



Learner Centric Advanced Manufacturing Platform



ADMA LEARNING ANALYTICS

WPN° 3 Observatory



**Co-funded by
the European Union**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



Co-funded by
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



This work is licensed by the LCAMP Partnership under a Creative Commons Attribution-NonCommercial 4.0 International License.

LCAMP partners:

TKNIKA – Basque VET Applied Research Centre, CIFP Miguel Altuna LHII, DHBW Heilbronn – Duale Hochschule, Baden-Württemberg, Curt Nicolin High School, AFM – Spanish Association of Machine Tool Industries, EARLALL – European Association of Regional & Local Authorities for Lifelong Learning, FORCAM, CMQE: Association campus des métiers et des qualifications industrie du future, MV: Mecanic Vallée, KIC: Knowledge Innovation Centre, MADE Competence Centre Industria 4.0; AFIL: Associazione Fabbrica Intelligente Lombardia, SIMUMATIK AB; Association HVC Association of Slovene Higher Vocational Colleges; TSCMB: Tehniški šolski center Maribor, KPDoNE: Kocaeli Directorate Of National Education; GEBKİM OIZ and CAMOSUN college.



Document summary

Document Type:	Public report
Title	Trends in advanced manufacturing and insights for vet (a view from the basque country)
Author/S	KIC (Organisation)
Reviewer	Camille LEONARD
Date	December 2024
Document Status	Final
Document Level	Confidential until its publication
Document Description	This document describes the main features of the trends in advanced manufacturing and insights for VET
Cite This Deliverable As:	KIC. ADMA Learning Analytics. (LCAMP4.0 Deliverable D3.2 Decembre 2024)
Document Level	Public

Version management

Version	Date	Action
0.1	2023-06-15	Draft version, lay out defined
0.5	2023-09-15	Draft version with partners contributions
0.8	2023-10-30	Final version for internal revision
0.9	2023-11-14	Final version for revision process
0.95	2024-11-10	Approval by the steering committee
1	2024-12-09	Version to be uploaded to the EU portal



GLOSSARY AND/OR ACRONYMS

AI - Artificial Intelligence

AM - Advanced Manufacturing

Cedefop - European Centre for the Development of Vocational Training

CoVE - Centres of Vocational Excellence

EAfA - European Alliance for Apprenticeships

EC - European Commission

ECVET - European Credit System for Vocational Education and Training

EntreComp - The Entrepreneurship Competence Framework

EQAVET - European Quality Assurance in Vocational Education and Training

EQF - European Qualifications Framework

ESCO - European Skills, Competences and Occupations

ETF - European Training Foundation

EU - European Union

HE - Higher Education

HVET - Higher Vocational Education and Training

I4.0 - Industry 4.0

KET - Key Enabling Technology

OECD - Organisation for Economic Cooperation and Development

SME - Small and Medium Enterprises

SWOT - Strengths, Weaknesses, Opportunities, Threats

TVET - Technical and Vocational Education and Training

VET - Vocational Education and Training

WBL - Work Based Learning



CONTENT TABLE

CONTENT TABLE	5
EXECUTIVE SUMMARY	6
1. INTRODUCTION	1
2. TOPIC: LEARNING ANALYTICS.....	9
2.1 Introduction	9
2.2 Contextualisation	11
2.2.1 How is learning analytics used?	12
2.2.2 Understand and predict user behaviour	12
2.2.3 Learning analytics data sources.....	13
2.2.4 Learning analytics methodologies	14
2.2.5 Learning analytics tools	14
2.2.6 Learning Analytics: Proposal for real-world application.....	16
2.2.7 Combining Learning Analytics with an Observatory Tool	17
2.3 Objectives / research question / problem statement.....	18
2.3.1 Objectives	18
2.3.2 Research question.....	19
2.3.3 Problem statement	19
2.4 Findings.....	20
2.4.1 Negative Impacts.....	21
2.4.2 Positive Impacts.....	21
2.4.3 Ways to avoid the negative impacts of Learning Analytics:	22
3. CONCLUSION.....	24
4. REFERENCES	25
5. INDEX OF IMAGES.....	28



EXECUTIVE SUMMARY

Advanced Manufacturing (AM) and Higher Vocational Education and Training (HVET) need to update training, implement new technologies, and get quick access to data.

The causes behind these needs are technological factors (Industry 4.0), factors conditioned by education systems and education methodologies, social factors and environmental factors (the European Green Deal with its emphasis on the greening industry).

Under the CoVE initiative, the LCAMP project aims to support regional skill ecosystems and various stakeholders in providing new skills and implementing new or updated technologies in VET centres. LCAMP will tackle this by incorporating a permanent European Platform of Vocational Excellence for Advanced Manufacturing.

By collaborating across borders, LCAMP's goal is to support and empower regional Advanced Manufacturing CoVEs to become more resilient, innovative, and better equipped to train, upskill, and reskill young and adult students, to successfully face the digital and green transitions. We will help European regions and countries grow and be more competitive through their VET systems.

Therefore, the LCAMP OBSERVATORY is one of the services in the LCAMP platform. The observatory is led by the French cluster *Mecanic Vallée* and the French VET provider *Campus des Métiers et des Qualifications d'Excellence Industrie du Futur*.

This present document details the first results of the LCAMP Observatory, through the methodology that the LCAMP consortium used to set up and run the Observatory. We had set up a process cycle for the observation consisting of 5 stages:

- Stage 1: Diagnosis and priority
- Stage 2: Search and information gathering
- Stage 3: Information Analysis
- Stage 4: Creating value. Elaboration of LCAMP reports
- Stage 5: Dissemination and communication.



1. INTRODUCTION

The LCAMP observatory is one of the services of the LCAMP platform.

The LCAMP Observatory must be a reliable and easily accessible source of information and data for trainers, VET teachers, and professionals, updated on Digital / Advanced Manufacturing / Smart Industry, delivered through a multimedia and interactive platform -LCAMP platform-, that can be customized according to individual interests (Work in progress in WP8).

