



Business Innovation Observatory



Service Innovation for Smart Industry

New demand driven skills

Case study 38

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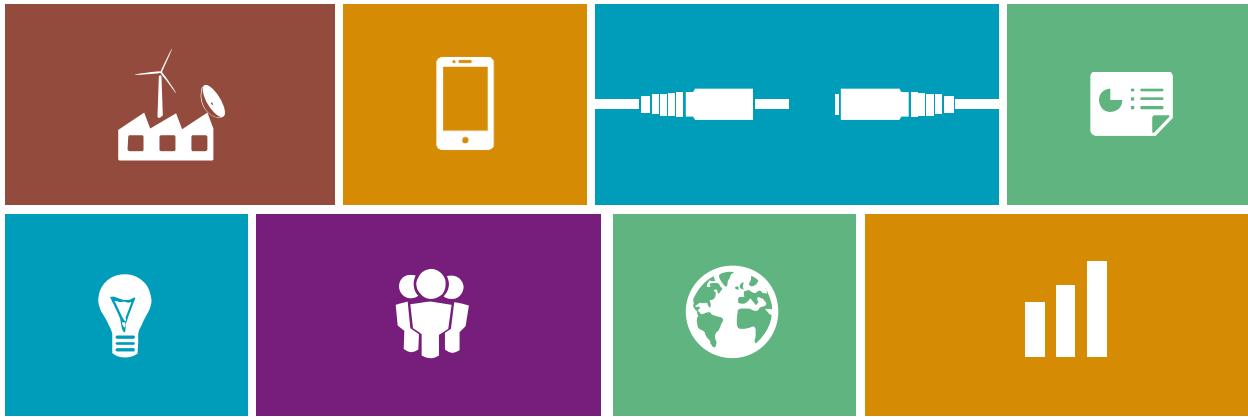
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1. Executive summary

New demand driven skills as a new approach to competencies development and recruitment is set to revolutionise the education sector. The trend encompasses a wide range of activities, tools and services aiming to directly improve educational outcomes of students and workers. The key differentiator of these innovative methods compared to traditional ones lies in the ability to better align learning materials and content to the industry demand for skills.

At the forefront of this trend, firms, education institutions and public authorities are developing complementary solutions to rethink European education strategies. By striving to address the European skills mismatch, these 3 actors are targeting a dynamic market with more than €150 bn estimated for the global corporate training market alone.

At firm level, customised corporate trainings are being integrated or enriched to ensure that each employee can acquire the specific skills necessary to increase his or her productivity. As regards recruitment processes, new digital platforms allow companies to improve applicants' skills assessment in order to better screen, attract and hire the talents needed at every step of their value chain.

At university level, institutions are adopting innovative services to provide alternative pathways and opportunities for students to develop relevant and valuable skills in line with industry needs. These new learning methods include Massive Open Online Course (MOOCs), industry-academia interactions, training-on the job, international mobility programs as well as mentoring programs. The integration of these demand driven services is opening up new prospects for universities to further fulfil their educational mission. They enable them to increase the employability of students while keeping pace with the rising demand for education.

With regards to public institutions, new demand driven programs are completely transforming the level and quality

of science-industry collaborations. New public-driven solutions endeavour to put an end to the European paradox according to which European economies are failing to turn R&D advances into marketable innovations. The fundamental objective of these collaborations is therefore to better align research activities with real industry interests while equipping students with the skills they need to adapt to the jobs of today and tomorrow.

The rapid emergence of new demand driven skills is fuelled by the tremendous rise of the demand for education and certification around the world. Increased need for professional, technical or managerial development in companies also reinforces the uptake of the trend. Besides, key enablers of the trend remain the technological advances that led to the boom of the online education market and completely revamped the whole education industry.

However, although cost savings constitute an evident driver for the uptake of online solutions designed to provide outcome-based education, the high start-up costs associated with such solutions also prevent a lot of companies and education institutions from acquiring them. In addition, societal obstacles such as the lack of recognition and accreditation of MOOCs courses also serve as brakes to the further development of educational and pedagogical innovations aiming to tackle the European skills mismatch.

It is thus critical for firms, universities and public authorities to work collaboratively to overcome the above-mentioned barriers and accelerate the uptake of new demand driven skills. Recommended policies include the introduction of customised business support, the further development of public-funded science-industry partnerships as well as awareness raising campaigns to close the gender gap in STEM fields. The accreditation of MOOCs along with early Information and Communications Technology (ICT) education and lifelong learning programmes should also be supported.

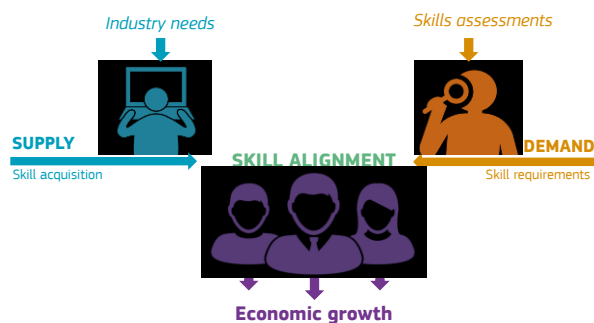


2. New demand driven skills

2.1. Presentation of the trend

“New demand driven skills” refers to the variety of innovative services, programmes or activities being developed to better align the skills supply with the market demand. Mainly driven by companies, education institutions and public authorities, this new approach to skills development focuses on placing skills at the centre of the Education to Employment path (E2E).

