which does not require a manual for usage. Nevertheless, overall quality of irregular verb apps on the market today was found to be rather poor as none of the irregular verb apps met all requirements (cf. Table 7) for a pedagogically viable language learning app. Even the only immersive

app (71), which offers a visually-rich environment with original game-play possibilities and a strong social aspect, failed to meet all requirements as it did not provide any example sentences nor verb meaning. Furthermore, it could not be verified whether the app contained a relevant list of irregular verbs because neither the number of verbs included nor the list's source were mentioned by the developer.

Only 19 out of 71 apps were found to provide a relevant list of irregular verbs which approached Wolters' standard list of 189 irregular verbs (cf. Appendix V), and only two apps provided Dutch translations. Less than twenty apps provided verb meaning and/or example sentences allowing learners to place the irregular verbs in context. Although the small-scale survey conducted amongst eleven Dutch first-year undergraduates at University College Ghent indicated that students find it particularly difficult to place irregular verbs in the right context and to recognise verbs as irregular ones, context-related and mixed verb exercises were only scarcely represented. Furthermore, only 21 out of 71 apps offered a personalised learning experience. Research in learning preferences by Steel (2012), however, highlighted that language apps were perceived as "very beneficial" when offering games that could be "personalised to assist targeted language training". Although lacking personalisation, a large majority of irregular verb apps did offer game-play possibilities.

On the basis of research findings, I endorse Sweeney et al.'s (2012: 2) need for developers, entrepreneurs, teachers and linguists to work together in order to improve education app quality so that they truly realise their potential to become "commercially viable, technically feasible and pedagogically useful". In order to prompt higher education leaders to introduce such m-learning tools in their curricula, I outlined an irregular verb app design which meets all requirements for a pedagogically viable language learning app. The irregular verb app is aimed at Dutch first-year undergraduates at University College Ghent and could easily be introduced as study aid for students who need more personalised or collaborative practice in irregular verb training. As I aspire to foster an engaged and useful learning experience, language learning preferences amongst first-year undergraduates were explored. Relevant data was provided by a large-scale survey conducted by Steel (2012) and an additional small-scale survey conducted amongst eleven Dutch first-year undergraduates at University College Ghent.

The design model (cf. Figure 6) embraces a search bar to look-up irregular verb forms in the verb list, verb definition, sample sentences, a translator, personalisation options, a social aspect, progress indicators, relevant language drawn from Wolters' irregular verb list, a mixed verb option, and it allows to train more than one skill as users are invited to translate verb forms and place them in the right context. As language learning preferences amongst first-year undergraduates as well as technical development details were taken into account, the proposed design can be considered both pedagogically viable and technically feasible.

Although I argued that web and hybrid apps are the best options for the development and introduction of education apps in higher education, it was noted that a web app might fail to implement all proposed user options due to its development limitations. Therefore, further research will be needed to confirm whether the design is technically feasible for the creation of a web app in particular. Furthermore, the actual effectiveness and students' appraisal of the proposed app design still needs to be evaluated. Future studies may also be needed to examine the pedagogical premises that underpin the design of current mobile education apps in other areas in English language learning and to suggest further improvements.

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APPENDIX

Appendix I: Different affordances in choosing a mobile device for school-based research

Table 1: Different affordances in choosing a mobile device for school-based research

Affordances	*Factors*	*Decision considerations*
Platform	Platform operating system	The device is running on a platform that also runs on different devices by other manufacturers
		A community of developers and software companies creates applications on the platform
Form Factor	Weight	The device must be light enough for a primary pupil to carry to school along with some books
	Size	The device must be small enough to be carried in a bag or easily carried by hand by primary school children
	Screen resolution	The device must have a good screen resolution and provide acceptable viewing experience outdoors
Mobility	'Paperback book' mobility	The device offers users the mobility to use them in school, out-school and at home. It is unlikely that students will carry them around pervasively because of the size and weight, despite their mobility
	'Pocket size' mobility	Users are likely to carry these small mobile devices with them pervasively because of their pocket size. These devices can be used in in-school, out-school, home and informal activities
Connectivity	WiFi	The device can connect to the Internet or to a local network through WiFi
	Bluetooth	The device can connect wirelessly to other devices with Bluetooth feature and even the Internet
	3G high-speed mobile broadband technology—eg, EDGE, HSPDA	The device can connect to the Internet through 3G or 3.5G directly
		The device has a USB port to use a modem for mobile broadband access if it does not have direct 3 or 3.5 G capability
	2G-based technology eg, GPRS	The device can connect to the Internet using GPRS
Applications	Web-based applications	Pupils can access web-based applications from the device
	Ready Learning and Mobile Learning applications	There are available mobile learning applications on the market for the device platform
	Software development kit (SDK) to create mobile learning applications	The device platform or manufacturer releases SDK for the development of applications on the device. Some points regarding the SDK: • How mature is the SDK in the market? • How open is the SDK? Is it proprietary or open source? • How widely used is the SDK by developers? • What are the tools to build the applications with the SDK and the availability of those tools?
	Integration to servers	Applications allow the device to upload or download information from or to a server
	Applications can operate off-line or online	Applications on the device can operate off-line. With connection to the Internet, the applications can upload or download information from the server

Table 1: Continued

Affordances	*Factors*	*Decision considerations*
Voice	Telephony support	The device can be used as a telephony device through cellular networks, eg, GSM The device can be used as a telephony device using voice-over-IP technology, eg, SKYPE
Battery	Battery	The device should be easily charged and have a long battery life for fieldwork
Durability	Robust	The device should not be too fragile for handling by primary school children
Cost	Cost is affordable for adoption by schools and parents	The device should be reasonably priced to be bought by school or parents of the students
Support	Available maintenance and support for school by the supplier	Good support and maintenance is available for the device by the manufacturer or distributor. The device should be replaceable, or an equivalent replacement should be available if it is under repair or lost
Features	Camera	The device has a camera for students to capture still shots or record video
	Pen-based input	The device has a touch-sensitive screen to allow direct pen input
	Keyboard	The device has a QWERTY keyboard for input
	Ease of use on the interface	The device interface is simple and intuitive to use
	Voice or Audio	There is audio input on the device to record voice or sound The device can play back audio in MP3 or WAV format
Memory storage	On-board	There is a large on-board memory to install and run applications on the device
	Expandable	The device has expansion slots for additional memory, eg, SD card
	Backup	Information on the device can be backed up easily on another computer or storage: • Cable connection to another computer • USB port for thumb or portable drives • Slot for mini-SD, micro-SD or SD card

EDGE, Enhanced Data rates for Global Evolution; HSPDA, High-Speed Downlink Packet Access; GPRS, General Packet Radio Service; GSM, Global System for Mobile Communication; IP, Internet Protocol; MP3, MPEG Audio Layer 3; WAV, Windows Wave Audio Format; USB, Universal Serial Bus; SD, Secure Digital.

Appendix II: top six smartphone mobile operating systems, shipments, and market share, Q3 2012 (preliminary) (units in millions).

Operating System	3Q12 Shipment Volumes	3Q12 Market Share	3Q11 Shipment Volumes	3Q11 Market Share	Year-Over-Year Change
Android	136.0	75.0%	71.0	57.5%	91.5%
iOS	26.9	14.9%	17.1	13.8%	57.3%
BlackBerry	7.7	4.3%	11.8	9.5%	-34.7%
Symbian	4.1	2.3%	18.1	14.6%	-77.3%
Windows Phone 7/ Windows Mobile	3.6	2.0%	1.5	1.2%	140.0%
Linux	2.8	1.5%	4.1	3.3%	-31.7%
Others	0.0	0.0%	0.1	0.1%	-100.0%
Totals	181.1	100.0%	123.7	100.0%	46.4%

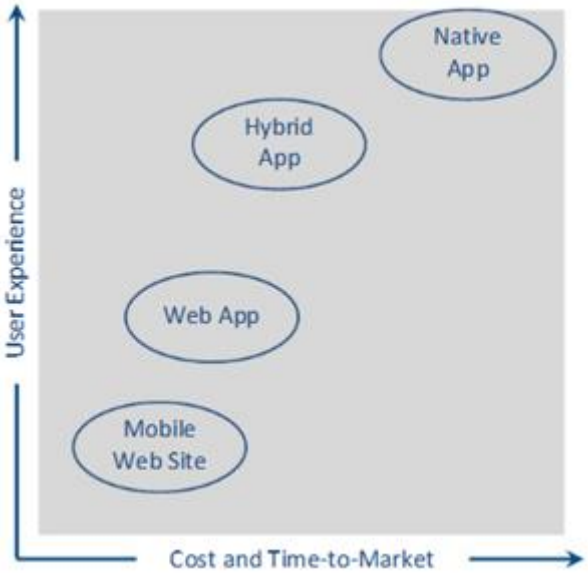
Source: IDC Worldwide Mobile Phone Tracker (November 2012). [12-02-2013].

Appendix III: Worldwide smartphone sales to end users by operating system in 4Q12 (thousands of units)

Operating System	4Q12 Units	4Q12 Market Share (%)	4Q11 Units	4Q11 Market Share (%)
Android	144,720.3	69.7	77,054.2	51.3
iOS	43,457.4	20.9	35,456.0	23.6
Research In Motion	7,333.0	3.5	13,184.5	8.8
Microsoft	6,185.5	3.0	2,759.0	1.8
Bada	2,684.0	1.3	3,111.3	2.1
Symbian	2,569.1	1.2	17,458.4	11.6
Others	713.1	0.3	1,166.5	0.8
Total	**207,662.4**	**100.0**	**150,189.9**	**100.0**

Source: Gartner (February 2013). [12-02-2013].

Appendix IV: An inherent trade-off:



Source: Worklight, http://www.scribd.com/doc/50805466/Native-Web-or-Hybrid-Mobile-App-Development [02.03.2013]

Appendix V: Wolters' irregular verb list (Gerritsen et al. 1990).

