2021

Digital Malta

Digital transformation as a route to **national productivity and competitiveness.**

National Productivity Report 2021

Seed

National Productivity Board

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The authors

JP Fabri is a Founding Partner at Seed. An economist by profession, he has extensive experience in applying economics in the private and public sector. He has advised nine international governments on building economic resilience. He is a visiting assistant lecturer at the University of Malta.

Glenn Fenech is a Senior Consultant at Seed. An economist by profession, he has amassed experience in both the private and public sector working at applying economics in regulatory and advisory fields.

Dr Joshua Ellul is an internationally recognised digital technology expert focusing on distributed ledger technologies, AI, and Internet of Things. He is the Director of the Centre for Distributed Ledger Technologies, at the University of Malta.

Dr Vincent Marmara is Malta's foremost statistician and expert in quantitative Surveying. He has been entrusted with numerous research projects both at a national and international level.

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Foreword

As the global economy continues with its gradual recovery following the economic the COVID-19 pandemic, productivity and competitiveness matters are taking centre stage. The recovery remains fragile in view of various risk factors that are impinging on the momentum including supply-side bottlenecks, energy driven inflation, and uncertainty surrounding the spread of COVID variants.

The pandemic and recovery have prompted businesses and economies to turn to digital transformation to overcome some of the economic challenges posed by the response to the pandemic. The acceleration towards digital transformation is in fact seen as something will continue taking place and various financial aid policy packages, such as the EU's Recovery and Resilience Plan and Fund are focused on supporting. The debate on whether digital transformation has a lasting impact on productivity levels remains ongoing in academic circles.

This notwithstanding, there is no doubt that firms and societies are realizing more than ever that digital transformation is central for firm survival in an ever-changing world and economy.

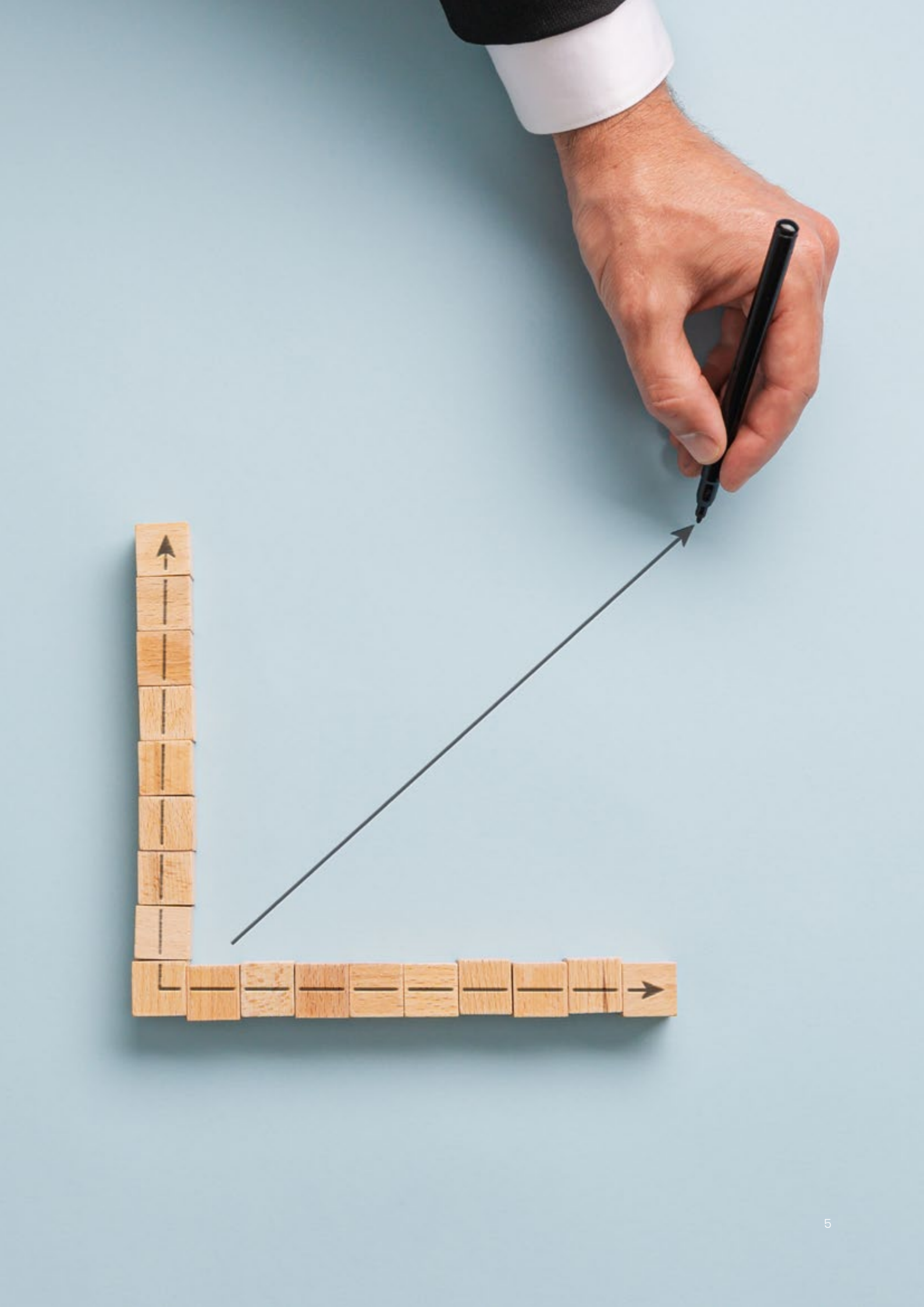
The Malta Council for Economic and Social Development Act, Article 8(b) stipulates that the National Productivity Board shall be tasked with 'preparing an annual report outlining the main competitiveness and productivity challenges facing Malta, and the policy responses required to meet them and any recommendations thereto.'

In this regard, also building on the two previously issues National Productivity Reports, this year's report focuses on the role and impact of digital transformation. Specifically, it looks at the level preparedness and readiness of Maltese firms across the economy to engage in digital transformation. By taking such a micro perspective, it offers a lens to understand the levers and barriers that Maltese firms are facing. Several recommendations are being put forward in this regard and a bottom-up approach is being taken to truly tackle the issues from a firm-level.

I believe that this Report offers a strong continuation on the previous two studies which took a more macro perspective towards productivity and competitiveness, and both mentioned the importance and centrality of digital transformation to achieve the needed productivity gains. Over the past year, the Board has also followed up on the recommendations put forward through an internal exercise with the various permanent secretaries. This allows the Board to monitor progress towards achieving the needed productivity gains.

Whilst thanking the Board members, social partners, and various consultants whom we worked with throughout this year, I believe that this report offers a detailed and micro perspective on digital transformation and the level of preparedness of Maltese firms. The insights gathered from this study and the recommendations put forward are robust and will allow Malta to register productivity gains in the short to medium terms, enhancing our resilience and allowing us to exploit opportunities brought about by the ongoing economic changes.

James Pearsall
Chairman
Malta National Productivity Board



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Executive Summary

The National Productivity Report 2021 focuses on the role of the digital transformation as a tool that can foster productivity gains leading to improved economic outcomes and to a higher quality of life. The Report presents the outcomes of Digital Transformation Readiness Index that was rolled-out amongst a representative sample of Maltese firms to gauge their readiness to implement and reap the benefits of transformation.

The Index is aimed at shedding light on the micro foundations of digital transformation and firm readiness through twenty-two indicators across five main dimensions being governance & leadership, people & culture, capacity & capability, innovation, and technology. The results highlight very specific gaps in Malta's digital ecosystem as well as in the readiness of companies across sectors, particularly the low-productivity ones, to truly embrace and internalise digital transformation.

Based on the results, the report presents a holistic policy framework to support a digital Malta which will enable the country to achieve higher productivity. In addition, twenty-five specific recommendations are put forward across five enabling factors being talent & skills, research & innovation, financing & incentives, infrastructure & security, and policy & governance.

