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The thematic perspectives series complements the general information on vocational education and training (VET) systems provided in 'VET in Europe' reports. The themes presented in the series feature high on the European agenda.

Thematic perspectives provide national overviews of specific themes in a common format and offer comparative dimension across the EU Member States, Iceland and Norway. They are available at:
http://www.cedefop.europa.eu/en/events-and-projects/networks/refernet/thematic-perspectives

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Table of contents

Policy strategies, initiatives and practices to prepare VET systems for digitisation and future of work technologies [1]

Vocational education and training is not only about what you are doing **now**... it's about your **future!**

@Aline Rollin

[1] Advisory Committee on Vocational Training, 2018. *Opinion on The Future of Vocational Education and training Post 2020*. European Commission, p. 3.
https://ec.europa.eu/social/BlobServlet?docId=20479&langId=en

1. Introduction

The European Union (EU) Advisory Committee on Vocational Training (ACVT) ([2]), in the introduction to its opinion on the future of vocational education and training (VET) post 2020, addressed to the European Commission ([3]), puts emphasis on the importance of investing in people. VET has a key role in providing people with the initial skills and qualifications to enter the labour market and supporting their upskilling and reskilling in a lifelong perspective to enable them to successfully manage career transitions.

Making the European Union competitive, cohesive and resilient in the future means investing in people: in their education and training, their skills, their creativity, and their capacity to innovate. The world of work is evolving at a brisk pace. Changing and increasing skills demands, coupled with economic, demographic and technological developments are posing considerable challenges as well as providing opportunities for innovative responses from VET systems.

Structural changes induced by rapid technological developments such as digitalisation, automation, robotics or artificial intelligence, and evolving consumer demands will continue to speed up the process of new jobs being created and others changing or even disappearing as well as trigger dynamic changes in skills requirements.

According to the Digital Transformation Scoreboard 2017([4]), Malta shows a rather positive level of digital transforamtion in the majpority of dimensions and is a strong performer in digital infrastructure, e-leadership and ICT start-ups. Malta shows a higher performance than its EU partners in three fields while the other two are broadly in line with the EU average.The major challenges are in the entrepreneurial cultrue at the national and European level, and the skills shortage of workers.

This article aims to examine the relevant policies and actions in Malta focused on how VET systems are, or intend to, prepare students for the future skills demands and labour market realities implied by industry.4.0 technologies ([5]). In addition, the article points out and reflects upon new forms of student learning that aim to improve the digital literacy of students and their ability to cope with i.4.0 technologies.

([2]) The Advisory Committee on Vocational Training, established by the Council Decision 63/266/EEC, has the task of assisting the Commission in implementing a Community vocational training policy.

([3]) Advisory Committee on Vocational Training (2018*). Opinion on the Furure of Vocational Education and Training post 2020*.   Available at: https://ec.europa.eu/social/BlobServlet?docId=20479&langId=en

([4]) European Union, 2017. *Digital Transformation Scoreboard 2017: Evidence of positive outcomes and current opportunities for EU businesses*.

([5]) Industry 4.0 (i.4.0) is a name given to the current trend of automation and data exchange in manufacturing technologies, the so-called 4th industrial revolution. It includes cyber-physical systems, the Internet of things, platform economy, cloud computing and cognitive computing.

2. Malta's National Reform Programme ([6])

2.2 Research and Innovation

According to Malta's National Reform Programme, in 2013 Malta's national gross domestic expenditure on research and development (GERD) target envisaged within the Europe 2020 Strategy was revised from 0.67 percent to 2.0 per cent of GDP by 2020 ([7]). Provisional figures by Eurostat indicate that Malta recorded a provisional GERD of 0.61 per cent of GDP during 2016 ([8]). Through the Horizon 2020 (H2020) Unit, MCST assists and supports local researchers from both public and private entities by giving specialised advice and guidance about Horizon 2020 programme ([9]).

In June 2014, the Malta Council for Science and Technology launched the National Research and Innovation (R&I) Strategy 2020 ([10]), which set out Malta's strategy for the forthcoming seven-year period. A conscious decision was made to separate the strategic vision from the rolling R&I Action Plan, which aims to implement the action lines identified in the Strategy. The Action Plan is a living document and is updated regularly according to the outcomes of the monitoring and evaluation process. Making use of structural funds and co-financing mechanisms, the Action Plan sets out a number of initiatives that stimulate the ambitious growth in the R&I sector. The strategy builds upon the previous strategic plan, introducing a number of new elements whilst retaining the same underpinning vision. The National R&I Strategy also incorporates the Smart Specialisation Strategy which has identified seven main areas of specialisation, together with ICT, both as a horizontal enabler as well as being a specialisation niche in itself. The thematic areas selected through the smart specialization also address indirectly some Horizon 2020 societal challenges. For instance, all thematic areas tackle the creation of job and the improvement of the quality of life of the citizens. Other areas have respective specific focuses: health with a focus on healthy living and active aging, e-health tackles challenges within this sector, while

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([6]) Ministry for Finance, 2018. *Malta: National Reform Programme*. Pp. 21-42. Department of Information, Valletta. Available at:
https://mfin.gov.mt/en/Library/Documents/NRP/NRP%202018.pdf or http://www.fi nance.gov.mt

([7]) Ibid. p34.