This observatory must feed other Work packages (WP), for instance, WP 5 on Learner Centric Training, or Open innovation Community in the WP4.

In a first document about methodology, are set up a process cycle for the observation consisting in 5 stages:

- Stage 1: Diagnosis and priority
- Stage 2: Search and information gathering
- Stage 3: Information Analysis
- Stage 4: Create value. Elaboration of LCAMP reports
- Stage 5: Disseminate-communicate.

Following this process cycle, are detailed the main aspects of the observation methodology:

- Identify reliable sources that we can find in Europe about Advanced Manufacturing.
- Classify and filter data gathered from different sources.
- Present several ways to collect data and to analyse them.
- Define the methods for the creation of annual reports.
- Validate process for those reports.

The observatory will publish periodical reports for VET and HVET target audiences about technology trends, labour market changes, skill needs, and occupations in Advanced Manufacturing. It is expected that SMEs, industry clusters and other associations will also find valuable information in the observatory.

The publication of a yearly report is planned.

- Report 1: June 2023,
- Report 2: June 2024,
- Report 3: June 2025.

This first annual report is gathering sub-reports written by around twenty different writers, from the main partners involved in the LCAMP project. 39 Topics were determined, and 22 TOPICS were analysed and worked on during this first period.



2. TOPIC: LEARNING ANALYTICS

The purpose of this chapter is to present some of the development areas related to AM.

These are topics that concern all or some of the stakeholders

- CoVEs and VETs: teachers, trainers and heads of VET schools;
- Learners: students, active workers, job seekers;
- Companies;
- Policy makers and other stakeholders.

2.1 INTRODUCTION

Learning analytics refers to the collection, analysis, and interpretation of data generated from educational activities and environments. It involves using technology and data analysis techniques to gain insights into learning processes, behaviours, and outcomes. Learning Analytics is positioned at the intersection of Learning, Analytics, and Human-Centered Design, and encompasses areas such as educational research, learning and assessment sciences, educational technology, statistics, visualization, computer/data sciences, artificial intelligence, usability, participatory design, and sociotechnical systems thinking.¹ The primary goal of learning analytics is to enhance and optimize learning experiences and outcomes.

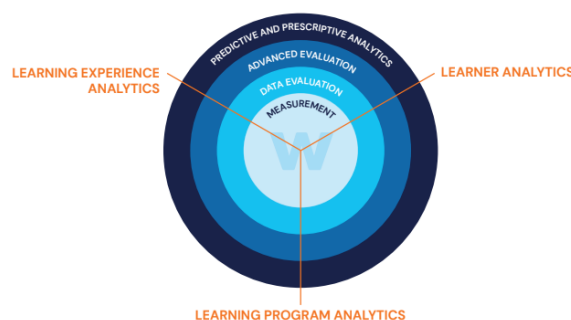


Figure 1 About Learning Analytics, Source: watershed LRS

By collecting and analysing data from various sources, such as learning management systems, online platforms, and educational tools, learning analytics aims to provide valuable information

¹SoLAR, "What Is Learning Analytics?", Society for Learning Analytics Research (SoLAR), 2019, <https://www.solaresearch.org/about/what-is-learning-analytics/>.



to educators, administrators, and learners themselves. This information can be used to make informed decisions, improve instructional strategies, identify areas of improvement, and personalize learning experiences.

Learning analytics empowers the workforce in advanced manufacturing by addressing skills gaps, enabling personalized training, promoting continuous learning, supporting predictive workforce planning, optimizing performance management, and facilitating knowledge sharing. Through the evidence-based approach, organisations can make more informed decisions, leading to better learning outcomes.² Leveraging data and analytics ensures that the industry remains competitive and that employees have the necessary skills to thrive in the dynamic field of advanced manufacturing.

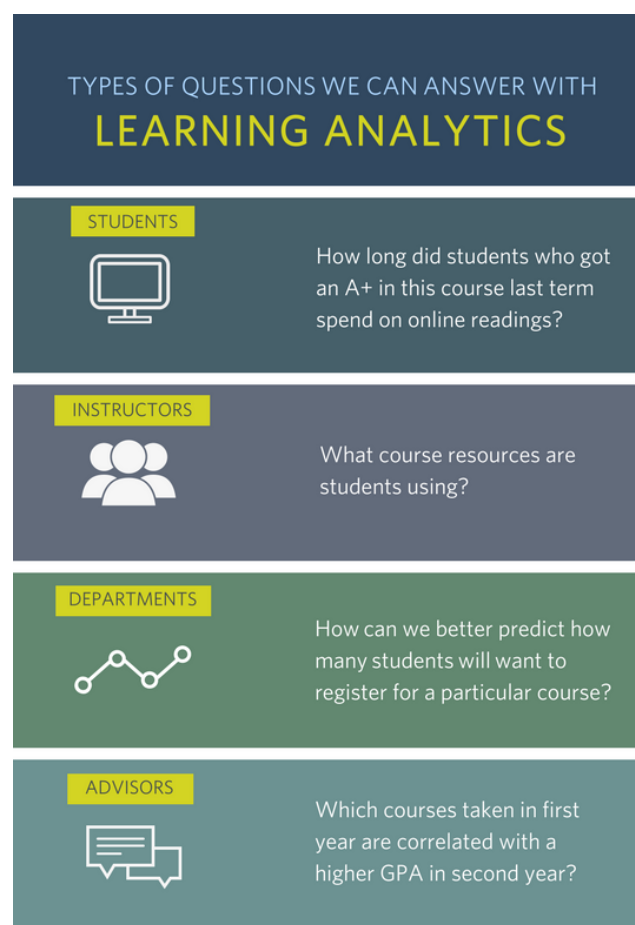


Figure 2 Typical answers from LE.AN. Source. Learning Technology Hub

² Dirk Ifenthaler, "Learning Analytics for School and System Management," in *OECD Digital Education Outlook 2021* (OECD, 2021), <https://doi.org/10.1787/d535b828-en>.