Figure 1: Demand-driven approach to skill formation



Source: PwC Analysis

Addressing the paradox of simultaneous skills shortage with increased levels of “over qualification” in the workforce and rising unemployment rates has become vital in securing long-term economic growth and prosperity in Europe. An increased number of Europeans are no longer satisfied with institutional approaches failing to provide graduates with skillsets matching industry needs. As reflected in the Fifth European Working Conditions Survey, despite the 27 million unemployed workers in the EU, in 2013, four out of ten employers reported difficulties in finding employees with the right skills². According to the 2012 European Vacancy and Recruitment Survey, the top bottleneck occupations where employers struggle to find talents with appropriate skillsets are concentrated in the following professions³:

“Only 57% of EU employees are in jobs that match their skills¹”

- **Health:** Physicians, dentists, veterinarians, pharmacologists, pathologists and nurses
- **ICT:** IT consultants, support staff and project leaders, software programmers, data processing technicians
- **Engineering:** Specialist engineers across various industries
- **Sales:** Finance and sales associate professionals, e.g. sales representatives
- **Finance:** Business professionals, e.g. accountants, accountant assistants

At the forefront of this skill challenge, firms, education institutions and public authorities are developing diverse solutions to rethink European education strategies.

On the one hand, forward-thinking **companies** are striving to upend traditional methods of teaching and learning by playing a more proactive role in the assessment and reduction of their skill gap. On the other hand, **education institutions** are adopting new service offers in order to create programs that are relevant to the industry needs, while improving the overall student learning experience. This strategic approach enables them to remain competitive in a globalised education market. At last, in the wake of the industry-led skills revolution, **public institutions** are now placing a greater emphasis on private sector skills’ needs and industry-academia collaborations. Public authorities are striving to reinvigorate existing programs to better address the needs of employers. As a result, more public-funded programmes and trainings tend to be driven by employment demand with content varying across industries and often being tailored to specific needs of firms.

Technological advancements have proven to be a key enabler in the shift towards the development of new demand driven skills. The rapid expansion of the online education market has been the source of many of the transformations that allow education institutions and companies to reinvent themselves, compete and thrive. The resulting new digitally-delivered training offers encompass a myriad of activities including corporate E-learning and training-on-the-job for firms and remote courses, lifelong learning as well as online graduate and postgraduate programmes in the case of education institutions.

From a business standpoint, key benefits lie in the ability to draw on the latest technological advancements to reshape the way they hire, train and engage their workforce. Through the new forms of competency-based education, companies are reversing most of the basic tenets of academic teaching by transmitting exclusively work-related skills. Further, workplace-based trainings have proved to provide higher returns on investment than any other forms of training thanks to gains in productivity. As regards recruitment processes, new digital tools are enabling companies to improve applicants’ skills assessment in order to better screen, attract and hire the skilled talents needed at every step of their value chain.

In this regard, the great disrupter of higher education lies in the new approaches to learning designed by firms, academia and public institutions which make plenty of use of the Internet but ties education more closely to industry needs.

**Table 1: Overview of the cases referred to in this case study**

Initiative	Location	Innovative initiative	Signals of success
Tribal learning	Finland	First online social learning platform applying “predictive analytics” to improve users’ learning outcomes.	<ul style="list-style-type: none"> Finalists in the Take That Tech to UK 2014 Competition Top 50 of Finland’s Startup100 ranking Formed part of the delegation of Finnish Minister of Education, Science and Telecommunication in Saudi Arabia Showcased at numerous international conferences on Disrupting Education and Digital Learning
YouRock	United Kingdom	Free, multi-language, employability networking tool helping users to better identify their professional work skills and employers to identify proactive new employees with specific skills.	<ul style="list-style-type: none"> Finalists in the European Social Innovation Competition Media coverage: Guardian, Forbes, Sunday Business Post (Ireland), Careers Advice blog (Poland), Greek TV channel “Skai”
School 42	France	Unconventional IT institute using a new pedagogical learning model, 100% project and skill based, promoting peer learning.	<ul style="list-style-type: none"> Showcased at multiple international conferences on Education Over 70,000 student applications per year for 1000 places Backed by successful and experienced French entrepreneurs such as Xavier Niel (president of School 42, Founder and Chief Strategy Officer of Iliad)
MEKTORY	Estonia	Innovation and business centre aiming to foster technology transfers through industry-academia collaboration projects.	<ul style="list-style-type: none"> Receiving more than 30,000 visitors in its first year of existence Although set up as a knowledge transfer centre in the first place, it has already absorbed the internationalisation department of the Tallinn University of Technology More than 40 active company sponsors
Unow	France	First European service provider specialised in MOOCs conception for firms and universities.	<ul style="list-style-type: none"> Extensive media coverage, including: Le Monde, L’Express, Challenges, L’Etudiant, La Tribune Partnerships with elite universities: HEC, ESSEC, Centrale
STEMettes	United Kingdom	Non-profit organisation aiming to encourage greater female participation in the STEM field from an early age.	<ul style="list-style-type: none"> 2014 European Digital Impact Organisation of the Year Extensive international media coverage: BBC Radio 4, Women 2.0, The Guardian, Huffington Post, BBC, Forbes, The Times, The Observer, Channel 4

2.2. Innovative solutions designed to accelerate the uptake of new-demand driven skills

Problem 1 – In an increasingly competitive education market, the outdated “one size fits all” educational model can prove fatal for education institutions failing to develop programs and courses in line with the market needs. It is thus critical for them to find means to personalise services in order to improve students’ retention rates.

Innovative solution 1 – Tribal learning is the world’s first online social learning platform. The website is transforming the whole digital learning market by applying “predictive analytics” into the education sector.

The key innovation lies in the set of algorithms and tools used to gather information about learners and their learning experience. These large datasets enable to read into the

users’ mind and reveal information such as their motivation, emotions and stress level. Through the analysis of such data, Tribal learning can recommend alternative personalised learning material most-suited to students or more optimal physical environments in order to improve learning outcomes.