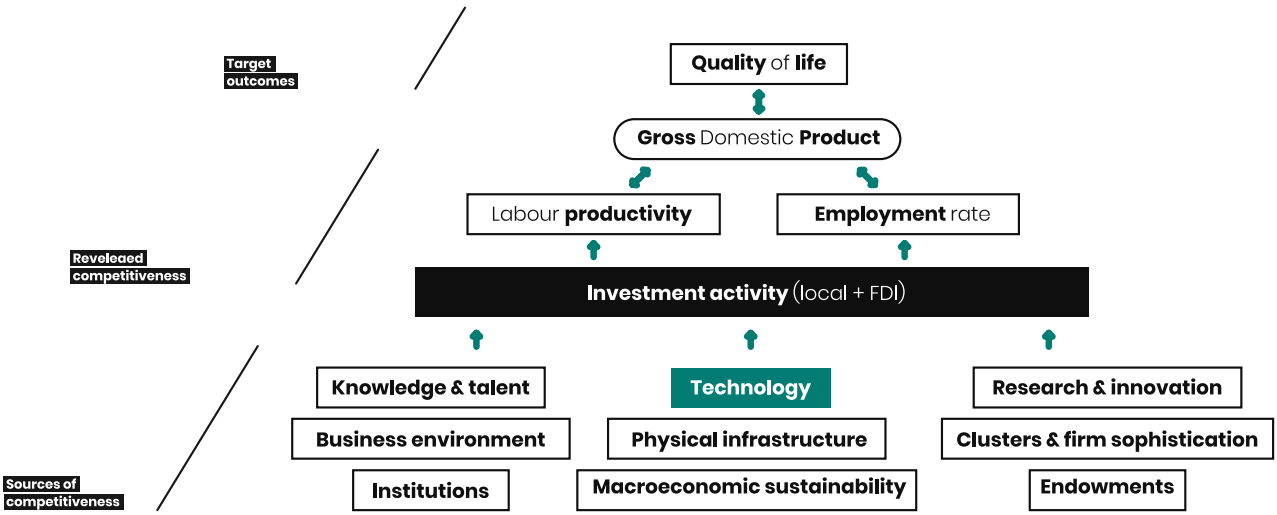
The results highlight very specific gaps in Malta's digital ecosystem as well as in the readiness of companies across sectors, particularly the low-productivity ones, to truly embrace and internalise digital transformation.

Productivity as a vehicle to achieving higher quality of life

Productivity matters greatly for the wellbeing of every person in Malta. It is key to supporting high quality and rewarding jobs, and funding public services. Unlocking Malta's productivity potential will help build a stronger more resilient economy that delivers inclusive and sustainable growth. At the outset it should be stressed that the concept of productivity is itself far from straightforward. The standard notion of productivity refers to the productive efficiency of a given workforce, that is labour productivity, measured in terms of output per input of labour.

This is an aggregative notion, and as Figure i suggests, in a national context labour productivity is the outcome of a variety of determinants including but not limited to technology. Many of these factors and assets also determine a country's investment attractiveness and its overall employment rate. Together, productivity and the employment rate are measures of what might be termed 'revealed competitiveness', and both are central components of a country's economic performance and its prosperity, going beyond traditional GDP figures, though obviously of themselves tell us little about the underlying attributes 'sources of competitiveness' on which they depend.

FIGURE I: THE MULTIPLE LAYERS AND FACETS OF PRODUCTIVITY



Source: Arthur D. Little analysis based on publicly available data

Malta's productivity challenge

Despite Malta's strong and resilient economic results over the past few years, its productivity performance unmasks several structural economic challenges the country and specifically non-service-based sectors are facing. Malta has successfully steered its economy towards service-based sectors. This has led to the formation of two main sectoral-based clusters. The first cluster, represented by the gambling, information & communication, and other service-based sectors, presents higher-than-average productivity which generated a high-level of value-added with a leaner workforce. In contrast, the second cluster of more labour-intensive sectors has failed to generate high levels of productivity. Even when benchmarked against European countries,

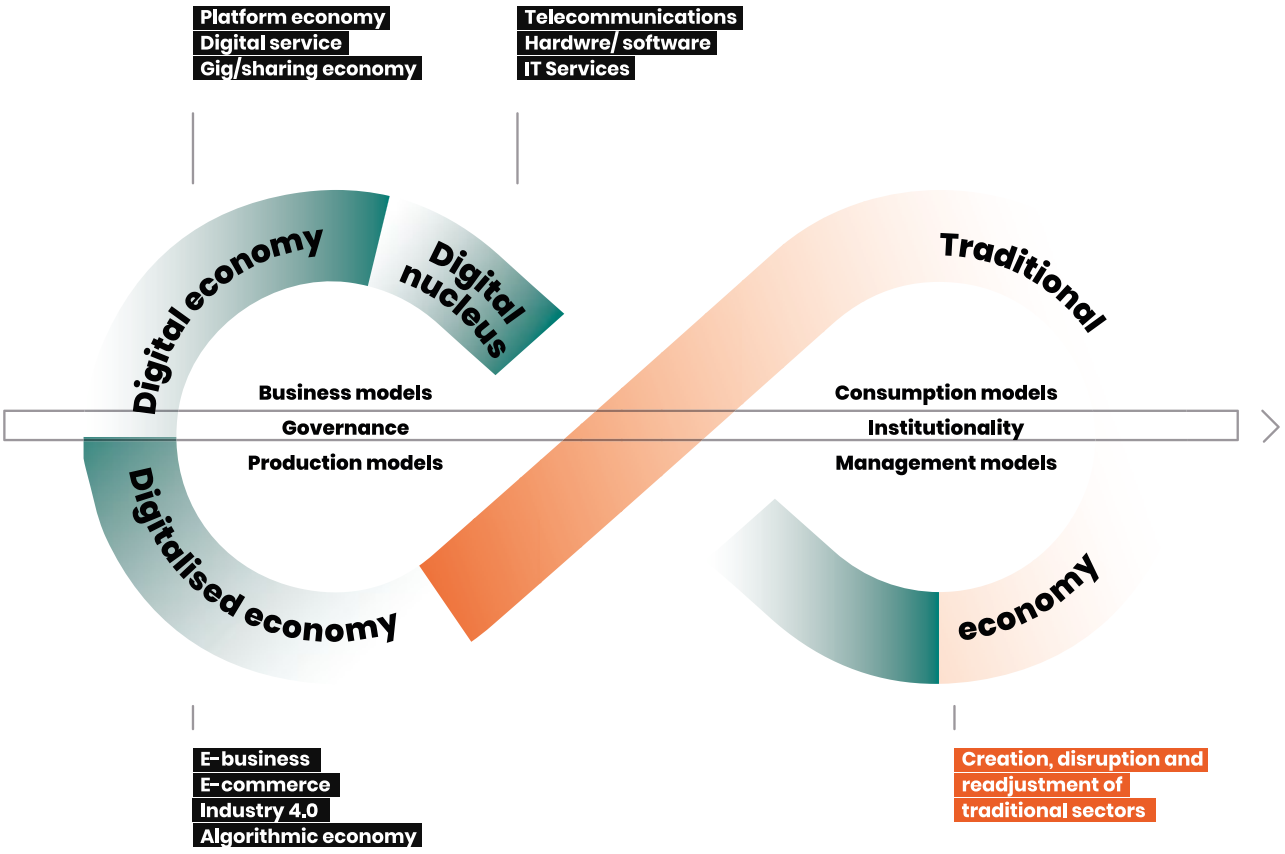
Malta's non-service-based sectors are los
compared to other European countries hig
reduced competitiveness and slower prod
This has an impact on Malta's national pro
and economic outcomes. Various other ec
challenges exist that are structural in natu
unfavourable demographics, low educatic
outcomes, and fragmented ecosystems. Ir
productivity is the only way to maintain inc
and access to essential goods and service
the first industrial revolution, the introducti
technologies has contributed to higher pro
in firms and in the economy. On this basis t
development and incorporation of new te
into production processes is essential for g

Digital technologies and productivity growth: a complex relationship

Productivity growth is the core engine of sustained economic growth. Since the first industrial revolution, new technologies have improved productivity. On the cusp of the fourth industrial revolution, there is a growing debate on the potential of digital technologies to foster productivity gains with the debate being highly polarised. The digital revolution should be a

driving force of productivity growth, particu
micro and small companies in labour-inte
The interplay of various technologies that
the fourth industrial revolution and include
blockchain, augmented & virtual reality an
Things, are bringing about significant chan
way firms produce, consume, and interact

FIGURE II THE DIGITAL TRANSFORMATION OF THE ECONOMY



Source: Latin American Economic Outlook 2020 © OECD/United Nations/CAF/European Union 2020

As shown in Figure ii, digital tools are triggering innovation in business and production systems, the reorganisation of economic sectors, the emergence of new dynamics in the world of work, the supply of smart goods and services, and new conditions of competitiveness. Indispensable and complementary dimensions such as a holistic digital ecosystem, adequate infrastructures, including transport infrastructure, and widespread digital skills, are needed to benefit from the digital revolution.