([8]) Available at: https://ec.europa.eu/eurostat/statistics-explained/images/4/4e/Gross_domestic_expenditure_on_R_%26_D%2C_2006_and_2016_%28%25%2C_relative_to_GDP%29_FP18.png

([9]) Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market. More information available at: https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

([10]) The Malta Council for Science and Technology, 2014. *National Research and Innovation (R&I) Strategy 2020*. Ministry for Education and Employment, Floriana. Available at:
http://mcst.gov.mt/wp-content/uploads/2017/02/National-RI-Strategy-2020-June-2014.pdf

resource-efficient buildings address indirectly the environment. The target expenditure on research and development as a percentage of GDP tripled from the previous figure of 0.67% to 2.0%.

In 2013 the Centre for Entrepreneurship and Business Incubation (CEBI) ([11]) was set up with the aim of strengthening the concept of entrepreneurship at the University of Malta. By the end of 2017, 100 students had obtained a Masters qualification in the Entrepreneurship programme, with a high number of students proceeding in setting up their own business ventures. Moreover, the *TAKEOFF* incubator based within the CEBI at the University of Malta is Malta's leading technology business incubator specifically designed to help incubatees create successful *STEAM* (science, technology, engineering, arts and media), knowledge-based, start-up enterprises. TAKEOFF provides a broad range of services across the business community and does not only focus simply on 'start-up' but also on sustainability and success of the enterprises.

The Malta College of Arts, Science and Technology (MCAST) ([12]), as the main higher vocational education institution, aims to build solid grounds in Research and Innovation. Thus, MCAST introduced a Research Framework and set up a Research Committee with the aim to improve the level of teaching through relevant research and to create a dynamic environment that encourages an active knowledge transfer between academics and students.

The Malta Information Technology Agency (MITA) Innovation Hub, which was set up in 2014, is acting as a hub to synergise the efforts of various parties aimed towards ICT-themed research and technological development, idea-generation, incubation and open-innovation.   It aims at stimulating digital entrepreneurship whilst also serving as a showcase for locally nurtured innovations and locally developed ICT products and services. In early 2017 the MITA Innovation Hub launched the first accelerator programme branded *YouStartIT* ([13]) to fund and support up to 45 start-ups during the period 2016 to 2020 with the aim to provide seed investment to partly fund the best start-ups.

2.2   eSkills

Malta's National Reform Programme states that addressing skills gaps is a priority for government. During 2014, the eSkills Malta Foundation [14] was set up as a multi-stakeholder initiative that recognises synergy of action between Government, education and industry, focusing on enhancing the ICT skills that are fundamental for Malta to sustain a Digital

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([11])   More information available at: https://www.um.edu.mt/cebi/aboutcebi

([12])   Further information on MCAST is available on: https://www.mcast.edu.mt/

([13]) More information available at: https://www.mita.gov.mt/en/ict-features/Pages/2019/The-YouStartIT-accelerator-in-context.aspx

([14])   More information on the eSkills Malta Foundation available at:https://eskills.org.mt/en/Pages/Home.aspx

Economy. The Foundation follows and participates in various EU-led policies, guidelines and initiatives. In this respect, it is the recognised national contact point in Malta for the Digital Skills and Jobs Coalition. Broadly speaking, National Coalitions for Digital Skills and Jobs bring together digital skills actors in EU Member States who work together to improve digital skills at national, regional and local level.

One of the Foundation's constant challenges is the energising of the digital economy sectoral skills in such a competitive environment. With this in mind, in 2018 the Foundation embarked on the following initiatives.

— *Digital Opportunity Traineeships opportunity*

On Tuesday 17th April 2018, the eSkills Malta Foundation in association with European Union Programmes Agency (EUPA) and with the participation of All DIGITAL ([15]) hosted the launch in Malta of the *Digital Opportunity Scheme for Traineeships.* This scheme is an EU-funded (Erasmus) training initiative to help companies fill digital roles with prospective digitally competent candidates and, at the same time, the student gets practical experience in the workplace.

— *Launch of the 'Guidelines to Increase and Retain Women in ICT'*

On Wednesday 11th April 2018 the Foundation launched the *Guidelines to Increase and Retain Women in ICT* to address the issue of the low percentage of women in the ICT sector.