Key facts on TribaLearning’s expansion



Source: Tribal learning



Tribal learning enhances academic performance by:

- Measuring teaching and learning efficiency
- Personalising the learning experience of each student, highlighting their strengths and identifying areas of improvement
- Predicting student performance and success
- Detecting students most likely to drop out the course

The benefits for students and education institutions are multi-fold. Analytics-driven educational institutions benefit from deeper insights into factors impacting student learning results and degree completion rates, thereby providing increased returns.

The rapid expansion of Tribal learning is a prime evidence of the growing demand for Smart Learning Data solutions across the world. Founded in 2013, the company has offices in Finland, Malta and in the UK. Further, with the rise of the online education sector in emerging markets such as Asia and the Middle East, Tribal learning has already conquered new prospects for growth.

Problem 2 – The recruitment channels of young unemployed people and employers often diverge in the value chain of recruitment. As a result, statistics demonstrate that only 40% of employers are confident they would find skilled graduates to fill junior positions. In addition, a high percentage of employers regularly leave positions open since they cannot find the skilled employees they need.

Innovative solution 2 – YouRock is a free, multi-language, employability networking tool designed for young individuals aged 16-30 and employers across Europe. Based on a personality-type-test focusing on user's interests and everyday activities, the online youth employability platform enables users to identify unrealised professional skills.

Through the detection of users with international transferable skills and the display of every user profile in the language of the visitor, YouRock supports cross border recruitment and facilitates youth individual mobility for professional purposes in the Single Market.

YouRock social media campaign



Source: YouRock

A significant number of employers in Europe regularly leave vacancies open because they cannot find the skills matching their needs. In this regard, the youth-focused professional network acts as a game-changer in the recruitment process. The tool enables employers to get a better understanding of the job applicant's personality. Rather than hiring the candidate with the best CV, they are given the opportunity to hire the candidate with the best skillset.

The prototype was developed in Lithuania at a hackathon⁴. It was supported through crowdfunding and investment from the international cable company Liberty Global.

Since its launch in 2014, the company has been expanding rapidly and is planning to generate revenue through advertising, sponsorship and data monetisation of user social media materials for markets and multipliers. Through the use of visual campaigns challenging preconceptions of youth and employability, the website serves as a promising tool towards the end of the European skills mismatch.

Problem 3 – 60,000 computer coding jobs are thought to be vacant in France because of a lack of qualified candidates. This skills shortage is the result of the failure of existing institutions to train students in skills that are in demand.

Innovative solution 3 – 42 is a computer institute defying with French conventional IT universities. The school model is entirely project-based as the overall aim is to enable students to develop work-related skills. The innovative nature of the pedagogical model stems from the focus on problem-solving skills and the absence of teachers or lectures which are replaced by a peer review mechanism. During each project, students are encouraged to debate, exchange ideas, try, fail and try again until they find a solution. This new pragmatic and hands-on approach to learning and skill development is breaking with the French traditional theory-based education model. As a result, 42 is not accredited by the French State which prevents the institute from delivering the diploma of "Engineer".

The added-value for students lies in the acquisition of on-the-job experience throughout their academic career. Through the organisation of regular workshops and conferences with experts from the IT sector and leaders from the IT department of successful companies, students are made aware of the real needs of employers and learn how to adapt to job-related situations. In this regard, an ever-growing number of employers do not hesitate to hire students from 42 as they have proved to be equipped with the appropriate skill-set.

Over 2 years, 42 has become part of France's leading IT institutes, receiving on average 50,000 applications per year and currently educating 2,000 students. The value proposition of the institute constitutes a successful example of an industry-led initiative to tackle the labour shortage of IT professionals.



42's state of the art facilities



Source: School 42

Problem 4 – A significant part of the actors in the education system is still operating in parallel universes. This lack of collaboration between the industry and the academia is a key explanation for the European skills mismatch.

Innovative solution 4 – Mektory is an educational project launched by the Tallinn University of Technology (TallinnTech) to foster technology transfers between the industry and academic world. The aim of the initiative is twofold as it intends to align research activities with real industry interests and needs while providing students with skills in line with the market demand.

By bringing together scientists, students and entrepreneurs in collaborative projects designed to solve practical product

development issues, the project has enabled multiple firms to exploit the full commercial potential of new ideas.

There is an ongoing need for innovation, but firms lack R&D competencies and capabilities.

Mektory proved to be a great tool

to bring together scientists, students and entrepreneurs to develop these innovations.

“We have demand on the industry side and knowledge on the university side; but there are still obstacles such as the lack of fundings and time (mostly on the industry side)” – MEKTORY

Mektory logo



Source: Mektory

Problem 5 – As the demand for MOOCs keeps growing, an increased number of companies and education institutions are willing to adopt MOOCs as part of their services. However, the creation of a MOOC can be very costly and time consuming.

Innovative solution 5 – Unow is the first MOOC building platform and provider of tailored MOOC services. The company guides companies, non-profits and higher education institutions at every stage of their MOOC development strategy in order to enhance their human capital and internal knowledge assets.

As the entire MOOC industry evolves, an increasing number of higher education institutions, private companies and individuals are starting to consider creating their own MOOCs. Unow enables these actors to reinforce and optimise their training activities by adjusting their value proposition to their training needs through the use of MOOCs.

The MOOC factory is a cost-effective solution offering a wide range of services to help clients build an ideal MOOC experience. With an army of learning designers and course production staff, Unow provides its clients with MOOCs including the optimal amount of customisation for higher learning outcomes.

Unow logo



Source: Unow

Problem 6 – Across Europe, programmes in Science, Technology, Engineering and Maths (STEM) commonly referred to “hard sciences” continue to be dominated by men. The number of girls and women, studying and choosing careers in STEM remains on a downward trend conflicting with the growing demand for highly skilled ICT professionals.

Innovative solution 6 – STEMettes is an educational initiative aiming to address the gender imbalance in the STEM (Science, Technology, Engineering and Maths) field.