The Digital Transformation Readiness Index: a survey of firms in Malta

Productivity gains are strongly correlated with firms' performance and capabilities. In fact, research finds that the efficient use of digital technologies is related to firms' capabilities, technological sophistication, managerial competencies, and workers' skills. A Digital Transformation Readiness Index was developed purposely for this study and rolled out amongst a representative sample for firms in Malta across all economic sectors. The Index is aimed at shedding light on the micro foundations of digital transformation and firm readiness through twenty-two indicators across five main dimensions being governance & leadership, people & culture, capacity & capability, innovation, and technology. The results highlight very specific gaps in Malta's digital ecosystem as well as in the readiness of companies across sectors, particularly the low-productivity ones, to truly embrace and internalise digital transformation.

Key challenges identified as barriers to digital transformation

The Index allowed a granular analysis of the main challenges Maltese firms face in embracing digital transformation across several dimensions. Results show that there is in general lack of integration of digital strategy in departmental planning processes, lacking influence on overall organisational strategy and direction and insufficient drive to engage in a constant business re-engineering process to digitise and to transform products and services. There is also a greater need for integration of digital culture with overall corporate culture and increased use of digital solutions to improve digital service delivery and internal productivity. When assessing the capacity and capability of firms to embrace digital transformation, there is an increased need to have digital policies, procedures and digital activities in place which are core to everyday business activity. Moreover, better allocation of resources and budgets to support digital channels, activities, service delivery and staff training is essential for digital readiness. The Index has highlighted a lack of alignment of new management practices and organisational structures with the needs of a transformed digital organisation. Finally, sectors need to increase the implementation of periodic IT and digital audits to see how both hardware and software can be improved to optimise performance and ensure that cybersecurity is seen and treated as one of the most critical risks the company faces.

A strong policy emphasis on digital transformation

There is no doubt that digital transformation is a key policy goal across many countries including the European Union and Malta as COVID has accelerated the push towards digital transformation. The digital agenda strongly promoted by the EU, supported by a clear strategy and generous funding mechanisms, provides a strong framework within which Malta can operate; membership of the envisaged Digital Single Market will also strengthen Malta's competitive position. Malta's digital readiness places it among the front-runners within the EU – Malta performed above the EU average across all five dimensions of the Commission's Digital Economy and Society Index (DESI) in 2020 and ranked 5th out of the 27 EU Member States. With a strong policy vision, supported by an investment package of the European Union, particularly the Resilience and Recovery Fund, Malta is well-placed to capitalise and accelerate digital transformation.

ACT on digital transformation: a holistic recommendation framework

The vision for Malta is clear: to be a leading digital economy with digitally transformed firms and sectors that reinvent themselves. It is acknowledged that to achieve an ecosystem that enables digital transformation to cut across firms and sectors, a national strategy on digital transformation needs to be based on five policy goals. This transformation will be led by both existing and new firms, public and private enterprises, large and micro-enterprises, students entering the workforce and older workers already in the workforce. The framework that is being presented is represented by the acronym ACT [Accelerate | Commit | Transition] and aims to build a thriving ecosystem of digitally transformed companies and workers that are fully immersed in a digital economy and society. The framework is based on three main strategic priorities and five key enablers. In turn, the enablers incorporate twenty-fifty recommendations to truly deliver a digitally transformed economy.

The mind-map of the framework and the salient parts of the results that led to the recommendations is presented in Figure iii.

Twenty-five recommendations across five key enablers

Digital transformation is all about a transition from a current to a future state. This requires resources to be able to manage this transition on an infrastructural, process and skill level.

The key enablers that have been identified as critical for Malta to lead with digital transformation across industries are talent & skills, research & innovation, finance & incentives, infrastructure & security, and policy & governance. Twenty-five recommendations are being proposed and these are tabled in Table i.

TABLE I RECOMMENDATIONS TO HARNESS DIGITAL TRANSFORMATION

Key enabler	Strategic Action
Talent & skills	Provide support to firms that upskill their existing employees through digital transformation courses, at all levels, including managerial-level capacity.
	Support industry-led training to ensure that courses are in line with industry requirements.
	Introduce a sectoral digital skills audit across firms and employees as part of the announced skills census.
	Launch schemes and popularization campaigns that incentivise students to follow STEM paths.
	Leverage European funds, particularly the European Social Fund, to help employers and employees in their digital skill training requirements.

Research & innovation	Given the lack of awareness of some of the main sector-specific technologies, sectoral demonstrator sites could be explored and aimed at allowing companies to learn about such technologies and how they can apply them to their operations.
	Provide support to firms to develop technology-driven pilot projects such as automation processes, robotics, and artificial intelligence in collaboration with educational institutes that would also act as exemplars to other firms.
	Enhance the awareness surrounding digital transformation opportunities for specific sectors that are encountering challenges such as agricultural and construction.
	Develop more collaboration between academia and private sector especially through traineeships and dissertation projects which can serve as pilot transformation projects.
	Gozo has the potential of becoming a living testing hub for new technologies including drones, agri-tech and relating to smart buildings and mobility. Establishing a dedicated research centre can support this potential.
Financing & incentives	Develop a Digital Transformation Loan Scheme together with the Malta Development Bank to ensure access to financing for transformation projects.
	Launch a multi-annual EU-funded grant scheme targeting digital transformation for companies to implement specific projects across several sectors.
	Continue the current support packages aimed at providing technical advisory and expertise to organisations on digital transformation.
	Line Ministries should invest on digital transformation with a view to catalyse this transition and to support the specific sector.
	Support the Gozitan economy and enterprises through additional support packages as digital transformation can allow companies to enhance their resilience to double-insularity.
Infrastructure & security	As operators continue to roll-out 5G networks across the island to tap into the potential of national digital transformation, Government should support the creation of testing environments for IoT technologies especially around the concept of smart localities.
	Prioritise cyber security on a national level and treat it as a national security risk.
	Create awareness at firm level on cybersecurity and launch schemes to support security audits and capacity enhancement in firms and industries.
	Government needs to engage with economic operators to understand whether any sector-specific infrastructure is needed to facilitate digital transformation in specific sectors.
	Facilitate digital infrastructure audits for industry to assess their infrastructural capacity to embark on digital transformation.
Policy & governance	Launch a national industry 4.0 strategy to truly leverage Malta's potential as a value-added manufacturing centre of excellence including areas such as 3D printing and additive manufacturing.
	Together with the Local Council Association start a process to develop a smart city vision for Malta's villages and launch pilot projects.
	Develop an open data portal on a national level to spur analysis and innovation that is evidence-based. This should be a government-wide project which brings together all data across different domains and satisfy the Once-Only principle criteria thus minimising the burden on business whilst maximising the use and re-use of publicly-held data for decision-making and analysis.
	Digital public services are often a foundational element for broader digital transformation and Government needs to continue with the design and delivery of digital public services. Specifically, regulators need to truly embed Reg Tech in their operations.
	Data governance and rights are critical. Government needs to continually review its legal framework and enforcement mechanisms to ensure that data governance is given the needed priority and focus by all public and private entities and authorities.

Moving ahead by harnessing digital transformation for enhanced productivity

Improving productivity is not only an important economic goal, but it can improve the quality of jobs and lead to an improved quality of life. It remains an important concept that needs to be understood and analysed properly. To this end, it is also being recommended that apart from this annual report, the National Productivity Board establishes a research programme and collates supporting datasets to assess and benchmark the driving factors behind productivity differentials between firms, and particularly Maltese firms, to build a broad evidence-base for further enterprise policy intervention. One such stream of research will be to further refine the proposed Digital Transformation Readiness Index and to have an annual report which can benchmark and trace sectoral developments towards digital transformation. Organisations, sectors, and countries are reimagining, reshaping, and retooling for a new era driven by fast technology developments which are impacting our daily lives, employment, consumption behaviours, business models and production processes. Embracing digital transformation has become a matter of survival and if harnessed fully, it can lead to productivity enhancements, improved growth and employment opportunities and better economic outcomes that ultimately can lead to improved quality of life.

Improving productivity is not only an important economic goal, but it can improve the quality of jobs and lead to an improved quality of life. It remains an important concept that needs to be understood and analysed properly.

