DELIVERABLE D6.5:

DISSEMINATION AND EXPLOITATION PLAN

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EXECUTIVE SUMMARY

LEA's BOX contains a multitude of tools, enabled by a central executive to carry out multi-source, competency based learning analytics. Competency maps can be introduced using FCA and competency states can be calculated using CbKST, based on the evidences from received data. The tools use this capability to support a large set of pedagogical scenarios, including but not limited to formative assessment, self-evaluation, personalized course planning, and tracking.

This report details a plan on the exploitation of the project outcomes. The exploitation avenues are three-fold:

1 – Exploitation of the scientific outcomes

2 – Exploitation of the system as a whole

3 – Exploitation based on specific business cases

On each of these avenues there has been certain exploitation progress to date and the activities will continue through the last 3 months of the project and beyond. This report is organized to identify the demand and opportunities for each of the avenues, the competition, project outcomes, their evaluation and strategic positioning, followed by a detailed plan of the exploitation activities.

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1 EXPLOITATION OF THE SCIENTIFIC OUTCOMES

The original goal of the project was to achieve two distinct scientific advancements:

(I) Contribute reasoning algorithms and services on the basis of 2 important psycho-pedagogical frameworks:

On the one hand the Competence-based Knowledge Space Theory (CbKST), which originated from the field of intelligent tutorial system and which has been advanced in the contexts of intelligent educational games as well as in the light of formative assessment and feedback.

On the other hand the Formal Concept Analysis (FCA), which originated from applied mathematics as an attempt to formalize concepts and concept hierarchies. The FCA as a qualitative methodology has been successfully applied in a wide range of areas such as knowledge representation and-management, visualization, data mining and analysis.

(II) Contribute novel approaches to visualizing activity/performance/achievement data

by utilizing (in this particular field rather unusual) methods such as structural Hasse diagrams. The ultimate goal is to feed back a broad spectrum of educationally relevant information to the involved stakeholders (in particular teachers but also students and administrators).

During the past 30 months, the project consortium fully met its higher level vision and accomplished most of its sub-goals. In addition to the research and development work, the project granted insights onto to educational systems and settings of various countries and enabled a deeper understanding of educators needs within their given context conditions, their mental models, and professional approaches. Such insights are at least equally valuable than the RTD work. Ultimately, they serve as the basis for the project's exploitation strategy as a distinct niche product.

In the following we start the report by explaining the achievements, separated in intellectual know-how and tangible software solutions. Subsequently we contrast the strength and weaknesses of existing 'competitors' with the solutions of the project. Finally we sketch the project's concrete dissemination and exploitation plans and actives in form of 6 'business use cases'.

1.1 RESEARCH ACHIEVEMENTS

The ultimate aim for learning analytics is to support teachers and help students to (self-) regulate their learning and teaching by empowering them with actionable insights or actionable predictions out of data. Available data is just the starting point. User experience design is crucial. Imagine tools that let's learners critically self-examine their own performance, where they're spending their time, their study habits, what they want out of their educational experience — and really how they can refine their thinking. How these tools would look like constitutes most of their impact.

Learning Analytics Features

Contribution	Pedagogical Aim	Achievement
Self-Assessment	Self-reflection; comparison of self-assessment with teacher evaluation and 'objective' tests; fostering group comparison and group dynamics; facilitate negotiation about learning outcomes, assessments, and grading.	The combination of the Flower App as a means of self-assessment in combination with the open API to link the system to external tests and the OLM including its negotiation features enable successful self-assessment and is a proven solution to meet the pedagogical aims.
Mind Mapping	Support of active construction of competence models and assessments.	The system's mind mapping tool supports the pedagogical aims of an active discourse of teachers and students with a knowledge domain, its structure, the involved competencies and skills, the relationships between competencies. In addition a common insight into assessment criteria and a common planning of evaluation is facilitated.
Negotiation Features	Learning analytics for students and open learner modelling, ultimately, want to foster personal engagement, self-efficacy, deeper insights and believe into assessment and grading, credibility, and attitude towards teachers and subjects. Allowing students to actively intervene in the evaluation process (on the long run),	We developed an approach to integrate negation with students into the open learner modelling process.

	negotiate outcomes, and thus contribute new data to the analytics process is a key feature to achieve the pedagogical aim.	
CbKST + FCA	CbKST and FCA are the theoretical and conceptual origin of the project: The main vision was to translate these (rather old) theories from the use in autonomous, intelligent tutorial systems to the field of learning analytics so that these theories can enrich the spectrum of learning analytics (and data mining) solutions. The advantages (structural view of domains and learners, actionable information, stochastic nature, separation of aptitude and indicators) promote a more practical approach to learning analytics in typical school settings.	We realized the originally envisaged CbKST and FCA learning analytics features for the system. In addition we successfully pursued a novel research strand towards a predication of academic achievements using the stochastic believe models of CbKST and FCA; this work manifests in the Learning Performance Vector approach and Learning Horizon feature of the system.
Visualizations and Learning Landscapes	Learning data of many students over a longer period of time is often complex to visualize. We proposed originally that Hasse diagrams and FCA lattice graphs might be an interesting approach to report the results of analytics to teachers (and perhaps students). These forms of visualizations clearly have a big repertoire of needful insights.	We developed and implemented performant algorithms to visualize the analytics results. Because Hasse diagrams and lattices have the downside of being hard to read, we developed an approach to translate the information into rather 3D-ish landscape data.
Data Warehousing	Solid analytics require a technical environment that is performant and robust. Specifically computational performance, data integrity, and data security are crucial aspects in a practical environment.	With the FLASH data analytics warehouse we developed and deployed a solution to treat the large amount of 'un-clean' multi-source data performant and appropriately.

Performance visualization:

Contribution	Pedagogical Aim	Achievement
Across Time Charts	Providing teachers and students with an insight to learning and an overview over time is a key feature of learning analytics. It improves the understanding of learning performance and pace, it allows identifying gaps and it gives a prospect to the potential of future learning.	We extended the set of visualization of the OLM proving across time charts to teachers and students.
Heat Maps	Heat maps are a proven method to display the distribution of veracious learning related aspects. On such aspect is to provide insight into the performance of an entire class.	We extended the set of visualization of the OLM proving heat map charts to teachers and students.
Structural Diagrams and Lattices	Learning data of many students over a longer period of time is often complex to visualize. We proposed originally that Hasse diagrams and FCA lattice graphs might be an interesting approach to report the results of analytics to teachers (and perhaps students). These forms of visualizations clearly have a big repertoire of needful insights: Learning paths, distributions, learning goals, domain structure, student comparisons, etc.	Hasse diagram and FCA lattice visualizations (and services) have been implemented.
Learning Landscapes		The Learning Landscape is an attempt to display similar information like Hasse and lattice diagrams but in a perhaps more intuitive, 3D-ish landscape visualization.

1.2 OTHER EXISTING APPROACHES

1.2.1 ALTERNATIVE REASONING APPROACHES

Typically, competency assessment is done by teachers or mentors using rubrics that link observable behavioral evidences with competency achievement. Analytic algorithms that help make competency based decisions utilizing the data accumulated in a digital environment are rare. This is because

competency achievements are not exclusively about acquiring knowledge and skills within a domain, but also developing a particular manner of thinking for the competency, which is hard to identify in the evidence set.

One alternative direction is to employ a set of enriched rubrics that could yield themselves to learning analytics[1]. SCALA (Scalable Competence Assessment through a Learning Analytics approach), is an analytics system that integrates usage (how the user interacts with resources) and social (how students and teachers interact among themselves) evidence data to support competency assessment. SCALA presents teachers a dashboard with enriched rubrics of blended datasets obtained from various formative assessment activities. SCALA uses EDM techniques to extract patterns from data that could evidence competency states according to the enhanced rubrics.

Another alternative is to estimate a competency achievement trajectory for each learner in time, and then track if the students is on, below or above the trajectory. EC funded (2012-2015) INTUITEL project[2] followed such approach. Project deliverables claim that learning pathways and learning history are analyzed on the basis of an n-dimensional hypercube model with moderate success.

1.2.2 ALTERNATIVE ACTIVITY/PERFORMANCE/ACHIEVEMENT VISUALIZATION

No matter how accurate and valuable the reasoning outcomes of any competency states, they need to be presented appropriately. In case of alarming situations for students who are likely to fail or dropout there are many visual paradigms, including traffic signals or other simple classification tools. However, if the aim is to let average or even well-achieving students to get better at learning, planning learning or develop competencies more efficiently, then the visualizations need to reveal cause and effect relationships among learning events, and help the students and their teachers figure out which activity works best, which ones need revision, and possibly what could be the time frame for mastery.

The OLM approach is to offer a multitude of visualizations to play with and a negotiation process for reconciliation if desired. Interactivity lets the end-users grasp the meaning of competency levels and their relation to completed activities so that they can derive insights. Some of the other approaches for interactive visualization are LARC and TUT LA tools.

[1] Alex Rayon et al, “Supporting competency-assessment through a learning analytics approach using enriched rubrics” published in ACM Proceedings of the Second International Conference on Technological Ecosystems for Enhancing Multiculturality, Pages 291-298 , New York, 2014

[2] http://www.intuitel.de/

The "Learning Analytics Report Card" (LARC) captures data from an individual student's course-related activity, and presents a summary of their academic progress in textual and visual form. However, rather than manifesting through hidden and inaccessible institutional data aggregation and analysis, LARC offers students an opportunity to play with their data; to choose what is included or excluded, when the report is generated, and how it might be presented.

The TUT LA tool, developed by Tampere University of Technology researchers3, collects and applies analytics on data from Moodle LMS and connected educational forums. It employs textual analytics as well as learning content use. However formal assessment data is not included as a source for analytics.

Further discussions on various scientific techniques are available in Deliverable D3.1 Review Article about LA and EDM Approaches (October 2014).

1.3 DISSEMINATION PLANS

LEA's Box contains a multitude of tools, enabled by a central executive to carry out multi -source, competency based learning analytics. Competency maps can be introduced using FCA and competency states can be calculated using CbKST, based on the evidences in arriving data. The tools use this capability to support a large set of pedagogical scenarios, including but not limited to formative assessment, self -evaluation, personalized course planning, and tracking. The tools provide an added value to a large range of stakeholders and communities:

- State officers: MoE decision makers can use the tools for planning and governing. They can employ the Box at national level for all state schools to benefit.
- Local entities: District educational authorities can finance the portal for local users
- Foundations and non-profits: These establishments can donate the tools to users in their supporting base.
- Private schools: The school owner or the management of the private school network can purchase/subscribe for the end-users in their domain, through a much less bureaucratic process than that demanded by state entities.
- Retail customers: End-users can be direct customers of the platform either by retail purchase or by using an "open" version.
- Academic: Researchers can use the platform to apply learning analytics on the pedagogical questions they inquire or by developing new analytics tools that can be taken on board.

[3] Anne Tervakari et al, "Interactive Visualization Tools to Improve Learning and Teaching in Online Learning Environments," Article in International Journal of Distance Education Technologies 14(1):1-21 · January 2016

- eLearning product vendors: Almost every eLearning product has a “reporting” functionality where LEA’s Box can be appended or cross-licensed, especially if there is TinCan support which ensure data interoperability.

Considering the above broad set of stakeholders and communities the target audience can be grouped in terms of common business requirements:

1. Sponsors: This group includes entities that have authority to make a bulk purchase for a large set of end-users. Their main business requirement is robust scalability and standards based data interoperability.

2. Private Schools: Representing a controllable amount of end-users, private schools can form data teams of teachers who can meet regularly and employ research based decision making on their immediate pedagogical needs. Their main business requirement is to be able to observe a more holistic view of the students, as well as the cause and effect relation between learning activities and achievement.

3. Retail: All vendors are included in this group. Their main business requirement is the ability to use LEA's Box as a value added to their own products.

The evaluation studies of the project serves two purposes: i) to inform research partners and orm the basis of their scientific findings ii) to inform development work towards better enhances of exploitation given the business requirements of target audience. Y3 evaluation studies are indicated to serve the latter purpose even more so. Evaluation outcomes identify how ready the platform is towards the use of target audience groups. They also identify the best options to reach those stakeholders and communities, given the readiness status. The exploitation plan deliverable will include an in depth review of the evaluation results mapped to specific target audience groups. However, early findings are available. The Technology Acceptance Model 3 (TAM3) analysis and technical quality and capacity evaluations done by various partners during pilot studies reveal the following status with respect to target groups:

1. Sponsors: The configuration tool which is added to the platform in Y2 is a tangible advance towards scalability. Once this tool can reliably process bulk user account information stress testing will reveal large scale performance and robustness. Y2 evaluation studies point to a need for data interoperability. TinCan support is planned in Y3 activities which would enable easy integration with the existing national eLearning infrastructures.

2. Private Schools: Multisource analytics is a virtue of LEA's Box which is piloted in a number of studies in Y2. The multitude in data source can be both in terms of the generator (a set of applications producing their own data streams) and in terms of the signal (attendance, performance, engagement and other qualities can all be regarded as different signals). For instance “across-time view” which is added to OLM in Y2 combines the attendance data and the performance data. This faculty has been positively evaluated by the speedreading use case. An example of multiple generators can be the use of

flower tool for self-assessment, a standard test results recorded in Google Docs, and the FCA tool for domain structuring carried out by TUG. Beyond technical challenges, using multiple data sources affects the algorithms of most of the analytics tools and their functions (e.g evidences in OLM negotiation).