Onregelmatige werkwoorden

Afgeleide werkwoorden zijn slechts opgenomen wanneer zij een afwijking van de grondvorm vertonen (dus wel *forbid, forget*, enz., maar niet *arise, awake*, enz., die in hun vormen geheel overeenkomen met *rise, wake*, enz.) De gegeven vertalingen zijn slechts als een aanduiding bedoeld. Voor verdere informatie raadplege men de hoofdtekst.
De letter R duidt aan, dat de regelmatige vorm ook gebruikt wordt.

abide	abode, R	abode, R	verbeiden, verdragen
be	was/were	been	zijn
bear [bɛə]	bore	borne	(ver)dragen
		Be born = geboren worden: *He* **was** *born in* 1898	
beat	beat	beaten, (*inz Am*) beat	slaan, verslaan
beget	begot	begotten	voortbrengen
begin	began	begun	beginnen
bend	bent	bent, R	buigen
		On his bended knees	
bereave	bereft, R	bereft, R	beroven
		Bereft of hope; the bereaved parents	
beseech	besought, R	besought, R	smeken
bestride	bestrode	bestrode,	schrijlings zitten op
		bestridden, (*vero*) bestrid	
bet	bet, R	bet, R	wedden
bid	bade [bæd, beid], bid	bid(den)	gebieden, verzoeken
		bid (bieden op een veiling) heeft: **bid - bid - bid**	
		Who **bids** *more? What was the highest price that was* **bid**?	
bide	R, (*vero*) bode	bided	afwachten
bind	bound	bound	binden
bite	bit	bitten	bijten
bleed	bled	bled	bloeden
bless	R, blest	R, blest	zegenen
blow	blew	blown	blazen, waaien
break [breik]	broke	broken	breken
breed	bred	bred	kweken, fokken
bring	brought	brought	brengen
build [bild]	built	built	bouwen
burn	burnt, (*inz Am*) R	burnt, (*inz Am*) R	branden
burst	burst	burst	barsten
buy	bought	bought	kopen
can	could	–	kunnen (*geen inf*)
cast	cast	cast	werpen
catch	caught	caught	vangen
chide	chid, R	chidden, chid, R	berispen
choose	chose	chosen	kiezen
cleave	cleft, clove	cleft, cloven	klieven, splijten
cling	clung	clung	zich vastklemmen
come	came	come	komen
cost	cost	cost	kosten
		Regelmatig in de betekenis van *de kostprijs berekenen*	
creep	crept	crept	kruipen
crow	R, crew	crowed	kraaien
cut	cut	cut	snijden
dare	R, (*vero*) durst	dared	durven
deal	dealt [delt]	dealt [delt]	handelen
dig	dug	dug	graven

dive	R, (*Am*) dove	dived	duiken
do	did	done	doen
draw	drew	drawn	trekken, tekenen
dream	dreamt [dremt], R	dreamt [dremt], R	dromen
drink	drank	drunk	drinken
drive [draiv]	drove	driven [drivn]	rijden, drijven
dwell	dwelt, R	dwelt, R	wonen
eat	ate [et, eit]	eaten	eten
fall	fell	fallen	vallen
feed	fed	fed	(zich) voeden
feel	felt	felt	(zich) voelen
fight	fought	fought	vechten
find	found	found	vinden
flee	fled	fled	vluchten
fling	flung	flung	(met kracht) werpen
fly	flew	flown	vliegen
forbid	forbade [fə'bæd, -beid], forbad	forbidden	verbieden
forecast	forecast, R	forecast, R	voorspellen
forget	forgot	forgotten	vergeten
forsake	forsook	forsaken	in de steek laten
freeze	froze	frozen	vriezen
get	got	got, (*Am*) gotten	krijgen
gild	R, gilt	R, gilt	vergulden
gird	R, girt	R, girt	(om)gorden
give [giv]	gave	given [givn]	geven
go	went	gone	gaan
grind	ground	ground	malen, slijpen
grow	grew	grown	groeien, worden, verbouwen
hang	hung	hung	hangen
		De betekenis 'doden door ophanging' is doorgaans R	
have	had	had	hebben
hear	heard	heard	horen
heave	R, hove	R, hove	hijsen
hew	hewed	hewn, R	houwen
hide	hid	hid(den)	verbergen
hit	hit	hit	treffen
hold	held	held	houden
hurt	hurt	hurt	bezeren
keep	kept	kept	houden
kneel	knelt, R	knelt, R	knielen
knit	R, knit	R, knit	breien
know	knew	known	weten, kennen
lay	laid [leid]	laid [leid]	leggen
lead [li:d]	led	led	leiden
lean	leant [lent], R	leant [lent], R	leunen
leap	leapt [lept], R	leapt [lept], R	springen
learn	learnt, R	learnt, R	leren
leave	left	left	verlaten, laten
lend	lent	lent	(uit)lenen
let	let	let	laten, verhuren
lie	lay	lain	liggen
light	lit, R	lit, R	aansteken
lose [lu:z]	lost	lost	verliezen
make	made	made	maken
may	might	–	mogen (*geen inf.*)
mean	meant [ment]	meant	bedoelen, betekenen
meet	met	met	ontmoeten
mow	mowed	mown, R	maaien
pay	paid	paid	betalen

plead	R, (*inz Am, Sch*) pled	R, (*inz Am, Sch*) pled	pleiten
put	put	put	leggen, zetten
quit	R, quit	R, quit	ophouden, weggaan
read [ri:d]	read [red]	read [red]	lezen
rend	rent	rent	(ver)scheuren
rid	rid, R	rid, R	ontdoen
ride	rode	ridden	rijden
ring	rang	rung	bellen, klinken
rise [raiz]	rose	risen [rizn]	opstaan, opgaan, stijgen, rijzen
rive	rove	riven [rivn], R	splijten
run	ran	run	hard lopen
saw	sawed	sawn, R	zagen
say	said [sed]	said [sed]	zeggen
see	saw	seen	zien
seek	sought	sought	zoeken
sell	sold	sold	verkopen
send	sent	sent	zenden
set	set	set	zetten
sew [səu]	sewed [səud]	sewn [səun], R	naaien
shake	shook	shaken	schudden
shall	should	–	zullen (*geen inf*)
shear [ʃiə]	sheared	shorn, R	scheren (van schapen)
shed	shed	shed	storten (bloed, tranen)
shine	shone [ʃɔn]	shone [ʃɔn]	schijnen
		Maar: *I've* **shined** *your shoes*	
shit	shit, R	shit, R	schijten
shoe	shod, R	shod, R	beslaan
shoot	shot	shot	schieten
show	showed	shown, R	tonen
shrink	shrank, shrunk	shrunk	krimpen, terugdeinzen
shrive [ʃraiv]	shrove, R	shriven [ʃrivn], R	de biecht afnemen
shut	shut	shut	sluiten
sing	sang	sung	zingen
sink	sank	sunk	zinken
sit	sat	sat	zitten
slay	slew	slain	doden
sleep	slept	slept	slapen
slide	slid	slid	glijden
sling	slung	slung	(met een slingerende beweging) werpen
slink	slunk	slunk	sluipen
slit	slit	slit	splijten
smell	smelt, R	smelt, R	ruiken
smite	smote	smitten	slaan
sow	sowed	sown, R	zaaien
speak	spoke	spoken	spreken
speed	sped, R	sped, R	zich spoeden
		Regelmatig in de betekenis van *bespoedigen* en (*te*) *snel rijden*	
spell	spelt, R	spelt, R	spellen
spend	spent, R	spent, R	uitgeven, doorbrengen
spill	spilt, R	spilt, R	morsen
spin	spun	spun	spinnen
spit	spat, (*Am*) spit	spat, (*Am*) spit	spuwen
split	split	split	splijten
spoil	spoilt, R	spoilt, R	bederven
spread [spred]	spread [spred]	spread [spred]	zich verspreiden, spreiden
spring	sprang, (*Am*) sprung	sprung	springen
stand	stood	stood	staan
stave	stove, R	stove, R	inslaan
steal	stole	stolen	stelen, sluipen

stick	stuck	stuck	steken, plakken
sting	stung	stung	steken, prikken
stink	stank, stunk	stunk	stinken
strew	strewed	strewn, R	strooien
stride	strode	stridden	schrijden
strike	struck	struck	slaan, staken
		Maar: **stricken** *by disease*	
string	strung	strung	rijgen, besnaren, spannen
strive [straiv]	strove, (*Am*) R	striven [strivn], (*Am*) R	streven
swear [swɛə]	swore	sworn	zweren
sweat [swet]	R, sweat [swet]	R, sweat [swet]	zweten
sweep	swept	swept	vegen
swell	swelled	swollen, R	zwellen
swim	swam	swum	zwemmen
swing	swung	swung	zwaaien
take	took	taken	nemen
teach	taught	taught	onderwijzen
tear [tɛə]	tore	torn	scheuren
tell	told	told	zeggen, vertellen
think	thought	thought	denken
thrive [θraiv]	throve, R	thriven [θrivn], R	voorspoed hebben
throw	threw	thrown	werpen
thrust	thrust	thrust	stoten
tread [tred]	trod	trodden	(be)treden
wake	woke, R	woken, R	ontwaken, wekken
wear [wɛə]	wore	worn	dragen (aan 't lichaam)
weave	wove, R	woven, R	weven
wed	R, wed	R, wed	huwen
weep	wept	wept	wenen
wet	R, wet	R, wet	nat maken
will	would	–	zullen (*geen inf*)
win	won [wʌn]	won [wʌn]	winnen
wind [waind]	wound	wound	winden
wring [riŋ]	wrung	wrung	wringen
write	wrote	written	schrijven

Appendix VI: irregular verb apps drawn from iTunes, Google Play and Windows Phone Hub.