“Our aim is to inspire the next generation of female STEM leaders” – STEMettes

Convinced that the lack of female talents in the technology industry results from the lack of new role models in the STEM field, Anne-Marie Imafidon, head of STEMette and UK tech prodigy has made tackling the under-representation of women in STEM one of her top priorities.



STEMette is a non-profit organisation promoting a higher participation of young women in the STEM workforce through a series of panel events, hackathons, exhibitions, and mentoring schemes. The aim is to engage young women with successful digital role models in order to generate vocations and inspire more girls to consider careers in the digital technology sector.

Through the use of web-based materials, the Student to STEMette programme for girls aged 16 and over, enables young women from all around the world to discover regular webinars featuring Big STEMettes and providing career guidance.

Students to STEMette: Mentoring event



Source: STEMettes

3. Socio-Economic Relevance

3.1. The market potential of the trend

From a business perspective, assessing the potential breadth and depth of economic benefits resulting from the development of new demand driven skills requires a multifaceted approach. As such, the market potential of the trend needs to be analysed with due consideration to its key enablers, namely the ever-growing demand for education, the corporate training market, the online education market, the MOOC market and industry-academia collaborations.

The global **demand for formal and lifelong education** is exploding. For instance, the number of new science and technology graduates has grown substantially over the last decade in Europe. In 2011, there were 16.8 science and technology graduates per 1,000 inhabitants aged 20-29 across the EU-27, compared to 11.1 in 2001⁵. This steady rise results from the increasing demand for high-level skills, especially in R&D intensive industries such as advanced manufacturing or healthcare. As a result, the escalating demand for formal and lifelong education constitutes an economic opportunity for European SMEs developing innovative solutions to adapt educational approaches to industry needs.

The **corporate training market** is undergoing a profound renaissance. The European demand for retraining and continuing education is rising among workers of all ages. Globalisation and automation have led to a constrained job environment, severely reducing the number of jobs requiring a middling level of education. Consequently,

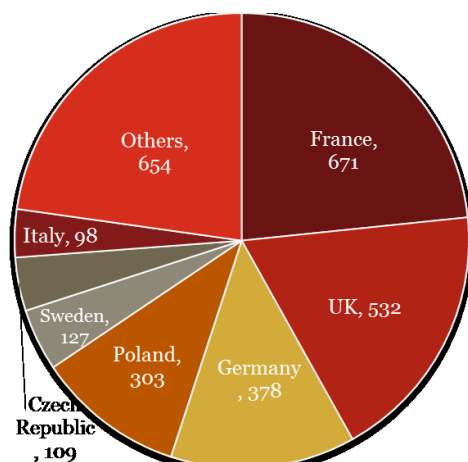
“While it is still a nascent market, the demand for Corporate Open Online Courses is there and we expect it to grow exponentially in the coming years” – Unow

across the world, workers with the means to do so are striving to stay ahead of the labour-demand curve which contributes to the current massive rise of the demand for corporate trainings. Already accounting for \$200 billion in

2013⁶, according to Unow, the global corporate-training industry will grow stronger in the next decade. Therefore, current sup-optimal levels of investments in corporate trainings and training systems coupled with such a dynamic demand for retraining are key indicators of the strong prospects for growth in the market.

The **online education market** is flourishing around the world. Online education (also referred to as E-learning) provides companies and education institutions enhanced means to help individuals and organisations to acquire new skills and access to knowledge. As illustrated under Figure 2, an increased number of European companies are now harvesting the latest technological developments to allow firms to better engage, train and transform new and existing workforce.

Figure 2: Number of EU E-Learning firms by country

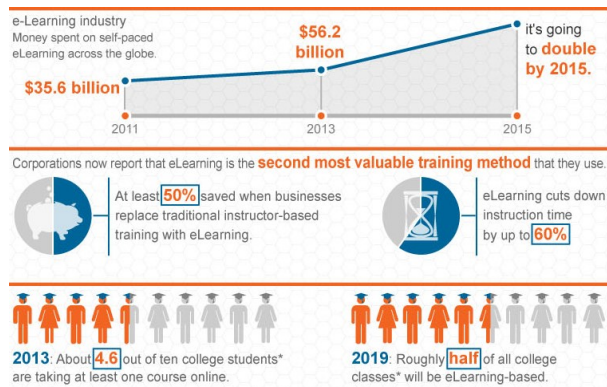


Source: Cedefop (IER estimates from StockMOD), 2012



However, Europe is lagging behind the US both in terms of number and variety of platforms and innovative tools drawing on online education to develop skills. Further, with an annual growth rate of 17.3%, Asia is forecasted to overtake Europe as regards E-learning revenues by 2016. According to Docebo, the global market for self-paced E-Learning represented \$35.6 billion in 2011, with a five-year compound annual growth rate estimated at around 7.9%⁷. Therefore, as illustrated in Figure 3, revenues are expected to reach \$107 billion by 2015.

Figure 3: A promising global market for E-learning



Source: *Elearning industry*

Numerous reports have pointed out the positive impact of the next generation of teaching technologies based on E-learning platforms. For instance, blended learning (which entails a combination of online and face-to-face instruction) has proved to enhance the test scores of students. A recent report indicates that “84% of students surveyed responded that the ability to study both online and in class improves their understanding of course concepts”⁸.

The **MOOCs-making industry** is expanding at an exponential rate. The MOOC market is revolutionising the education sector. Unlike traditional training approaches, MOOCs are taking advantage of sophisticated learning technologies such as video-based learning content, collaborative learning methods, machine learning, instructional simulation and the gamification⁹ trend. The unique value provided by this new learning approach lies in the ability to teach customised content at a massive scale.