3. Retail: Evaluation studies carried out using the TAM3 indicate that the “perceived ease of use” is the largest loading factor of teachers’ behavioural intentions. Therefore seamless usability is very important for exploitation, especially given that the study also reveals that the students’ “perceived usefulness” depend heavily on teachers’ attitudes. The project has a disadvantage at that point since the existing products and LEA's Box are separate sites, with separate login and navigation paradigms, practically doubling the cognitive and time burdens of use. To address this, exploitation tasks in Y3 will include an MoU to clarify IPR issues and TinCan support to enable tighter integration. The evaluation studies also revealed that learning analytics is usef ul for vendors’ assessment of the educational value of their own products. This kind of consultation service may as well be a venue of exploitation. Publishers and content developers could be very strong stakeholders as potential users of learning analytics to validate their products and underlying structures.

The dissemination activities are also informed by the target groups. There has been a rather strong dissemination work done by the research partners to address Science/LA community, keep strong connections, open new doors for continued work. A small, but dedicated group of professionals were included, who care to make products more visible in their adaptivty and flexibility to the arising needs in the community and use the existing contacts as multipliers. here is however room for improvement towards Business/Politics i.e. “sponsors” community since this target audience requires a well mature system to build an impression. As the project outcome matures in Y3, new relations are likely to be built with this audience, and demonstrations can be organized. The training activities should focus not only on learning analytics but also, in the case of LEA's Box, competency based data processing and tracking. Users should have a keen notion of what competencies are, especially compared to knowledge and skills. The simple tree structure competency filter menu in OLM is the main facility in OLM for a user to observe the competency structure. However, LEA's Box also includes more advanced tools such as Learning Spaces and Hasse Diagrams for this purpose. Such training, even though an exposition of simple material and presentations will help further end user studies and exploitation.

Effective dissemination and sufficient training material are essential for researchers to exploit tools, components and evaluation materials to further explore and research technology enhanced learning, affective interaction, interactive narratives, etc.

As our exploitation strategy relies on awareness of Lea’s Box IP, we have taken a strong, proactive approach to disseminating the potential of our system and highlighting the exploitable elements that are now available as a result of this project. This strategy has included publications in a wide range of

research channels. In total the project produced more than **25 scientific publications** until M30. Throughout the final year of the project we have aimed at maximizing relevant audiences. Notable successes have included workshops at famous **Worldcomp'16, LAK'16, or EC-TEL 2016**. Furthermore, we targeted practitioner related channels, such as **END 2016, iGBL 2016**, or teacher communities in the partner countries. These dissemination opportunities increase connections and collaborations and promote the possibilities for an uptake of Lea's Box solutions in practice. In addition, we have aimed to increase awareness of Lea's Box through our website and social media channels.

On the website, we not only published typical deliverables ad documents, we aimed at providing a broader, more interesting, and more up-to-date set of information, specifically for the semi-scientific community (which includes on the one hand teachers and educators who are interested in recent technologies and scientific developments, as well as researchers and developers who are interested in aligning their work to practical needs and real world context conditions). For example we published general articles such as 'Learning Analytics for Guitar Players' or 'Learning Analytics for Painters'. By the combination of scientific and particle worlds, we aimed at reached the most awareness and impact (which definitely is not an easy challenge for a EU project). These endeavors have been strengthened by realizing a lively Facebook appearance. All that, of course, within the scope and possibilities of such type of project, bearing in mind that comparable PR initiatives are extremely costly.

Of course, we will continue and intensify the dissemination efforts in the final months of the project and far beyond the project duration. This includes following activities:

- **Finalization of the website:** We will compile the final results and all available information in the project context and re-design the website as a durable information source around competence-centered learning analytics and open learner modelling. We will also collect important Facebook posts from the past years to show the project's history.
- Update of the **print brochure** and printing of a package of brochures and boxes as successful promo material.
- Set up of a **press package** with information materials and royalty free images.
- **Journal publications**: Beyond M30, we plan to submit at least 5 journal publications (a general CbKST/FCA Learning Analytics paper, a mathematical paper on the fusion of CbKST and FCA, a paper on the Learning Performance Vector and the Learning Horizon feature, a paper on open learner modeling, a paper on the FLASH learning analytics data warehouse solution).
- **Conferences / conference paper and events**:

EVENT	**OBJECTIVE**		
AEA Annual Conference 2017, Prague	Find dissemination and exploitation routes and connections Europe-wide	SCIO	2-5 November 2017
Education Day 2016 Prague	Disseminate LA possibilities to parents, teachers and NGOs. Presentation.	SCIO	October 2017
Trvalá obnova škola Conference	Find exploitation partners among progressive schools	SCIO	August 2017
Article in Perpetuum Magazine	PR article aimed at teachers and practicioners about the use of LA in school´s daily life	SCIO	Q4 2017
Presentation at the annual conference of the Association of gymnasia headmasters http://www.arg.cz/	Presentation or workshop (depending on organizers) on using LA in school practice.	SCIO	Q2 2018
LAK'17	SOLAR's main learning analytics and knowledge conference as the hub for scientific dissemination	TUG	March 2017

UMAP '17	User Modelling, Adaptation and Personalization	TUG	July 2017
AIED 2017	International Conference on Artificial Intelligence in Education	TUG	June 2017
Didacta	Didacta is the biggest German educational trade fair and a key event for a broad commercial exploitation in the German speaking countries.	TUG	February 2017
Learntec	Learntec is one of the largest trade fairs with a strong scientific side program. The event is an ideal hub for conveying science and practical solutions.	TUG	January 2017
Interpädagogica	Austria's largest fair for educational products. The event is the best way to reach Austrian teachers and organizations that are interested in innovative technologies.	TUG	November 2016

The overarching tangible result of LEA's BOX is a web platform for teachers and learners. LEA's BOX Platform has the following properties and functionalities:

- the platform provides links to existing components and interfaces to a broad range of sources for educational data. In such a way, teachers will be able to link the various tools and methods they are already using in their daily practice and which provide software APIs (for example Moodle courses, electronic tests, Google Docs, or other educational tools) together in one central location.
- The platform hosts a set of existing tools and web services to provide an initial set of functions for teachers. These components support activity tracking, domain modeling, and visualization of educational data. The components primarily come from the consortium background of existing developments, tools, and products. The component portfolio is available in system release deliverables D2.4, D2.5 and D2.6.
- The web platform also hosts newly developed LA/EDM services, empowering educators to conduct competence-based analytics of the rich data sets. Modular components are developed to filter, streamline, and aggregate data coming from various sources, to analyze and interpret these data, and to store them in a secure way. Special measures are taken to address data protection and privacy requirements. The set of modules and services as well as data streams are controlled by a superordinate component, the central executive. The concrete properties and designs are available in system release deliverables D2.4-6.
- Furthermore, the web platform provides teachers and learners with existing and newly developed components for visualizing the data and reporting the results of the analyses. Special focus of the research in the project is to develop network and lattice based techniques, such as Hasse diagrams, adapt them to the understanding and expectations of end users, and apply them for user model negotiation.
- Finally, the web platform provides interfaces and links to export/report the data and to transfer them to external tools such as the OLM platform of UoB, ePortfolios, or learning management systems.

1.4 THE MARKET POTENTIAL FOR A LEARNING ANALYTICS PLATFORM AND LEARNING ANALYTICS SERVICES

The global learning analytics market is growing substantially on account of the rise in adoption of various digital learning technologies and ERP software solutions among schools, as well as the increasing trend of big data and the need to analyze it to derive meaningful insights and/or actionable interventions for better learning.

The latest market studies on Learning Analytics are released by TechNavio in February 2016. TechNavio is a leading global technology research and advisory company which prepares studies on emerging

technologies' market size, segmentation and players based on an in-depth market analysis with inputs from industry experts. This market research report estimates the global learning analytics market will grow at a compound rate of 25.45% to attain a little more than **$2,144 million** by 2019,[4] which means it will reach **$888 million** in 2016. To calculate the market size, the report considers revenue generated from software licenses, maintenance, implementation, and subscriptions. In addition, the report considers the revenue generated from: Content analytics, Adaptive learning analytics, Functional support analytics, Social media analytics and Predictive analytics. The report also defines the market by deployment model: On-premises and Cloud.

Rising competition among educational institutions to achieve quality standards is expected to prompt them to structure their teaching processes. First among these institutions are the higher education and adult training segments as there are more private companies competing, and higher stakes for the students as their careers are on the line. They are turning to modules of learning analytics to ensure they are making logic-based and data-driven decisions to navigate their future. Learning analytics solutions empower colleges to outsmart competition with improved performance management in

- Curriculum design (expected to be **$161 million** by 2020, growing at a rate of 26%)
- Institutional management (expected to be **$108 million** by 2020, growing at a rate of 24%)
- Personalization (expected to be **$54 million** by 2020, growing at a rate of 23%)

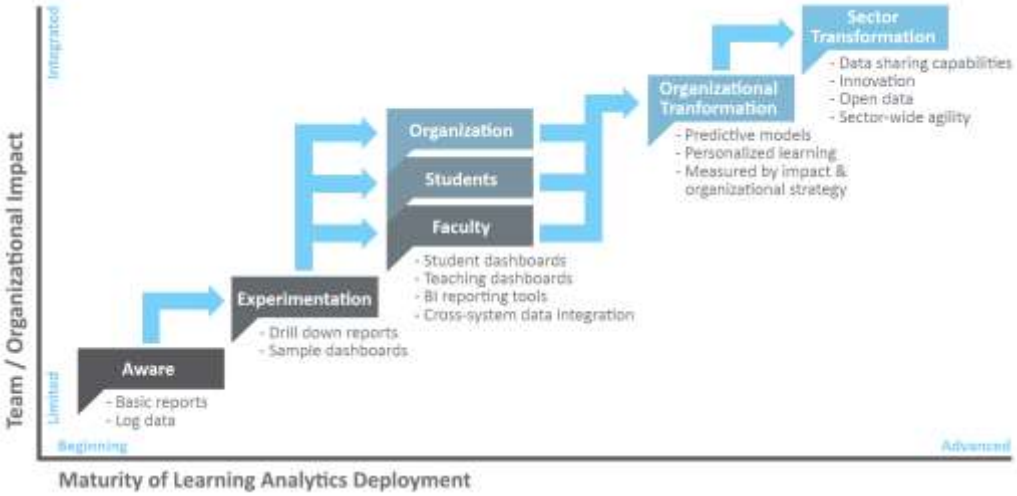
The analytical tools are increasingly used to proactively monitor and gauge the academic performance of students. The intervention policies benefit students by comparing and assessing their grades. These inputs play a critical role for teachers to help them develop personalized learning methodologies, triggering enhanced student engagement while fostering inclusive learning. The phenomenal popularity of online learning is also contributing to market growth. The report forecasts the Higher Education Learning Analytics Market in the US to grow at a compound rate of 25.92% during the period 2016-2020 and exceed **$322 million** by 2020.

In public education segment, the major driver for employing learning analytics is to reduce dropout rates, especially in STEM-related tertiary education programs. One of the top Europe 2020 strategy targets on education is to reduce the dropout rate to less than 10% by 2020[5] and there has been a steady achievement on this goal since 2002. However, completion rates of STEM-related programs are dropping. The situation is similar in North America and APAC regions. Predictive Learning Analytics has been shown to reduce dropout rates, primarily by providing students and faculty early warning signals[6]. In USA, the National Dropout Prevention Network had formed a strategic alliance with BrightBytes (a leading learning analytics vendor for Higher Ed) and in Europe, EC supported Learning Analytics European Policy (LAEP) and Learning Analytics Community Exchange (LACE) projects are building bridges between vendors, researchers and educational institutions to energize the market.

[4] http://www.technavio.com/report/learning-analytics-market
[5] http://ec.europa.eu/eurostat/statistics-explained/index.php/Europe_2020_indicators_-_education
[6] https://www.jisc.ac.uk/reports/learning-analytics-in-higher-education

In terms of geographical regions, the growth is mainly driven by the promising growth prospects in the APAC region. It has strong market foothold in North America and Europe as well. Both these regions follow identical trend with regards to the usage of latest advances in technology it the education sector.

On the other hand, there exists market challenges. As e-learning is gaining popularity, a greater emphasis is being placed on privacy, security, and ethical issues. These problems have emanated from going online and storing each and every piece of information on the cloud or on computers. This has increased the vulnerability to hacking and misuse of information.



The Society for Learning Analytics Research (SoLAR) is an interdisciplinary network, exploring the role and impact of analytics on teaching, learning, training and development. A 2014 study commissioned by SoLAR on the market situation defines 5 maturity levels in the deployment of learning analytics. The report reveals that nearly 70% of institutions are not out of the experimentation phase yet, with academic analytics.[7] However, most US higher education institutions can be considered going through the "organizational transformation" stage with Learning Analytics. McGraw-Hill Education's third annual survey on digital study trends (surveying 2,600 U.S. college students) which is released in October 2015[8], reports that 87% of the students said learning analytics would improve their academic performance, and nearly 66% of those who use it already say its impact is "very" or "extremely" positive. Students embrace analytics as a form of continual feedback on their progress. If their school is using a Social LMS to manage the online learning activity in the campus and blend analytics results in the personalized activity stream at the student's home page, it is perceived much like the feedback they receive after taking any action on social media. It helps them learn more effectively through continual feedback.