Utility Apps

N°	APP NAME	OS	COMPATIBLE WITH	PRICE
1	**English irregular verbs**	Android 1.6 or up	Phone	Free
DESCRIPTION		A simple table of English irregular verbs. The table includes 50 basic irregular verbs, however, a more advanced and paid version comprises 136 irregular verbs which can be uploaded once the app is installed.		
FEATURES		• Search bar; • possibility to hide panel; • link to app home page.		
2	**English Irregular Verbs**	Android 2.3 or up	Phone, Tablet	Free
DESCRIPTION		A list of 200 most frequently used verbs.		
FEATURES		• Word pronunciation; • possibility to select favourite verbs by marking a star.		
3	**620 English Irregular Verbs**	Android 2.1 or up	Phone	$0.99 (€0,75)
DESCRIPTION		The application provides a full list of 620 English irregular verbs. Each verb contains meaning, three time forms, and audio transcription. The included translator can translate any text into more than fifty languages.		
FEATURES		• Search bar; • word pronunciation; • translation into more than fifty languages; • verb definition.		
4	**Irregular Verbs**	Android 2.1 or up	Phone	€0,85 (FE)
DESCRIPTION		This App contains a predefined list of most popular English irregular verbs. The programme can demonstrate correct pronunciation and sample usage of all predefined verbs. Each verb has 3 forms, translation, sample usage and user notes about it. The user can also add new words, and use this programme as a very handy personal dictionary.		
FEATURES		• Search bar; • word pronunciation; • sample sentences; • several user edit options.		
5	**Irregular Verb Dictionary**	Android 1.1 or up	Phone	Free
DESCRIPTION		An irregular verb dictionary for English learners which contains over 370 irregular verbs used in modern English.		
FEATURES		• Irregular verb songs; • word pronunciation		
RELATED		Extended Irregular Verb Dictionary, which contains over 489 verbs including rare and antiquated forms and native pronunciation.		
6	**English Irregular Verbs**	Android 1.6 or higher	Phone	Free
DESCRIPTION		This application proposes a list of English irregular verbs, including base form, past participle, third person present –ing form. Essential graphics and quick reference are its main features. The developer offers consultancy for the construction of dictionaries, glossaries and chronologies, marked with the company's brand to be distributed to		

	potential customers on smartphones. Furthermore, it mentions that the app can be customised by a sports, culture or language school and a training organisation. It is available in English and Spanish.		
FEATURES	• Search bar; • link to developer's website.		
7 372 English irregular verbs in your pocket	Android 1.6 or higher	Phone	€1,00
DESCRIPTION	This application provides a list of 372 English Irregular Verbs and their infinitives, preterits and past participles.		
FEATURES	• Search bar.		
8 Irregular Verbs Pro	Android 2.2 or higher	Phone	Free
DESCRIPTION	A directory which contains a list of irregular verbs translated into four languages.		
FEATURES	• Search bar; • translation into four languages, including Spanish, French, German and Russian.		
9 BKS English-Spanish Irr. Verbs	Android 1.6 or higher	Phone	Free
DESCRIPTION	The free English to Spanish dictionary of irregular verbs for Android provides translations in Spanish of the most frequently used 91 English irregular verbs.		
FEATURES	• Search bar; • translation into Spanish; • word pronunciation; • add to favourites.		
10 Irregular English Verbs	Android 1.6 or higher	Phone	Free
DESCRIPTION	Search and browse the list of the English Irregular Verbs. The list contains infinitive, past simple, past participle, present simple and gerundive.		
FEATURES	• Search bar.		
11 Irregular Verbs	Windows Phone 1.0.1.0	Windows Phone 8 Windows Phone 7.5	Free
DESCRIPTION	This App provides a simple list of English irregular verbs, containing 470 verbs.		
FEATURES	X		
12 Irregular Verbs	Windows Phone 1.2.0.0	Windows Phone 8 Windows Phone 7.5 Windows Phone 7	Free
DESCRIPTION	This apps allows to check a form of English irregular verb listing 372 verbs. It gives several meanings of the word in detailed view.		
FEATURES	• Click on the word to get detailed meaning.		
13 Learn Irregular Verbs	iOS 4.0 or higher	iPhone, iPod, iPad	Free
DESCRIPTION	This app allows to learn the most common 120 irregular verbs used in modern English. It combines the list of verbs with the native audio recordings to practice pronunciation.		
FEATURES	• 120 irregular verbs; • translations in German, French, Spanish and Portuguese;		

		• native voices.		
14	**Pic-English Irregular Verbs**	iOS 4.1 or higher	iPhone, iPod, iPad	Free
DESCRIPTION		PicEnglish allows to learn the most common 120 irregular verbs used in modern English using pictures. This application combines 120 drawings with the base form of the verb and includes three verb forms (infinitive, past simple and past participle). Designed for fast learning and self-learning.		
FEATURES		• 120 irregular verbs; • 120 drawings; • native voices.		
15	**Do Did Done Lite: English IV revision**	iOS 4.2 or higher	iPhone, iPod, iPad	$1.99 (FE)
DESCRIPTION		This application offers a list of irregular verbs as well as an automatic reading of the revision lists which allows users to study 'on the go'.		
FEATURES		• Search bar; • word pronunciation.		
16	**620 English Irregular Verbs**	iOS 3.0 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION		The application provides a full list of 620 English irregular verbs. Each verb contains meaning, three time forms, and audio transcription. In addition, an included translator allows to translate any text into more than fifty languages. The verb lists includes the verbs aby, abbey, alight, etc.		
FEATURES		• Covers about 620 irregular verbs with possible meanings; • translator which translates into 50 languages; • search bar.		
17	**Irregular Verb in use for learners, IELTS, TOEFL, TOEIC**	iOS 4.3 or higher	iPhone, iPod, iPad	Free
DESCRIPTION		This irregular verb dictionary contains nearly 500 irregular verbs used in modern English. This app uses multi-interaction/applications which allow learners and candidates to improve English skills simultaneously.		
FEATURES		• Covers about 300 irregular verbs; • search bar; • **native speech engine which repeats whatever you enter**; • build your own verb list; • example sentences; • in the iVerb dictionary, verbs are inconveniently arranged as there are no clear tables separately indicating 'infinitive, past simple, past participle'; • option to edit list by adding or deleting verbs; • option to define words in built-in dictionary.		
18	**English irregular verbs 250**	iOS 4.0 or higher	iPhone, iPod, iPad	$ 0.99
DESCRIPTION		This application includes 250 irregular verbs with pronunciation symbols.		
FEATURES		• Covers about 250 irregular verbs; •three categories, including 'All Verbs', 'level' and 'pattern'. Level categories orders verbs according to importance, and in the pattern categories verbs are classified according to their change forms; • each verb is accompanied by a phonetic description;		

	• click on the verb to see past simple and present simple; • example sentences; • search bar.		
19 Irregular Verbs in English	iOS 5.0 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	This application contains over 450 irregular verbs, with every one of them recorded by native speakers in both American and British English.		
FEATURES	• Covers 450 most used irregular verbs; • translations available in German, Spanish and Catalan; • word pronunciation in American and British English; •options to simplify the list by removing compounds, less common verbs, verbs with a regular alternative or alternative forms • neatly arranged table; • search bar.		
20 The Language Wheel	iOS 4.0 or higher	iPhone, iPod, iPad	Free
DESCRIPTION	This application allows to conjugate 80 English irregular verbs in all tenses. Verbs can be quickly located in the index.		
FEATURES	• Covers 80 irregular verbs; • distinguishes between American English (AE) and British English (BE); • word pronunciation; • search bar; • when you touch the verb 'simple form', 'past tense', 'past participle' and 'ing-form' are displayed; •all tenses are represented, including present/past/future perfect, present/past/future continuous, present/past/future perfect continuous; • original lay-out.		
21 I&P English Verbs	iOS 5.0 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	Besides a list of irregular verbs, the application contains a list of over 1800 phrasal verbs. Each verb contains a link to the www.thefreedictionary.com web page which allows the learner to see its meaning and its modes of use. To see the list itself, no internet connection is needed.		
FEATURES	• Search bar.		
22 Irregular	iOS 6.0 or higher	iPod, iPhone, iPad	Free
DESCRIPTION	This app lists all English irregular verbs with audio capabilities.		
FEATURES	• Word pronunciation.		

Productivity Apps

N° APP NAME	**OS**	**COMPATIBLE WITH**	**PRICE**
23 English irregular verbs	Android 2.1 or up	Phone	Free
DESCRIPTION	A simple game in which the learner has to complete the irregular verb forms. There are three chests, two of which need to be unlocked by using the key with the correct verb form.		
FEATURES	• Contains list with irregular verbs; • word pronunciation; • possibility to practice errors; • high-quality images;		