2.2 CONTEXTUALISATION

- In the context of advanced manufacturing, learning analytics can be used in several ways:
- **Skills Assessment and Training:** Learning analytics can be employed to assess the skills of employees in advanced manufacturing. By analysing data on performance, training outcomes, and job requirements, organizations can identify skill gaps and develop targeted training programs to address them. Learning analytics can track the progress and effectiveness of training initiatives, ensuring that employees acquire the necessary skills and knowledge to excel in their roles.
- **Performance Monitoring and Optimization:** Learning analytics enables organizations to monitor and analyse employee performance in advanced manufacturing. By collecting and analysing data on productivity, quality metrics, and other performance indicators, organizations can identify areas for improvement and provide targeted feedback and coaching. This data-driven approach helps optimize individual and team performance, leading to increased efficiency and quality in manufacturing processes.
- **Predictive Analytics for Workforce Planning:** Learning analytics can be used for predictive analytics in workforce planning for advanced manufacturing. By analysing historical data on employee performance, training outcomes, and industry trends, organizations can forecast future workforce needs. This helps in planning for skill requirements, identifying potential skill gaps, and ensuring the availability of a capable workforce to meet the evolving demands of advanced manufacturing.
- **Adaptive Training and Personalized Learning:** Learning analytics can support adaptive training approaches in advanced manufacturing. By analysing data on individual employee performance, learning preferences, and skill levels, organizations can personalize training programs to meet the specific needs of each employee. This ensures that training is efficient and targeted, maximizing learning outcomes and skill development.
- **Process Improvement and Optimization:** Learning analytics can be utilized to identify bottlenecks, inefficiencies, and areas for improvement in manufacturing processes. By analysing data on employee performance, process metrics, and quality indicators, organizations can gain insights into areas that can be optimized. This data-driven approach helps in streamlining processes, reducing waste, and improving overall operational efficiency in advanced manufacturing.
- **Knowledge Sharing and Collaboration:** Learning analytics can facilitate knowledge sharing and collaboration among employees in advanced manufacturing. By analysing data on employee interactions, knowledge acquisition, and expertise, organizations can identify opportunities for collaboration, identify subject matter experts, and foster a culture of knowledge exchange. This promotes innovation, problem-solving, and continuous learning within the workforce.

By leveraging learning analytics in advanced manufacturing, organizations can optimize workforce skills, enhance performance, improve process efficiency, and foster a culture of



continuous learning and improvement. Ultimately, learning analytics helps drive innovation, productivity, and competitiveness in the field of advanced manufacturing.³

2.2.1 HOW IS LEARNING ANALYTICS USED?

Learning analytics typically involves the following steps:

- **Data Collection:** Gathering data from different sources, including student assessments, interactions with digital resources, online discussions, and more.
- **Data Analysis:** Applying statistical and computational techniques to examine the collected data and identify patterns, trends, and correlations.
- **Interpretation and Visualization:** Interpreting the analysed data and presenting it in a meaningful way through visualizations, dashboards, and reports.
- **Actionable Insights:** Extracting insights from the analysed data and using them to inform decision-making and improve learning experiences.

2.2.2 UNDERSTAND AND PREDICT USER BEHAVIOUR

Learning analytics helps understand and predict user behaviour by analysing data patterns. It uncovers insights into how users engage with learning materials and platforms. By examining factors such as learning paths, content preferences, and engagement levels, it deepens understanding of user interactions. Learning analytics also identifies patterns in activity sequences, time spent, and frequency of engagement. This knowledge enables tailored learning experiences and predicts user performance. Historical data analysis, including completion rates and assessment scores, allows for forecasting performance and timely interventions. Learning analytics enhances understanding of user behaviour, enabling personalized and effective learning experiences.⁴

Personalise and improve courses

By analysing data on individual learner performance, preferences, and behaviour, learning analytics provides insights to customize course content and delivery. It helps identify gaps in knowledge, areas of difficulty, and preferred learning styles for each learner. This information enables instructors to tailor instructional strategies, resources, and assessments to meet individual needs. By continuously monitoring learner progress, learning analytics facilitates timely interventions and adjustments, ultimately enhancing the effectiveness and relevance of courses, leading to improved learning outcomes.⁵

³Dirk Ifenthaler, "Learning Analytics for School and System Management," in *OECD Digital Education Outlook 2021* (OECD, 2021), <https://doi.org/10.1787/d535b828-en>.

⁴ Graduate Programs Staff, "What Is Learning Analytics & How Can It Be Used?," Graduate Blog, February 18, 2020, <https://graduate.northeastern.edu/resources/learning-analytics/>.

⁵ "How Can Learning Analytics Help You Design More Effective Courses?," [www.linkedin.com](https://www.linkedin.com/advice/3/how-can-learning-analytics-help-you-design), accessed June 13, 2023, <https://www.linkedin.com/advice/3/how-can-learning-analytics-help-you-design>.



Enable early intervention and support

Through ongoing monitoring and analysis, learning analytics helps track learner progress and provides insights to optimize intervention strategies. This proactive approach helps ensure timely support, leading to improved learner outcomes and a more inclusive and effective learning environment.⁶

2.2.3 LEARNING ANALYTICS DATA SOURCES

- Depending on the type of organisation, learners and learning outcome in relation to advanced manufacturing, specific data source for learning analytics could be:
- Learning Management Systems (LMS): LMS platforms capture data on learner interactions within advanced manufacturing training programs. This includes information such as course enrolment, completion rates, time spent on activities, assessment scores, and participation in discussion forums. LMS data provides insights into learner engagement, progress, and performance within the structured learning environment.
- Simulation and Virtual Reality Systems: Simulations and VR systems used in advanced manufacturing training generate data on user interactions and performance. This includes metrics like task completion time, accuracy, decision-making processes, and user feedback. Learning analytics can analyse this data to assess learner proficiency, identify areas for improvement, and provide personalized feedback within the simulated environments.
- Sensor Data and Internet of Things (IoT): In advanced manufacturing, sensors and IoT devices capture real-time data on equipment performance, process parameters, and product quality. Learning analytics can integrate with these data sources to track learner interactions with sensor-equipped machinery, analyse performance metrics, and provide insights on skill development and operational understanding.
- Workforce Performance Data: Performance data from the advanced manufacturing workforce, including productivity levels, quality metrics, and operational efficiency, can be valuable for learning analytics. By analysing this data, learning analytics can identify skill gaps and training needs, assess the impact of training initiatives on workforce performance, and align learning programs with the specific requirements of the advanced manufacturing industry.
- Learning Content and Courseware: Learning analytics can analyse data from the content and courseware used in advanced manufacturing training programs. This includes data on content utilization, completion rates, learner interactions with specific learning resources (e.g., videos, simulations, quizzes), and feedback provided by learners. Analysing this data helps identify the effectiveness of learning materials, areas where