[7] https://sydney.edu.au/education-portfolio/ei/projects/SoLAR_Report_2014.pdf
[8] https://www.mheducation.com/news-media/press-releases/learning-analytics-new-likes-college-better-access-personalized-data-new-research.html

When reviewing the market, of course there is a vast amount of educational tools available, even Learning Analytics solutions. However, the value / uptake of such products is still sparse. The reasons are on the one hand educational tools are overly simple and do not incorporate specific advanced analytics features. On the other hand, tools are sparsely tailored to the concrete needs of education.

Similarly, University of Minnesota educational technologies hype cycle inventory claims that academic analytics still has 5+ years to yield productivity[9]. Hype Cycle is a model for market analysis that is invented by world's leading research and advisory firm Gartner. Gartner's own educational technology hype cycle (2015) identifies Learning Analytics "at the peak" of expectations. The ADL standard for representing and storing learning data (Tin Can API), as well as Competency-Based Education Platforms are also identified to be "on the rise." The Tin Can API has the potential to have a very big impact, especially in terms of how we understand, analyze and act on student learning. It allows to capture the

[9] http://hypecycle.umn.edu/hype-cycle-technologies/academic-analytics

full range of learning activities, no matter where they happen, which will allow analyzing more sources of data for building a more holistic view of the learner.[10]

There are two standards bodies in eLearning world: IMS Global Learning Consortium who developed LTI for learning tools, QTI for assessment and ADL who developed SCORM for standardizing content packaging across LMSs. Of these two, ADL was the first to notice the need for a standard to represent and store learning data and created the Tin Can API (sometimes known as the Experience API or xAPI). The xAPI was released as version 1.0 in April 2013. There are currently 179 adopters[11], most of which are European vendors, products or consumer groups. The equivalent standard created by IMS is called Caliper Analytics and it provides a standardized framework to enable real-time collection and analysis of data across learning systems. Version 1.0 of the Caliper standard was released in October 2015, but the first certification was granted that very same month and the standard was adopted, especially in higher education sector in USA very rapidly. The two standards are likely to have their own separate life cycles. Caliper will potentially be a de facto standard in US higher education market and xAPI will be de facto in enterprise training and schools, especially in Europe.

Unlike SCORM or LTI standards, the standards on data do not bring the same easy set of incentives for vendors. Data accumulated in an LMS is used by that LMS to generate some reports and add value to the product. If the LMS vendor standardizes the data store learning analytics software vendors can also use it, but there is no direct benefit for the LMS vendor. Therefore, the growth in adoption needs to be driven by customer demand, as the institutions increasingly add this requirement in their requests for proposals. Secondly, publishers and content providers are likely to be early adopters. Giving institutions access to data that increases the likelihood they will remain customers is a win-win. For example, Kaltura's open source video platform was one of the first products to receive conformance certification based on Caliper. Blackboard, D2L, Elsevier, Intellify Learning, Learning Objects, McGraw-Hill Education, and VitalSource Technologies are among the other Ed-Tech providers to achieve conformance certification for their products.

1.5 TECHNICAL COMPETITORS (OPEN OR COMMERCIAL)

1.5.1 PLATFORMS

According to TechNavio's report, the major global learning analytics market key players are Blackboard, D2L, McGraw-Hill, Pearson and Saba Software. These LMS providers naturally enhanced their products with learning analytics tools and functionalities. Other prominent vendors in the market are Cornerstone OnDemand, IBM, Jenzabar, Knewton, Kronos, Brightbytes, Mastery Connect, and Totvs. Learning analytics is a highly anticipated area in educational technology, therefore in the radar of venture capital

[10] https://www.gartner.com/doc/3090218/hype-cycle-education-
[11] http://tincanapi.com/adopters/

funds. European startups such as CLANED or many US startups such as Panorama, Civitas, Education Elements, Clever, LearnSprout (recently acquired by Apple), Learnmetrics (funded by Intel), Intellify, Schoolzilla and Junyo. Most of these solutions utilize cloud-based SaaS platforms to be able to scale across the market and provision new schools faster. There are also many Indian startups such as Xamcheck or UpGrad, that focus on high stakes exam preparation which is a huge market in India. SEBIT also use learning analytics (at the moment with company's own foreground) in its university entrance exam prep product for the Turkish market called RAUNT.

The below table summarizes some of the offerings that may qualify as a "platform" and hence, compare to LEAs Box.

Platform Name	Business Model	Host/ Owner	Target User Segment	Purpose	Specific Advantage	STATUS
Apereo	Open Source	Unicon Inc.	Higher Ed	Early warning on drop outs (the OAAI initiative) and decision support with learning design.	Supported by JISC, SoLAR and Sakai. Relies on xAPI.	Pilot
Cornerstone OnDemand	Commercial	Cornerstone	Adult Training & HR	Talent Management	Links to certification and career mobility	Firm has 2,700 clients worldwide, spanning 25 million users
IBM PASSES	Commercial	IBM	Higher Ed + K12	Predictive Analytics and Decision Support		Sparse market Imple-mentation
Course Signals	Commercial	Purdue University venture Ellucian	Higher Ed	Classification for early warning	Focused to early warning, a clear value add.	More than 2,400 institutions in 40 countries
Knewton	Commercial Service – has partnership with Sanoma in EU and SEBIT in TR/US.	Knewton	K12	Personalisation	Adaptive Learning Service provider for publishers	36 publishers are customers but some are just for piloting.

Smart Author	Commercial – annual subscription (cloud-based)	Carnegie Mellon University venture Acrobatiq	Higher Ed	Assessment and adaptive instruction	Content authoring for professors with built-in analytics	About 35 universities Mostly Trials
Learnmetrics	Commercial SaaS-based data analytics platform	Private Venture (founder is a former teacher turned technologist)	USA - K12	Essentially a multisource data translator for teachers to interact with data easier	More friendly than Excel, which is what most teachers use still. Competes with Tableau.	Seed funding – accelerated by Intel.
Schoolzilla	Commercial SaaS-based data analytics platform	A private spin out of a public school network	USA - K12	A hosted service that connects, cleans and visualizes all of a school's data sources	Multisource analytics with a warehouse and a dashboard	Series A funding – Used by at least 8 school system through a strategic partnership with Tableau.
Brightbytes	Commercial SaaS-based data analytics platform	Private Venture	USA - K12	Measures and links data from the use of technology in education to learning outcomes	Presenting analytics for high impact actionable insights is 1st priority.	Series C funding – supporting many US districts who are doing 1:1 rollouts. In total 1/5 of all US schools.

1.5.2 CLASSROOM SOLUTIONS

In addition to the general e-Learning platforms, the following key solutions are competitors to Lea's Box when it comes to a strong focus on classroom applications. The most direct competitor is likely **Klassdata** (see below).

NoRedInk

A US based company offering a product for the English language learning field. The product is a rather simple online course the provides certain questions and analysis these in order to provide teacher with some feedback and insights into their individual students' learning progress. The tool is rather superficial and lacks a theoretical foundation. Also the UX quality appears rather low. https://www.noredink.com/

Google Classroom

Perhaps the most professional solution at the moment for support classroom teaching. The basic idea is to provide Google-like solution to reduce administrative efforts. Extensions include features of analytics and personalization: http://www.shakeuplearning.com/

Blackboard

Given that one is using the monolitic Blackboard learning environment, Blackboard is committed to supporting the entire student experience by helping colleges and universities extract value from data they already have. With Blackboard Intelligence and Blackboard Predict institutions can identify barriers to retention and keep students on track to graduate with high quality degrees. X-Ray Learning Analytics gives teachers the tools they need to better understand their learners and cultivate the critical thinking skills required to survive and thrive in the 21st century. http://www.blackboard.com/education-analytics/index.aspx

Dreambox Learning

Similar to Blackbox, Dreambox Learning offers a stand-alone e-Learning solution with features for adaptation and personalization of contents and content delivery. A specific strength of Dreambox is in their analytics: Actionable data reported to teachers drive better teaching and learning. The unique adaptive learning platform that personalizes learning also generates what one needs to know to help students meet their full potential. http://www.dreambox.com/

Klassdata

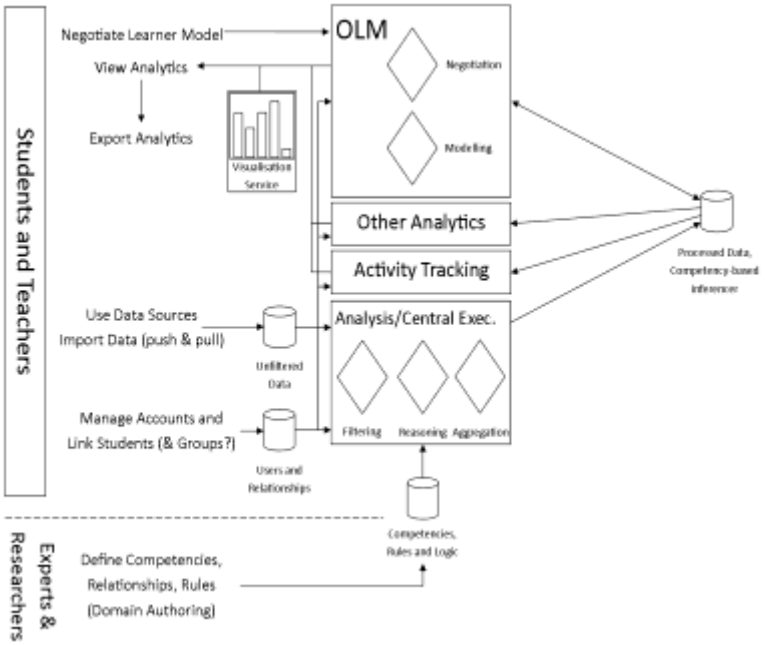
SmartKlass™ is a multi-platform, open source, learning analytics solution that enables powerful data tracking through a simple and easy to use dashboard, directly embbeded in your LMS (Learning Management System) of choice. Insofar, KlassData has the same background idea as Lea's Box and thus is the closest direct competitor. However, KlassData and SmartKlass is a plug-in that is only available for

limited learning management systems (such as Moodle, Blackboard, Sakai) and then works only with this single platform. http://klassdata.com/smartklass-learning-analytics-plugin/

Summarizing this market overview, we find a situation where strong commercial players and open-source solutions (e.g., Moodle), dominate the educational market. Effective Learning Analytics features, however, are sparse. More importantly, the uptake of Learning Analytics among teachers (and students) is very low across Europe. This gives a solution like such of Lea's Box a distinct and highly promising market niche. As plugin and/or web service Lea's Box can connect practical analytics features to existing e- and non-e learning solutions. This opens also pathways to a commercial exploitation of the project's research work.

1.6 EVALUATION OF THE LEAS BOX PLATFORM

LEA's BOX platform as a whole is designed to ingest a multitude of data streams into a structured warehouse and then employ CbKST of FCA to discover and track states of progress. A set of tools are built to act on this knowledge such as achievement visualization, active learning class assessment or self-assessment tools. The platform is flexible in that many other tools can be built in similar fashion. User/Class configuration and data import functionalities completes the platform.



Following the Deliverable 2.2 Revised System Design (August 2015), the platform got mature and operational enough to be piloted. During the last 12 months of the project many piloting activities took place to evaluate the platform and specific tools therein, for the purpose of improving functionalities and validating various business cases. These developments are described in detail in Deliverable D5.5 Piloting and Evaluation Report 2 (March 2016). Though the evaluation studies focus on specific business cases, naturally the whole platform had to function end-to-end to deliver the analytics services. Below is a SWOT analysis, evaluating the LEA's BOX platform as a whole, based on the outcomes of the evaluation studies.

Strengths	**Weaknesses**
1. Data warehouse that can keep multiple streams of data from varying sources 2. Real-time data processing by using data adaptors 3. Ability to visualize multiple and complex information in an easily intelligible form and in context 4. Ability to reveal quickly cause-effect relationships in learning and identify possible areas where attention is required 5. Directly usable by publishers and content developers (i.e. prospective early adopters). 6. Open through TinCan / xAPI 7. Aligned to competence standards through CASS[12].	1. The data warehouse is not standards compliant (IMS or ADL) 2. There is no open framework for independent 3rd parties to add tools directly to the platform 3. The visualization tools and platform functionalities are two different open source projects 4. User friendliness of some system parts (being still in a research prototype phase) 5. Documentation, training, and open registration features are still not on a professional product level.
Opportunities	**Threats**
1. By implementing xAPI data from any LRS (Learning Records Store) can be imported 2. During the creation of an open source version of the platform, measures and mechanisms for a developer community can be established 3. Growing interest of school governing bodies in Europe to implement LA tools. 4. Generational change expected in some EU countries among teaching staff. Higher acceptance among young teachers can be expected.	1. An incumbent user base may turn out to be essential to attract developers 2. There may not be financial support for an initial group of researchers to maintain the platform until a community is established 3. Unwillingness of school governing bodies to use LA tools other than imposed by e.g. state, regional authorities, etc. 4. Fear of parents, students and teachers from the increasing number of personal information stored in ICT/Cloud based devices

[12] CASS Project mission is to facilitate the transition to competency-based education, training, and credentialing through the development and dissemination of open source infrastructure and tools. Lea's Box (TUG) is already a member of this initative.