— *Training of Careers and Guidance teachers*

During 2018 the Foundation continued on its pledge to train 60 career and guidance teachers on an annual basis to raise awareness and knowledge on ICT careers within the career guidance community. The Foundation recognises the importance of reaching out to career and guidance teachers who are key influencers in study choices and career aspiration, and so works hand in hand with the National School Support Services within the Ministry for Education and Employment.

— *Two Day Training on the European e-Competency Framework*

The Foundation identified the European eCompetence Framework (eCF) as an important tool for the development of the local ICT industry and community of ICT practitioners. On the 28th and 29th March 2018 eSkills Malta Foundation, in collaboration with the Council of European Professional Informatics Societies (CEPIS), organised, facilitated and funded a two-day eCompetency Training course. Malta was the first country to receive such practical training by CEPIS. The course

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([15]) All Digital, previously known as Telecentre Europe, is a leading pan-European association based in Brussels representing member organisations across Europe that work with 25,000 digital competence centres. All Digital supports Europeans that have an insufficient level of digital skills so as to be included in today's society. More information available at: https://all-digital.org/about-us/

attracted participants from the public and private Sector, as well from the education sector.

— *Education*

In line with its statutory purpose, one of the Foundation's activities is increasing awareness amongst students on career opportunities and competences. In collaboration with the National School Support Services Department, the Foundation facilitated school visits to Year 9 (age 14-year old) students who had already chosen computing as an optional subject. These visits help students to understand better the use of ICT, the various employment opportunities and the respective knowledge and skills requirements. The visits also serve to encourage the students to pursue ICT studies at further and higher education. With this in mind, the Foundation were also present during various Career Fairs and Expos held during 2018.

— *Participation in the EU Code Week 2018 reached new records*

EU Code Week 2018 has proven to be the most successful to date (since 2015). Of the 41,000 EU Code Week activities organised this year, more than 36,000, or 88%, were carried out in schools. This means that over 10% of schools in the EU and Western Balkans participated in EU Code Week this year, as targeted by the European Commission for 2018. Malta was one of the few countries that reached and superseded this target with the involvement of approximately 6,000 teachers and 28,300 students. This means that 82% of all Maltese schools participated with over 190 coding events that placed Malta at the top of the map with the most number of events per capita.

— *Cyber Security*

The eSkills Malta Foundation, in collaboration with the Malta Information Technology Agency (MITA), PwC Malta, University of Malta, and SECFORCE [16], organised an event on Cyber Security on two half-days. Cybersecurity has become one of the prominent subjects in this technology era and this is bound to become more important as Malta increases its activities in the areas of Artificial Intelligence (AI), machine learning, the Blockchain and Distributed Ledger Technology (DLT), Internet of Things (IoT), Quantum Computing and other prominent technologies. Cybersecurity affects everyone, from techies to the citizen.

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[16] **SECFORCE** is a world leading information security consultancy specialising in bespoke penetration testing and red team engagements. More information is available at: https://www.secforce.com/

3. Digital Malta: National Digital Strategy 2014-2020 ([17])

The Digital Agenda for Europe represents the EU's objective leading towards the maximisation of the social and economic potential of ICT through high-speed internet and interoperable applications. At this stage, Malta has managed to secure EU funds for a feasibility study on the possibility of a connecting submarine cable to mainland Europe. Malta has also secured further funding through the Connecting Europe Facility (CEF) for the BeSmartOnline4 Project ([18]).

Launched in 2014, the Digital Malta Strategy outlines the Maltese government's vision to transform the country into one that will prosper as a digitally enabled nation in all sectors of society. This strategy, branded as *Digital Malta*, sets out what the Maltese should be doing in the next few years and how everyone can learn, broaden their skills and make good use of technology. It is also flexible in that it recognises how fast technology changes and puts us on alert for future developments. Contemporary living means an online world of email, social media and the web. Government has been increasingly putting its services online and most businesses are now powered by technology. Technology matters to us all and that is why the Digital Malta Strategy is the way forward for the Maltese.

The National Digital Strategy outlines three strategic themes – Digital Citizen, Digital Business and Digital Government. Three strategic enablers support these themes: Regulation and Legislation, Infrastructure and Human Capital. The strategy puts forward also a suite of guiding principles and actions for ICT that are important for socio-economic development. It sets out how ICT can make a difference in areas such as the economy, employment, industry and small businesses, and how it can be used to empower citizens and transform government. It encourages the Maltese to realise how ICT can provide a better quality of life for them through better education, stronger businesses, efficient Government, sustainable economic growth and much more. The strategy states that the benefits of this nation's knowledge society are to be enjoyed by every citizen irrespective of age, gender, sexual orientation, disability, education, economic means or race.

([17]) Government of Malta, 2014. *Digital Malta: National Digital Strategy 2014-20.*
Available at: http://www.mitla.org.mt/wp-content/uploads/2014/07/Digital-Malta-Vision.pdf

([18]) Ministry for Finance, 2018. *Malta: National Reform Programme*, pp. 21-42. Department of Information, Valletta.