FIGURE III FRAMEWORK MIND-MAP

ECONOMIC REALITIES

Malta experienced an economic boom in recent years
Buoyant labour market with record employment rates
Transition to a services-based economy continued
COVID-19 highlighted both Malta's vulnerability and resilience
Sectoral disparities exist
Productivity remains a key economic challenge

PRODUCTIVITY ANALYSIS

Two clusters exist. Services-based sectors exhibit productivity gains
Compared to other EU member states, Malta's has made productivity gains in services-sector although gaming is retreating
Non-services sectors including manufacturing are declining in their productivity metrics

ECONOMIC CHALLENGES

Supporting the still delicate recovery
Scaling back business support
Supply logistics & cost-push inflation
Grey listing and its adverse effects
Corporate insolvency framework
Ensure fiscal buffers are rebuilt
Enhance capacity to absorb EU funds
Address structural challenges in education
Demographic challenges will impact productivity
Entrench an innovation ecosystem

THE NEED FOR PRODUCTIVITY

Productivity matters greatly for the wellbeing of every person in Malta. It is key to supporting high quality and rewarding jobs, and funding public services. Unlocking Malta's productivity potential will help build a stronger more resilient economy that delivers inclusive and sustainable growth.

DIGITAL TRANSFORMATION

The digital revolution should be a driving force of productivity growth, particularly for micro and small companies in labour-intensive sectors. The interplay of various technologies that are driving the fourth industrial revolution and include big data, blockchain, augmented & virtual reality and Internet of Things, are bringing about significant changes in the way firms produce, consume, and interact.

DIGITAL TRANSFORMATION READINESS INDEX

The Index is aimed at shedding light on the micro foundations of digital transformation and firm readiness through twenty-two indicators across five main dimensions being governance & leadership, people & culture, capacity & capability, innovation, and technology. The Index was computed across a representative sample of over 100 firms across ten economic sectors .

Digital Malta

VISION

Malta to be a leading digital economy with digitally transformed firms and sectors that reinvent themselves

GOALS

To stimulate firms and workers to adopt and build capacity and capability in digital transformation.
To support firms and workers to seize the opportunities enabled by digital transformation.
To develop a complete ecosystem that is backed by access to finance, infrastructure, and a strong regulatory & policy framework.
To equip the current and future workforce with the required skills to deliver digital transformation in their respective industries.
To ensure a secure cyberspace that underpins national security, powers a digital economy, and protects our digital way of life.

STRATEGIC PRIORITIES

ACCELERATE

By accelerating such efforts to incorporate digital adoption across all economic sectors, Malta will be in a better position to seize the opportunities that the future will bring. More importantly, Maltese firms will be able to seize growth opportunities, reap efficiencies, boost productivity, and ultimately contribute to improved economic outcomes in the medium-term.

COMMIT

Government has already committed a significant percentage of Malta's Resilience and Recovery Plan to enable the digital transformation. However, for it to be truly transformative, firms and industry leaders need to commit themselves too undergoing such a digital transformation and that is why Government needs to be a key catalyst and enabler to support them embark on such a journey through funds and incentives.

TRANSITION

Given the deep shifts that digital transformation requires, the transition might not be so easy for several firms and workers and therefore Government needs to actively support such a transition by helping firms transform themselves through schemes and financial help. Upskilling programmes that allow workers to transition into the new realities and requirements demanded by a digital economy also need to be encouraged and incentivised.

KEY ENABLERS

TALENT & SKILLS

The demands on the current and future workforce will be significant. Needs to be prepared to meet the challenges that transformation brings about as well as to seize its opportunities too.

RESEARCH & INNOVATION

Research and innovation require ecosystems that are holistic in nature and that span across sectors. Therefore, a dedicated focus on research and innovation needs to be developed so that the right environment is conducive to such investments.

FINANCE & INCENTIVES

Having specific funding schemes and incentive packages aimed specifically at digital transformation will allow firms to engage in such projects and investments further contributing to improved productivity and economic outcomes.

INFRASTRUCTURE & SECURITY

Apart from the need of having national infrastructure, sector-specific infrastructure will be central to deploying digital transformation. Having national but also at firm level cyber security solutions will be critical going forward and considered to be of utmost priority.

POLICY & GOVERNANCE

Given the pervasiveness of the digital transformation across our economy and society, there are a broad range of framework conditions that need to be in place to support an inclusive and sustainable transition.

Digital Malta

1.

Introduction

Productivity and competitiveness remain important policy goals and determinants of economic growth and employment.

Amongst the many determinants of productivity and competitiveness, technology has always been seen as a general-purpose technology that has the potential of improving productivity outcomes. However, literature has highlighted the productivity paradox in the sense that the expected productivity gains did not fully materialise or have not been captured in the data yet. This notwithstanding, it is still argued that technology can be an important vehicle for productivity enhancements.

This report sets out to analyse Malta's competitiveness and productivity developments over the past year with a focus on 2020 and the impact COVID-19 had. Rather than taking a broad approach towards productivity, this report is focused on exploring the theme of digital transformation which has become a key policy agenda, both at boardroom and national level during the pandemic and ensuing recovery. To gauge Malta's sectoral sentiment towards digital transformation, this report presents the results of a national survey and roll-out of a Digital Transformation Readiness Index. Placing these developments within the broader European and national level policies on digital transformation, this report proposes a frame for action on digital transformation.

With an overarching vision to develop Malta into a digitally transformed economy, the framework has five policy goals and is based on three strategic pillars. These pillars focus on accelerating the transformation, committing the requiring resources, and adopting a transition approach. With five key enablers, this report has identified twenty-fifty strategic actions that can support the digital transformation of Malta's economic fabric.

This report is set out as follows.

Chapter 2 presents the economic content with a focus on productivity and competitiveness developments over the past year. The focus is both on a local level by looking at sectoral developments but also by benchmarking Malta's performance on an international level. Several economic challenges are also identified.

Chapter 3 unbundles the concept of digital transformation and looks at its impact on productivity. An assessment of various technologies is presented as well as key determinants of transformation and technology adoption. A Digital Transformation Readiness Index is presented, and which will serve to gauge Malta's readiness to digitally transform.

Chapter 4 presents the results of a national representative survey of businesses based in Malta across all economic sectors. The analysis is anchored around a detailed sectoral productivity assessment as well as an identification of sector-specific technology applications that can have a positive bearing on sectoral productivity.

Chapter 5 presents the policy context of digital transformation on a European and National level. An overview of the key strategies and policies in relation to digital transformation with a focus on the Resilience and Recovery Plan is given. Finally, the Chapter also looks at the past two National Productivity Reports and gives a status update of the recommendations that were digital in nature.

Chapter 6 presents the framework for action. Comprising fifty recommendations, the framework is built around five key enablers being Talent & Skills, Research & Innovation, Financing & Incentives, Infrastructure & Security, and Policy & Governance.

Chapter 7 concludes the report.

2.

Economic context

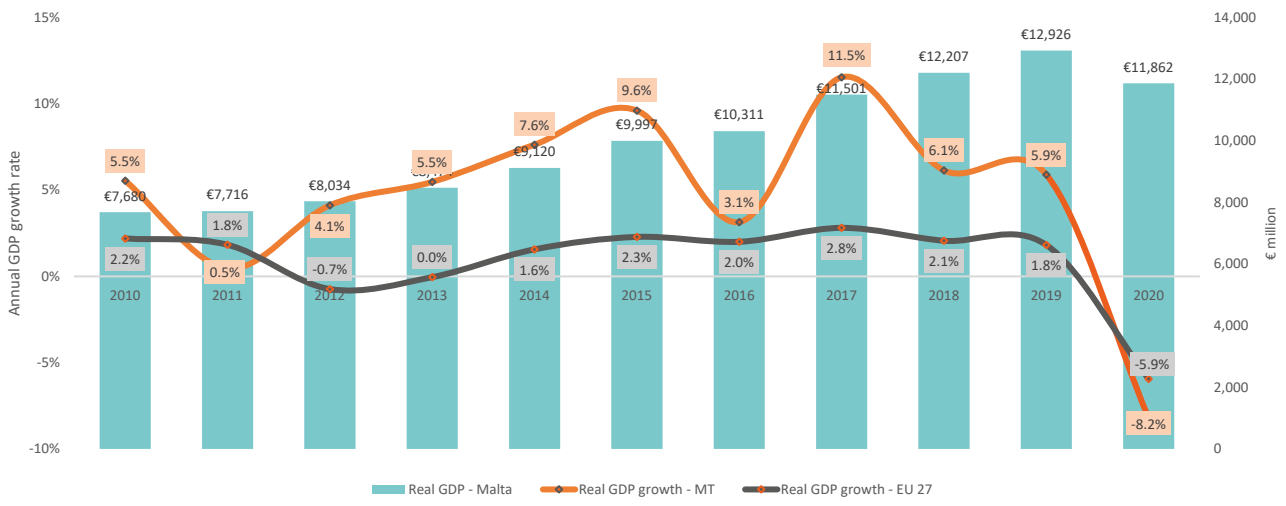
This section presents an economic analysis of Malta's performance over the past few years. Whilst taking a macroeconomic approach with a focus on the main indicators, this section also gives a detailed analysis of the impact of COVID-19 on Malta's economic performance. A detailed analysis of Malta's productivity and competitiveness follows with a focus on both the local context as well as by benchmarking Malta's performance on a regional level. This section also highlights several pressing economic challenges.