Through making the components available, Lea's Box leaves a legacy of a complete, robust learning analytic toolbox that could be used and/or extended for research contexts for future studies and development.

1.7 LEAS BOX PLATFORM STRATEGIC POSITIONING

Our assessment reviewed if there was an extant market for learning analytics in schools and classrooms. Clearly, the market for learning analytics will (eventually) be schools, educational practitioners and teachers. However, the software that is developed at the moment is not at a stage where it would be possible for a school or a school network to use it on a large scale as it is not possible to provide the support and up-time that would be required. We have proposed schools (e.g. those participating in the evaluation, etc.) as a possible exploitation route for our technologies. However, this was infeasible as the involved schools had financial constraints typical of the sector precluding the purchase of new software systems. In response, the dissemination message was tailored to focus on communication and increasing the awareness and interest of schools, pupils, teachers and parents rather than seeing them as a potential consumer segment.

For exploitation of the platform as a whole, the target segment is identified as the "sponsors." This segment includes entities that finance the platform to be used by a large population. They include:

- State officers: MoE decision makers can use the tools for planning and governing. They can employ the platform at national level for all state schools to benefit.
- Local entities: District educational authorities can finance the portal for local users
- Foundations and non-profits: These establishments can donate the tools to users in their supporting base. Sector (Learning Analytics) specific NGOs can adopt the platform as a baseline.
- Academics: Researchers can use the platform to apply learning analytics on the pedagogical questions they inquire or by developing new analytics tools that can be taken on board. The platform can be a background for other research projects.

In targeting the "sponsors" segment four directions of exploitation for the platform as a whole emerges. Potential activities and interactions along these four directions are given below:

Direction 1 - Memberships:

Project partners can join a list of organizations to broaden exploitation and impact. These organizations may either represent sponsors or have established formal communications channels with the sponsors. A tentative list is as follows:

Organization	Liaising Partner	Membership Cost	Expected Benefit
UK STEMNet	UoB	none	STEMNET works with thousands of schools, colleges and STEM employers, to enable young people of all backgrounds and abilities to meet inspiring role models, understand real world applications of STEM subjects and experience hands-on STEM activities that motivate, inspire and bring learning and career opportunities to life
AEA Europe	SCIO	600€	AEA is a leading association for educational assessment researchers and practitioners in Europe. Established in 2000, its principal aim is to foster connections and developments in assessment across Europe and beyond. They have an Annual Conference with over 300 delegates, representing over 25 countries, a LinkedIn site, Newsletter, professional accreditation and awards for assessment research. SCIO will be hosting its annual conference in 2017 where there will be a lot of opportunities to engage with potential sponsors in Europe.
Trvalá obnova školy[13]	SCIO	none	A network of progressive schools in the Czech Republic trying to find efficient methods for running schools. Prospective early adopters and/or promoters. Scio regularly attends their events.
Asociace ředitelů gymnázií[14]	SCIO	none	The Association of Directors of general high-schools of the Czech Republic is a network of headmasters who regularly meet at conferences, organize trainings and events, provide system advice and lobbying. Prospective early adopters or/and promoters. Scio regularly attends their events.
Association of	SEBIT	none	This association has access to 3000+ private schools across the country. A limited set of

[13] https://www.facebook.com/TrvalaObnovaSkoly/
[14] http://www.arg.cz/

Private Schools			analytics services can be provided through this association to promote a larger business in private schools.
CASS	TUG	none	The CASS Project mission is to facilitate the transition to competency-based education, training, and credentialing through the development and dissemination of open source infrastructure and tools.
SOLAR		3000$	The Society for Learning Analytics Research (SoLAR) is an inter-disciplinary network exploring the role and impact of analytics on teaching, learning, training and development.
ISTE	TUG	305$	Online Network of educators including journals and the organization of events and conferences.
eLSA, Lehrer-Online	TUG	none	The strongest and largest online communities of teachers in Austria and Germany.

Direction 2 - Background for Other Projects:

Project partners are prominent actors in further R&D project at national and EU level. The platform can be brought in to those project as a background by a partner. This avenue of exploitation must be enabled by a Memorandum of Understanding signed by LEA's BOX partners. Some of the indicated projects are listed below:

Project Name	Acting Partner	Status	Purpose for using the LEA's BOX Platform
BEACONING	SEBIT	EC funded IA Project	To assess game-based learning activity outcomes
MoE-FATIH	SEBIT	National Project	To establish a data infrastructure for a national digital educational content moderation and reutilization platform.
UNI-FATIH	SEBIT	Government Tender	A government tender was awarded to SEBIT to create an ePlatform that would serve public universities across the country. The platform must have a data infrastructure that would provide decision support to academic personnel and personalization features.

Head in the Clouds: Digital Learning to Overcome School Failure	SCIO	Erasmus	Use LEA'S BOX tools for assessing learning development in excluded Roma communities in Slovakia, Kosovo and Romania.
LA4S	TUG	Erasmus+	Fully exploit the results of Lea's Box (in terms of know-how and technical solutions) in the context of small universities and other small scale educational establishments.
RAGE	TUG	H2020	In the context of GALA and cooperation with the OUNL and the University of Genoa, we could demonstrate that the service-oriented nature of Lea's Box can fuel learning analytics features in educational games. This opens a broad and highly promising field for exploitation.

Direction 3 - Background for a Spin-Off or a Joint Company

Lea's Box is a professional brand name including amicable logo and Lea as a character that embodies the project, the vision, and the technical solutions. Thus the brand Lea's Box has a high value in itself. Under this brand a joint or spin off (university) entity can be established to represent and exploit the IPR and tangible outcomes of the project.

In markets where private school systems compete (such as in Turkey, US or India), educational technology provides an edge over the competition, hence School systems are willing to pay for help with their data. Education technology companies that help school systems analyze and manage data—like BrightBytes, Clever, Education Elements, LearnSprout, MasteryConnect, and Schoolzilla—are drawing significant interest from both customers and investors, which potentially signals healthy growth ahead for this segment of the education technology market[15].

The legal procedures, shareholding and management structure of such a venture is complicated and none of the partners have previous experience with ventures, perhaps with the exception of TU Graz commercial spin-off Know-Center[16]. Therefore, the viability and motivation for such company may depend on the success in the specific business cases given below, in Section 3 of this plan.

[15] http://www.christenseninstitute.org/wp-content/uploads/2014/06/Schools-and-Software.pdf
[16] http://www.know-center.tugraz.at/en/

Direction 4 - NGO Handover:

The entire platform can be handed over to an NGO in the educational sector, which needs to have an assessment, evaluation or tracking platform to support particular educational approaches such as project-based learning for STEM education, active learning, self-regulation, and competency-based education. Serving as such an evaluation platform, LEA's BOX can help measure the return-on-investment of 1:1 education initiatives or any other mass scale technology enhanced learning deployments[17].

This would maximize a possible impact by making the exploitation independent from the partners.
Some similar activities can be listed as

- Open Education Challenge[18]
- Klass Data[19]
- Reimagine Education[20]
- Scientix[21]
- Open Education Europa[22]
- European Research Network

1.8 THE EXPLOITATION PLAN FOR THE SYSTEM AS A WHOLE

TU Graz will host and maintain the platform in its final form for at least 5 years beyond the project. This includes the set of demo data and demo accounts. All partners can and will access this portal for demonstration and dissemination purposes. Having the know-how and experiences from the project in combination with a stable demonstration system strengthens all partners' standing and reputation in the field. Relying on the prolonged hosting and maintenance of the end results, exploitation activities that has been ongoing can be taken further, throughout the last 3 months of the project and beyond.

The plan as to how the strategy given in the previous section can be realized was briefed in the amendment of the Year 2 Management Report. Detailing on that outline, the progress to date, the action points for the last 3 months of the project and the foreseen activities beyond the project end-date are given in the below sections.

[17] https://www.edsurge.com/news/2016-08-18-how-can-we-measure-edtech-s-return-on-investment
[18] http://openeducationchallenge.eu/
[19] http://klassdata.com/
[20] http://www.reimagine-education.com/
[21] http://www.scientix.eu/
[22] http://www.openeducationeuropa.eu/

1.8.1 PROGRESS AS OF THE ACTION PLAN

Below is an incomplete list of actions taken towards exploitation, since the beginning of the project. The list mainly includes exploitation activities, started or achieved in particular during the first 9 months of Year 3.

ACTION	OBJECTIVE	PARTNER	DURATION	PROGRESS TO DATE
Branding	Visibility and Recognition	TUG	Since Project start	Successful recognition among European researchers and policy makers
Web Presence	Value Proposition	All (esp. TUG)	Since M6	Project web-site is up-to date
Social Media Presence	Value Communication	All (esp. TUG)	Since Y2	Active Facebook and Youtube channels
Making Open Source	Collaboration and crowdsourcing	TUG, UoB	Y3	OLM is partially available as open source
Build associations with other groups	Establish collaboration between LEA'S BOX and Adaptive Learning group in Brno.[23]	SCIO, TUW	Since July 2015	Successful joint activities
Discuss the possibility of using LEA'S BOX in Head in the Clouds project	Establishing collaboration	SCIO	Since August 2016	Ongoing
Discuss the possibility of using LEA'S BOX in SCIO network of schools	Establishing sales channel	SCIO	Since July 2016	Ongoing
Presentation of LEA'S BOX self-assessment	Establishing	SCIO	July 2016	Finished

[23] http://www.fi.muni.cz/adaptivelearning/

tools at Trvalá obnova školy workshops	collaboration			
Release evaluation materials	Evaluation materials included a range of protocols and questionnaires for evaluating technology acceptance of visualisations and negotiation tools.	SCIO	Since 2015.	Materials created and used.
Build Data Adaptors	To link data from existing products to LEAs Box platform	SEBIT	Y3	Achieved and utilized during evaluation studies
Expositions	Establishing sales channel	SEBIT	Y3	Showcased at BETT Fairs in UK and UAE
Liaise with other projects	Establishing collaboration and potential exploitation path	SEBIT	Y3	Bridge with BEACONING Project (H2020 – started 01/2016)
Liaise with MoEs	Establishing collaboration and potential exploitation path	ALL	Y3	SEBIT briefed Turkish MoNE, assessment center about the project outcomes

1.8.2 THE FINAL MONTHS OF THE PROJECT

During the final 3 months of the project a communication plan is set in place to disseminate the exploitation messages of the project. The Communication Plan aims at the following actions:

1. To promote awareness, interest and engagement in learning analytics for future markets, stakeholders, policy makers, schools, users and the general public.
2. To inform and promote use of Lea's Box IP by researchers, providing IP in a format that could be accessed, repurposed and re-used for other researchers.
3. To achieve a timely uptake of the project's results
4. To create a basis for marketing activities for exhaustive exploitation of the project's results
5. To create interest in the "Learning Analytics as a Service" concept among potential customers as well as end-users
6. To show businesses in the e-learning domain how they can benefit from the uptake of the innovative results from the project and how they can integrate these results in their present and future commercial products

The exploitation message is to inform researchers of the IP that is available, how it can be used and where it can be downloaded.

Getting the Message to the Market: this focused on creating dissemination materials for the general public and stakeholders. We focused on providing interesting and engaging dissemination materials to promote learning analytics.

The number of events that were foreseen in the DoW are copied below:

Training and Dissemination Workshops			
	Country	Nr. of Events	Nr. of Participants
Y2	CZ	15	10 to 20
	AT	2	40 to 50
	TR	5	10 to 20
Y3	CZ	10	10 to 20
	AT	2	15 to 25
	TR	5	80 to 100

Concrete plans to organize these events are listed below:

EVENT	OBJECTIVE	PARTNER	DURATION
Trvalá obnova škola Conference	Find and involve exploitation partners among progressive schools (early adopters). Joint workshop.	SCIO	August 2016
Education Day 2016 Prague	Disseminate LA possibilities to parents, teachers and NGOs. Presentation.	SCIO	October 2016
Czech School in the 21st Century conference	Disseminate LA possibilities to practicioners, publishers and authorities. Presentation.	SCIO	October 2016
5 LA workshops CZ	Promote use of LA and LEA'S BOX among teachers directly in the field (at least 5 sessions countrywide)	SCIO	September – November 2016

E-ATP Annual Conference	Promote the results and use of LEA'S BOX among publishing industry partners and potential sponsors. Discussion.	SCIO	September 2016.
AEA Annual Conference 2016	Promote the results and use of LEA'S BOX among European researchers, practitioners and potential sponsors. Discussion.	SCIO	November 2016.
Maya School Network Training Workshop	3 sessions (in 1 wk) training workshop for 11 teachers from this school network (plus their headmaster) will prepare them for data-smart mentoring and subsequent LEAs Box evaluation study.	SEBIT	March 2016
Ayse Abla School Network Training Workshop	3 sessions (in 1 wk) training workshop for 11 teachers from this school network (plus their headmaster) will prepare them for data-smart mentoring and subsequent LEAs Box evaluation study.	SEBIT	June 2016
Evidence-based Practice in HEI Workshop	Prominent people from Turkish Higher Education Institutions will join this workshop as an action research exercise. Project main approach will be presented to establish	SEBIT	October 2016

	an exploitation channel at HEIs.		
TinCan Plugfest	Demonstration of standard-based (TinCan) connectivity for 3rd party eLearning platforms	SEBIT	November 2016
Joint Workshop with Turkish MoNE	Establish a preliminary design (potentially based on LEAs Box) for data-oriented decision support at national educational digital platform in Turkey.	SEBIT	November 2016
Training and dissemination workshop	Demonstration of platform features to eLSA teachers from eastern Austria in Graz	TUG	August 2016
Training and dissemination events	Demonstration of platform features to Austrian teachers	TUG	Fall 2016
Dissemination towards commercial partners	Demonstration of features and integration into solutions for German schools via cooperation with MTO, Germany (www.mto.de). The same activities will occur for Austria together with 'Verein offense Lernen' in Vienna (o-le.org).	TUG	Fall 2016

The final report on the achievements of these events will be delivered as D5.8 Training and dissemination workshop report II: This document will present the workshops conducted in the context of task 5.4 based on the second major software release (November 2016).