⁶ Le OctopusBI, "5 Ways Learning Analytics Helps Schools Predict Students at Risk," OctopusBI, November 10, 2021, <https://octopusbi.com/5-ways-learning-analytics-helps-schools-predict-risk-and-manage-early-intervention/>.



content can be improved or adapted, and the impact of different resources on learner engagement and comprehension.^{7 8}

2.2.4 LEARNING ANALYTICS METHODOLOGIES

Learning analytics methodologies encompass a range of approaches to analyse and derive insights from educational data. These include descriptive analytics, which examine historical data to understand patterns and trends; predictive analytics, which use data to forecast future outcomes and learner performance; and prescriptive analytics, which recommend actions and interventions based on data analysis. Additionally, learning analytics methodologies may involve data mining, machine learning algorithms, visualization techniques, and statistical analysis to uncover meaningful patterns and inform decision-making in education and training contexts.^{9 10}

11

2.2.5 LEARNING ANALYTICS TOOLS

In order to conduct learning analytics, organisations are reliant on an arsenal of tools that help them collect and sort the data. Therefore, choosing the most suitable and effective set of tools is a vital step in ensuring your learning analytics strategy is a success.

There are various factors that come into play when determining which learning analytics tools you will need. Some aspects to consider are the sector you work in and which learning tools you already have at your disposal. Since many learning management systems include learning analytics features, this is something that should be considered.

Since some tools are specifically designed for education and some are specifically designed for corporate settings, you'll want to make sure you're selecting a tool that is appropriate to your learners and learning objectives.

⁷ Jim Yupangco, "What Sources of Learning Analytics Should You Be Collecting?," eLearning Industry, July 3, 2017, <https://elearningindustry.com/sources-of-learning-analytics-should-collecting>.

⁸ Jeanette Samuelsen, Weiqin Chen, and Barbara Wasson, "Integrating Multiple Data Sources for Learning Analytics—Review of Literature," *Research and Practice in Technology Enhanced Learning* 14, no. 1 (August 28, 2019), <https://doi.org/10.1186/s41039-019-0105-4>.

⁹ Andy Nguyen, Lesley Gardner, and Don Sheridan, *A Design Methodology for Learning Analytics Information Systems: Informing Learning Analytics Development with Learning Design*, Scholarspace.manoa.hawaii.edu (HICSS, 2020), <http://hdl.handle.net/10125/63753>.

¹⁰ Learning Analytics: The Ultimate Guide | DLI Blog," Digital Learning Institute, September 6, 2022, <https://www.digitallearninginstitute.com/blog/learning-analytics-the-ultimate-guide/>.

¹¹ ProjectPro, "Types of Analytics: Descriptive, Predictive, Prescriptive Analytics," ProjectPro, 2021, <https://www.projectpro.io/article/types-of-analytics-descriptive-predictive-prescriptive-analytics/209>.



Tools for educational institutes

When it comes to choosing an appropriate tool for schools, universities and educational institutes, you'll want to ensure the system is able to effectively identify at-risk students so that support and early intervention can be provided.

Within education, it is typically the teachers, instructors and advisors who are responsible for monitoring student success. Therefore, the tool should ideally include a user-friendly dashboard with data visualisations.

Some examples of learning analytics tools that are designed for education are Intellischool Albitros and Blackboard Predict. There are also various Moodle plugins with learning analytics capabilities.¹²

Tools for corporate training

When choosing learning analytics tools for corporate training or L&D, it's crucial to align the tools and features with the business and learning objectives. For example, whether your focus is on employee onboarding, leadership development or upskilling, you may need specific types of learning analytics strategies and tools.

It is also important to ensure that the tool is user-friendly. While some L&D teams may have a specialised Learning Analyst, or Training Analyst within their team, this is not always the case. Therefore, choosing tools that enable you to make the most use of the data without advanced data analysis skills is also an important factor.

One example of an enterprise learning analytics tool is Learning Pool. Their reporting and analytics solution includes customised dashboards with data visualisations and AI-powered predictive analytics. A further example of a corporate learning platform with analytics features is 360learning, which uses AI to create personalised learning experiences.¹³

¹² Dirk Ifenthaler, "Learning Analytics for School and System Management," in OECD Digital Education Outlook 2021 (OECD, 2021), <https://doi.org/10.1787/d535b828-en>.

¹³ CommLab India Bloggers, "How to Optimize Corporate Training Courses with Learning Analytics?," Rapid eLearning Blogs – CommLab India, June 30, 2022, <https://blog.commlabindia.com/elearning-design/learning-analytics-effective-corporate-training>.



2.2.6 LEARNING ANALYTICS: PROPOSAL FOR REAL-WORLD APPLICATION

Learning Analytics is a service built on a set of tools, that can be part of a platform such as LCAMP. The aim of the service would be to help individuals (or account owners) understand and follow their educational needs and progress.

The user would be able to access their current educational status (skills and/or competencies), their desired educational goals and their desired vocational goals (jobs).

Learning analytics, utilizing tools such as GAP analysis, learning pathways and Course recommendation, can help steer the user towards their educational or vocational goals and help them monitor their progress.

Without such a service and with the exponentially growing number of required new skills, new types of vocations and a plethora of courses of various quality levels, it will be near impossible for individuals, let alone companies, to navigate the space of required learning, that would allow them to adapt to new ADMA requirements.