2.1 Macroeconomic trends

Malta entered the COVID-19 pandemic with very strong economic fundamentals, allowing the Government to act swiftly and decisively. In fact, the Maltese economy and its labour market have rebounded and indeed flourished since the 2009 economic crisis. Local performance has consistently outperformed European Union and Euro Area averages with record labour force participation rates and lowest unemployment rates being registered.

Malta has sustained several years of strong economic performance. Its average real Gross Domestic Product (GDP) growth was 4.4 per cent between 2010 and 2020 as opposed to an average rate of 0.9 per cent for the EU27. Growth in Malta peaked at 9.6 per cent in 2015 before stabilising in subsequent years, with annual growth dipping to 5.9 per cent in 2019 (see Figure 2.1). This reflects a general slowdown in economic activity even before the COVID-19 crisis, particularly with regards to external demand conditions in key foreign markets, with the EU27 countries registering an average annual growth of 1.8 per cent in 2019. On the other hand, given Malta's open economy and strong reliance on the tourism sector, the economy shrunk by 8.2 per cent in 2020 as opposed to an average contraction of 5.9 per cent in the EU27 countries.

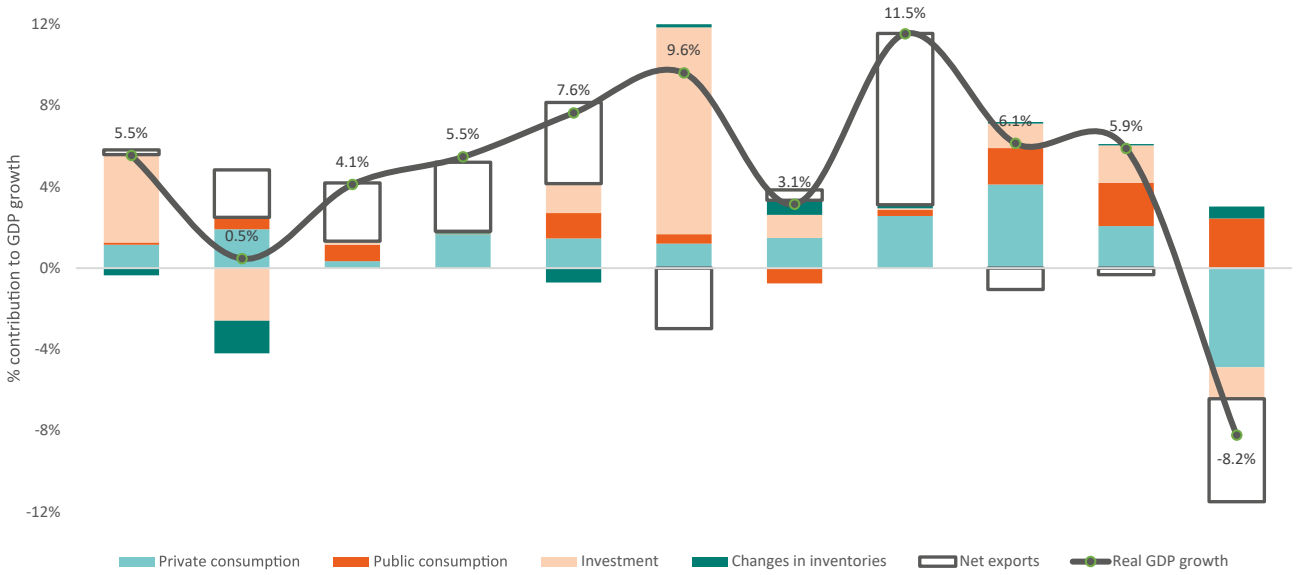
FIGURE 2.1 – REAL ECONOMY PERFORMANCE



Source: Eurostat, 2021

Prior to 2020, domestic demand had become a critically important growth contributor, mainly driven by private consumption which increased on the back of high employment growth and higher disposable income. A further factor was a growing population due to the influx of non-Maltese nationals, which increased the size of the domestic market (see Figure 2.2). In 2020, following an average growth of 6.8 per cent in the previous two years, private consumption contracted by 10.7 per cent largely due to the pandemic-related restrictions. The fall in private consumption was broad-based across almost all expenditure categories except for utilities. The sharpest decline in absolute terms was recorded in spending on restaurants and accommodation services. This was followed by spending on recreation and culture as well as transport.

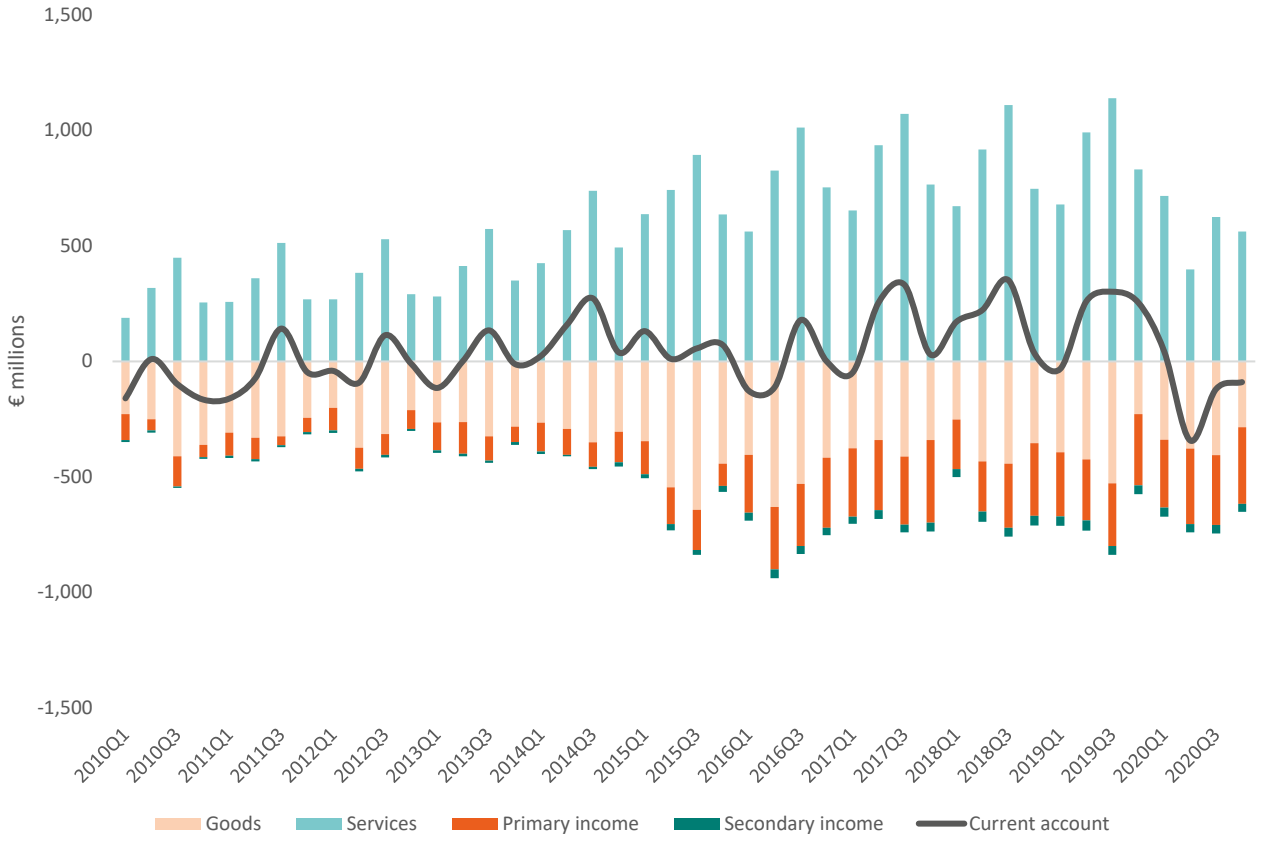
FIGURE 2.2 – REAL GDP AND ITS COMPONENTS



Source: NSO, 2021, Authors' calculations

As an open economy, international trade is not only an important contributor to economic performance but also to employment. Malta's ability to export goods and services, and its relative competitiveness, are critical to sustaining the labour market and the broader economy. Figure 2.3 presents the developments in the main components of Malta's current account within the Balance of Payments.