The concrete action plan for the last 3 months of the project is given below

ACTION	OBJECTIVE	PARTNER	DURATION
Memorandum of Understanding (MoU)	To establish a legal background for commercial exploitation	ALL	August-October 2016
Make the Platform Open Source	To have a reliable, legally clear software basis to exploit	TUG	Sept-Nov 2016
Make Domain Modelling Open Source	To have a reliable, legally clear software basis to exploit	TUG	Sept-Nov 2016
Make Competency State Calculation Open Source	To have a reliable, legally clear software basis to exploit	TUG, UoB	Sept-Nov 2016
Make OLM and Visualisations Open Source	To have a reliable, legally clear software basis to exploit	UoB	Sept-Nov 2016
Unite OLM and Platform source code under the same open source project	To have a reliable, legally clear software basis to exploit	TUG, UoB	Sept-Nov 2016
Result Transfer Workshops	To communicating the exploitation messages and to establish exploitation channels	SCIO, SEBIT, TUG	See the communication plan in the previous table
Project Flyer (In 3 languages)	Communicating the exploitation messages	SCIO, SEBIT, TUG	Sept 2016
Final Press Package (In 4 languages)	Communicating the exploitation messages	SCIO, SEBIT, TUG	Sept 2016
External Advisors	Establish exploitation channels via influential advisors	ALL	Sept-Nov 2016

1.8.3 BEYOND THE PROJECT

Thanks to sustaining of the platform beyond project lifetime, project partners can plan ahead the below exploitation activities during 2017 and beyond. Note that, these actions involve using the whole LEA's BOX platform. Actions towards exploitation in specific use cases are given in the next Section.

ACTION	OBJECTIVE	PARTNER	DURATION
Maintaining the project website as background information and entry portal	To enable the exploitation of the system as a whole	TUG	5 years
Make the final result(s) clearly visible and searchable	To enable the exploitation of the system as a whole	TUG	5 years
Add documents and websites to the appearances of the TU Graz website (kti.TUG.at)	To enable accessibility of the results	TUG	5 years
Showcase this particular know-how on the web appearance of the institute's commercial spin-off	To enable accessibility of the results	TUG	5 years
Attend BETT Fair	To showcase as a potential extension to SEBIT's cloud services offering	SEBIT	January 2017
MoE Demo	Proof of concept demonstrations for the Turkish MoE	SEBIT	March 2017
TinCan / xAPI Demonstration	TinCan proof-of-concept demonstration at LAK'17	SEBIT	April 2017
BEACONING Trial	Trial integration with the BEACONING project	SEBIT	May 2017
AEA Annual Conference	Find dissemination and exploitation routes and	SCIO	2-5 November 2017

2017, Prague	connections Europe-wide		
Trvalá obnova škola Conference	Find exploitation partners among progressive schools	SCIO	August 2017
Scientific exploitation (conference, papers, journals)	Based on our experiences, the results of a EU project are exploited in a scientifically sense clearly beyond the project. In fact, writing quality journal publications begins after projects.	TUG, UoB	2+ years

2 EXPLOITATION BASED ON DISTINCT BUSINESS CASES

Starting with the elements that can be exploited from within the project outcome, concrete business cases will be described, followed by how the LEA's BOX elements can be fashioned to address the specific business case and to what maturity and effect. Evaluation and validations results will be presented to delineate the value proposition. After disclosing a strategic positioning of the solution, an exploitation action plan will be given. Note that most of the early action points have already been accomplished, which are indicated here, but will be delivered in larger detail in D6.6 Piloting and evaluation report III, which is due in M33 (November 2016 – as the project deadline).

2.1 ELEMENTS FOR EXPLOITATION

The following table presents and extensive list of elements that can be individually exploited

Element	Description of foreground	Type of foreground	IP Owners	Status	Dependencies
myClass Light	An original version of myClass was brought in by TUG and extended / adjusted to the needs in Lea's Box.	Released as open source. Exploitable via commercial product	TUG	TRL 6	Depends on the full Lea's Box system

myClass	An original version of myClass was brought in by TUG and advanced in the context of the project. In the context of future cooperation this will be made a final product.	Release license will be finalized in the context of deployment.	TUG	TRL 5	
FCA Tool	An early version of the FCA from the WeSpot project was adapted to the use in Lea's Box and fully integrated into the system.	Advancement of Knowledge and reduction to software released as open source.	TUG	TRL 5	Depends on the full Lea's Box system as well as a FCA backend engine that is hosted by TUG.
Competency Map / Domain Validation		Advancement of Knowledge, exploitable as consultancy	TUG		
Mindmapping tool	Interactives visualization of a structure of a certain competency with respect to a particular activity.	Open source software	TUG	TRL 5	
Competency Landscapes	A tool to visualize the results of CbKST/FCA type analytics developed in the context of the project	Distributed as commercial product – special access grants to the project partners apply (cf. MoU)	TUG	TRL 6	
Flower App	Tool allowing input and output of comparable data, (e.g. students to compare their own opinion of their abilities with their teacher's opinion and with the results of an external test). Based on direct requirement from the field, incorporated in LEA'S BOX environment	Open source software	TUG	TRL 5	Depends on the full Lea's Box system

Hasse Diagrams	A software solution to display Hasse diagrams in the context of CbKST based learning analytics including the visualization of learning paths, state probabilities, and the LPV / Lerning Horizon predictive algorithm	Distributed as commercial product – special access grants to the project partners apply (cf. MoU)	TUG	TRL 4	
OLM and OLM Visualisation Service	The Visualisation Service allows for the graphical output of various types of data. API requests can be made providing the type of graphical output and data value is given, the Visualisation Service will generate HTML visualisation to return. At the moment this service is hosted at UoB but the software will be made open source and could be run by other users. The visualisation set, requirements, and API is detailed in the software deliverables.	Released as open source. Exploitable via commercial product	UoB	TRL 5	
Negotiation Module	LEA's BOX provides learners with a persuasion feature that allow them to obtain evidence for their learner model data and try to persuade the system to make changes to their model by challenging evidence or providing justifications. This persuasion feature aims at making the learner model more	Released as open source. Exploitable via commercial product.	UoB	TRL 5	

	accurate, support learner reflection on their learner model contents, as well as their learning more generally, and also facilitate planning and self-monitoring. Teachers are able to set by how much and how often a student may influence their model. This module may be able to be adapted to other systems that have an OLM.				
FLASH	FLASH is Lea's Box's Data Analytics Warehouse, a service that performs certain analytics function in the context of a multi-source data scenario as envisaged by Lea's Box	Distributed as commercial product – special access grants to the project partners apply (cf. MoU)	TUG	TRL 4	

2.2 THE MARKET POTENTIAL FOR SPECIFIC BUSINESS CASES

This exploitation plan focus on 6 specific business cases. These cases will be realized or are already under realization.

2.2.1 *BUSINESS CASE 1:* VALUE-ADDED FEATURE OR SERVICE IN A PARTNER'S PRODUCT

SEBIT and SCIO are commercial companies and project partners. Both companies have a strong foothold in their countries and have successful products. Therefore, the most feasible business case for a fast market implementation of the project outcomes is to use them as a value-added feature or service in a SEBIT or SCIO product. Below two sections describe the potential, competition, strategic positioning and the evaluation of this business case.

Commercial Exploitation in SEBIT Products

Vitamin and its derivatives for various countries such as Uzinggo and Vitamina are the main retail products of SEBIT. However, most pedagogical scenarios that involve competency based learning analytics have a context in a course plan such as decision support in planning to keep a progressive learning trajectory. In that context, SEBIT speed reading product HızlıGo, with its 21 Day, 40 Day, 60 Day and now 12 Day course plans is an ideal retail product to validate the added value of learning analytics as implemented in LEA's BOX. SEBIT has other product that such added value can be feasible. These products are:

RAUNT: A university entrance preparation system which is currently used by more than 70K students. It includes a dashboard to track individual student learning outcomes on weekly basis.

VCLASS: Classroom management software for 1:1 initiatives where each student is equipped with a mobile computer or tablet. Self-assessment or active learning assessment tools can be value-adds to this product.

Although there is no commercial competition in Turkey in learning analytics services, the MoE portal "e-okul" is a successful project that aggregates all educational data in Turkey. All schools, public or private, are legally obliged to enter their assessment, attendance, performance and other data to this government platform and print their report cards from this platform. Therefore, any analytics service in the country must somehow link to this platform. SEBIT products are linked to e-okul ever since it became operational.

As a summary, SEBIT has no competition in Turkish market but rather would benefit from value-added features in order to scale to a larger user base. Towards that end, 2nd system release of LEA's BOX was taken to an evaluation study at the end of Year2 of the project. The pilot and the evaluation that followed was carried out with high school students. Among other evaluation tools TAM3 framework was used to validate the end-users' behavioral intentions towards tracking their progress using learning analytics tools (CbKST competency state estimations via OLM visualizations). Data from TAM3 survey was placed in a correlation matrix[24].

Factor analysis of the variables that load "perceived usefulness" and "perceived ease of use" for LEA's BOX turned out to reveal that both students and teachers have a strong behavioral intention to use LEA's BOX OLM tools. Detailed analysis is given in Deliverable D5.5 Piloting and Evaluation Report 2 (March 2016). However, those intentions are reduced by mostly "perceived usefulness" factors in case of teachers, and mostly "perceived ease of use" factors in case of students.
As briefed in the amendment of the Year 2 Management Report: "seamless usability is very important for exploitation, especially given that this study reveals that the students' "perceived usefulness" depend heavily on teachers' attitudes. The project has a disadvantage at that point since the existing

[24] The values of correlations between variables and those of the partial correlations are compared by Kaiser-Meyer-Olkin (KMO) measure to reveal 87% sampling adequacy. In statistics, KMO measure in 80s is considered to be "meritorious" to carry out factor analysis.

products and LEA's Box are separate sites, with separate login and navigation paradigms, practically doubling the cognitive and time burdens of use." In order to evaluate these aspects of exploitation a second study was commissioned in June 2016. This evaluations study, as promised in the amendment of the Year 2 Management Report, focused on three inquiries:

1. What should be the target age group of HızlıGo+LEA product? To answer this question, 6th and 7th grades were taken to the pilot, because grades 9 to 11 were already piloted in March.
2. What should be the strategic positioning in school study cycle? To answer this question, the pilot was carried out in the school computer lab, because the course was assigned as a homework, already in March pilot.
3. What should be the convention in using analytics results? At will, whenever the students feel the need to evaluate his/her progress and plan his/her training OR regularly, during each study session as part of the course plan? To answer this question, the two conventions were tried at the two grades. 6th grade students used LEA's BOX routinely as part of their course plan, while 7th grade students 1 week after their course started and used LEA's BOX in special, dedicated sessions.

The detailed results of this important evaluation study towards exploitation will be delivered in Deliverable D5.6 Piloting and Evaluation Report 3 (November 2016). Nevertheless, the end result of the TAM3 evaluation is very relevant to this particular business case and worthy of including here:

1. Behavioral intentions towards using LEA's BOX analytics (at least in the context of speedreading skills development) decline about 10 base points on the average as the grades get lower. On the other hand, when used simultaneously with the learning product, perceived ease of use increase substantially (about 5 base points). **In conclusion, the product should rather be positioned for high school students and the analytics models must always be present on display, with real-time updates. Therefore, the features must be integral to the product**.