	• gamification: test results are shown in percentage.		
24 Irregular Verbs	Android 2.2 or up	Phone	Free
DESCRIPTION	A full book reference of English irregular verbs with translations in Russian, Italian, German, French, Spanish, Romanian, Portuguese and Ukrainian.		
FEATURES	• Word pronunciation; • search bar; • quiz to train knowledge; • gamification: scores and statistics information.		
25 Irregular Verbs Dragunkin Pro	Android 2.1 or up	Phone	€0,80 (FE)
DESCRIPTION	The irregular verbs are classified in groups based on their similarities which helps to memorise them easily. The learner's knowledge is tested by means of two exercises: choose the right answer from the keyboard or choose from the list of options. Available in the following languages: Russian, Chinese, Czech, Dutch, French, German, Greek, Italian, Japanese, Korean, Polish, Portuguese, Spanish, Turkish		
FEATURES	• Word pronunciation; • gamification: test results.		
26 English Irregular Verbs	Android 2.2 or up	Phone	Free
DESCRIPTION	A complete list of English irregular verbs and a "game mode" for practicing tenses. The learner has to complete the missing tense for a given verb.		
FEATURES	• Word pronunciation; • "my list", consisting of recent mistakes.		
27 English Irregular Verbs - Test	Android 1.6 or up	Phone	Free
DESCRIPTION	A table of irregular verbs and a test. Learner has to select infinitive, past simple, past participle. The test can be translated into several languages (Czech, Polish, German, Korean, Arabic, Chinese, Russian, Spanish)		
FEATURES	• Link to online dictionary; • gamification: exercise options are poor, for example, "stout – stad – stood", results are given • visible progress bar; • personalisation through selection of difficult verbs.		
28 English Irregular Verb Quiz	Android 1.6 or up	Phone	Free
DESCRIPTION	The quiz consists of guessing the simple past and the past participle of an English irregular verb shown in simple present. At every stage you will see a random English verb, and you can guess the related simple past and past participle by clicking on the correct answer. While playing no internet access is required.		
FEATURES	• No reference list.		
29 VerbBuster	Android 2.2 or up	Phone	€1,99 (FE)
DESCRIPTION	VerbBusters is a complete practice and reference resource for English irregular verbs. It provides a quiz type activity on six levels of difficulty with scoring, error-highlighting and help functions. It can be used in English-English or Native Language-English modes and currently supports German, French, Spanish, Italian and Portuguese. Verb lists with native language translations are provided for each level and users can		

	search the database and hear the pronunciation of almost 180 of the most and least common irregular verbs, using English or their native language.		
FEATURES	• Search bar; • translation into five languages; • word pronunciation; • gamification: levels of difficulty with scoring, error-highlighting and help functions.		
30 Irregular Verb Quiz	Android 2.2-4.1	Phone	€0,74
DESCRIPTION	Irregular Verb Quiz(IVQ) is a very simple irregular verb conjugation quiz app which helps to learn English irregular verbs and English verb conjugations at the same time. The learner has to select the number of questions in the quiz and can specify the verb tenses he/she wants to practice. The app instantly tells you when you are correct and provides the correct verb conjugation when you are incorrect.		
FEATURES	• over hundred irregular verbs and twelve different verb tenses;		
31 Quiz English Irregular Verbs	Android 1.6 or higher	Phone	Free
DESCRIPTION	This application offers a irregular verb quiz with multiple choice questions. The infinitive is given and the learner has to select the correct conjugation forms. It does not provide an irregular verb list. After 60 questions, a grade is given together with the number of correct and incorrect answers. The number of questions which were jumped are given as well.		
FEATURES	• Gamification: results and quiz mode; • word pronunciation.		
32 English Irregular Verbs	Android 2.1 or higher	Phone	€1,51
DESCRIPTION	This application contains 155 English irregular verbs with a sample sentence accompanied by a picture. However, it does not provide a list. The learner can choose between three levels: irregular verbs, mixed verbs and advanced verbs. In Level One, the sentence is spoken by the app when the frame appears, so the student can hear the correct verb. The student then slides the correct word into the sentence. In Level Two, there is no audio clue to the correct answer, and the sentences have a mixture of both regular and irregular verbs. In the Advanced Level, the student is presented with each verb and must select the correct conjugation for both past tense, and past participle. The student must also correctly identify the verb as either regular or irregular. This app allows each student to work at their own level. It is ideal for self-paced learning or home schooling.		
FEATURES	• Example sentences and pictures; • word pronunciation; • gamification: game and results; • select verbs.		
33 Irregular Verbs Quiz	Android 2.2 or higher	Phone	Free
DESCRIPTION	This quiz contains 70 irregular verbs which can be practiced by means of a quiz. Each quiz consists of ten multiple questions. After each question the app shows whether the answer was correct or false, without providing the right answer.		
FEATURES	• share results on Twitter; • gamification: quiz and results.		
34 Irregular Verb Quiz	Android 2.2 or higher	Phone	Free

DESCRIPTION	An English irregular verb app aimed at German learners.		
FEATURES	• Word pronunciation; • translation into German; • gamification: quiz and results.		
35 Irregular Verbs English	Android 2.1 or higher	Phone	Free
DESCRIPTION	A simple app to learn the irregular verbs in English. The app shows a list with all irregular verbs in their 3 forms: infinitive, past simple and past participle. You can also practice with the "memory" mode, where past forms will be hidden so that you can try to find them out. The user can choose to list "verbs that are the same in all forms" and "verbs that have irregular and regular forms".		
FEATURES	• gamification: practice mode.		
36 Irregular Verb	Android 1.5 or higher	Phone	€0,50
DESCRIPTION	Consult and learn the list of 184 English irregular verbs. An exercise will allow you to be questioned about the verbs which you select.		
FEATURES	• gamification: practice mode and results; • translations into French.		
37 Verbes irréguliers en anglais	Android 2.2 or higher	Phone	Free
DESCRIPTION	This application is aimed at French learners. It offers a revise and a test mode in three different levels, namely "easy", "medium", "hard". During the exercise mode, the infinitive form is given and the learner has to fill in all missing forms.		
FEATURES	• gamification: practice mode; • select your favourite verbs; • revise your most common mistakes.		
38 İngilizce Düzensiz Fiil Uygula	Android 1.6 or higher	Phone	€0,75
DESCRIPTION	AppWheelz IRVerb Apps offer 200+ commonly used English irregular verbs display in the forms of present, past and past participle tenses. For non-English speakers, you have the option to choose Apps with verb translation, including Traditional Chinese, Simplified Chinese, Korean, Japanese and Spanish. IRVerb Apps allow you to search verbs from the database, study the list with easy to access forward and back buttons or add/delete any verbs/vocabularies of your choice. It also offers a testing feature to monitor your learning process/outcomes. Users can easily set up number of testing questions to be taken each time depending on the time allowed. Users have the option to email test results and answers to all incorrectly answered questions to anyone, including teachers or parents with whom may want to monitor the user's learning outcomes.		
FEATURES	• gamification: practice mode, results; • several user editing options; • personalise tests; • share your results by e-mail.		
39 Irregular verbs กริยา 3 ช่อง	Android 2.1 or higher	Phone	Free
DESCRIPTION	This Thai app lists the most common English irregular verbs and their Thai translations. A practice mode consists of one type of exercise.		
FEATURES	• Translations into Thai;		

		• gamification: practice mode, no results.		
40	**Irregular Verbs Quiz Test**	Android 2.2 or higher	Phone	Free
DESCRIPTION		A very simple test with visible progress indicators for each verb. It contains a list to revise the verbs as well.		
FEATURES		• Visible progress indicators.		
41	**Go-went-gone**	Windows Phone 1.4.0.0	Windows Phone 8 Windows Phone 7.5	Free
DESCRIPTION		Your personal trainer to cope with English irregular verbs. There are two modes of practicing the verbs. In exercise mode the selection of verbs to practice is based on your personal record. In quiz mode you can demonstrate your knowledge.		
FEATURES		• Share your results on Facebook, Twitter, e-mail; • statistics to show results and progress; • list of all irregular verbs; • details for every single irregular verb; • translations in German; • no search bar; • no word pronunciation.		
42	**Learn Irregular Verbs Pro**	Windows Phone 1.0.0.0	Windows Phone 8 Windows Phone 7.5	$0.99 (FE)
DESCRIPTION		This application includes over 360 irregular verbs. The study mode provides a comprehensive and easy-to-search list of all the irregular English verbs. The test mode is developed to put knowledge in practice. You can select between three difficulty levels (elementary, intermediate and advanced) based on your level of English. The elementary level includes the most popular verbs while the advanced level includes all the available English verbs. In addition, you can customise the number of questions for test.		
FEATURES		• Three levels of learning; • search bar.		
43	**IrreVerbs**	Windows Phone 1.4.0.0	Windows Phone 8 Windows Phone 7.5	$0.99
DESCRIPTION		This irregular verb test is developed for Spanish learners. The learner has to fill in the missing verb form. His/her failed and successful attempts are recorded and given in percentages. It also includes a timer.		
FEATURES		• Gamification: timer, results, test.		
44	**English Irregular Verbs Test**	iOS 3.1.3 or higher	iPhone, iPod, iPad	$2.99
DESCRIPTION		A simple test consisting of empty text fields in which the simple past and past participle have to be filled. The correct answer appears after having clicked on ‘go’. There are ten sections to this test with one hundred verbs overall.		
FEATURES		• Click on ‘go’ and see the correct answer; • no reference list.		
45	**Irregular-Verbs Trainer**	iOS 2.2.2 or higher	iPhone, iPod, iPad	$2.99
DESCRIPTION		This application offers various forms of over 400 irregular verbs. It includes exercises to apply English verb conjugations in written and spoken communication.		