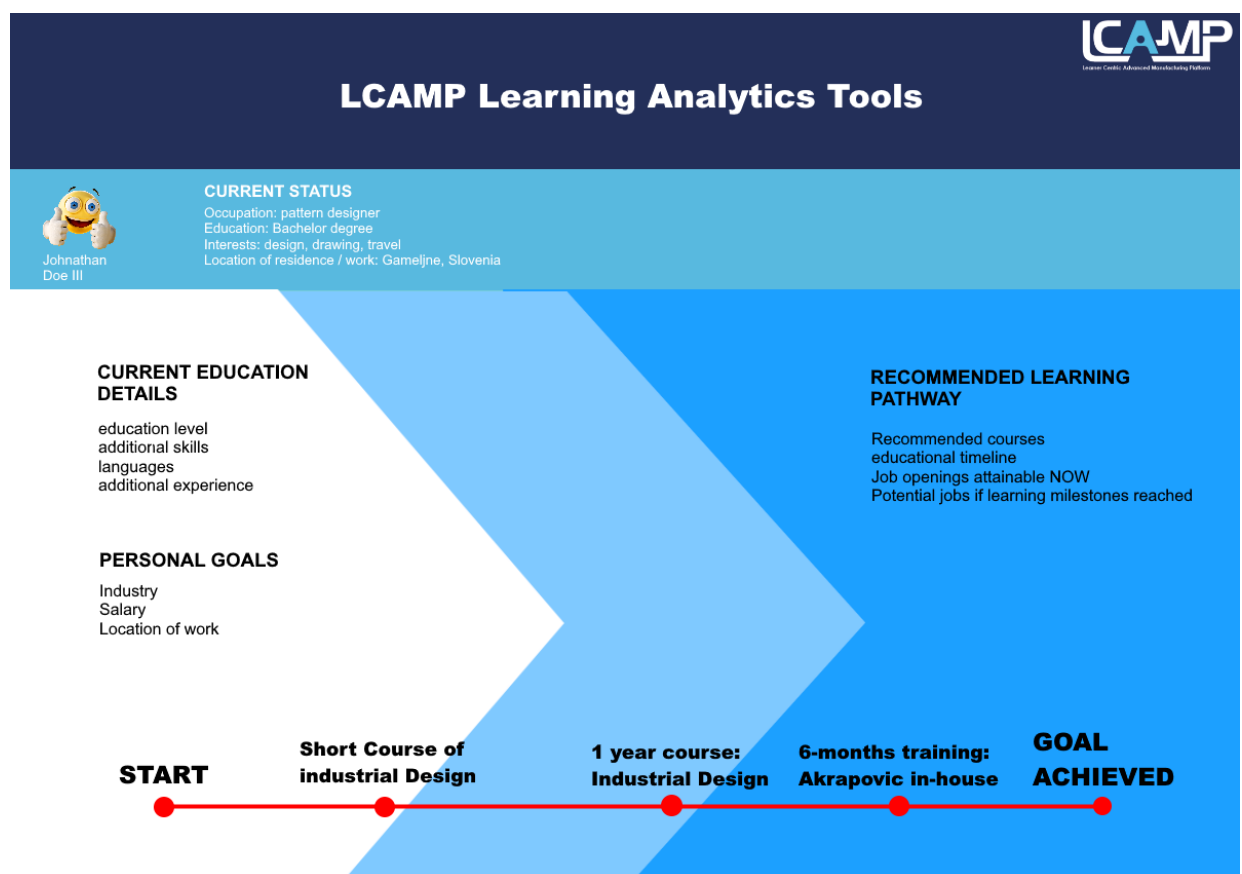


Figure 3 Early idea for a learning pathway overview



The tools would ultimately combine the services of a customized HR and educational advisory and concierge – it would help identify interesting jobs, analyse for skills/competencies gaps, recommend the correct courses to take and ultimately propose a timeline with viable courses.

¹⁴

2.2.7 COMBINING LEARNING ANALYTICS WITH AN OBSERVATORY TOOL

The aim of the observatory tool is to gather information on the ADMA trends and statistics. Such information can be of use for individuals either trying to learn more about ADMA or trying to learn specific data about a certain section within ADMA, to help them decide which vocational path to take, perhaps even whether or not to change their career paths.

¹⁴ Darcy Dario, “12 Learning Analytics Software,” EdApp Microlearning Blog, October 6, 2022, <https://www.edapp.com/blog/learning-analytics-software/>.