Factor	High School Teachers (%)	High School Students (%)	Middle School Students (%)
Perceived Usefulness	88	80	71
Perceived Ease of Use	83	88	77

2. Using analytics as part of a course cycle dramatically increases the usage time, but strong mentoring becomes essential as students are affected very much from each other's comments on the analytics results. The correlation between responses within one classroom was almost double the value correlation between different classrooms. **In conclusion, the product would require strong mentoring and role modeling by the teachers to be used consciously and effectively.**

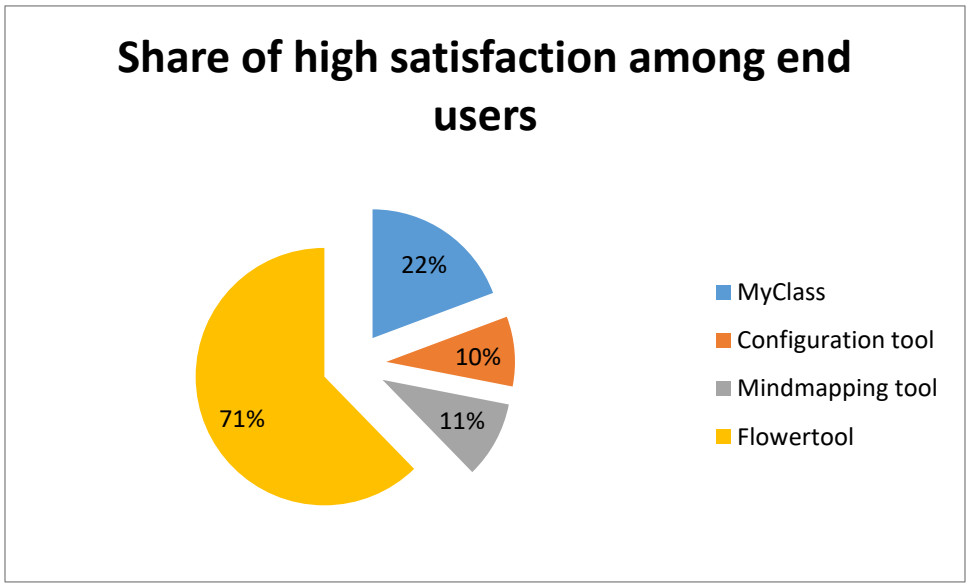
Relying on these evaluation studies the value-added speedreading software is planned to be release in November 2016, using the final release of the LEA's BOX tool (scheduled to September 2016), relying on the signing of an Memorandum of Understanding and open source licensing of the software. In case of success, we would achieve the first MARKET IMPLEMENTATION of the outcomes in the project lifetime.

Commercial Exploitation in SCIO Products

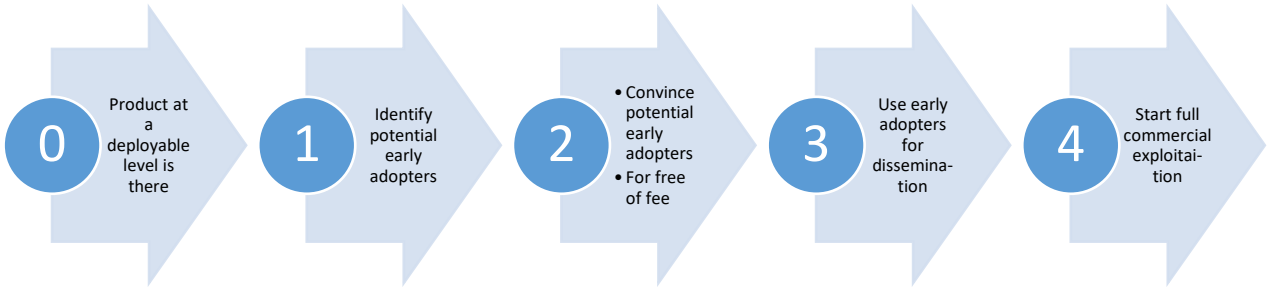
Scio is interested to make use of some elements developed within the project and to put them into regular exploitation, e.g. self-assessment tools, visualization methods and others. The condition for this is the solution of all legal matters related to intellectual property rights within the Consortium. Scio is ready to contribute to finding this solution within the next months.

The main pillars of the commercial activities of SCIO consist of services aimed at mapping the climate of schools, mapping and analyzing of school and students´ results, and organization of entrance examinations for different types of schools. Most projects are offered for a small fee. The decision of a school is partly dependent on the willingness and readiness of the school and its governing body to a) take part in such project, i.e. they have to perceive it as a useful; b) willingness and readiness to finance it. It is also conditional on the fact that everything must be absolutely flawless and smoothly. Any failure of the service offered leads in most cases to the loss of a client. For this reason, we evaluated LEA's BOX parts, where there is the greatest potential to succeed in the Czech market.

Scio had the opportunity to test many elements of LEA's BOX tools in real school environment, and simultaneously tested the readiness of schools to adopt these elements into real operation. As can be seen from results of our past piloting and evaluation studies, the highest satisfaction levels among Czech schools is with the application of Flower tool.



Here it must be mentioned that at the moment it is not always necessary to express the expected results of a launch directly by means of financial turnover. It turns out, based on our experience, that for a successful deployment on the Czech market it is usually necessary to take several steps, where only the last step can generate an income.



We have also analyzed the reasons of this result. Partly this is due to the fact that there are already some products[25] on the Czech school market offering services similar albeit not same as MyClass. In this situation the schools have to consider the cost of moving from one system to another. (Not only financial cost, but also related costs e.g. retraining of teachers, schools governing bodies, modification of the system to the needs of the school, etc.). However, there are few if any competitors offering services similar to the one described further. Nevertheless, the competing companies can be also viewed as potential collaborators in using LEA's BOX tools in a possible future joint project (e.g. if commissioned by the MoE). The main competitors include, DAP services[26], Společnost pro kvalitu školy (Institute of School Quality)[27], and KALIBRO[28].

These are all private companies offering a limited range of educational measurement tools. Besides that, there are also ad – hoc projects organized by the Ministry of Education that in a certain sense can be viewed as competitors as the time a school can devote to learning analytics is limited, and if, in a particular year there is an obligatory project ordered by the MoE, then schools usually have little capacity for any other projects.

In **strategic positioning** respect we are planning to build on the successful perception of the first Flower tool trials and offer them en masse to Czech schools (6th grades of elementary schools) in September 2016.

[25] E.g. http://www.bakalari.cz/homepage/index.htm
[26] http://www.dap-services.com/
[27] http://www.kvalitaskoly.cz/
[28] http://www.kalibro.cz/

The offered product will be a bundle of Scio´s traditional assessment tools (Czech language, English language, Maths, General Study Prerequisites – all based in SCIO´s proprietary systems), self-assessment tools (based on LEA's BOX system) and a Learner Autonomy Survey (based on LEA's BOX system).

The competitive advantage will lie in the fact that it covers a very wide range of skills and competencies measured, and at the same time, thanks to LEA'S BOX, offers clear and understandable visualizations. We have identified potential early adopters and started contacting them, though the main part of the task will be completed in September 2016. If proved successful, full commercial exploitation can be started in September 2017 (i.e. step 4 from the chart above).

Further evaluation of results will be conducted as part of final piloting and evaluation activities (i.e. until November 2016) including surveys of willingness to participate in a similar project next year, but this time for a fee. We are also considering the possibility of using the so-called preliminary concessional pre-order, which is proving to be an excellent indicator of the real interest. That is if the school is willing to pre-order a product at a certain price, there is a high probability that it will also actually use and pay for it, hence effectively validating the business case.

2.2.2 *BUSINESS CASE 2:* VALUE-ADDED FEATURE OR SERVICE IN A 3RD PARTY VENDOR

Besides NGO´s there are industrial large companies, such as LMS providers, operating in the area of Learning Analytics that might be interested in LEA´s Box outcomes as value-added features in their own products. Namely Blackboard Inc., Microsoft, IBM, Oracle, Pearson, Saba Software Inc., SumTotal Systems, McGraw-Hill Education, SAP AG, and D2L Corporation could be interested. Of these potential suitors IBM is already opting to collaborate, seeking financial support to establish a joint product.

In the more accessible Czech market, potential 3rd party vendors could be DAP services, Společnost pro kvalitu školy (Institute of School Quality), KALIBRO. Scio is in a continuous contact with most of the organizations and will promote the use of LEA'S BOX tools in the future.

In the Turkish market, potential 3rd party vendors may be from the adult training sector, where online courses are delivered leading to certification. As these are paid courses, failure to achieve the certification is a costly loss. Competency-based tracking of progress will increase the chance of success and so would be a favorable value-add to these online learning providers.

Finally, in European market, the Finnish company CLANED can be a vendor who may be interested. CLANED works as a social and digital learning environment that creates a personal learning space for each student. The student can read, write, watch videos, make notes, plan, chat, and collaborate with others within that space. The platform uses a combination of artificial intelligence and educational psychology theories. Based on this combination, it begins to understand how each student learns and

what the factors affecting his or her learning processes and study performance are. On the basis of the insights the algorithm provides, students are recommended study buddies, learning materials, and mentors that best suit their needs. LEA's BOX can add value to this product using its tool on competency state measurements.

School systems increasingly seek out sophisticated and reliable data analysis and management solutions. Education technology companies that help school systems analyze and manage data—like BrightBytes, MasteryConnect, or Schoolzilla— are drawing significant interest. This is encouraging for LEA's BOX as well. However, developing effective data solutions, may be contingent on a number of factors. These include

1. whether academic software providers share meaningful and useful data with their customers,
2. whether common data standards emerge to create consistencies in how data from discrete programs are reported and analyzed, and
3. what achievement data will look like in the near feature as active learning is getting increasingly popular.

LEA's BOX can add a dashboard feature to online-learning vendors. The business risk here is that currently, dashboards produced using programs like Tableau or Learnmetrics tend to include SIS student and achievement data, but are severely limited by the incomplete performance data that online-learning providers are willing or able to share with their customers. The reasons why online-learning providers wouldn't like to reveal how effective their product is for learners can be business safe-keeping, but it is a potential weakness of this business case.

Secondly, schools may rely on limited data from diagnostic or formative assessment programs that they trust. So customers who already use an assessment software may not value a platform that can integrate all data. Establishing reliability on analytics is very hard and although most issues stem from problems with the data, the culprit can easily be regarded as the analytics tools.

It is important to recognize these risks before pushing harder for this exploitation option. A potential mitigation can be adherence to standards. These risks are also the main reasons of the need for learning analytics standards in the market. Standardization bodies ADL and IMS are racing to get their data interoperability standards TinCan and Caliper (respectively) mature with wide-spread support. Therefore, although it is not a part of the DoW, the project partners are working to establish support for the TinCan standard.

2.2.3 *BUSINESS CASE 3:* VALUE-ADDED FEATURE OR SERVICE IN A NATIONAL SOLUTION

MoE Turkey is the largest potential exploitation opportunity for the project with 16 million students in primary and secondary schools. In January 2015, SEBIT has signed a 10-year contract with the MoE to provide the software stack for FATIH project[29] which is an ongoing initiative to equip every student with a mobile computer and every classroom with an interactive white board. SEBIT VClass product is being

[29] http://blogs.worldbank.org/edutech/observing-turkeys-ambitious-fatih-initiative-provide-all-students-tablets-and-connect-all-classrooms

prepared for this 1:1 initiative. LEA's BOX tools, especially MyClass can be used as a value-added feature in FATIH teachers' tablet, as well as other tools such as the FCA tool to help developing domain maps.

The Ministry of Education in the Czech Republic[30] covers a whole network of institutions and organizations which carry out ad hoc assessment projects where some of the elements of LEA'S BOX can be utilized, e.g. the Flower tool or OLM. The same applies to regional education bodies which are in charge of education in particular regions and districts. Some of them have established their own regional agencies that can make use of LEA'S BOX tools, e.g. Vysočina Education[31] in the region of Vysočina. However, projects must undergo a demanding selection process and must meet a number of criteria (quality, content, financial, time).

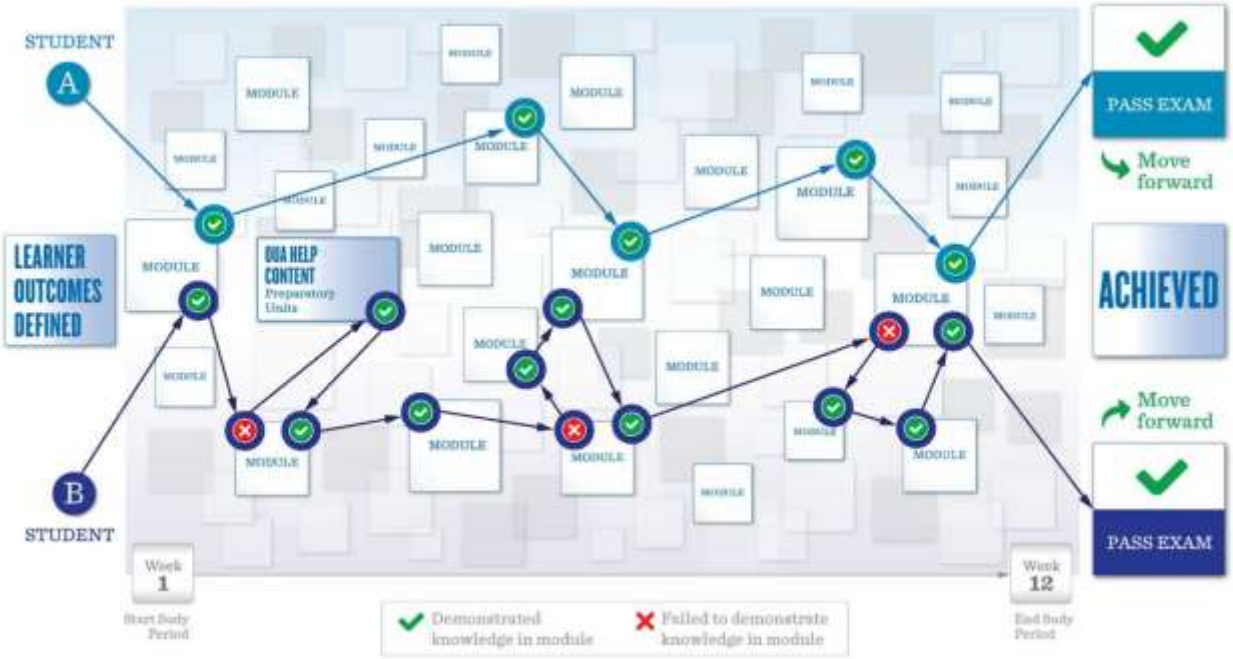
2.2.4 *BUSINESS CASE 4:* HIGHER EDUCATION ACADEMIC DEVELOPMENT ASSISTANCE

Students in higher education need more insight when choosing and following their courses as the options are more abundant and their decisions about their transcript and major determine their grad profile.