With more than 2 billion potential learners across the globe, including 70% of these unable to afford a college degree, the economic prospects of the MOOC market are far-reaching. As a result, the potential benefits expected from MOOCs are not only leading to a proliferation of courses but also to an explosion of the number of MOOC platform providers. As explained by the CEO of Unow, the market opportunity is colossal as building MOOCs can prove to be expensive and time-consuming. Therefore, a growing number of companies call upon the services of external MOOC providers to save time and resources.

Further, the MOOC certification market is maturing which contributes to add greater value to this new form of online education. The recent announcement of a partnership between LinkedIn and renowned MOOCs providers such as Coursera, EdX, lynda.com, Pearson, Skillsoft, Udacity and Udemy to create a “Direct to Profile Certifications” beta program on LinkedIn is a prime evidence of the mounting recognition of this new method of learning.

Industry-academia collaborations are experiencing a major renewal. These partnerships allow research centres to transform research findings into marketable products and services. Universities can ensure their offers are up-to-date, relevant and lead to results without unreasonable delay. This form of collaboration also contributes to increase the employability of new graduates participating in such projects as they are trained to respond to the needs of the industry. For companies, industry-academia interactions directly support the development of skills that will benefit their business in the future. As demonstrated with the example of MEKTORY, many universities as well as public and private research centres are already active in this space and increase the amount of collaborative projects with companies. Across Europe, there is an increasing appetite and enthusiasm for collaboration as the projects have proved to generate valuable intellectual property which supports innovation by all industrial partners.

3.2. The social potential of new demand driven skills

In today’s globalised world, it is a social and economic imperative for European industries to compete in the international race for talents. According to McKinsey, a potential global shortage of 38 to 40 million high-skilled workers is expected in 2020 (13% of the demand for such workers)¹⁰. As illustrated in Figure 4, at the moment the most difficult positions to fill at the global level are essentially comprised of occupations such as skilled trade workers, engineers and IT staff.

Figure 4: Top ten job shortage positions for 2014



Source: *ManpowerGroup's ninth annual Talent Shortage Survey*



“28% of employed engineering graduates across the EU are not working in the engineering profession” – European Engineering Report 2010¹¹

The European skills mismatch and the increased number of challenges faced by companies to find the right knowledgeable, skilled workers comes at an unprecedented price. According to Eurofound, the cost to the European Union of youth unemployment was estimated—in terms of both direct costs and lost output—at €153 billion in 2011 including the annual cost of the NEET (not in education, employment or training) population. Recruitment difficulties in Europe tend to be most apparent in industries such as construction, manufacturing or healthcare, which stand among the highest growth sectors across the EU¹². Adjusting the labour supply to the demand of workers is therefore crucial to strengthen the European industrial base.

In order to succeed in a highly competitive marketplace, firms across European leading industries such as advanced manufacturing, construction or the retail and distribution industries need to adopt more sophisticated approaches to skill development and talent recruitment. These three strategic industries provides the most striking evidence of the extent of the economic and social potential of new demand driven skills on European economies.

Increasing specialisation associated with **advanced manufacturing** is intensifying the need for highly skilled workers. The overall number of jobs in manufacturing requiring high level qualifications is expected to grow by 1.6 million (21%) by 2025¹³.

Rapid advances in the fields of nanotechnologies, materials science, electronics, ICT and biotechnology are likely to lead to new manufacturing methods which will require workers to develop skills that are primarily ICT-based in digital techniques; computing; analytical thinking; machine ergonomics; manufacturing design.

Europe is a world leader in advanced manufacturing. The global market is estimated to reach over €750 billion by 2015¹⁴ with a current European share of over 35% and a patent share of more than 50%¹⁵. As a result, the need to develop new-demand driven skills is critical to reap the massive benefits flowing from the advanced manufacturing industry and keep Europe's leading role especially as jobs in this capital-intensive industry are associated with high-value. Indeed, the growth in advanced manufacturing techniques stem from improved efficiency in the application of new technologies made possible by a highly-skilled workforce. In this regard, the quality of R&D personnel constitutes a key driver for innovation in the sector.

In the **construction sector**, a growth of 3.9% is expected between 2013 and 2025 across the EU in the level of employment¹⁶. Over 6 million job openings are forecast during the same period. However, the trend towards constructing 'green' and energy efficient buildings is leading to new skill requirements. It has been predicted that upgrading the energy efficiency of existing buildings could create about 280,000–450,000 new jobs for energy auditors, certifiers, inspectors of heating systems and renewable technology installers¹⁷. In this regard, a study carried out as part of the BUILD UP Skills European initiative, estimates that 'by 2020 more than 3 million workers in Europe will require training on energy efficiency or renewable energy sources'¹⁸.

Employment in **retail and distribution industries** is forecast to grow by 6.2% from 2013 to 2025, nearly double the rate for all sectors. Some 2 million new jobs are expected to be created, fairly evenly split between retail and distribution. Estimations report that 19% of retail and distribution jobs required a high-level qualification in 2013, this figure is predicated to rise to 26% by 2025¹⁹.

Companies in the retail and distribution sector are gradually increasing their need for a mix of advanced ICT expertise and effective communicators in order to succeed in a globalised and highly competitive marketplace. Further, steady growth in e-commerce has led to the apparition of new jobs in the sector such as e-merchandisers, IT developers, graphic designers, web analysts and technical project managers²⁰.

New approaches to training are considered as the key solution for companies to keep pace with the changing skills requirements across their value chain. As new business processes are introduced, the prospects for the creation of new strategies to adapt the workforce to the changing composition of skill demand increases. In this regard, the economic and social potential of the new demand driven skills is a fundamental driver of the uptake of the trend.

3.3. The impact of new demand driven skills on the value chain

New demand driven education models focusing on skills development are impacting every stages of the value chain of the firms and academic institutions they have been designed for.