The strategy outlines the actions to be taken to enhance digital literacy and social equality, increase access for all and stimulate local content.

On the launch of the strategy, Mr. Robert Madelin, Director General of the DG for Communications Networks, Content and Technology at the European Commission had commented that the way in which Digital Malta as a vision had been created was exemplary: "*Digital Malta was a great initiative at exactly the right time. Setting a multi-annual strategy in place to build IT opportunities for the country, the people and the economy is what Europe 2020 vision is all about and what the Digital Agenda for Europe has been developing since 2010. Malta is extremely well placed not only to be an ICT hub within the European Union but also to be a frontier post for ICT engagement with Africa and a staging post for ICT connectivity across the Mediterranean - east west as well as north south.*" Mr. Madelin had also pledged the European Commission's support to Malta in fulfilling the benefits that Digital Malta could bring about ([19]).

To date, Malta has already achieved the first two targets of the Digital Agenda for Europe related to broadband (100 per cent basic coverage by 2013 and 30Mbps broadband coverage by 2020).

([19]) News article available at:
https://economy.gov.mt/en/press-release/documents/press%20releases/dm_1.pdf

4. VET 4.0 Initiatives

4.1 In Compulsory education

Computer based approaches to teaching and learning have been a feature of curriculum development for the past thirty years. In compulsory education, the current learning provision for digital literacy in schools is as follows:

— ICT features as a core subject in lower and upper secondary (ages 12-13 & 14-16 respectively);
— Computing is offered as an elective subject at upper secondary (ages 14-16);
— Digital Literacy - in lower and upper secondary - is integrated in the learning outcomes of other subjects/learning areas, namely Mathematics, Science, Design & Technology, and Personal, Social & Career Education;
— Digital Literacy is a cross-curricular theme in all subjects in the Primary, lower and upper secondary schools.

As from the current scholastic year, Malta has started to change the content of the ICT syllabus in secondary schools to a national curriculum entitled ICT C3 [20]. The change is being introduced as part of the implementation of the *Learning Outcomes Framework* [21] and in congruence with the *National Curriculum Framework for All* [22] and the *Framework for the Education Strategy for Malta 2014-2024: sustaining foundations, creating alternatives, increasing employability* [23].

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[20] The syllabus of the new subject ICT C3 for year 7 students (12 years of age) is available at:
https://curriculum.gov.mt/en/syllabi as from sept 2018/Documents/Year 07/ICT Yr07 Syllabus Sept 2018.pdf

[21] MEDE, 2014. *Learning Outcomes Framework*. Floriana, Malta: Ministry for Education and Employment. Available at https://curriculum.gov.mt/en/Resources/LOF_Project/Pages/default.aspx and https://curriculum.gov.mt/en/Resources/LOF_Project/Pages/default.aspx

[22] MEDE, 2012. *A national curriculum framework for all.* Floriana, Malta: Ministry for Education and Employment. Available at:
https://education.gov.mt/en/Documents/A%20National%20Curriculum%20Framework%20for%20All%20-%202012.pdf

[23] MEDE, 2014. *Framework for the education strategy for Malta 2014-2024: sustaining foundations, creating alternatives, increasing employability*. Floriana, Malta: Ministry for Education and Employment. Available at: https://ec.europa.eu/epale/sites/epale/files/booklet_esm_2014-2024_eng_19-02.pdf and https://education.gov.mt/en/resources/documents/policy%20documents%202014/booklet%20esm%202014-2024%20eng%2019-02.pdf

The pedagogical goal is to create an ICT strategy to ensure that all students:

— can understand and apply the fundamental principles and concepts of computational thinking, including abstraction, logic, algorithms and sequencing;
— can analyse problems in computational terms, and have repeated practical experience of writing solutions using computing applications to solve such problems;
— can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems and self-learning;
— are safe, responsible, competent, confident and creative users of information technology.

The introduction of this new ICT programme is being implemented in conjunction with other initiatives being taken by stakeholders in the area of education, such as Coding Clubs being organized in schools with the support of the Malta Communications Authority and a Robotics programme being set up in selected schools by a private company.

At upper secondary – the last three years of compulsory education – Computing ([24]) is offered as an elective subject. The Subject Learning Outcomes (SLOs) for Computing span from Attainment Level 8 to Attainment Level 10. These SLOs derive from the following subject themes:

— Introduction to computer systems
— Principles of computing, software and hardware
— Understanding the digital world
— Machine logic
— Practical problem solving, structure diagrams, algorithms, flowcharts, pseudocode and programming concepts
— Communication networks and internet technologies
— Databases
— Robotics and automation
— Ethical hacking and security

The Subject Learning Outcomes are written in a way that enables educators to adopt learning to learn strategies. Educators should regularly consider the opportunities presented by the SLOs to develop active learning throughout the levels in the Learning Outcomes Framework.