Applications of Learning Analytics in HigherEd usually address performance issues such as drop outs (Signals at Purdue University), at-risk students (SoS Initiative at NYIT), poor retention (Connect for Success implementation at Edith Cowan University) and early alert systems (NTU Student Dashboard)[32]. There is, however, a much needed support in academic counselling area. In contemporary universities the curriculum of the academic programme varies significantly for each student. The abundance of course offerings from faculties and departments, undergraduate research opportunities and service learning activities present a multitude of directions and transcript compositions. The path through the curriculum is always a trade-off between the abilities of the students and job market expectations upon graduation. LEA's BOX tools (eg the FCA tool) can be configured to work in conjunction with LMSs that are widely used in HigherEd to discover levels of engagement per course or course module, ensuing success level, and overall learning outcomes for the qualification. These analytics results can be used to compare the student trajectory with alternative paths and help decide on the target qualification.

In this business case a competing service is available at Open Universities Australia, which is called Personalised Adaptive Study Success (PASS) initiative. PASS aims to personalize the study experience for each student, especially the path through the curriculum, adapting at course modules level as well as switching between courses that has overlapping outcomes.

[30] http://www.msmt.cz/index.php?lang=2
[31] http://www.vys-edu.cz/
[32] https://www.jisc.ac.uk/reports/learning-analytics-in-higher-education



2.2.5 *BUSINESS CASE 5:* CONTENT EVALUATION SERVICES FOR PUBLISHERS

Many publishers are producing educational digital content and present it to their customers through their web site or in content marketplaces. LEA's BOX can leverage its CbKST features to see exactly how much a given product impacts learning outcomes. This evaluation can provide

1. Feedback about the validity of the knowledge structure that is built into a publisher's content offering
2. Feedback about the relative difficulty of the assessment items and groups of items — e.g., do students generally find Subject A easier to understand than Subject B?

Publishers can use this service to rewrite items or content parts that prove much harder or easier than other items that assess the same concepts, to provide a more consistent experience for all students.

Competition: Knewton Content Insights Service[33]. Knewton Content Insights service help publishers improve their content's quality, quantity, and organization; make informed investments in their development cycle; and better support students using learning products. LEA's BOX have qualified tools to achieve the same service for the European market.

2.2.6 *BUSINESS CASE 6:* THE BRAND LEA'S BOX

Due to the dissemination and exploitation efforts within the project, Lea's Box became a professional brand name including amicable logo and Lea as a character that embodies the project, the vision, and the technical solutions. Thus the brand Lea's Box has a high value in itself. The value of such brand including logo and including first steps in making the brand public is in fact priceless. As the final and perhaps most important exploitation use case, Lea's Box shall be made a brand for practical, competence-centered educational products for the niche we identified in the context of research (cf. point 2.2.2). This exploitation occurs in the light of the Memorandum of understanding that is currently being developed, either as SME or a non-commercial legal body. In the context of exploitation activities,

[33] https://www.knewton.com/resources/blog/adaptive-learning/introducing-knewton-content-insights-for-publishers/

TUG already investigated and evaluated the possibilities and legal procedures of making such spin off entity.

Concretely, the plan is to setup the Lea's Box platform as a demonstration platform for the tools and the know-how TUG can offer in the context of learning analytics and educational personalization. Similar to the business use cases 1 – 5, we will offer know-how in form of consultancy as well as concrete services and tools. Concrete collaborations and talks have been started with iGumps (http://www.igumps.com/), MTO (www.mto.de), Create 21st (www.create.at), and Magna Int. (www.magna.com) – although still under the label of TU Graz and its spin-off Know-Center (http://www.know-center.tugraz.at/). The leas-box.eu domain will be maintained to serve as a source of semi-scientific information about solutions and products, as well as the legacy of the European Research Project. Equally to the website of the FP7 project 80Days (2008 – 2010, www.eightydays.eu), such information source is of priceless value for highlighting the strengths, expertise and solutions of the work group at TUG.

2.3 THE EXPLOITATION PLANS

To achieve exploitation towards the five specific business cases detailed in the section above, basic work goals include:

- To achieve a timely uptake of the project's results
- To create a basis for marketing activities for exhaustive exploitation of the project's results
- To create interest in the LEA's BOX approach to analytics and its uses among potential customers as well as end-users
- To show businesses in the e-learning domain how they can benefit from the uptake of the innovative results from the LEA's BOX project and how they can integrate these results in future commercial products

Concretely below actions will be committed by the Project partners:

Business Case	Action	Acting Partner	Progress-to-date
General	Sign the MoU to enable commercial license for exploitation	ALL	The Memorandum of Understanding is drafted and added to this deliverable
General	Release the open source of the software	UoB, TUG	The software is already partially open
General	Establish support for the TinCan/xAPI standard	TUG, SEBIT	TUG have made some rudimentary work towards this support and SEBIT provided training to a group of company developers on TinCan/xAPI. This action will intensify in September, towards the release of the final system.
Value-Add in a Partner's Product	Include LEA tools in the next version of the speedreading software: HızlıGo	SEBIT	Test integration was completed in February 2016 and were taken to two pilot studies successfully. Final integration will be completed after the third release of LEA's BOX in October and **the first MARKET IMPLEMENTATION is planned during the project lifetime**.
Value-Add in a Partner's Product	Include LEA tools in the next version of the class mngmnt software: VClass	SEBIT	The timeframe for this product depends on the planning that will be done with Turkish MoE.
Value-Add in a Partner's Product	Include LEA tools in the next version of the test prep software: RAUNT	SEBIT	A sample set of longitudinal data was provided for modelling purpose, the integration and proof-of-concept study is scheduled for October 2016, soon after the final release of LEA's BOX.
Value-Add in a Partner's Product	Offering flower tool nation-wide	SCIO	Test integration was completed and taken to numerous pilot and evaluation studies. **The first MARKET IMPLEMENTATION is planned during the project lifetime (September 2016)**.

Value-Add in a 3rd Party Product	IBM Watson Services	TUG, SEBIT	Already LEA's BOX is introduced to IBM Watson researchers and a joint description of work has been drafted and submitted for financial back up (e.g. to H2020).
Value-Add in a 3rd Party Product	Obtain an LoI from TTNET Academy	SEBIT	TTNET Academy is an online adult training provider (and a sister company with SEBIT) who have already been notified about this exploitation option.
Value-Add in MoE National Solution	Present LEA's BOX to Turkish MoE as a potential data layer solution.	SEBIT	SEBIT is building the software stack of the FATIH project, which is the national solution to be used by 27K state middle+high schools. The data layer is scheduled to be designed in 1H2017.
HEI Solution	Use LEA's BOX in university ePlatform data facilities trials.	SEBIT	UNI-FATIH project is at design phase at the moment. As part of the UNI-FATIH project SEBIT is leading the design of an ePlatform and analytics services. LEA's BOX can be included in the trials of the "development phase" (expected to start in 2017)
Content Evaluation Service	Use know-how in business project with Create 21st.	TUG	Create 21st is a provider of media solutions and corporate learning solutions. In joint projects, this company seeks consultancy about knowledge and domain structuring as well as learning evaluation.
Value-Add in a 3rd Party Product	Use LEA's BOX in corporate learning scenarios.	TUG	Implement LA features in large scale learning solutions in the context of business projects. Lea's Box can only play a minor role in such project but it is a great starting point for future cooperation. Expected start: fall 2016.

3. CONCLUSION

This deliverable is organized to present an inventory of the scientific outcomes and tangible tools available in LEA's BOX at the time of planning and their positioning for current and subsequent exploitation. This positioning of the whole system is covered as well as positioning towards specific business cases. Late evaluation studies of the project were designed to cover exploitation scenarios. Therefore, for each case, information based on these evaluation studies is also provided.

Due to the variety of tools and usage scenarios the project outcome may be exploited in piecewise manner or the whole platform can be provided as a service so that different stakeholders can choose to use different tools as demanded by their individual pedagogical needs. Potential cases of whole platform exploitation include ownership resumed by the consortium as a whole. Compiling an open version of the platform and releasing it in an open source venue such as GitHub can be an option for such a case. This option is particularly important for persisting LEA's Box as a brand, for which a lot of effort has been paid during the project lifetime. Piecewise exploitation is discussed always within a context, considering specific business cases. Concrete action items are tabulated, including brief descriptions of progress to date.

The settlement of IPR issues under various modes of exploitation will be covered by a Memorandum of Understanding (MoU) among the partners. The MoU notwithstanding, an extensive agreement will be sought among all the partners that concretely outlines the joint or exclusive ownerships, as well as how the IPR is going to be transferred under specific modes of exploitation. Even if the bureaucratic process may be incomplete by the time the plan would be delivered, a model document is added (Appendix 5.2)

The evaluation studies revealed concrete evidence that studies supported by learning analytics lead to better achievement, engagement and stronger agency. However, these benefits come with a condition. Technical perfection and fluency at the first contact with the software are the largest determining factors for the users to adopt analytics frameworks for everyday use. Factors such as an easy URL, easy login, simple use cases, browser support, mobile support affects hugely. The evaluation studies also reveal that peer influence is a great factor in adoption. When students start to talk about the application being "cool" or being "cumbersome," the idea spreads very easily and becomes a general belief. Part of the project outcome (eg OLM tools) is planned to be released as open source at the end of the project. The open source preparation activities as well as dissemination material creation are planned being aware of these perception factors.

The MoU and open source releases are the major milestones in this exploitation plan. However, having identified specific business cases, this plan identifies critical activities that partners are committed to execute towards well-focused market implementations. It is encouraging that many activities that serve these exploitation purposes have already been achieved while preparing for, performing and following up of a large set of pilots and evaluation studies so far. The partners are committed to build upon these achievements and determined to accomplish the first market implementations within the lifetime of the project.

4. APPENDICES

(I) CURRENT EU STUDENT DATA PROTECTION REGIME

At present, the most important EU legal instrument on personal data protection is the 1995 Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data (DPD).

Recognising the important role vendors play in processing personal data, the DPD distinguishes between first parties and vendors through the introduction of "data controllers" and "data processors" (art. 2(d)-(e)).

Within this structure, a school acts as a data controller if it decides on (a) outsourcing of student data processing; (b) delegating all or part of the processing activities to an external organisation; and (c) determining the ultimate purpose of the processing. A vendor acts as a data processor if it merely supplies the means and the platform, acting on behalf of the school (Article 29 Working Party, 2012 [PDF]).

Deemed data controllers, schools must abide by data protection legislation and must adhere to basic principles of the DPD. Without entering into a discussion as to the effect of holding schools accountable for the actions of third parties, the DPD has two key drawbacks in protecting student privacy and personal data in the context of "big data education".

First, the DPD does not protect student data from re-identification. The DPD's definition of personal data is: "any information relating to an identified or identifiable natural person ('data subject')" (art. 2(a)). If the data is anonymised or aggregated and an individual cannot be identified from the remaining data, it ceases to be personal data, and the provisions of the DPD no longer apply.

When talking about big data, it is questionable whether the personal/non-personal data distinction remains viable and whether anonymisation and aggregation remain effective in protecting users against tracking and profiling (Monreale, Rinzivillo, Pratesi, Giannotti, & Pedreschi, 2014, pp. 1-2 [PDF]). Even if identifiers, such as names and ID numbers, have been removed, one can use background knowledge and cross-correlation with other databases in order to re-identify student data records (Narayanan & Shmatikov, 2008 [PDF]). Therefore, it could be that when student data is anonymised or aggregated the provisions of the DPD will not apply, but the risk of identifying the student - or more precisely: re-identifying - still remains.

Second, setting consent as the DPD's main legal guide may be ineffective. A key principle in the DPD is the need to obtain personal unambiguous consent before data can be processed (art. 2(h)). Before big data, parents could roughly gauge the expected uses of their children's personal data and weigh the

benefits and the costs at the time they provided their consent. Today, the ability to make extensive, often unexpected, secondary uses of student data makes it simply too complicated for the average parent to make fine-grained choices for every new situation (Kay, Korn, & Oppenheim, 2012 [PDF]). Moreover, in many instances vendors do not offer users the option of choosing which data they agree to share and for which purposes, thus users are forced to accept or deny the service as a whole. Consequently, parents could end up unintentionally excluding their children from services necessary for their education just because they are unable or unwilling to parse out complex data policy statements (Polonetsky & Jerome, 2014).