At firm level, new demand-driven activities occur at the recruitment and the employee development process, two stages that are transversal to the value chain. As reflected in Figure 5, outcome-oriented training solutions to upskill the existing workforce and new recruitment systems developed to better screen new employees both serve the same ultimate purpose, which is to foster value creation.

Figure 5: Talent value chain at firm level



Source: Tata Strategic Management Group

On the one hand, the assessment of skills need and the identification of the talents with the right skillset to fill the skill gap is a significant driver of value creation thanks to productivity gains.

Further, in a competitive talent market, the definition of strategies to reallocate resources from less productive activities to more productive ones ensures a better use of the human capital. In this context, employees are assigned to services generating more value to the firm.

On the other hand, the integration of improved methods of trainings also has a positive impact on employees' performances, thereby generating more efficiency and productivity gains. The benefits arising from the new training offering also include value added through cost savings or enhanced service delivery and customer satisfaction which increases firms' overall competitiveness while creating new revenue streams.

Far beyond economic growth, the impact of new demand-driven training activities have widespread positive effects, in particular on employees' motivation and well-being. Notably, the American Research Institute has demonstrated that eLearning solutions could increase retention rates up to 60%²¹.

Human resources being essential at every stages of the business value chain, improved training activities and recruitment processes translate into productivity growth enabling firms to compete in an increasingly knowledge-based global economy.

At educational level, new outcome-based educative solutions have a positive impact on the value chain of education institutions. The introduction of pedagogical innovations and technology-rich online education models enable to better train students by focusing on skills in demand by the labour force which increases students' employability. Further, the focus on learning outcomes and the integration of new methods to increase learning experiences generate improved students' satisfaction which increases student retention rates. As such, new demand driven educational tools can substantially enhance an education institution's reputation and upgrade its scores in international education assessments which increase its overall competitiveness in the education market.

Moreover, new online outcome-based education platforms not only act as a driver of quality in the education sector but also enable academic institutions to reduce costs. As regards for-profit education institutions, online education platforms can be regarded as cost-effective solutions to boost revenue growth.

From a social standpoint, cost reductions resulting from the acquisition of online training solutions allow education institutions to widen their class offering. In this regard, education institutions are enabled to keep pace with the growing global demand for education. These innovative learning approaches can provide students - previously put away from the education system- with the skills required by the labour market which is a key step to reducing unemployment rates. Indeed, the cost reduction associated with the provision of education through online platforms sometimes translates into the reduction of tuition fees. As a consequence, online education resources can be used as a mean to democratise the access to education.

Another key added value of new demand driven education models is the facilitation of a continuous skills development. Skills can quickly depreciate and become obsolete due to the evolution of skill requirements. On the contrary, through online lifelong learning classes, individuals can retain their value by continuously maintaining and upgrading their skills throughout life. These technology-rich educative tools contribute to the empowerment of people so that they can collaborate, compete and connect in ways that drive economies forward²².



4. Drivers and obstacles

The explosion of the global demand for education constitutes the main driver of new skill-oriented education methods and training systems. Besides that, new technological advancements in training models (and the cost savings thereof) are completely reshaping conventional teaching-and-learning approaches while generating increased quality in the education sector. However, financial, academic and political obstacles are still hampering the uptake of these innovative solutions.

4.1. The exploding demand for education

In today's globalised world, the current **rise in demographic rates** in emerging countries coupled with the **ageing population** in western countries are affecting the education demand at the international level. In Europe, both traditional and continuing education enrolments levels are growing at a breakneck pace. Moreover, according to the most recent calculations more than 3 billion people in the world now have **access to the internet**, which equates to around 42% of the global population²³. In this regard, online outcome-based education has the potential for further educating millions of people who previously had no access to this calibre of teaching.

For instance, capacity development for internationalisation has become of the utmost importance for businesses to

“31% of EU employers rank foreign language skills in the top three most important skills” – Eurobarometer 2010²⁴

grow their markets. Foreign language skills are now increasingly important in helping individuals succeed in the job market and support the internationalisation of small- and medium-sized businesses. Firms are progressively more aware of the language barriers hampering their progress and have a better understanding of the competencies needed to overcome them. The success of online recruitment platforms supporting cross-border recruitments such as YouRock is a prime evidence of the moves of firms towards increased foreign language requirements.

4.2. The rise of cutting-edge digital learning technologies

Rapid technological advancements as well as social and economic changes have transformed the industry demand for skills. Drastic technological changes are thereby acting as a key driver for both the growth of the retraining demand and the development of innovative tools to keep pace with

the rising education demand. As a result, higher education institutions and businesses are leveraging on new technologies to create new training opportunities.

The example of TribaLearning is a prime evidence of the use of new technological advancements to open up new and improved learning opportunities through online education. Higher education institutions and firms no longer question the necessity of online education platforms but rather focus on improving online education experiences.

The education sector faces a period of transition introduced by the digital era. Online trainings have become mainstream and users of these interfaces are now expecting them to offer new ranges of services such as the use of videos, the availability in mobile devices, and the integration with social tools²⁵. The increasingly competitive higher education market drives academic institutions to develop new digital strategies to customise learning experiences and increase student learning outcomes.

As such, as expressed by all the showcased companies, education institutions and firms are now willing to draw on online education opportunities to enhance learning results of students and employees. They are increasingly making use of the services of companies offering tools to gather data to optimise their range of services and sharpen their competitive edge.

4.3. E-learning as a cost reduction strategy

Firms and education institutions strive to enhance their training methods and materials by aligning them to the industry demand while finding new windows of opportunity to reduce costs. General budget constraints are therefore leading firms and education players to turn to online learning technologies when looking for such solutions. These digitally-rich learning systems have proved to be cost-effective solutions enabling to increase and improve the range of trainings of firms or education institutions while decreasing their levels of investments.