FEATURES	• Over 1600 verb forms, over 400 irregular verbs; •spaced repetition algorithm, i.e. a learning technique in which increasing intervals of time are used between subsequent reviews; • statistics to track learning progress; • paraphrases for all verbs to explain their meaning; • built-in help and short grammar points; • no network connection needed; • future updates are free; • no search bar; • no word pronunciation; • in the list itself, verbs are inconveniently arranged as there are no clear tables separately indicating 'infinitive, past simple, past participle'.		
46 Irregular-Verbs	iOS 4.3 or higher	iPhone, iPod, iPad	Free
DESCRIPTION	This application offers a complete list of irregular verbs which is updated periodically. You can browse through the list, click on each entry to see the three verb tenses and listen to their pronunciation. Three types of exercises will help you learn: association test, memory test, and "fill-in-the-gap". Fill-in-the-gap exercises allow the student to understand the context in which the verb can be used. Translations are given in French, Spanish, **Dutch** and Italian.		
FEATURES	• Search bar; • translator into French, Spanish, Dutch and Italian.		
47 Irregular Verbs for Beginners	iOS 3.1 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	Irregular Verbs for Beginners gives quick access to irregular verb forms. Languages are English and Korean.		
FEATURES	• Covers about 170 irregular verbs with some practical examples; •audio files with native speaker's pronunciation of verbs and example sentences; • provides exercise in the form of a quiz; • search and bookmark functions.		
48 Irregular Verbs Pro	iOS 5.0 or higher	iPhone, iPod, iPad	$0.99 (FE)
DESCRIPTION	This application offers a list of 360 irregular verbs, including all the common irregular verbs as well as some unusual verbs. Furthermore, a test mode and a list of user's favourite verbs allows personalised learning.		
FEATURES	• Covers about 360 irregular verbs; • list of user favourite verbs; • test mode with random questions about the irregular verbs, e.g. "What is the past participle of brought"; • intuitive user interface; • hide unwanted verbs; • search bar.		
49 Irregular Verbs Game: Play & Learn	iOS 4.0 or higher	iPhone, iPod, iPad	$4.99 (FE)
DESCRIPTION	"Verbs Game" helps memorizing 100 the most popular irregular verbs. The more you play, the better you know. All verbs are sounded in order to practice listening comprehension. Memorisation occurs gradually: new verbs are added as the previous are learned so that already learned verbs are still used in the game for better memorizing. The main game menu displays how many verbs have been learned in order to visually monitor the progress of your learning. You must type on the keyboard the specified form of the verb whilst the verb is falling down. If you are		

	wrong the word is crashed into letters and they fall on the playing field. These letters can also be used to input words. The game is over when the fallen letters fill the playing field to the top.		
FEATURES	• Covers about 100 irregular verbs; • a sounded dictionary of irregular verbs, but no search bar; • supported native languages include Russian, German, French, Italian, Spanish, **Dutch**, Japanese, Chinese, English. Note: in version 1.5.0 the duplicate Dutch and Japanese translations have been removed; • in the list itself, verbs are inconveniently arranged as there are no clear tables separately indicating 'infinitive, past simple, past participle';		
50 VerbBuster	iOS 3.1 or higher	iPhone, iPod, iPad	$1.99 (FE)
DESCRIPTION	VerbBusters (with audio) is a complete practice and reference resource for the English irregular verbs. It provides a quiz type activity and verb lists with translations and pronunciations of almost 180 of the most and least common irregular verbs. VerbBusters can be used in English-English or Native Language-English modes and currently supports German, French, Spanish, Italian and Portuguese.		
FEATURES	• Covers about 180 irregular verbs; • search bar; •different levels, including beginner, easy, intermediate, difficult, advanced, special; • no statistics, but score and turn are mentioned on the exercise screen; • in the list itself, verbs are inconveniently arranged as there are no clear tables separately indicating 'infinitive, past simple, past participle'. In the search mode, however, search term, infinitive, past and participle are neatly arranged		
51 English irregular verbs with pronunciation	iOS 3.0 or higher	iPhone, iPod, iPad	$ 0.99
DESCRIPTION	This application contains a reference table with all irregular verbs. In the test mode, the learner has to guess the right verb form and he/she gains points for every correct answer. At the end, the learner receives a score and an indication of how well he/she has done, e.g. 40 – bore – you can do better.		
FEATURES	• Listen to the correct pronunciation; • neatly arranged reference table; • attractive lay-out; • no search bar.		
52 English Verb Trainer	iOS 4.0 or higher	iPhone, iPod, iPad	Free
DESCRIPTION	For each verb, you get to choose between the correct past or perfect form and two wrong forms, again and again until you know them all by heart. The programme trains the 150 most used irregular verbs, with a few regular ones to keep the learner alert.		
FEATURES	• Covers 150 most used irregular verbs; • no reference table; • indicates how many verbs the learner masters with reset option.		
53 Campus Irregular Verbs	iOS 4.3 or higher	iPhone, iPod, iPad	Free
DESCRIPTION	Campus Education has been providing English language training to international students since 1999. Its first app, devoted to irregular verbs in English, allows students to access the most commonly used irregular verbs on their mobile devices and provides practice sentences, quizzes, and pronunciation help. It is built as a tool for English language users of		

	all levels of proficiency.		
FEATURES	• Attractive lay-out; • word pronunciation; • search bar; •in the list, verbs are inconveniently arranged as there are no clear tables separately indicating 'infinitive, past simple, past participle'; • three levels: beginner, intermediate, expert; • fill in exercises which allow the learner to grab the context in which the verbs can be used. As only the infinitive is given, it requires from the learner to now when the past simple or past participle is used; • bookmark option: difficult sentences can be added to the bookmark to allow the learner to revise personal difficulties.		
54 Irregular Verbs Easy 2	iOS 4.0 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	For each verb, you get to choose between the correct past or perfect form and two wrong forms, again and again until you know them all by heart. The programme trains the 150 most used irregular verbs, with a few regular ones to keep the learner alert.		
FEATURES	• Covers 162 irregular verbs; • translations in French, German, Japanese, Spanish; • graphics; • option to highlight the verbs by a simple touch; • test yourself by hiding some columns; • word pronunciation; • search bar; • share on facebook; • very attractive lay-out.		
55 English Verbs	iOS 2.2 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	This application covers over 600 irregular verbs. It shows base form, simple past and past participle. It offers a practice mode.		
FEATURES	•Covers 600 irregular verbs, including verbs which have regular conjugation forms as well (e.g. alight) and compounds (e.g. overpay, prepay) • shows base form, simple past, past participle and gives definition. For example: alight – alit (-ed) – alit (-ed) – To get off a bus, train, etc.; • search bar; • gamification: practice mode, results.		
56 290 English Irregular Verbs	iOS 4.3 or higher	iPhone, iPod, iPad	$2.99
DESCRIPTION	A high-quality tool to learn and revise 290 irregular verbs in an easy and enjoyable manner. In the flash cards, the translation and one of the three forms is given. The learner has to fill in the gaps;		
FEATURES	• List of 290 irregular verbs in their three main forms; •translations in French, German, Japanese, Spanish and Italian. Each translation is visualised by means of an image; • each verb has a phonetic transcription; •alphabetic and configurable classification (ascending, descending or random) • automatic scrolling of card; • pink lay-out; • time recording.		
57 A list of verbs	iOS 6.0 or higher	iPhone, iPod, iPad	Free

DESCRIPTION	Select your level (beginner, medium or advanced), look up irregular verb forms and perform tests based on your response time. Learners can choose between different types of tests and adjust length and time limit. The application contains an elaborate 'look up' page which ranges the verbs according to their change pattern. For example, under "Irregular ending with no vowel change. Past simple and participle are equal, 'd' ending changes to 't', 'ent' changes to 'end'." the verbs bend, build, lend, send and spend are listed. Other categories are the verbs 'make' and 'have' and verbs with a regular past and participle in American English, irregular in British English.		
FEATURES	• Covers 156 irregular verbs; • translations in Spanish; • statistics show average time and difficulties, i.e. verbs that the learner has failed to conjugate; • possibility to look up by name or by hint.		
58 iVerb	iOS 4.3 or higher	iPhone, iPod, iPad	Free
DESCRIPTION	iVerb lists all English irregular verbs in their three main forms and provides definitions. Users can create their personal verb list, perform a knowledge test or use the cloud interface for verbs. Click on the verb to have infinitive, simple past, past participle and definition displayed on the screen. For example 'awake – awoke – awoken – to stop sleeping'.		
FEATURES	• Contains compounds of irregular verbs, such as "misspend"; • fill in the correct form exercise; • help function provides limited grammatical information on when to use the form; • a verb cloud.		
59 Verbitonic	iOS 6.0 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	This app contains 221 irregular verbs and 441 verbal forms divided into levels. Levels are locked and the learner can only unlock the next level by scoring 100% in each drill. The drills give access to the dictionary which gives verb definitions and example sentences. Failed attempts are recorded so that the learner can review errors.		
FEATURES	• Covers 221 irregular verbs; •statistics show levels accomplished, number of words in the level, percentage of level completion, number of correct answers, all incorrect answers; • alphabetical list of infinitive forms; • three types of drills: select correct verb form out of list, indicate whether the verb form given is correct or incorrect, give the verb form.		
60 English Verb Master	iOS 4.3 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	This application allows to learn the most important English verbs, including irregular verbs, whilst learning all the English verb tenses. It contains two exercises: tense forms and tense meanings. In the first, the learner has to build a sentence with a given subject, verb, and modifier. The latter asks to determine the meaning of a given sentence.		
FEATURES	• Covers all irregular verbs; •statistics show mastery of all verb tenses separately, i.e. present/past/future of simple, continuous, perfect and perfect continuous; • two types of exercises.		
61 iVerbs English	iOS 5.0 or higher	iPhone, iPod, iPad	$0.99