With the new curricula, many teachers have to face a new challenge that their initial teacher training did not prepare them for. It follows that a special focus on training and supporting teachers is necessary to change the educators' mindsets. Digital education is

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([24]) The syllabus of the Computing Subject is available at:
http://www.schoolslearningoutcomes.edu.mt/files/documents/Computing.144889249296.pdf

about technology-use to enhance teaching and learning.[25] Digital literacy should not be perceived as another add on, another syllabus, but as a cross curricular theme that should be owned by each educator rather than the realm of a particular area. It is a paradigm shift that brings to mind Moore's chasm theory [26].

So, how can educators be supported to make this leap? Given that teachers take on change mainly when given in-class support, the Directorate assigns digital literacy mentoring staff to provide in-class support to upskill teachers' digital proficiency and education in order to become competent in the use of technology as a fascinating pedagogical tool.

Lecturing staff from the Department of Artificial Intelligence within the Faculty of IOCT at the University of Malta are holding school visits to meet Year 8 (age 12), Year 11 (age 16, last year of compulsory education), and students in further education as part of their STEM popularisation outreach focusing on artificial intelligence (AI). AI is the technology of the future being driven by multinationals such as Google, Facebook and Microsoft. The themes covered include Robotics, Game AI and Virtual Reality as these innovative areas provide new career aspirations and opportunities for students [27].

4.2 In Further and Higher Education: MCAST

As the main state provider of further and higher VET, the Malta College of Arts, Science and Technology (MCAST) is committed to address challenges being presented by developments in technology and to promote excellence in the provision of innovative technical and tertiary vocational education. So, in January 2019, MCAST started offering a master's degree in vocational education applied research 4.0 (MVEAR4.0) to address the challenges posed by industry 4.0. Using a blended learning and interactive pedagogical approach to provide access to also to mature learners with work and family commitments, MCAST has spread the 120 ECTS degree over three years, offering three exit points: a post-graduate certificate after the first 45 ECTS, a post-graduate diploma after 90 ECTS, and a master's degree on completion of 90 ECTS and a 30 ECTS dissertation.

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[25] All teaching staff – from kinder to secondary – has been given a laptop as a pedagogical resource to work with since 2010. All classrooms in state and non-state schools are manned with an interactive whiteboard (currently being replaced with digital ones) with a projector and a three-in-one desktop computer attached to it.

[26] **Geoffrey Moore** (born 1946) is an American organizational theorist, management consultant and author, known for his work *Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Customers*. Crossing the Chasm is closely related to the technology adoption life cycle where five main segments are recognized: innovators, early adopters, early majority, late majority and laggards. The most difficult step is making the transition between early adopters and majority. This is the chasm that he refers to. The correlation here is with the introduction of the new and the management of change.

[27] Ministry for Education and Employment, 2018. *Circular DLAP 352/2018*: *School Presentation about Artificial Intelligence.* Floriana, Malta: Directorate for Learning and Assessment Programmes, Department for Curriculum, Lifelong Learning and Employability. Available at: https://curriculum.gov.mt/en/Resources/DLAP_Circulars/Documents/DLAP%20Circulars%202018/DLAP%20352%20-%20School%20Presentation%20about%20Artificial%20Intelligence.pdf

4.3 In Further and Higher Education: The Institute for Tourism Studies (ITS) ([28])

A survey undertaken by YouGov on behalf of Mazars on the impact of artificial intelligence and the internet of things on the hospitality industry reckons that this is an exciting time to be in the hospitality industry where technology-led innovation is beginning to revolutionise the guest experience ([29]). It states that how the industry reacts to this change is vital to the continued success of the wider travel and tourism sector that now accounts for 10.5% of global GDP ([30]).

In Malta, the total contribution of Travel & Tourism to GDP was 27.1% of GDP in 2017, and was forecasted to rise by 2.7% in 2018, and to rise by 4.2% pa to 32.9% of GDP in 2028 ([31]).

Following considerable investment in teacher and student workstations over the past few years, the Institute of Tourism Studies has now embarked upon increasing the awareness and application of information and communications technologies as educational tools.

The Institute for Tourism Studies is preparing the students for this technological innovative scenario through its Centre for e-Learning Technologies (CELT) that aims to:

— create and maintain a centre for e-learning and computer based learning with special emphasis on their use in the Tourism Industry;
— develop courseware and software systems to support teaching and learning;
— carry out research into e-learning and computer based learning techniques;
— teach and promote the use of e-learning and computer based learning;
— promote the creation of the information society.

CELT hosts a video-editing and compositing lab fully equipped for the production of live and animated features ([32]). CELT's research and development interests are varied and include distance learning, interface design, cultural adaptation and multimedia.