In this regard, the shift towards online outcome-based education is opening doors for high returns on investments. MOOCs and other similar categories of web-based training solutions enable to train employees and students at a massive scale both in terms of quantity and geographical reach. As stressed by the CEO of Unow, the impact of the productivity and efficiency gains of these promising new models are reshaping the education sector.



4.4. High up-front costs

The cost of online learning solutions and their new ranges of customised service offering is one of the most controversial aspects of digital learning. It is widely known that online teaching and learning are cost-effective solutions compared to traditional education models. However, the heterogeneity of online learning solutions due to their varying levels of quality and efficiency makes it impossible to put a single price tag on online learning²⁶.

High fixed costs are a key barrier to firms and education institutions' investments in new forms of online learning platforms. These up-front costs usually include content development and acquisition as well as the purchase of hardware, software, storage and servers²⁷. The integration of an online learning platform also implies the cost of professional development for user support services and IT staff costs.

Taken altogether, the high unique start-up costs associated with online learning can put a strain on a firm's or an education institution's budget which are often already too tight.

4.5. Lack of MOOC recognition, certification and accreditation

The future prosperity of MOOCs is inextricably tied to accreditation and recognition. "MOOCs for ECTS credits²⁸" is a growing European concern among students and MOOC providers. According to Mattia Nelles, academic partnership manager at Iversity, the barriers to MOOC recognition include the lack of information about content providers, the lack of transparency as regards to institutional procedures, pedagogy and assessment, and the lack of trust in institutional quality of MOOCs.

Yet, the lack of recognition of MOOCs by employers due to persisting absence of accreditation and certification by universities is a serious blow to the further development of MOOCs.

In the USA, an ever-growing number of universities are already providing for-credit courses. In Europe, academia stakeholders could take advantage of the Bologna process to widen the accreditation of MOOCs if more partner universities of MOOCs platforms would agree to include MOOCs as part of their accredited programmes.

5. Policy recommendations

The uptake of new demand driven education models focusing on skills development is a critical step in addressing the European skills mismatch. The alignment of skill supply and demand is still a long-term process requiring multi-sectoral and participatory efforts. Therefore, strong political commitment is needed to tackle specific issues putting a strain on the further development of digital strategies responding to the educational crisis.

5.1. Introduce customised business support

One of the biggest hurdles for entrepreneurs in the education sector continues to be the lack of **customised assistance** in response to very specific business issues. Yet, a great number of start-up support providers are still delivering generic legal or financial business development support to tech entrepreneurs. According to YouRock, the most common sector-specific issues and concerns faced by tech entrepreneurs include:

- Intellectual Property (IP) and Trademarks,
- Terms of use & Privacy policy issues
- Data monetisation, data mining of learners
- Cloud data security and safety

Growth-oriented entrepreneurs do not necessarily have the funds to seek specialised counselling services. Tech entrepreneurs may need a patent attorney to deal with IP issues or to understand licensing process and requirements. They may also seek the capital and expertise that a venture capitalist can provide. When considering expanding their business presence at the international level, entrepreneurs may need one-on-one assistance in accessing export markets or in understanding legal provisions from local regulations and instructions.

International experience shows that business support agencies enhance the competitiveness of firms. It is essential for European local authorities to provide a **one-stop-shop** where SMEs can obtain a directory and hands-on support on specific issues faced by their company.

5.2. Foster Industry-academia collaborations

Higher education institutions, companies and public authorities must join efforts and work closely in the development of university-industry partnerships.

From the business standpoint, project managers must ensure the alignment of the collaboration with the firm's long term



research and development strategy. Such a strategic point of view guarantees the ability of the project to address the real needs of the company and its capability to have a positive impact on company products and processes.

From the university perspective, industry-academia collaborations are essential as they provide students with tangible hands-on experience. Students learn to solve practical business issues by carrying out tasks which apply a combination of essential skills highly demanded by the market. This latter point is illustrated by the MEKTORY program where the employment of young graduates participating in the collaborative projects with companies has increased.

“EU structural funds should be used to finance structural changes (infrastructure, access to education and research results, etc) rather than to replace national public funds” – MEKTORY

Public authorities also have a key role to play in order to support the development of industry-academia collaborations. National and regional public institutions can encourage the creation of such programs as a majority of SMEs and HR leaders see talent as a major challenge to growth. The replication of programs supporting closer collaboration between businesses and universities is a key necessity to ensure that education better matches market needs.

5.3. Favour the accreditation of MOOCs

As with any effort at change in the higher education sector, the development of MOOCs has been punctuated by interrogations about their quality. Yet, greater institutional awareness on the future of digital has led to the rapid integration of MOOCs by most of the highly prestigious universities around the world.

These institutions allow millions of students to interact with internationally renowned professors from elite universities. In this regard, MOOCs constitute a form of “direct-to-students” education unlocking a myriad of new opportunities to shape one’s own and unique learning pathway.

The further development of blended learning (the combination of face-to-face and online learning) is a first step to higher recognition of MOOCs by both education institutions and employers. Universities benefit from multiple options to include MOOCs as part of their accredited programs. MOOCs can form part of a **structured degree program** as a **replacement course**, an **integrated course**, a **background course** or as **enrichment** to the course. Students can receive an acknowledgment of their achievement by earning a **certificate** or a **“MOOC badge”** which guarantees mastery of knowledge.

As these certifications are also taken into account for professional education credits, MOOCs represent a cost-

effective enabler of lifelong learning. However, the accreditation and higher recognition of MOOCs is linked to the ability of MOOCs provider to **improve exam proctoring and verification**, to ensure more **transparency** on their internal procedures as well as on learning outcomes.