DESCRIPTION	A Russian application to learn 71 irregular verbs in their three main forms. Each verb is translated into Russian. The learner can add notes. A note added to 'win', for example, could be: "spelling: don't mix up the pattern of this verb with the usual <i-a-u> as in drink-drank-drunk". Practice mode contains one type of exercise.		
FEATURES	• Covers 71 irregular verbs and their Russian translation; • personalisation of app through note-taking; • no reference table. User has to type in a verb in order to get the three forms and their translation.		
62 Learn iVerbs	iOS 3.1 or higher	iPhone, iPod, iPad	Free
DESCRIPTION	Learn iVerbs allows to create a list of verbs to be studies on the basis of the complete list of irregular verbs. In the test mode, the user has guess the answers on the screen of questions to view the answers afterwards on the screen of answers. The tab 'study' allows to study the verbs of the list of study. The list is classified in the order, the disorder or in order ' LIFO ' (last in, first out).		
FEATURES	• French translations; •in the list, verbs are inconveniently arranged as there are no clear tables separately indicating 'infinitive, past simple, past participle'; • only one type of exercise, i.e. drill exercise in which only the infinitive is given.		
63 Belingual	iOS 3.2 or higher	iPhone, iPod, iPad	$1.99
DESCRIPTION	This application is available for French, German and Spanish learners. Each application contains irregular verbs, the three main forms and their translations. The app gives an infinitive and the user has to fill in the three English forms.		
FEATURES	• No table of reference; • word pronunciation; • levels of difficulty; • translation in either French, German or Spanish.		
64 English Verb Drills	iOS 4.2 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	The selected verb is given in infinitive form and the learner has to guess its form in present, past and perfect tense.		
FEATURES	•Student has to click on a verb in order to fill in the gaps, so no possibility for self-study first.		
65 Ingles EnTuldioma – Verbos Irregulares en Pasado - Básico	iOS 5.0 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	This Spanish application helps learners to practice basis English irregular verbs. Learners have to click on a verb to get the three main forms, a definition, the translation and supplementary grammatical explanation. During the quiz mode, the learner loses a life for every mistake. He/she has to gain points in order to succeed to the next level.		
FEATURES	• Spanish translation and definition; • several learner levels (1-7); •two types of exercises: give the correct form or multiple-choice question; • incomplete list of irregular verbs.		
66 Do Did Done	iOS 3.1 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION	This application provides quick reference of irregular verbs and is		

	intended primarily for Czeck users. It contains a list of 150 hand-picked most used irregular verbs. For more detailed information, such as phonetics, you have to click on the verb.		
FEATURES	• Czech translations; • covers 150 irregular verbs; • only one type of drill exercise.		
67 English Irregular Verbs	iOS 3.2 or higher	iPad	Free
DESCRIPTION	This application contains an incomplete list of 20 irregular verbs. Its target audience are young children in particular.		
FEATURES	• 20 irregular verbs with example sentences; • three different skill levels; • audio pronunciation for every word; • each sentence is accompanied by a picture; • possibility to perform mixed verbs exercises.		
68 All Your Verbs	iOS 5.1 or higher	iPod, iPhone, iPad	$0.99
DESCRIPTION	This application contains the most common irregular verbs and phrasal verbs used in modern English, with meaning, sample sentences and audio recordings.		
FEATURES	• 120 irregular verbs with artworks; • 100 phrasal verbs with sample sentences and definitions; • word pronunciations; • translations into four languages, including Spanish, German, French and Portuguese		
69 Irregular Verbs - Verbiland	iOS 6.0 or higher	iPod, iPhone, iPad	$0.99
DESCRIPTION	This app contains 221 irregular verbs which are most used in communication. It is to help the student to memorise and to learn how to write irregular verbs. The verbs are divided in locked levels which can only be unlocked by scoring 100 per cent in each drill. It contains four drills and provides access to an integrated dictionary without online access. You have to click on the verb to get its definition and sample sentences.		
FEATURES	• 221 irregular verbs with sample sentences and definitions; • gamification: test mode, results, different levels; • integrated dictionary; • personalisation through reviewing mistakes.		
70 Ticwow English Grammar	iOS 5.1 or higher	iPod, iPhone, iPad	$4.99
DESCRIPTION	This app is described as an efficient training game for developing automaticity in English grammar usage based on tic-tac-toe. You play instead of memorizing. It offers game play with various complexity levels. The quicker you answer, the more lasting your automatic skills are.		
FEATURES	• Word pronunciation; • share your results on social media; • several games to learn irregular verbs;		

Immersive Apps

N°	APP NAME	OS	COMPATIBLE WITH	PRICE
71	**Irregular Verbs top 100**	iOS 4.3 or higher	iPhone, iPod, iPad	$0.99
DESCRIPTION		This app provides flash cards to practice English irregular verbs and their translations (German, Russian and Spanish). Furthermore, it integrates a quiz on countries, capitals and flags allowing learners to test their general knowledge. Users can contribute questions which can be uploaded worldwide. This interactive game mode provides a truly immersive experience.		
FEATURES		• Flash card irregular verb trainer; • translations into German, Russian and Spanish; • bar chart statistics about your learning progress: learner sees how many words he/she has learned on a day or in a given period. The blue part of the bar indicates how many good answers were given, whereas red shows the wrong answers given; • text to speech for internet enabled devices; • mark flash cards as your favourites; • support for text and image content in flash cards; • import your own content from Google Docs; • import public and private sets from Quizlet.com; • extra module with questions to learn about countries, capitals and flags. Questions such as "*Who was the first President of the United States?*" • random mode can be activated during learning session; • search bar; •in the list, verbs are inconveniently arranged as there are no clear tables separately indicating 'infinitive, past simple, past participle';		

Appendix VII: summary of all features found in irregular verb apps.

APP	Appropriate for the device	Search bar	Word pronunciation	Speech engine	Verb definitions	Sample sentences	Translator	Personalisation	Gamification	Social aspect	Progress indicators	Relevant language	Mixed verb option	More than one skill
1	✓	✓												
2	✓		✓					✓				✓		✓
3	✓	✓	✓		✓		✓					✓		✓
4	✓	✓	✓			✓		✓						✓
5	✓		✓									✓		✓
6	✓	✓												
7	✓	✓										✓		
8	✓	✓					✓							
9	✓	✓	✓				✓	✓						✓
10	✓	✓												

11	✓											✓		
12	✓				✓									
13	✓		✓				✓							✓
14	✓		✓											✓
15	✓	✓	✓											✓
16	✓	✓			✓		✓							✓
17	✓	✓	✓	✓		✓		✓				✓		✓
18	✓	✓				✓						✓		
19	✓	✓	✓				✓	✓				✓		✓
20	✓	✓	✓											✓
21	✓	✓												
22	✓		✓											✓
23	✓		✓					✓	✓					✓
24	✓	✓	✓				✓		✓					✓
25	✓	✓		✓					✓					
26	✓		✓					✓	✓					✓
27	✓						✓	✓	✓		✓			
28	✓								✓					
29	✓	✓	✓				✓		✓			✓		✓
30	✓							✓	✓					✓
31	✓		✓					✓	✓					✓
32	✓		✓			✓		✓	✓				✓	✓
33	✓								✓	✓				
34	✓		✓				✓		✓					✓
35	✓								✓					
36	✓						✓		✓			✓		✓
37	✓							✓	✓					
38	✓							✓	✓	✓		✓		
39	✓						✓		✓					✓
40	✓								✓		✓			
41	✓				✓	✓	✓		✓	✓	✓			✓
42	✓	✓						✓	✓			✓		
43	✓								✓					
44	✓								✓					
45	✓				✓				✓		✓	✓		✓
46	✓	✓					✓		✓					✓
47	✓	✓	✓			✓		✓	✓					✓
48	✓	✓						✓	✓			✓		
49	✓		✓				✓		✓		✓			✓
50	✓	✓					✓		✓			✓		✓
51	✓		✓						✓					✓
52	✓								✓				✓	
53	✓	✓	✓					✓	✓					✓
54	✓	✓	✓				✓		✓	✓				✓
55	✓	✓							✓			✓		

56	✓						✓		✓			✓		✓
57	✓						✓		✓		✓			✓
58	✓				✓			✓	✓					
59	✓				✓	✓			✓		✓	✓		
60	✓								✓		✓			✓
61	✓						✓	✓	✓					✓
62	✓						✓		✓					✓
63	✓		✓				✓		✓					✓
64	✓								✓					
65	✓						✓		✓					✓
66	✓						✓		✓					✓
67	✓		✓			✓			✓				✓	
68	✓		✓		✓	✓	✓		✓					✓
69	✓				✓	✓		✓	✓			✓		
70	✓		✓						✓	✓				✓
71	✓	✓	✓	✓			✓	✓	✓	✓				✓

Appendix VIII (a) : questionnaire in Dutch.

1. Bezit je een smartphone?

#	Antwoord		Respons	%
1	Ja		5	45%
2	Nee		6	55%
	Total		11	100%

2. Welk type smartphone heb je?

#	Antwoord		Respons	%
1	iPhone		1	20%
2	Android Phone (Samsung, Sony Ericsson, LG, Dell, Huawei, Fujitsu Toshiba, Motorola, Panasonic, Acer, Asus, NEC, Kyocera, etc.)		3	60%
3	Windows Phone (Nokia, HTC)		1	20%
	Totaal		5	100%

3. Beschik je over een tablet?

#	Antwoord		Respons	%
1	Ja		1	9%
2	Nee		10	91%
	Totaal		11	100%

4. Welk merk van tablet heb je?

#	Antwoord		Respons	%
1	iPad		1	100%
2	Samsung tablet		0	0%
3	Microsoft tablet		0	0%
4	Amazon tablet (Kindle)		0	0%
	Totaal		1	100%

5. App-gebruik. Geef aan de hand van de frequentie schaal aan hoe vaak je volgende stellingen uitvoert:

#		Dagelijks	Wekelijks	Maandelijks	Jaarlijks	Nooit	Totaal	
1	Ik download Apps online.	0	1	2	0	5	8	4.13
2	Ik download Apps via mijn smartphone.	0	2	4	0	3	9	3.44
3	Ik download Apps via mijn tablet.	0	0	2	0	6	8	4.50
4	Ik download Game Apps.	0	1	5	0	3	9	3.56
5	Ik download educatieve Apps.	0	1	3	3	2	9	3.67
6	Ik download educatieve taalapps.	0	0	2	3	4	9	4.22
7	Ik leer mijn vreemde taal via Apps.	0	2	0	2	5	9	4.11
8	Ik leer Engels via Apps.	1	2	2	0	4	9	3.44
9	Ik leer Engelse werkwoordvervoegingen via Apps.	0	1	1	0	7	9	4.44

6. Sterke versus zwakke werkwoorden. Zijn de volgende stellingen juist of fout?

#	Vraag	Juist	Fout	Totale respons	Gem.
1	Zwakke werkwoorden worden ook regelmatige werkwoorden genoemd.	8	1	9	1.11
2	Zwakke werkwoorden worden ook onregelmatige werkwoorden genoemd.	0	9	9	2.00
3	Zwakke werkwoorden worden altijd vervoegd door het suffix "–ed" aan de stam van het werkwoord toe te voegen.	8	1	9	1.11
4	Sterke werkwoorden zijn onregelmatige werkwoorden die van vorm veranderen bij de vervoeging.	9	0	9	1.00

7. Als sterke werkwoorden voor jou moeilijk zijn, wat is het dan dat je precies moeilijk vindt? Kruis alles aan wat voor jou van toepassing is.