FIGURE 2.3 – CURRENT ACCOUNT BALANCE AND COMPONENTS



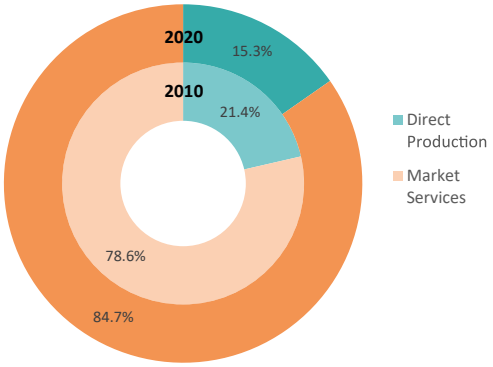
Source: Eurostat, 2021

Although the current account balance has occasionally dipped into negative territory, Malta has recorded current account surpluses in recent years, largely stemming from the fast growth of strong service-based export sectors like tourism and gaming. In parallel, the negative trade balance in goods has only increased moderately between 2011 and 2019, driven mainly by the importation of mineral fuels, lubricants and machinery and transport equipment.

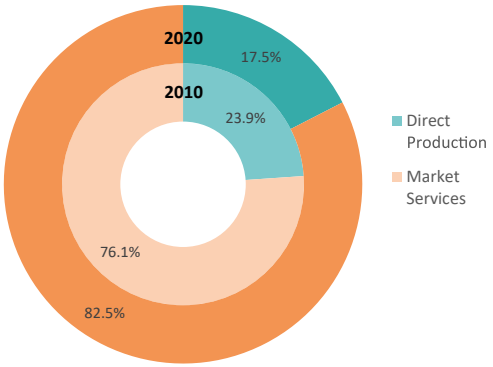
This development is yet another reflection of Malta's unabated shift towards a service-based economy. In fact, Malta's most significant economic transformation over the years has been precisely its success in becoming a services-based economy. Despite being broad-based, Malta's economic growth was mainly driven by the robust performance of the service-based sectors. These are mainly, but not limited to, the regulated industries. The growth in output was also reflected in the demand for employment in these sectors as can be seen from Figure 2.4.

FIGURE 2.4 – MALTA'S ECONOMIC TRANSFORMATION 2020 VERSUS 2010

Gross Value Added



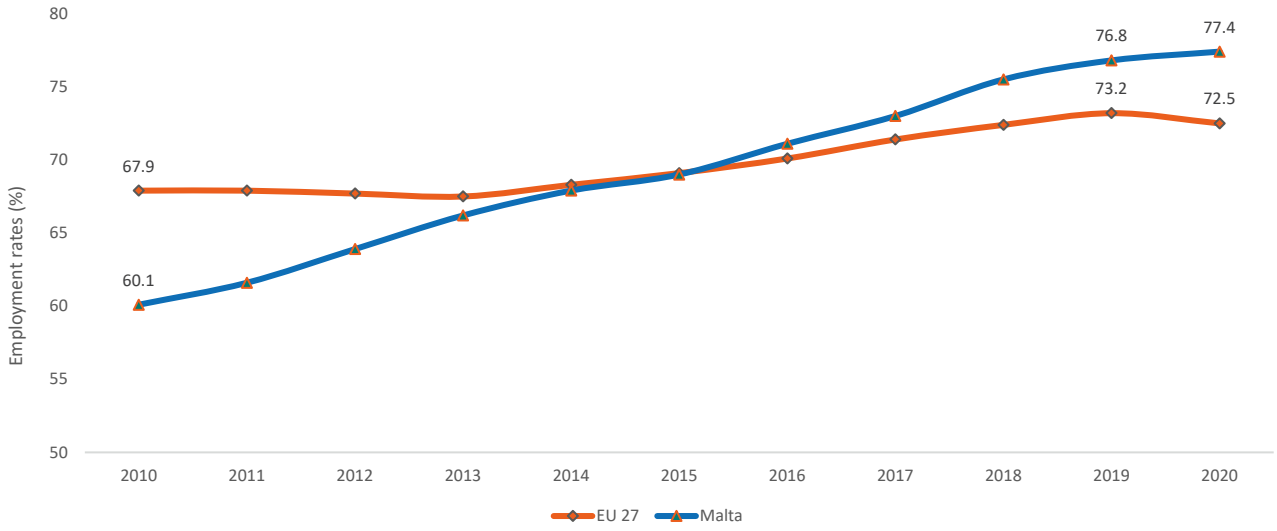
Labour Market



Source: NSO, Jobsplus, 2021

Malta's impressive economic performance in recent years is also reflected in its employment growth figures, with record employment rates that have consistently outperformed European averages. Malta's employment rate in fact surpassed the EU27 average in 2016 (see Figure 2.5) and, by 2020, stood at 76.8 per cent compared to 73.2 per cent for the EU27. Considering that in 2010 Malta's employment rate stood at 60.1 per cent, this indicates a steep rise over the last decade as a result of effective active labour market policies.

FIGURE 2.5 - EMPLOYMENT RATE



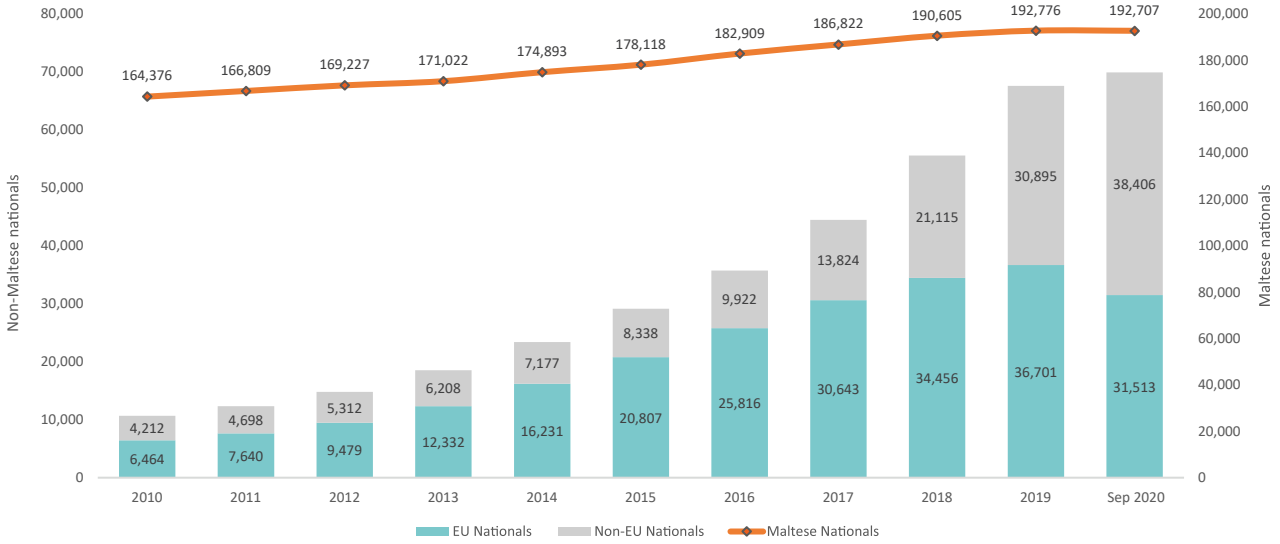
Source: Eurostat, 2021

The success Malta achieved in the labour market is a direct result of the National Employment Policy in 2014 which was based on an aggressive set of active labour market policies primarily geared towards attracting females into the labour market. The fast growth that was achieved in this cohort was mainly driven by a flagship policy that provided free childcare to returning mothers. In addition, significant increases were also evident in older workers remaining in employment past retirement.

One of the main drivers and transformations most visible in Malta's labour market was the sharp increase in non-Maltese working in Malta. The non-Maltese workforce has been the largest contributor to the growth of Malta's labour force and has contributed significantly to overall economic performance.

Between 2010 and 2019, the non-Maltese component of the labour force exhibited the fastest average annual growth rates. Whereas the Maltese cohort grew on average by 1.8 per cent each year, the non-EU national cohort registered an average annual growth rate of 24.8 per cent, closely followed by 21.3 per cent registered by the EU national category. As a result, the share of non-EU nationals in the labour force continued to increase over the years, and as at September 2020 exceeded the number of EU nationals working in Malta (see Figure 2.6), with non-Maltese nationals comprising 26.5 per cent of the total Maltese labour force.

FIGURE 2.6 – EMPLOYMENT BY NATIONALITY



Source: Jobsplus, 2021

Statistical note: The UK left the EU at the end of 31 January 2020. UK nationals working in Malta, as at September 2020, have therefore been included with non-EU Nationals.