([28]) The Institute of Tourism Studies (ITS) is a state-funded institution of higher education aimed at meeting the changing needs of the Travel, Hospitality and Tourism Industry. It was established in 1987 and consolidated by the Institute of Tourism Studies Act (2016) of the Laws of Malta. Its main responsibility is to provide the Tourism Sector with professional personnel who are able to guarantee an excellent standard of products and services within the Hospitality Industry. More information is available at: https://its.edu.mt/abouts-us-its.html

([29]) Mazars, 2018. *Artificial Intelligence: A Game Changer in the Hospitality Industry*. Available at: https://www.mazars.com/content/download/945401/49211039/version//file/Mazars_2018_AI_in_Hospitality_Study.pdf

([30]) World Travel Tourism Council: *Travel & Tourism Economic Impact 2018 World*. Available at: https://www.wttc.org/-/media/files/reports/ economic-impact-research/regions-2018/world2018.pdf

([31]) World Travel and Tourism Council, (2018). *Travel and Tourism: Economic Impact 2018 Malta, p.1*. London, UK. Available at: https://www.wttc.org/-/media/files/reports/economic-impact-research/countries-2018/malta2018.pdf

([32]) ITS has also a Virtual Learning Environment at http://its-elearning.com/?redirect=0 and accessible at: http://its-elearning.com/login/index.php

The ITS eLearning site, ITSELNET, was developed as part of the MEDFORIST Project funded by the European Commission under the EUMEDIS Initiative. The objective of the Project is to build a Mediterranean network of teachers in the field of Information and Communications Technologies (ICTs) applied to trade and industry. Through this site the Institute of Tourism Studies provides on-line learning opportunities for its students, and will eventually include opportunities for external students and on-line workers in the hospitality industry [33].

4.4 In Further and Higher Education: The University of Malta

In 2007, the University of Malta, set up the Faculty of Information and Communication Technology with five departments responsible for the areas of Informatics, Computer Science, Artificial Intelligence, Communications and Computer Engineering and of Microelectronics and Nano electronics. As from October 2012, the Faculty of Information and Communication Technology introduced the following five 3-year B.Sc. (Hons) and B.Sc. IT (Hons) Degree courses on a full-time basis managed by its five departments:

— Bachelor of Science (Honours) (Computer Engineering)
— Bachelor of Science (Honours) (Computing Science)
— Bachelor of Science in Information Technology (Honours) (Artificial Intelligence)
— Bachelor of Science in Information Technology (Honours) (Computing and Business)
   - Business or Finance or Marketing Stream
— Bachelor of Science in Information Technology (Honours) (Software Development)

The Faculty offers also a suite of master degrees with the intent to produce graduates who are fit to occupy responsible positions in the today's Information and Communication Technology industry according to the area within ICT that they choose to focus upon. They aim also to address current and future industry demands and niches by allowing the possibility of internships with industry partners as part of applied projects and/or the final project.

— Master of Science in Computer Science (by Research) - Full-time or Part-time;
— Master of Science in Artificial Intelligence (by Research) - Full-time or Part-time;
— Master of Science in Computer Information Systems (by Research) - Full-time or Part-time;
— Master of Science in Communications and Computer Engineering (by Research) - Full-time or Part-time;
— Master of Science in Microelectronics and Nano electronics (by Research) - Full-time or Part-time.

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[33] This information is available at: https://its.edu.mt/industry-research/e-learning.html

Moreover, in October 2019, the Centre for Distributed Ledger Technologies (DTL) ([34]) within the University of Malta will be starting the following suite of four multi-disciplinary Masters (full and part-time) in Blockchain and Distributed Ledger Technologies (DTL):

— Master of Science in Blockchain Technology and Distributed Ledger Technologies;
— Master of Science in Blockchain Technology and Distributed Ledger Technologies (Business and Finance);
— Master of Science in Blockchain Technology and Distributed Ledger Technologies (Law and Regulation);
— Master of Science in Blockchain Technology and Distributed Ledger Technologies (Information and Communication Technology).

These post-graduate degrees aim to attract students having an undergraduate first degree in ICT, Business or Law. The programme provides an introduction to the various Blockchain and Distributed Ledger Technology (DLT) disciplines to all students coming from the different streams and offers advanced units to students within their specific stream.

([34]) More information is available at:
https://www.um.edu.mt/dlt/masters and
https://www.um.edu.mt/courses/search?level=Postgraduate&entity=dlt

5. Malta's vision as a hub of digital innovation and invention

In his intervention during the Malta Innovative Summit held in Ocotober 2018 ([35]), the Prime Minister of Malta, Joseph Muscat, underscored Malts's vision to become a blockchain hub and its drive to enter the artifical intelligence sector as it seeks to be at the forefront of regualting for innovation. In July 2018 Malta became the first jurisdiction in the world to provide a comprehensive legislative framework to have laws that cover the treatment of cryptocurrencies,the launch of the initial coin offerings (ICOs) and subsequent treatment of virtual assets once these are placed on an exchange. Malta's efforts are particularly commendable due to the fact that it created a framework which is fully compliant with its obligations as an EU member state as it ensured that the assets that would be considered as financia instruments or electronic, and which should be regulated under the Markets in Financial Instruments Directive 2004/39/EC and the Electronic Money Institutions Directive 2009/110/EC respectively would still be captured under their respective law.