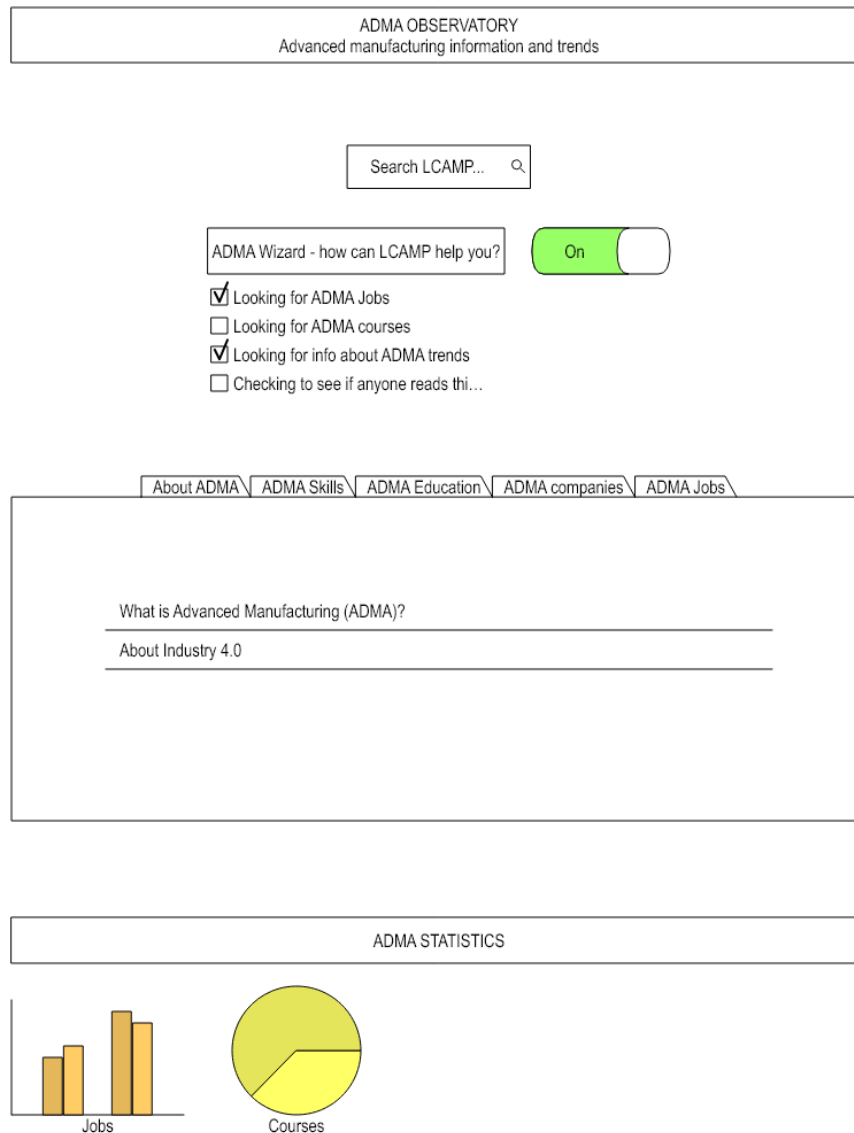


Figure 4 Idea for an ADMA observatory subpage

2.3 OBJECTIVES / RESEARCH QUESTION / PROBLEM STATEMENT

2.3.1 OBJECTIVES

The ability to develop new skills and competencies is a central concept of lifelong learning. Research to date has largely focused on the processes and support individuals require to engage in upskilling, re-learning or training. However, there has been limited attention examining



the types of support that are necessary to assist a learner's transition from “old” workplace contexts to “new”. Professionals often undergo significant restructuring of their knowledge, skills, and identities as they transition between career roles, industries, and sectors. Domains such as learning analytics (LA) have the potential to support learners as they use the analysis of fine-grained data collected from education technologies.

However, in order to support transitions throughout lifelong learning, LA needs fundamentally new analytical and methodological approaches that differ from existing methodologies and tools used in classical education. To enable insights, research needs to capture and explain variability, dynamics, and causal interactions between different levels of individual development, at varying time scales. ¹⁵

2.3.2 RESEARCH QUESTION

- What measures can VETs and SMEs take to implement the benefits of Learning Analytics while avoiding the challenges that come with it?

2.3.3 PROBLEM STATEMENT

Most important aspects of Learning Analytics that are key to helping VETs and universities to meet contemporary demands and future possibilities ARE NOT without its challenges

- Placing the learning analytics strategy in practice can be a treacherous road.
- Cross-unit collaboration is essential, with continuous feedback from academics.
- Fail fast strategies work only when proper communication strategies are in place.
- Out-of-the-box solutions will most likely not serve the needs for academics and L&T research.
- Data pipelines need to be simplified and allowing connectivity with sandboxes. ¹⁶

Challenges of learning analytics

Although there are numerous practical uses and benefits that come along with leveraging learning analytics, it is not without challenges. Below we address some of the main challenges associated with learning analytics and how organisations can overcome them. ¹⁷

¹⁵ Sandra Nunn et al., “Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review,” *Online Learning* 20, no. 2 (January 10, 2016), <https://doi.org/10.24059/olj.v20i2.790>.

¹⁶ Sandra Nunn et al., “Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review,” *Online Learning* 20, no. 2 (January 10, 2016), <https://doi.org/10.24059/olj.v20i2.790>.

¹⁷ Sandra Nunn et al., “Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review,” *Online Learning* 20, no. 2 (January 10, 2016), <https://doi.org/10.24059/olj.v20i2.790>.



Integrating large amounts of data

Learning analytics often involves working with large amounts of data from varying sources. Some of the challenges that come along with working with large amounts of data include safely storing the data and effectively integrating it. These are two logistical challenges that organisations should keep in mind when planning their learning analytics strategy.¹⁸

Lack of analytical skills

Although technology is able to collect large amounts of data, it is of little use without the skills required to understand and interpret the data in meaningful ways. Therefore, one challenge of learning analytics is attracting and retaining talent with the analytical skills required to effectively work with learning analytics.¹⁹

Data security

Due to the fact that learning analytics deals with user data, ensuring data is properly handled and stored can be a challenge. It's crucial that students consent to their data being collected and that the data is anonymised when possible. It's also a good idea to provide employees with training on data protection in order to minimise the risk of data breaches.²⁰

2.4 FINDINGS

Learning analytics is a necessary set of tools and methodologies to help the industry catch up with newest technologies by offering faster and more custom learning pathways. However, in

¹⁸ Sandra Nunn et al., "Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review," *Online Learning* 20, no. 2 (January 10, 2016), <https://doi.org/10.24059/olj.v20i2.790>.

¹⁹ Sandra Nunn et al., "Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review," *Online Learning* 20, no. 2 (January 10, 2016), <https://doi.org/10.24059/olj.v20i2.790>.

²⁰ Sandra Nunn et al., "Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review," *Online Learning* 20, no. 2 (January 10, 2016), <https://doi.org/10.24059/olj.v20i2.790>.



order for it to achieve the objectives, it has to be set up correctly in such a way, that it avoids the Negative impacts and maximizes the positive impacts.