Compared to the other EU27 countries in 2019, Malta had the second highest share of non-Maltese employed in the labour market, second only to Luxembourg which had a staggering 53.5 per cent of its labour force which were foreign, the majority of which were EU nationals (47.2 per cent). Cyprus came a close third to Malta with 22.5 per cent of its total employed being non-Cypriot. Other EU countries with a relatively high share of foreigners in the labour force include Ireland (17.1 per cent), Austria (16.7 per cent) and Estonia (13.5 per cent). However, of all the EU member states Malta has the highest share of non-EU nationals making up its labour force – in 2019 these amounted to approximately 14.0 per cent of the total employed.

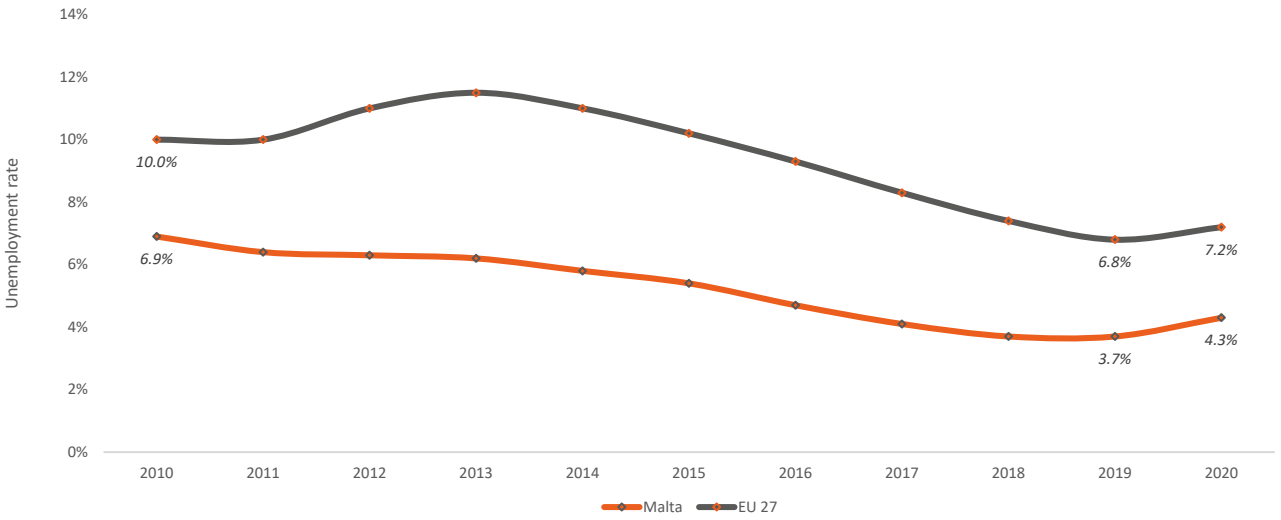
With employment achieving record highs, unemployment was on a downward trend and reached record lows prior to the crisis. Malta consistently achieved some of the lowest rates in Europe and was at its natural rate of unemployment between 2017 and 2019. Significant reductions were also achieved in the number of long-term unemployed.

There are two main statistical sources that capture movements in the labour market. These are the National Statistics Office, which runs a labour force survey (LFS)[1] carried out on an ongoing basis using a quarterly gross sample of 3,200 private households, and Jobsplus, which is the national public employment service agency, and which provides information through administrative sources on the actual numbers of registered full-time and part-time employment, and on persons registered as unemployed with the agency.

Results from the LFS show how over the course of nine years, Malta halved its unemployment rate from 6.9 per cent in 2010 to 3.7 per cent in 2019, before edging slightly up in 2020 because of the pandemic's economic impact (Figure 2.7). Statistics published by the latest Labour Force Survey suggest that unemployment rates in the first quarter of 2021 have been restored to 2019 levels.

[1] All criteria used for this survey match international methodologies used by the International Labour Organisation (ILO). The LFS is designed to satisfy the concepts and definitions as outlined by Eurostat, which is the EU Statistical Agency. This allows the comparability of results with other EU member states and countries following ILO definitions of employment and unemployment.

FIGURE 2.7 – UNEMPLOYMENT RATE (LABOUR FORCE SURVEY)

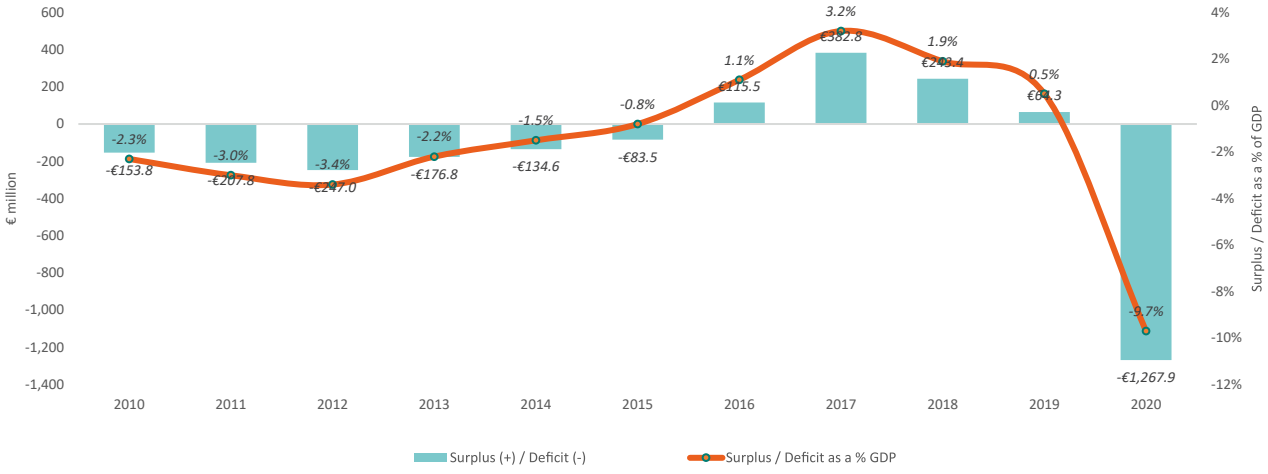


Source: Eurostat, 2021

Sustainable fiscal health is a key component for macroeconomic stability and long-run growth prospects. The recent crisis has highlighted the importance of having a fiscal buffer to act as a counter-cyclical stabiliser to safeguard employment. In fact, during the past year, fiscal policies were key to softening the economic blow of the crisis and have contributed to protecting thousands of jobs in Malta.

Since 2016, Malta's general government balance has entered positive territory following several years of deficits (see Figure 2.8). This improvement has been fuelled by increased government revenue and significant economic growth.

FIGURE 2.8 – GOVERNMENT DEFICIT-TO-GDP

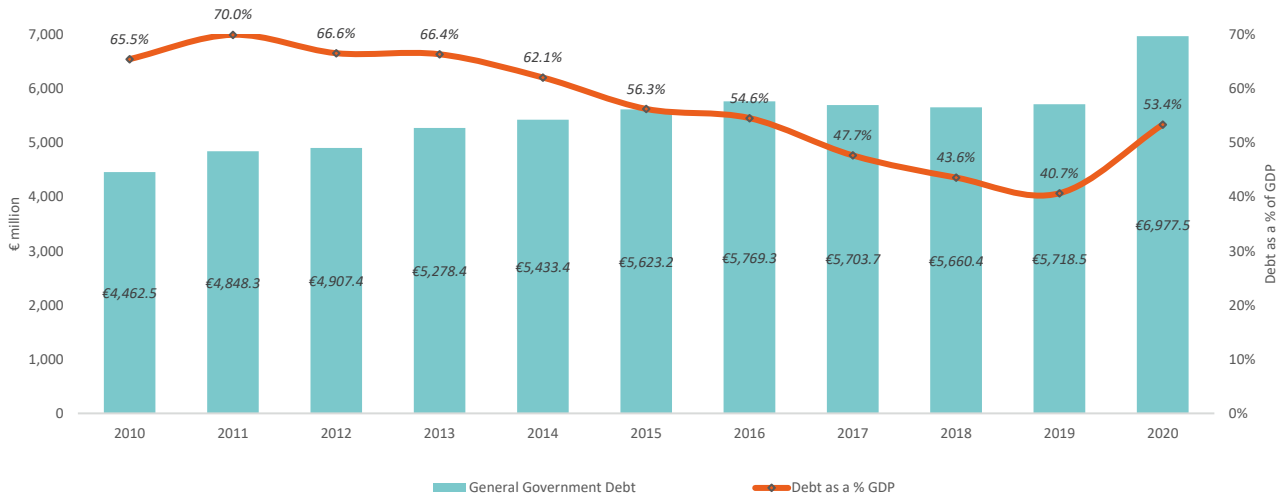


Source: NSO, 2021

As a result of the various support packages introduced by the Government over the past few months, the deficit in 2020 has swung back to a significant deficit. It is worth pointing out that in March 2020, the European Commission activated the general escape clause within the Stability and Growth Pact, effectively suspending the Maastricht Criteria requirements.