During the same summit, Digital Economy Parliamentary Seceretary Silvio Schembri said that, after the materialising of Malta's blockchain vision, the next priority is AI, quantum communication technology, space mining, big data and the internet of things.

6.1 Blockchain, Distributed Ledger Technologies, Cryptoassets and Robots

At the moment Malta is attracting substantial and major industry players in the Blockchain and DLT business sphere. Beyond the educational and academic challenges inherent in such an interdisciplinary field, Malta is working towards becoming a major player in the Blockchain and DLT industry, and therefore the local ecosystem will require experts versed in the cross-disciplinary nature of Blockchain and DLT. These new technologies have the potential to change many applications and services. The field poses new academic and educational challenges due to the multi-disciplinary nature that includes ICT, Business and Law at its core. The underlying technology is required to provide decentralisation

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([35]) The Malta Innovative Summit took place between the 5th – 12th October 2018.
More information available at: http://www.maltainnovationsummit.com/schedule/

mechanisms and computational execution engines built on sound computer science and ICT principles.

The provision of smart contracts is blurring the lines between real-world legal contracts and automated execution of legal obligations. Programmers will require knowledge of regulatory and legal frameworks within which smart contracts are proposed, and similarly lawyers would be required to understand obligations laid out within smart contracts. With the advent of cryptocurrencies, built on Blockchain and DLTs, new financial and business models are proposed - whereby finance and business professionals are requiring an appreciation of the underlying technical implementations and algorithms and surrounding legal frameworks. Software developers writing smart contracts and financial systems also require an understanding of the financial and business models that they are translating into code.

On Thursday 21 February 2019 the Department of European and Comparative Law, Faculty of Laws, in collaboration with Malta European Law Association (AMSDE), Centre for Distributed Ledger Technologies, University of Malta, and Malta University Consulting Ltd. organized a seminar entitled *Cryptoassets and Blockchain: Technological Innovation and Legal Challenges* at the Valletta campus of the University of Malta.

In October 2018 the Minister for Health Chris Fearne, in declaring that the government was in the final stages of drafting a 2020-2030 national health strategy, announced that robots will soon start assisting doctors during surgical operations at Mater Dei Hospital [36]. He said the technology would be introduced in 2019 with Malta being one of the few countries in the EU that would provide this state of the art technology. Mr Fearne said also that cutting edge blockchain technology would soon be introduced to the public health records system *My Health* [37].

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[36]   Mater Dei Hospital is the main public hospital in Malta. It is an acute general and teaching hospital, offering a wide range of hospital treatments and specialist services. More information available at: https://deputyprimeminister.gov.mt/en/MDH/Pages/Home.aspx

[37]   As reported in the Times of Malta on Tuesday, October 9, 2018 at: https://www.timesofmalta.com/articles/view/20181009/local/robots-to-start-assisting-mater-dei-doctors-during-surgery.691168

6. Conclusion

Malta regards digitalisation as the catgalyhst t oachieve econojkic growth, social development and environment protection. The aspiration is to transform the country into a digitally empowered society and knowledge economy ([38]). Quoting from the Prime Minister's foreword to the National Digital Strategy 2014 - 2020:

"…….. we are well positioned on the digital superhighway. We are accelerating in the fast lane of technology and don't intend to take our foot off the pedal. The road ahead is a lot clearer because of the Digital Malta Strategy. I encourage you to be part of it."

The increase in technology and the rapid development of production and service provision is placing new challenges on teachers and lecturers in vocational education and training as well as in universities.

Education and educational change is a slow process. On the other side, the industry rate of change is very fast. Thus, there will always be gaps between the two as it is almost impossible for the education sector to develop at the same rate as that of industry, technology and artificial intelligence. Yet it is through education and training that economies flourish or perish. Educators must strive to be aware of what is happening in industry and what technical talent and skills-sets are being expected from young people.

The emerging new technologies and work organisation formats are expected to be captured faster through skills anticipation systems and translated to VET provision in terms

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([38]) Ministry for the Environment, Sustainable Development and Climate Change, (2019). *Malta's Sustainable Development Vision for 2050, p.28*.   Available at: https://meae.gov.mt/en/Public_Consultations/MSDEC/Documents/Malta's%20Sustainable%20Development%20Vision%20for%202050.pdf

of needed skills, curricula and qualifications.([39])   In Malta, the currency of vocational education and work-based learning has been consistently increasing over the past two decades, starting from compulsory level to further and higher education provision. VET has become a key factor in enabling the educational sector to remain continuously proactive and receptive to the needs of local industry, thus being an important player in Malta's economic growth.