2.4.1 NEGATIVE IMPACTS

- Increased reliance on technology can lead to decreased face-to-face interactions with colleagues, resulting in a lack of collaboration and cohesiveness.
- Potential to create an ‘us vs. them’ dynamic in the workplace, wherein ‘data-driven’ employees feel superior to those who lack the skills to work with the technology.
- Data-driven decisions may lead to a focus on short-term objectives and neglect of long-term goals.
- Analytics can create false assumptions and cause decision makers to base decisions on incorrect data.
- Data may be incomplete or outdated; analysis of such data can lead to incorrect conclusions.
- Data privacy and security is a concern, as companies need to ensure they are collecting and managing data responsibly.
- Over-reliance on analytics can lead to “analysis paralysis”, where too much time is spent analyzing data and not enough time is spent taking action.
- Data-driven decisions may lead to a lack of creativity and innovation.
- Analytics can lead to a “one-size-fits-all” approach to learning, which may not be suitable for all employees.
- Companies may be tempted to make decisions based on data without taking into account the perspectives of employees.^{21 22 23}

2.4.2 POSITIVE IMPACTS

- Learning analytics can provide meaningful insights into employees’ learning patterns and needs, allowing companies to tailor learning experiences to individual employees.
- Companies can use analytics to identify areas of improvement and develop strategies for addressing them.

²¹ Yi-Shan Tsai and Dragan Gasevic, “Learning Analytics in Higher Education --- Challenges and Policies,” *Proceedings of the Seventh International Learning Analytics & Knowledge Conference*, March 13, 2017, <https://doi.org/10.1145/3027385.3027400>.

²² Neil Selwyn, “What’s the Problem with Learning Analytics?,” *Journal of Learning Analytics* 6, no. 3 (December 13, 2019): 11–19, <https://doi.org/10.18608/jla.2019.63.3>.

²³ Madeth May, Sébastien Iksal, and Claus A. Usener, “The Side Effect of Learning Analytics: An Empirical Study on E-Learning Technologies and User Privacy,” *Communications in Computer and Information Science*, 2017, 279–95, https://doi.org/10.1007/978-3-319-63184-4_15.



- Analytics can help to identify employees who are struggling with certain skills and allow companies to provide additional support.
- Analytics can provide a holistic view of the employee experience, allowing companies to track progress and measure employee performance.
- Companies can use analytics to identify areas where employees have mastered particular skills and adjust training accordingly.
- Learning analytics can help to identify employees who have the potential to take on new roles and responsibilities.
- Companies can use analytics to identify the most effective training methods and use them to improve the overall learning experience.
- Analytics can provide insights into employees' engagement with learning content, helping companies to develop and adjust courses to ensure they are engaging and effective.
- Learning analytics can help to identify potential gaps in an organization's skillset and can be used to develop training programs to address those gaps.
- Analytics can provide valuable data to help companies assess the effectiveness of their training programs and make necessary adjustments.²⁴

2.4.3 WAYS TO AVOID THE NEGATIVE IMPACTS OF LEARNING ANALYTICS:

- Lack of privacy: Companies must ensure that employee data is securely stored and that individuals are aware of how their data is being used. This could be done through periodic privacy notifications, as well as training staff on data protection and privacy best practices.
- Data manipulation: Companies must ensure that data is not manipulated in any way, and that the analytics are used to support learning goals, not to manipulate outcomes. Companies should also have internal checks and balances in place to monitor the use of data and detect any irregularities.
- Data overload: Companies must be aware of the potential to overwhelm employees with data, and must be proactive in providing contextual guidance and support to help make sense of the data.
- Stereotyping: Companies must ensure that the data collected is not used to perpetuate stereotypes or target individuals based on their race, gender, or any other distinguishing characteristics.
- Unfair comparison: Companies must ensure that analytics are not used to make unfair comparisons between individuals, but rather to provide guidance for improving learning outcomes.

²⁴ Jason Collins, "Understanding How Learning Analytics Is Driving Positive Strides in Higher Education," [www.impactio.com](https://www.impactio.com/blog/understanding-how-learning-analytics-is-driving-positive-strides-in-higher-education), May 5, 2021, <https://www.impactio.com/blog/understanding-how-learning-analytics-is-driving-positive-strides-in-higher-education>.



- Overreliance: Companies should be aware of the potential for overreliance on analytics, and should not replace traditional learning methods with analytics.
- Data bias: Companies should be aware of the potential for data bias, and should take steps to ensure that data is collected and analyzed in an objective and unbiased manner.
- Lack of trust: Companies should be mindful of the potential for mistrust when using analytics, and should ensure that employees are informed of how the data is being used and how their privacy is being respected.
- Unethical use: Companies should be aware of the potential for unethical use of data, and should ensure that all data is used in an ethical and responsible manner.
- Unsustainable: Companies should be aware of the potential for analytics to become unsustainable, and should ensure that analytics are used in a sustainable way that does not overburden employees or the organization. ²⁵

²⁵ Oleksandra Poquet et al., "Transitions through Lifelong Learning: Implications for Learning Analytics," *Computers and Education: Artificial Intelligence* 2 (2021): 100039, <https://doi.org/10.1016/j.caeai.2021.100039>.



3. CONCLUSION

Without Learning analytics, assessing the current knowledge, competence and skill levels, creating custom learning pathways and monitoring and adapting it to the progress of individuals and groups is almost impossible. It proved to be crucial to implement an adequately fast learning curve in response to the coming ADMA challenges, where SMEs need to find new or re-educate existing employees with new skills and competences.

At the very least, both VETs and SMEs should either create Learning Pathways with Learning Analytics or cooperate with companies that can provide those services to them.

The most important measures to be taken in order to ensure success of Learning Analytics is to do the following:

- Encourage and facilitate face-to-face interactions between colleagues and emphasize collaboration. This can be done through the use of video conferencing, virtual meetings, and other technology-mediated communication methods.
- Provide training and resources to ensure all employees have the necessary skills to work with technology.
- Ensure that decisions are based on long-term goals as well as short-term objectives.
- Analyse data carefully and question any assumptions that may be made.
- Ensure that data is up-to-date and accurate, and that data privacy and security measures are in place.
- Ensure that data is used to drive action and not just to analyse.
- Ensure that creativity and innovation are encouraged and rewarded.
- Provide training and resources to tailor learning to each employee's individual needs.
- Ensure that employee perspectives are taken into account when making decisions.
- Ensure that data-driven employees do not create an 'us vs. Them' dynamic and that all employees are treated equally regardless of their software and technology skills.