#	Antwoord		Respons	%
12	Ik herken het woord niet als een sterk of een zwak werkwoord.		1	13%
13	Ik weet niet welke vorm ik moet gebruiken.		4	50%
14	Ik weet niet welke tijd ik moet gebruiken.		3	38%
15	Ik heb er moeite mee om een lange tabel van buiten te leren en dan in een schrijftaak die te moeten toepassen.		1	13%
16	In een alfabetische tabel staan de werkwoorden niet volgens uitgangsvorm gerangschikt.		1	13%
17	Ik weet niet wat het werkwoord betekent, want ik kan het niet in een context plaatsen.		5	63%
18	Ik ken het betekenisverschil niet tussen werkwoorden met zowel een zwakke als sterke vorm en weet dus niet wanneer welke vorm van toepassing is.		3	38%
19	Andere:		1	13%

Andere:
er is een klein aantal vormen die ik maar niet kan onthouden

8. Leermethoden. Hoe studeer je de sterke werkwoorden in?

#	Vraag	nooit	zelden	soms	vaak	altijd	Totaal	Gem.
1	Ik leer enkel de tabel en dek kolommen af om te oefenen.	0	1	2	4	2	9	3.78
2	Ik leer enkel de tabel en dek nooit kolommen af om te oefenen.	3	1	3	2	0	9	2.44
3	Ik leer/bekijk de tabel en maak oefeningen.	2	3	1	3	0	9	2.56
4	Ik leer/bekijk de tabel en maak oefeningen online.	5	1	0	3	0	9	2.11
5	Ik leer/bekijk de tabel niet en maak oefeningen.	6	0	1	1	0	8	1.63
6	Ik leer/bekijk de tabel niet en maak oefeningen online.	8	0	0	1	0	9	1.33

9. Oefeningen op sterke werkwoorden. Welke oefeningen helpen volgens jou het best bij het instuderen van sterke werkwoorden?

#	Vraag	slecht	minder goed	matig	goed	zeer goed	Totaal	Gem.
1	Driloefeningen waarbij je de ontbrekende werkwoordsvorm invult, bv. to lay - ? - lain - liggen	0	1	2	6	0	9	3.56
2	Driloefeningen waarbij je enkel de Nederlandse vertaling krijgt, bv. zingen - ? - ? - ?	0	0	2	3	4	9	4.22
3	Quizoefening waarbij naar de passende werkwoordsvorm gevraagd wordt, bv. "What is the past participle of the verb sing?"	1	1	1	6	0	9	3.33
4	Multiple-choice vragen naar de passende werkwoordsvorm, bv. "What is the past participle of the verb sing?" A. sang B. sung C. sing	2	2	2	2	1	9	2.78
5	Context-gerelateerde invuloefeningen waarbij de werkwoordsvorm gegeven wordt, bv. "This Beatles song was … (sing, past participle) on Glee yesterday."	1	0	2	6	0	9	3.44
6	Context-gerelateerde invuloefeningen waarbij de werkwoordsvorm niet gegeven wordt, bv. "This Beatles song … (sing) on Glee yesterday."	1	1	0	3	4	9	3.89
7	Context-gerelateerde invuloefeningen waarbij je de infinitiefsvormen uit het kader in de juiste zin en in de juiste vorm moet aanvullen.	2	0	2	1	4	9	3.56

10. Sterke werkwoordparen. Tegen welke werkwoordparen denk je wel eens fouten te maken?

#	Vraag	nooit	zelden	soms	vaak	altijd	Totaal	Gem.
1	Werkwoorden waarbij alle vormen hetzelfde zijn, bv. cut – cut – cut	4	1	1	2	0	8	2.13
2	Werkwoorden waarbij de 2de en de 3de vorm hetzelfde zijn: 'd' wordt 't', bv. lend - lent - lent	1	4	2	1	0	8	2.38
4	stam + t, bv. learn - learnt - learnt	1	4	3	0	0	8	2.25
5	klinker valt weg en 't' wordt toegevoegd, bv. keep - kept - kept	2	5	2	0	0	9	2.00
6	middelste klinker verandert, bv. stick - stuck - stuck	1	2	3	1	1	8	2.88
7	de eerste twee letters blijven hetzelfde, bv. light - lit - lit	3	4	2	0	0	9	1.89
8	eindigend op –ought, bv. bring - brought - brought	2	5	2	0	0	9	2.00
9	eindigend op –aught, bv. teach - taught - taught	2	5	2	0	0	9	2.00
10	Werkwoorden waarbij de 2de en de 3de vorm verschillend zijn: 3e vorm is 2e vorm + n, bv. break - broke - broken	2	1	4	1	0	8	2.50
12	2de vorm 'o' wordt 'i', 3de vorm eindigend op -en, bv. thrive - throve - thriven	1	0	4	2	0	7	3.00
13	3e vorm is 1e vorm + en of + n, bv. shake - shook - shaken	1	2	3	2	0	8	2.75
14	2e vorm klinker verandert in "e" / 3e vorm klinker verandert in "o", bv. fly - flew - flown	2	3	1	3	0	9	2.56
15	2e vorm klinker "a" en 3e vorm klinker "u", bv. drink - drank - drunk	2	3	2	1	1	9	2.56
16	2e vorm eindigt op –ung, bv. sting - stung - stung	1	2	3	2	1	9	3.00
17	Werkwoorden die niet tot de bovengenoemde regels vallen: verwarring tussen lie (regular, liegen) /lie (irregular, liggen) /lay (leggen)	1	0	2	3	2	8	3.63
19	verwarring tussen rise (irregular)/ raise (regular)	2	3	0	2	2	9	2.89
20	forget - forgot - forgotten	2	3	2	2	0	9	2.44
21	wear - wore - worn	2	4	2	1	0	9	2.22
22	Andere:	0	0	0	0	0	0	0.00

Andere:
1: zelden, 2: soms, 3: soms, 4: vaak, 6: soms, 10: soms, 12: zelden, 13: soms, 17: vaak
degene die twee volledig verschillende Simple Past-vormen en Past Participle-vormen hebben

11. Graag had ik nog geweten of je een student of studente bent. Kruis aan wat past:

#	Antwoord		Respons	%
1	vrouw		6	75%
2	man		2	25%
	Total		8	100%

Appendix VIII (b) : questionnaire in English.

1. Do you own a smartphone?

#	Answer		Response	%
1	Yes		5	45%
2	No		6	55%
	Total		11	100%

2. Which type of smartphone do you own?

#	Answer		Response	%
1	iPhone		1	20%
2	Android Phone (Samsung, Sony Ericsson, LG, Dell, Huawei, Fujitsu Toshiba, Motorola, Panasonic, Acer, Asus, NEC, Kyocera, etc.)		3	60%
3	Windows Phone (Nokia, HTC)		1	20%
	Total		5	100%

3. Do you own a tablet computer?

#	Answer		Response	%
1	Yes		1	9%
2	No		10	91%
	Total		11	100%

4. Which brand of tablet do you use?

#	Answer		Response	%
1	iPad		1	100%
2	Samsung tablet		0	0%
3	Microsoft tablet		0	0%
4	Amazon tablet (Kindle)		0	0%
	Total		1	100%

5. App usage. Please indicate how frequently you practice the following activities:

#		Daily	Weekly	Monthly	Yearly	Never	Total	
1	I download apps online.	0	1	2	0	5	8	4.13
2	I download apps on my smartphone.	0	2	4	0	3	9	3.44
3	I download apps on my tablet.	0	0	2	0	6	8	4.50
4	I download game apps.	0	1	5	0	3	9	3.56
5	I download education apps.	0	1	3	3	2	9	3.67
6	I download educational language apps.	0	0	2	3	4	9	4.22
7	I use apps to learn foreign languages.	0	2	0	2	5	9	4.11
8	I use apps to learn English.	1	2	2	0	4	9	3.44
9	I use apps to learn English verbs.	0	1	1	0	7	9	4.44

6. Strong versus weak verbs. Are the following premises true or false?

#	Question	True	False	Total Responses	Mean
1	Weak verbs are also called regular verbs.	8	1	9	1.11
2	Weak verbs are also called irregular verbs.	0	9	9	2.00
3	Weak verbs are always conjugated by adding the suffix "–ed" to the verb stem.	8	1	9	1.11
4	Strong verbs are irregular verbs with irregular conjugation forms.	9	0	9	1.00

7. If you find irregular verbs difficult to conjugate, than what is it you have difficulties with? Indicate all options which apply to you.

#	Answer		Response	%
12	I cannot distinguish irregular verbs from regular ones.		4	50%
13	I do not know which form to use.		4	50%
14	I do not know which tense to use.		3	38%
15	I find it difficult to learn an irregular verb list by hard and then apply them in a written task.		1	13%
16	An alphabetical list does not range the verbs according to conjugation patterns.		1	13%
17	I do not know what the verb means as I cannot place it in context.		5	63%
18	I do not know the difference in meaning of verbs with both weak and strong forms so that I cannot tell when to use which form.		3	38%
19	Other:		1	13%

Andere:
There is a small number of irregular verb forms which I fail to remember.