Digital skills are permeating across all business sectors, as ICTs become a central tenet of businesses development creating additional employment opportunities. According to the Malta ICT Audit 2017 ([40]), at the moment there are considerable tech-skills shortages within the Maltese labour force that are being compensated for by foreign nationals. The challenge for Malta, as for many developed economies, is its capacity to provide the industry with people with the required knowledge and skills-sets. Similarly, to encourage the optimum number of nationals, from across the social spectrum, to pursue tech related careers complemented by an appropriate level of tech savvy immigrants.

([39]) Advisory Committee on Vocational Training, 2018. *Opinion on The Future of Vocational Education and training Post 2020*. European Commission, p. 5.
https://ec.europa.eu/social/BlobServlet?docId=20479&langId=en

([40]) eSkills Malta Foundation and FastTrack into Information Technology (FIT) Ltd., 2017. *Building Malta's Tech Talent Pipeline*. Gattard House, B'Bajda. Available at: https://eskills.org.mt/en/Documents/Eskills_audit.pdf

List of abbreviations

ACVT	Advisory Committee on Vocational Training
CEBI	Centre for Entrepreneurship and Business Incubation
CEF	Connecting Europe Facility
CEPIS	Council of European Professional Informatics Societies
eCF	eCompetence Framework
EU	European Union
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure On Research And Development
ICT	Information and Communication Technology
ITS	Institute of Tourism Studies
GDP	Gross Domestic Product
IoT	Internet of Things
MCAST	Malta College of Arts, Science and Technology
MCST	Malta Council for Science and Technology
MEDE	Ministry for Education and Employment
MITA	Malta Information Technology Agency
R&I	Research and Innovation
VET	Vocational Education and Training

References

Advisory Committee on Vocational Training, 2018. *Opinion on The Future of Vocational Education and training Post 2020*. European Commission. https://ec.europa.eu/social/BlobServlet?docId=20479&langId=en

eSkills Malta Foundation and Fast Track into Information Technology (FIT) Ltd., (2017). *Building Malta's Tech Talent Pipeline.* Gattard House, B'Bajda, Malta. https://eskills.org.mt/en/Documents/Eskills_audit.pdf

European Union, 2017. *Digital Transformation Scoreboard 2017: Evidence of positive outcomes and current opportunities for EU businesses*. http://www.cgil.it/admin_nv47t8g34/wp-content/uploads/2017/03/FRANCIA-Digital-Transformation-Scoreboard-2017-1-1.pdf

Malta Council for Science and Technology, (2014). *National Research and Innovation (R&I) Strategy 2020.* Floriana, Malta: Ministry for Education and Employment,. http://mcst.gov.mt/wp-content/uploads/2017/02/National-RI-Strategy-2020-June-2014.pdf

Mazars, (2018). *Artificial Intelligence: A Game changer in the Hospitality Industry* https://www.mazars.com/content/download/945401/49211039/version//file/Mazars_2018_AIin_Hospitality_Study.pdf

MEDE (2012). *A national curriculum framework for all, 2012*. Floriana, Malta: Ministry for Education and Employment. https://education.gov.mt/en/Documents/A%20National%20Curriculum%20Framework%20for%20All%20-%202012.pdf

MEDE (2014a). *Framework for the education strategy for Malta 2014-2024: sustaining foundations, creating alternatives, increasing employability*. Floriana, Malta: Ministry for Education and Employment. https://ec.europa.eu/epale/sites/epale/files/booklet_esm_2014-2024_eng_19-02.pdf

MEDE (2014b). *Learning Outcomes Framework.* Floriana, Malta: Ministry for Education and Employment. http://www.schoolslearningoutcomes.edu.mt/en/

MEDE (2018). *Circular DLAP 352/2018: School Presentation about Artificial Intelligence.* Floriana, Malta: Ministry for Education and Employment.

Ministry for Finance, 2018. *Malta: National Reform Programme*. Department of Information, Valletta, Malta. https://mfin.gov.mt/en/Library/Documents/NRP/NRP%202018.pdf

Ministry for the Environment, Sustainable Development and Climate Change, (2019) *Malta's Sustainable Development Vision for 2050.*
https://meae.gov.mt/en/Public_Consultations/MSDEC/Documents/Malta's%20Sustainable%20Development%20Vision%20for%202050.pdf

Moore, G. (1991). *Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream*. HarperCollins, USA.

Parliamentary Secretariat for Competitiveness and Economic Growth, (2014). *Digital Malta: National Digital Strategy 2014–2020.*
https://digitalmalta.org.mt/en/Documents/Digital%20Malta%202014%20-%202020.pdf

World Travel Tourism Council, (2018). *Travel & Tourism Economic Impact 2018 World.*
https://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2018/world2018.pdf