The Directive does not address the fact that opting-out is hardly a feasible alternative for users in the educational context, since most parents do not have the privilege of changing their children's schools based on the applicable privacy policy (Zeide, 2016). Therefore, student privacy should not be a binary concept that is either on or off and parents should be given the option of choosing which data they agree to share and for which specific purposes, without having to disengage their children from "big data education".

Furthermore, the DPD presumes that consent is not freely given in situations where the party requesting consent has power over the individual granting it. Since a school, ultimately, has the power to make decisions that can affect a student's life chances, there is a risk that parents will feel compelled to consent (Kay et al., 2012).

In depth information and best practices on the subject is available in the JISC report, titled "Code of practice for learning analytics: A literature review of the ethical and legal issues" (November 2014) and in Deliverable D2.3 Privacy and data protection policy of LEA's BOX (December 2014).

(II) MODEL MOU DOCUMENT

The Memorandum of Understanding (MoU) is a joint agreement to demonstrate the partners' will to continue the work commenced in the Lea's Box project and to exploit the results to the best possible extent. The attached document is a first draft version the will undergo the partner organizations' legal procedures and evaluations.

Memorandum of Understanding [Draft v0.1]

Between

The Consortium Members of the Lea's Box project (grant number 619762, co-funded by the European Commission under the 7th Framework Proramme), in the following partners

Graz University of Technology (TUG)

University of Birmingham (UoB)

SCIO sro (SCIO)

SEBIT Egitim ve Bilgi Teknolojileri Anonim Sirketi (SEBIT)

This Memorandum of Understanding (MOU) sets for the terms and understanding between the partners, to …

… exploit the tangible and intangible outcomes and results of the Lea's Box project in order to maximize the general impact of the project and the benefit of the partners. The MoU is composed in the spirit to openly share the project's foregrounds and intellectual property among partners under fair and open conditions.

The MoU is intended to extend the agreements already made in the Consortium Agreement of the Lea's Box project and to render the conditions more precisely.

Specifically, the aim of this MoU is not only to make results open and usable, but also to grant project partners, where possible, legal, and applicable, with priorities in terms of technical support and/or know-how over other parties.

I. Scope

This MoU comprises the elements for exploitation listed and described in section 2.1 of the Deliverable D6.5 of the Lea's Box project.

II. Confidentiality

A. Acknowledgement. The Parties agree that any and all information disclosed by either Party to the other shall be deemed confidential (hereinafter referred to as "Confidential Information") whatever the subject (technical, industrial, financial, commercial ...), the nature (know-how, methods, processes , technical or installation details ....), the form (written or printed documents, CD Rom, computer diskettes, samples, drawings....) and the mode of transmission (written, oral, computer, including networks and/or electronic mail).

The Parties acknowledge that "Confidential Information" means including but not limited to the existence of the discussions between the Parties, all materials and information gathered from the employees during the workshops, executive briefings and planning meetings, any information about the results of the engagement and deliverables and other company related material and any other information concerning the scope of this MoU defined above, information regarding each Party's product plans, softwares, product designs, product costs, product prices, finances, marketing plans, business opportunities, personnel, research and development activities, know-how, ideas and pre-release products.

B. Non-Disclosure. Each Party hereby undertakes, from the date of receipt of the Confidential Information and until the end of a period of 5 (five) years following expiration or termination of this MoU, except as otherwise provided, that such Confidential Information:

a) shall be protected and kept strictly confidential and shall be treated with the same degree of care and protection as it uses to treat its own Confidential Information of like importance, but in no instance shall such standard be less than reasonable care.
b) shall not be used, in whole or in part, for other purposes than what is specified in this MoU, without the prior written consent of the Disclosing Party.

c) shall be disclosed internally only to those of its employees having a need to know such Confidential Information and duly informed of the strictly confidential nature of such Information, and shall be used subject to the provisions hereof. Each Party declares it has taken or agrees to take any necessary measures with its employees so that they may comply with the undertakings under this clause.

d) shall not be disclosed nor likely to be disclosed either directly or indirectly to any third party including subcontractors or any other persons without the prior written authorization of the Disclosing Party and provided that such third party undertakes in writing to comply with the same confidentiality obligations as provided herein.

e) shall not be copied, nor reproduced, not duplicated in whole or in part without the prior written authorization of the Disclosing Party.

f) shall promptly cease to use the Confidential Information and return all copies thereof upon the written request of the Disclosing Party.

g) shall not be disclosed nor likely to be disclosed either directly or indirectly to any third party in any form for any academic purposes without the prior written authorization of the Disclosing Party.

"Confidential Information" shall not include such information which the Receiving Party can argue that :

a) was in the public domain prior to or after disclosure but through no fault of the Receiving Party, or

b) was already known to the Receiving Party, as evidenced by the Receiving Party's written records, or

c) was lawfully received from third parties without fault of the Receiving Party and without restriction or breach of this Agreement, or

d) was to be disclosed by reason of a governmental or judicial order or applicable law. In such a case, the Disclosing Party shall be informed prior to such disclosure

e) was used or disclosed with the written authorization of the Disclosing Party.

C. Property of Confidential Information. Any and all Confidential Information transmitted by one Party to the other Party under this Agreement, as also any copies, reproductions or

duplications duly authorized and made for the sole purposes of the achievement of this MoU and all rights related thereto shall remain in any case the property of the Disclosing Party, subject to third parties' rights.

D. No Licenses. Each Party shall retain all rights, title and interest to such Party's Confidential Information. No license under any trademark, patent or copyright, or application for same which are now or thereafter may be obtained by such Party is either granted or implied by the disclosure of Confidential Information. Transmission by one Party to the other Party of Confidential Information under this MoU shall not be construed as expressly or impliedly granting the Receiving Party any Intellectual Property right (under any licence or any other means) in respect of any drawings and models, inventions, patents, trade marks, software or ideas in relation to such Confidential Information, nor as a disclosure under patent law.The Parties undertake to comply with the notice of reservation of intellectual property and confidentiality indicated on the Confidential Information.

E. Return Or Destruction Of Confidential Information. Upon written demand by the Disclosing Party, the Receiving Party shall: (i) cease using the Confidential Information, (ii) return the Confidential Information and all copies, notes or extracts thereof to the Disclosing Party within seven (7) days of receipt of demand; and (iii) upon request of the Disclosing Party, certify in writing that the Receiving Party has complied with the obligations set forth in this paragraph.

F. Independent Development. The terms of confidentiality under this MoU shall not be construed to limit either Party's right to develop independently or acquire products without use of the other Party's Confidential Information. The Disclosing Party acknowledges that the Receiving Party may currently or in the future be developing information internally, or receiving information from other third parties, that is similar to the Confidential Information. Accordingly, nothing in this Agreement will prohibit the Receiving Party from developing or having developed for it products, concepts, systems or techniques that are similar to or compete with the products, concepts, systems or techniques contemplated by or embodied in the Confidential Information provided that the Receiving Party does not violate any of its obligations under this MoU in connection with such development.

G. Disclaimer. CONFIDENTIAL INFORMATION IS PROVIDED "AS IS" WITH ALL FAULTS. IN NO EVENT SHALL THE DISCLOSING PARTY BE LIABLE FOR THE ACCURACY OR COMPLETENESS OF THE CONFIDENTIAL INFORMATION. None of the Confidential Information disclosed by the Parties constitutes any representation, warranty, assurance, guarantee or inducement by either Party to the other with respect to the infringement of trademarks, patents, copyrights, any right of privacy, or any rights of third persons.

H. Export. The Parties acknowledge that the Confidential Information disclosed by each of them under this MoU may be subject to export controls under the laws of Belgium and other applicable laws. Each Party shall comply with such laws and agrees not to knowingly export, re-export or transfer Confidential Information of the other party without first obtaining all required authorizations or licenses, and any other.

III. Intellectual Property

A. Acknowledgement. The Parties acknowledge that **"Intellectual Property"** means including but not limited to all intellectual and industrial property rights owned or held under license by a Party in any jurisdiction, including all such rights in, to, or arising out of any municipal law or foreign (i) patents (including design and utility patents) and applications therefor and any and all reissues, divisions, continuations, renewals, extensions and continuations-in-part thereof; (ii) inventions (whether patentable or not), invention disclosures, improvements, trade secrets, proprietary information, know-how, technology, specifications, methodologies, processes and technical data; (iii) copyrights, copyright registrations and, applications therefor, and all other rights corresponding thereto; and (iv) any trade names, trademarks, service marks, logos, slogans, trade dress, indicators of origin and similar rights; in each case whether in development, production form or otherwise, and including all goodwill associated with the foregoing, and all claims and defenses, and all rights in any agreement related to the foregoing.

B. Obligations. The Parties acknowledge that the subject matter of this MoU consist of the Parties' Materials as construed to be the intellectual property of the Parties. The Parties acknowledge that original and derivative works is likely to be created within the context of joint software development activity. With This MoU the undersigned Parties officially accept that no

intellectual property will be disclosed until that Joint Ownership Agreements or License Agreements can be signed based on the developed outcomes whether the knowledge used in the outcome is separable in terms of contributing Parties or not. The following clauses concerning the intellectual property rights of this MoU is valid and effective until such agreements can be signed:

a) Where either Party has any intellectual property rights in any material that is subsequently used by the Parties in connection with this MoU, then those intellectual property rights remain vested in that Party.

b) Any intellectual property rights that do not exist at the date of this MoU and which are created by Party/Parties, or by Party's employees or by Party's contractors (and assigned to Party) during the term of this MoU, in connection with the MoU, shall remain vested in Party provided that Party will during the term of this MoU allow the intellectual property rights so created to be used royalty free by the Parties for the purposes of achieving the goals of this MoU.

c) Unless the Parties otherwise agree, no intellectual property rights will be jointly owned unprompted by them and the Parties must establish a system to identify those things in which intellectual property rights exist and the owner of the intellectual property right in accordance with this clause.

d) Each party agrees to do such further things as may reasonably be required of it to give effect to the intentions of the Parties regarding ownership of intellectual property rights as expressed in this clause (including, without limitation, by executing such assignments and licenses of intellectual property rights as may reasonably be required).

e) Before any registration or commercialisation of any intellectual property takes place, the parties agree to reach a separate agreement covering issues such as exploitation rights and revenue sharing. Any publication including but not limited to academic presentation of such intellectual property shall only be possible with the prior written consent of concerned parties.

C. Prohibitions. Upon the terms and conditions of this MoU, the materials described as intellectual property rights of the Party, the Receiving Party;

-shall not copy of the Materials except and only to the extent of joınt software development activity,

-shall not assign or resell, sublicense, rent, lease or lend the delivered Materials to another party,

-shall not reverse engineer, decompile, or disassemble the Materials except and only to the extent of joint software development activity and such activity is expressly permitted by the owner Party,

-shall not remove, disable, modify, or tamper with any copyright, trademark or other proprietary notices and legends contained within the Material,

-shall not tamper with, alter, or use the Materials in a way that disables, circumvents, or otherwise defeats its built-in licensing verification and enforcement capabilities,

-shall not use, modify, translate, reproduce or transfer the right to use the Material or copy the Material except as expressly provided in this MoU.

IV. Term and Termination

This MoU will be retrospectively valid starting XXXX, upon its signing and conclude on the XXX anniversary of the signing. After this period the Parties will review the MoU and may choose to extend it for a period of another twelve months, provided that all parties are agreed that the arrangement should continue.

Parts of the developed software can immediately be excluded from the effect of the MoU once Joint Ownership Agreements or License Agreements are signed on those parts.

This MoU may be terminated at any time by either party for any reason upon thirty days written notice to the other Parties.

V. General Provisions

A. Nature of the Agreement. It is agreed that this Agreement establishes a contractual relationship but does not create any legal structure such as a partnership, joint venture or any agency relationship between the Parties, nor shall either Party hold itself out as such contrary to the terms hereof by advertising or otherwise, nor shall either Party be bound or become liable because of any representation, action or omission of the other Party

B. Warranties, Liabilities and Indemnities. Neither Party will be liable to the other under or relating to this MoU for any direct or indirect, special, economic or consequential loss or damage or loss of revenue, profits, goodwill, bargain, opportunities or loss of anticipated savings whether caused by negligence or otherwise and whether or not that Party was aware or should have been aware of the possibility of such loss or damage (b) Neither Party shall be liable to the other for any defects within any information, know-how, technologies, services, background technology, Foreground and Prototypes provided to the other Party hereunder, except to the extent that such liability is incapable of exclusion at law (c) Neither Party shall be liable to the other if any information, know-how, technologies, services, background technology, Foreground and Prototypes provided to the other Party hereunder infringe the Intellectual Property Rights of any third party, except to the extent that such liability is incapable of exclusion at law.

C. Rights of Parties. The Parties accept that this MoU will not limit the freedom of members of the Parties from engaging in activities and research within the same field that is covered by this MoU.