As declared by Neelie Kroes, the former EU Commissioner for the Digital Agenda, “MOOCs are likely to become the first choice in delivering web skills to European learners”. Accordingly, policy-makers need to increase academic acceptance of MOOCs by taking concrete measures to widen their use. For instance, national public awareness campaigns can be launched to inform on the existence of MOOCs. National governments can also provide financial incentives for the integration of MOOCs as part of the accredited programs of universities in order to reduce the induced costs. In addition, national Ministries of education must ensure that MOOCs deliver the highest possible quality of education and training. A possible way forward could be the creation of **European standards** (based on quality indicators) for the accreditation of MOOCs by European universities.

5.4. Lead to renewed political impetus to generate more young people and female STEM talents

Public authorities, academia experts and firms must provide a collaborative response and build together a coherent system level approach to address the STEM skills shortage.

At the advent of the digital age, the ubiquitous presence of information technologies have made it critical for the workforce of tomorrow to start developing technological literacy at an early age. Multiple studies have demonstrated that skills gaps are often initiated at a very early stage in life.

Therefore, young students unable to attain foundational skills at the right time (more particularly in the ICT sector) carry a deficit that later becomes harder to surmount. The implementation of the following set of measures will enable European economies to enhance STEM education in early childhood programs:

- Introduce digital learning resources such as classroom technologies
- Ensure schools access to broadband infrastructure
- Highlight the careers potential arising from a STEM education
- Align education programmes to changing skill needs of firms at every stage of the curriculum
- Provide enough ICT personnel expertise.



Further, increasing the participation of women in the STEM field is an effective solution to alleviate the growing labour shortage in STEM-intensive industries. For instance, in the ICT sector (a subset of the STEM field), the European Commission estimates to 900 000 the number of unfilled jobs in the EU by 2020²⁹. However, only 30% of the 7 million people working in the ICT sector are women³⁰. In 2013, a study on women active in the ICT sector estimated that an increase of women in the digital jobs market could create an annual €9 billion GDP boost in the EU area³¹. Yet, the share of ICT female graduates remains at low level “only 29 out of every 1000 female graduates have a computing or related degree, including only 4 in ICT-related activities³²”.

From a policy point of view, more collaboration between schools and STEM companies could be envisioned to inspire more young women into the STEM field. In addition, public authorities could **incentivise more industry-led programs** designed to engage and empower more female entrepreneurs especially in the STEM field.

Awareness-raising campaigns on STEM-related careers can also be considered as they are recognised as efficient and effective means of communicating information to promote vocations. Moreover, if replicated across all EU countries, initiatives such as the STEMettes in the UK, Womentor in Sweden, and Girls in Tech in France, Italy, Luxembourg, Romania, the UK and the Netherlands would have a higher impact.

5.5. Incentivise lifelong learning programmes

European companies need to be responsive to the changing skillset required by the market and the shifting needs of the workforce. According to a recent survey, “Millennials are inclined to want and expect the freedom to move from one career path to another³³”. This new generation of workers seems to be following non-traditional career models where opportunities for trainings and mobility have gained an increased importance.

Policy makers should **increase investments in training programs** designed to upskill and retrain workers made redundant or negatively affected by disruptive technology such as automation processes. The creation of “**training vouchers**” or “**individual learning accounts**” transferable from one employer to another are effective means to achieve this goal. In addition, public authorities could also provide financial incentives to companies willing to acquire new recruitment tools or improved training solutions. For instance, the design of incentives enabling the share of the costs of trainings should be considered. At the regional (or national) level, a possible option could be the implementation of a **collective training fund** paid by all employers and awarding training grants on the basis of defined criteria. At last, the establishment of institutional bodies such as **sector skill councils** or **network of employers** could serve to encourage employers to invest in lifelong and on-the-job trainings.

5.6. Support European labour mobility

Policy could ensure a better alignment of demand and skills requirements while getting more people into work by fostering greater labour mobility. For instance, across Europe employer language deficits can be offset through migration and international recruitment³⁴.

The example of YouRock serves to demonstrate how employers are increasingly calling for tech-rich solutions to facilitate cross-border recruitments. In cases of persistent vacancies and skills mismatches, policy makers need to **make the most of the single market** by setting out new approaches to increase labour mobility. For instance, national, regional and local governments as well as unemployment agencies should raise awareness and encourage the use of **EURES**, the European job mobility portal. At EU level, policy-makers should tackle the barriers to European labour mobility by taking concrete measures to harmonise social insurance systems (pension and unemployment compensation systems). European leaders also need to accelerate the recognition of professional qualifications in the EU.



6. Appendix

6.1. Interviews

Company	Interviewee	Position
Tribal learning	Vesa Perälä	Founder and CEO
YouRock	Ian Clifford	Founder and CEO
STEMettes	Anne-Marie Imafidon	Founder and head of STEMettes
Unow	Jeremie Sicsic	Co-Founder
School 42	Nicolas Sadirac	Co-Founder and General Manager
MEKTORY	Heidi Pihlak	Project Manager

6.2. Websites

Tribal learning	http://www.tribalearning.com/
YouRock	http://yourock.jobs/en/
STEMettes	http://stemettes.org/
Unow	http://www.unow.fr/
School 42	http://www.42.fr/
MEKTORY	http://www.mektory.eu/

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²⁷ Creating Sound Policy for Digital Learning, *The Costs of Online Learning*, Tamara Butler Battaglino, Matt Haldeman, and Eleanor Laurans

²⁸ ECTS is the acronym for the "European Credit Transfer and Accumulation System"

²⁹ European Commission (2014), E-skills for jobs in Europe: measuring progress and moving ahead

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³² European Commission (2012), Women active in the ICT sector

³³ Harvard Business Review, *The U.S. Chairman of PwC on Keeping Millennials Engaged*, November 2014, available at : <https://hbr.org/2014/11/the-us-chairman-of-pwc-on-keeping-millennials-engaged>

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