4. REFERENCES

- Ifenthaler, Dirk. "Learning Analytics for School and System Management." In OECD Digital Education Outlook 2021. OECD, 2021. <https://doi.org/10.1787/d535b828-en>.
- Bonnin, Geoffray, and Anne Boyer. 2017. "Higher Education and the Revolution of Learning Analytics." *Inria.hal.science*. <https://inria.hal.science/hal-03012475/>.
- Collins, Jason. 2021. "Understanding How Learning Analytics Is Driving Positive Strides in Higher Education." *Www.impactio.com*. May 5, 2021. <https://www.impactio.com/blog/understanding-how-learning-analytics-is-driving-positive-strides-in-higher-education>.
- CommLab India Bloggers. 2022. "How to Optimize Corporate Training Courses with Learning Analytics?" *Rapid ELearning Blogs – CommLab India*. June 30, 2022. <https://blog.commlabindia.com/elearning-design/learning-analytics-effective-corporate-training>.
- Dani, Vishal. 2019. "5 Ways to Use Learning Analytics in K-12 Education." *Kitaboo*. February 26, 2019. <https://kitaboo.com/use-learning-analytics-k-12-education/>.
- Dario, Darcy. 2022. "12 Learning Analytics Software." *EdApp Microlearning Blog*. October 6, 2022. <https://www.edapp.com/blog/learning-analytics-software/>.
- "How Can Learning Analytics Help You Design More Effective Courses?" n.d. *Www.linkedin.com*. Accessed June 13, 2023. <https://www.linkedin.com/advice/3/how-can-learning-analytics-help-you-design>.
- "Learning Analytics: The Ultimate Guide | DLI Blog." 2022. *Digital Learning Institute*. September 6, 2022. <https://www.digitallearninginstitute.com/blog/learning-analytics-the-ultimate-guide/>.
- May, Madeth, Sébastien Iksal, and Claus A. Usener. 2017. "The Side Effect of Learning Analytics: An Empirical Study on E-Learning Technologies and User Privacy." *Communications in Computer and Information Science*, 279–95. https://doi.org/10.1007/978-3-319-63184-4_15.
- Nguyen, Andy, Lesley Gardner, and Don Sheridan. 2020. *A Design Methodology for Learning Analytics Information Systems: Informing Learning Analytics Development with*



Learning Design. Scholarspace.manoa.hawaii.edu. HICSS.
<http://hdl.handle.net/10125/63753>.

Nunn, Sandra, John T. Avella, Therese Kanai, and Mansureh Kebritchi. 2016. "Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review." *Online Learning* 20 (2). <https://doi.org/10.24059/olj.v20i2.790>.

OctopusBI. 2021. "5 Ways Learning Analytics Helps Schools Predict Students at Risk." OctopusBI. November 10, 2021. <https://octopusbi.com/5-ways-learning-analytics-helps-schools-predict-risk-and-manage-early-intervention/>.

Poquet, Oleksandra, Kirsty Kitto, Jelena Jovanovic, Shane Dawson, George Siemens, and Lina Markauskaite. 2021. "Transitions through Lifelong Learning: Implications for Learning Analytics." *Computers and Education: Artificial Intelligence* 2: 100039. <https://doi.org/10.1016/j.caeai.2021.100039>.

ProjectPro. 2021. "Types of Analytics: Descriptive, Predictive, Prescriptive Analytics." ProjectPro. 2021. <https://www.projectpro.io/article/types-of-analytics-descriptive-predictive-prescriptive-analytics/209>.

Samuelson, Jeanette, Weiqin Chen, and Barbara Wasson. 2019. "Integrating Multiple Data Sources for Learning Analytics—Review of Literature." *Research and Practice in Technology Enhanced Learning* 14 (1). <https://doi.org/10.1186/s41039-019-0105-4>.

Selwyn, Neil. 2019. "What's the Problem with Learning Analytics?" *Journal of Learning Analytics* 6 (3): 11–19. <https://doi.org/10.18608/jla.2019.63.3>.

Singh, Harvey. 2021. "Learning Analytics for Personalized Learning [an Updated Perspective]." [Www.linkedin.com](https://www.linkedin.com/pulse/learning-analytics-personalized-updated-perspective-harvey-singh/). March 16, 2021. <https://www.linkedin.com/pulse/learning-analytics-personalized-updated-perspective-harvey-singh/>.

SoLAR. 2019. "What Is Learning Analytics? - Society for Learning Analytics Research (SoLAR)." Society for Learning Analytics Research (SoLAR). 2019. <https://www.solaresearch.org/about/what-is-learning-analytics/>.

Staff, Graduate Programs. 2020. "What Is Learning Analytics & How Can It Be Used?" Graduate Blog. February 18, 2020. <https://graduate.northeastern.edu/resources/learning-analytics/>.



- Tsai, Yi-Shan, and Dragan Gasevic. 2017. "Learning Analytics in Higher Education --- Challenges and Policies." *Proceedings of the Seventh International Learning Analytics & Knowledge Conference*, March. <https://doi.org/10.1145/3027385.3027400>.
- "What Is Learning Analytics: Methods, Ethics and Privacy [2022]." 2023. Valamis. March 16, 2023. <https://www.valamis.com/hub/learning-analytics>.
- Yupangco, Jim. 2017. "What Sources of Learning Analytics Should You Be Collecting?" ELearning Industry. July 3, 2017. <https://elearningindustry.com/sources-of-learning-analytics-should-collecting>.



5. INDEX OF IMAGES

Figure 1 About Learning Analytics, Source: watershed LRS.....9

Figure 2 Typical answers from LE.AN. Source. Learning Technology Hub10

Figure 3 Early idea for a learning pathway overview16

Figure 4 Idea for an ADMA observatory subpage18





Learner Centric Advanced Manufacturing Platform



**Co-funded by
the European Union**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.