8. Learning methods. How do you study irregular verbs?

#	Question	Never	Seldom	Sometimes	Often	Always	Total	Mean
1	I learn the list by heart and practice by hiding columns.	0	1	2	4	2	9	3.78
2	I learn the list by heart without any practice.	3	1	3	2	0	9	2.44
3	I learn/look at the list and make exercises.	2	3	1	3	0	9	2.56
4	I learn/look at the de list and make exercises online.	5	1	0	3	0	9	2.11
5	I do not learn/ look at the list and make exercises.	6	0	1	1	0	8	1.63
6	I do not learn/look at the list and make exercises online.	8	0	0	1	0	9	1.33

9. Exercises on strong verbs. Which exercises are most beneficial to irregular verb training?

#	Question	Useless	Poor	Mediocre	Good	Very good	Total	Mean
1	Drill exercises in which you have to fill in the missing form, e.g. to lay - ? - lain - liggen	0	1	2	6	0	9	3.56
2	Drill exercises in which only the Dutch translation is given, e.g. zingen - ? - ? - ?	0	0	2	3	4	9	4.22
3	Quizzes with open questions, e.g. "What is the past participle of the verb sing?"	1	1	1	6	0	9	3.33
4	Quizzes with multiple-choice questions, e.g. "What is the past participle of the verb sing?" A. sang B. sung C. sing	2	2	2	2	1	9	2.78
5	Context-related fill-in-the-gap exercises in which the verb form is given, e.g. "This Beatles song was … (sing, past participle) on Glee yesterday".	1	0	2	6	0	9	3.44
6	Context-related fill-in-the-gap exercises in which the verb form is not given, e.g. "This Beatles song … (sing) on Glee yesterday".	1	1	0	3	4	9	3.89
7	Context-related fill-in-the-gap exercises in which only a box with all base forms is given.	2	0	2	1	4	9	3.56

10. Strong verb patterns. Against which strong verb patterns do you make mistakes?

#	Question	Never	Seldom	Sometimes	Often	Always	Total	Mean
1	Verbs with three identical forms, e.g. cut – cut – cut	4	1	1	2	0	8	2.13
2	Verbs which have similar past participle and past simple forms: 'd' becomes 't', e.g. lend - lent - lent	1	4	2	1	0	8	2.38
4	Stem + t, e.g. learn - learnt - learnt	1	4	3	0	0	8	2.25
5	One vowel is left out and a 't' is added, e.g. keep - kept - kept	2	5	2	0	0	9	2.00
6	Only vowel changes, e.g. stick - stuck - stuck	1	2	3	1	1	8	2.88
7	Only the first two letters remain unchanged, e.g. light - lit - lit	3	4	2	0	0	9	1.89
8	Ends on –ought, e.g. bring - brought – brought	2	5	2	0	0	9	2.00
9	Ends on –aught, e.g. teach - taught – taught	2	5	2	0	0	9	2.00
10	Verbs which have different past participle and past simple forms: past participle is past simple form + n, e.g. break - broke – broken	2	1	4	1	0	8	2.50
12	Simple past form 'o' becomes 'i', past participle ends on -en, e.g. thrive - throve – thriven	1	0	4	2	0	7	3.00
13	Past participle is base form + en or + n, e.g. shake - shook – shaken	1	2	3	2	0	8	2.75
14	Simple past form vowel changes into "e" / past participle form vowel changes into "o", e.g. fly - flew - flown	2	3	1	3	0	9	2.56
15	Simple past form vowel "a" and past participle form vowel "u", e.g. drink - drank - drunk	2	3	2	1	1	9	2.56
16	Simple past ends on –ung, e.g. sting - stung – stung	1	2	3	2	1	9	3.00
17	Verbs which do not resort under any of the above categories: confusion between lie (regular, liegen) /lie (irregular, liggen) /lay (leggen)	1	0	2	3	2	8	3.63
19	Confusion between rise	2	3	0	2	2	9	2.89

	(irregular)/ raise (regular)							
20	forget - forgot - forgotten	2	3	2	2	0	9	2.44
21	wear - wore - worn	2	4	2	1	0	9	2.22
22	Other:	0	0	0	0	0	0	0.00

Other:
Irregular verbs which have totally different simple past and past participle forms.

11. Please indicate your gender:

#	Answer		Response	%
1	Female		6	75%
2	Male		2	25%
	Total		8	100%

Appendix IX: correspondence Mr Joeri Van Steen, lecturer in informatics at University College Ghent

ORIGINAL E-MAIL in Dutch

woensdag 27 maart 2013 11:35

Beste Juffrouw Bracke,

Begrijp ik het goed dat dit klaar zou moeten zijn voor het einde van dit semester? Of kan dit voor volgend academiejaar ingepland worden?

Ik denk dat, indien dit in het eerste semester van het volgende academiejaar zou kunnen ontwikkeld worden, **dit perfect als project aan onze laatstejaarsstudenten kan worden aangeboden**.
Aangezien ik zelf deze cursussen niet doceer maar hier vooral in mijn vrije tijd mee bezig ben, zal dit met de betrokken collega's moeten overlegd worden.

Ik zal al eens bij hen polsen en laat u zo snel mogelijk iets weten.

Met vriendelijke groeten,

Joeri Van Steen, Lector Informatica - Cisco CCNA instructeur

TRANSLATION into English

Dear Miss Bracke,

Do I understand correctly that this [app development] should be ready before this term's end? Or could it be planned for next year?

I think that, if the app is to be developed during the first term of next year, this could be perfectly offered as an assignment project to our last-year undergraduates. As I only practice app development during my spare time and do not lecture app development courses, this will have to be discussed with the colleagues concerned.

I will propose it to them and inform you as soon as possible.

Kind regards,

Joeri Van Steen, lecturer in informatics at University College Ghent - Cisco CCNA instructor

Dissertatiegegevens bij fiche

Titel van de scriptie

Apps for mobile language learning:
A market research into English language learning apps.

Auteur(s)

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Taal van de scriptie

Engels

Vrije trefwoorden

mobile learning
blended learning
English Language Learning
higher education
design framework
apps
MALL
tablet computing
mobile OS-market

Trefwoorden en annotatie

Trefwoord:
Studie in de (vreemde)taalverwerving

Annotatie:
Garrison, D. & Vaughan, N. (2008). Blended learning in higher education. San Francisco: Jossey-Bass. Godwin-Jones, R. (2010). Emerging technologies: Mobile apps for language learning. Language Learning & Technology, 15(2), 2-11. Sweeney, P. & Moore, C. (2012). Mobile apps for learning vocabulary: Categories, evaluation and design criteria for teachers and developers. International Journal of Computer-Assisted Language Learning and Teaching, 2(4), pp.1-16.

Iwetocodes

S281-computergesteund-onderwijs
H360-vreemde-talenonderwijs
H350-linguïstiek

Doelstelling, methode en resultaten

Doelstelling:
Deze masterproef gaat dieper in op "mobile applications", afgekort apps, als hulpmiddel tot het verwerven van Engels als vreemde taal. Het doel is enerzijds om te achterhalen wat er reeds geschreven is over mobile learning (m-learning) en apps in de academische context en anderzijds om de pedagogische kwaliteit te meten van beschikbare Engelse taalapps op de hedendaagse markt. Op basis daarvan wordt een app design voorgesteld dat voldoet aan zowel pedagogische als technische vereisten voor de ontwikkeling van een educatieve taalapp.

Methode:
Aan de hand van een status quaestionis werd achterhaald welke mobiele toestellen en besturingssystemen het meest geschikt zijn voor de ontwikkeling van educatieve taalapps. Verder werd een marktonderzoek gevoerd naar taalapps die gericht zijn op het verwerven van Engels als vreemde taal. Door het overweldigende aanbod aan zulke taalapps werd het onderzoek beperkt tot "irregular verb apps", waarvan er in totaal 71 gevonden werden in de drie bekendste app stores. De pedagogische en technische kwaliteit van deze apps werd getoetst aan Sweeney et al.'s (2012) vereisten voor pedagogisch verantwoorde taalapps. Alle apps, vereisten en belangrijkste kenmerken werden in een kruistabel samengevat om zo na te gaan welke apps aan alle vereisten voldoen. Op basis van de literatuurstudie, vondsten uit het marktonderzoek en leervoorkeuren van eerstejaarsstudenten, werd uiteindelijk een irregular app design voorgesteld.

Resultaten:
In de literatuur wordt mobile learning (m-learning) gezien als een sub domein in blended learning dat studenten toestaat om op een persoonlijke, collaboratieve, creatieve en gemotiveerde manier leerstof te verwerken. Uit de status quaestionis bleek dat smartphones en tablets de meest geschikte toestellen voor mobiele taalverwerving zijn. Een aantal hogescholen en universiteiten hebben deze toestellen met bijhorende apps reeds succesvol in hun curricula ingevoerd. Evoluties op de mobiele besturingssystemenmarkt (OS-market) voorspellen bovendien een snelle groei in de verkoop van Android en iOS smartphones en tablets enerzijds en dalende prijzen anderzijds waardoor mobiele toestellen nog toegankelijker worden voor jonge studenten. Om m-learning toepassingen succesvol te introduceren in het hoger taalonderwijs, zijn echter pedagogisch waardevolle en technisch geschikte taalapps nodig. Van alle onderzochte irregular verb apps in het marktonderzoek voldeed echter geen enkel aan Sweeney et al.'s (2012) vereisten voor pedagogisch verantwoorde taalapps. Hieruit werd afgeleid dat er behoefte is voor app ontwikkelaars, linguïsten en pedagogen om samen de kwaliteit van taalapps te verbeteren zodat ze hun potentiële meerwaarde aan het onderwijs kunnen waarmaken. Tot slot, stel ik een app design voor dat wel voldoet aan alle vereisten voor pedagogisch verantwoordde en technisch geschikte taalapps. De app beschikt over de volgende kenmerken: zoek balk, definitie, voorbeeldzinnen, vertaalmodus, opties voor personalisatie van de leerervaring, een sociaal aspect, vooruitgangsindicatoren, relevante lijst van onregelmatige werkwoorden, gemengde oefeningen met regelmatige werkwoorden, en een Ruzzle game modus. Verder onderzoek moet echter nog uitwijzen of het design, dat zeker geschikt is voor native app ontwikkeling, ook in een web of hybrid app format kan uitgevoerd worden.