In terms of government debt, since 2015 Malta has aligned with the Maastricht criteria 60.0 per cent debt-to-GDP threshold after several years of exceeding this limit. In fact, Malta's debt-to-GDP ratio continued to fall reaching an all-time low of 40.7 per cent in 2019. Once again, this trend has now reversed, with Malta's debt figures increasing once again albeit remaining below the 60.0 per cent threshold.

FIGURE 2.9 – GOVERNMENT DEBT-TO-GDP



Source: NSO, 2021

It is evident that Malta's structural economic performance has been robust and broad-based. The strong economic growth that was registered, together with its convergence to EU27 averages, had a positive impact on employment trends and unemployment rates. This strong performance was felt across other macroeconomic indicators including balance of payments and public finances. COVID-19 and the ensuing negative economic impact have dented Malta's growth and remains a key challenge for the short-to-medium term.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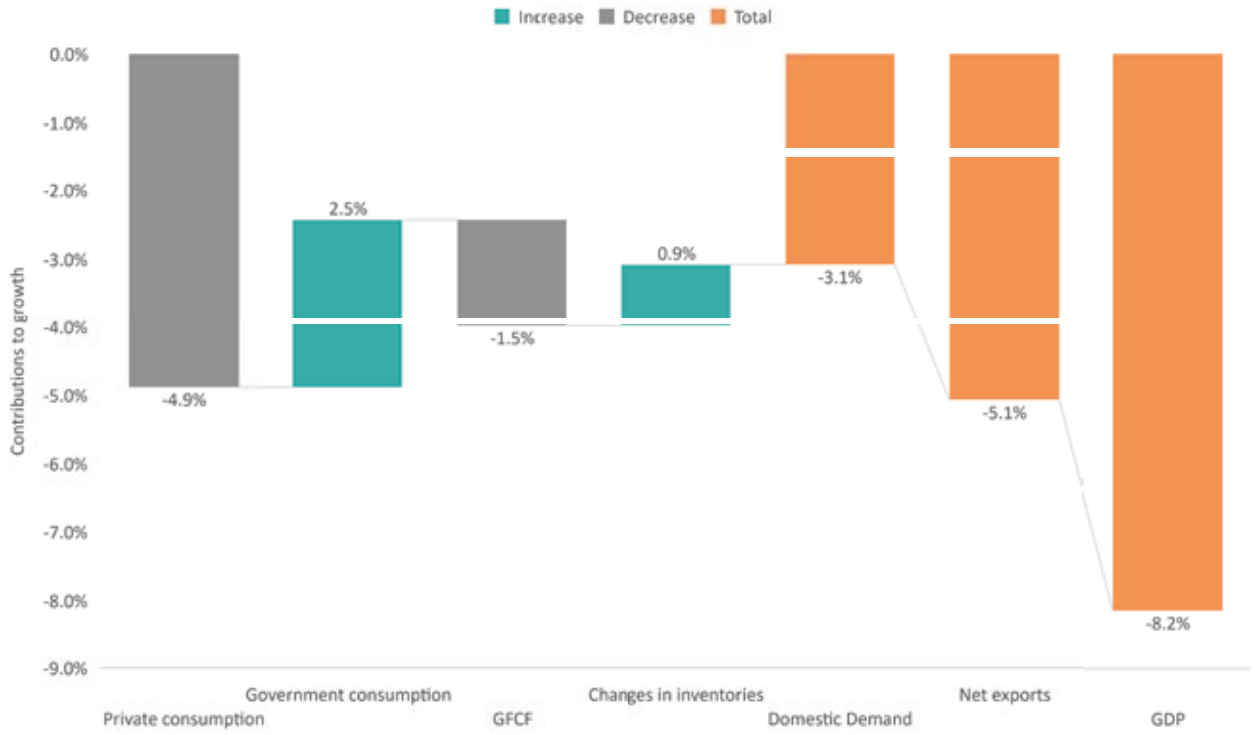
2.2 COVID-19 and its economic impact

The global pandemic hit in 2020 and Malta's economy registered a sharper contraction when compared to the EU average. Restrictions on air travel, tourism and social activities were mostly to blame for the expected drop in real GDP of 8.2 per cent (Figure 2.10). The decline in GDP was largely underpinned by lower net exports, as domestic demand, although negative, was of a smaller magnitude. Net exports shed 5.1 percentage points from GDP growth, reflecting a stronger decline in exports than imports. At the same time, overall domestic demand shed 3.1 percentage points from GDP growth, mirroring lower private consumption expenditure (-4.9 percentage points) and investment (-1.5 percentage points). With Government assuming a stronger stabilising role during this time, government consumption had a positive contribution to GDP growth (+2.5 percentage points).

FIGURE 2.10 – 2020 REAL GDP DEMAND



Source: NSO, 2021 (Chain linked volumes, reference year 2015), Authors' calculations

The worse hit economic sectors were those directly impacted by containment measures on international travel and the temporary closure of all but essential retail. To this end, the largest declines occurred in the accommodation & restaurants sector and the transport & logistics sector, which contracted by 68.8 per cent and 44.4 per cent respectively, and the wholesale & retail sectors, which decreased by 9.9 per cent over 2019. The agricultural sector was also significantly impacted by the slow activity in hotels and restaurants, which are generally an important consumer to the local agricultural sector.

The impact on other services sectors was broadly neutral, except for the information & communication sector, which registered a growth of 8.0 per cent in Gross Value Added (GVA), and the gaming sector, which was up by 11.8 per cent over 2019.

The manufacturing sector too was left relatively unscathed, and despite major disruptions to its supply chain the sector's GVA decreased by 1.4 per cent during 2020.

Notwithstanding all this, employment levels continued to increase, though at a slower rate than in previous years, clearly suggesting that the Governments support measures to prevent large-scale layoffs have so far paid off. Besides fiscal support, growth in employment during this period may also reflect an element of labour hoarding by firms following a period of skills shortages. Although during the period under review the unemployment rate edged up to 4.3 per cent, it remained close to its historical low and well below the average rate in the EU. In July 2021, Malta's unemployment rate stood at 3.3 per cent compared to a euro area average of 7.6 per cent and remained one of the lowest in Europe.

Against general expectations, registered employment data as at September 2020 and published by Jobsplus does not seem to suggest that the supply of non-Maltese employment has been significantly impacted by the economic disruption triggered by the COVID-19 pandemic. To the contrary, by September 2020 overall employment levels increased by more than 2,200 employees, the majority of which were non-Maltese (see Table 2.1). [2]

TABLE 2.1 – MOVEMENT IN SECTORAL EMPLOYMENT BY NATIONALITY (2020/2019)

Movement in sectoral employment by nationality 2020/2019	Maltese Nationals	Non-Maltese Nationals	Total change	Change as a % of 2019 sectoral employment
Agriculture & fisheries	-42	21	-21	-0.6%
Manufacturing	-363	194	-169	-0.7%
Construction	-128	659	531	3.3%
Wholesale & retail trade	-562	398	-164	-0.5%
Transport & storage	-311	257	-54	-0.4%
Accommodation & food services	-606	-548	-1,154	-5.7%
Information & communication	-55	5	-50	-0.5%
Financial & insurance	104	756	860	7.1%
Real estate	131	69	200	8.4%
Professional, scientific and technical	-375	-227	-602	-3.0%
Administrative & support services	727	590	1,317	5.3%
Public administration	177	48	225	0.7%
Education	-188	24	-164	-1.3%
Health & social work	1,253	421	1,674	13.6%
Gambling & betting	-51	-527	-578	-6.5%
All sectors	**-69**	**2,323**	**2,254**	**0.9%**

Source: Jobsplus, 2021

[2] The true extent of the pandemic on labour dynamics is believed to be more severe than actually reported, with a significant number of unregistered foreign workers thought to have returned to their home countries when faced with the slim prospect of work as a result of lockdowns and no government support through the wage supplement scheme due to their irregular work status. Although no data is available to support this claim, critical labour shortages being reported across several economic sectors points towards this assertion.

Despite this, certain sectors, notably the accommodation & food services sector, lost roughly 5.7 per cent of the 2019 staff complement resulting from both Maltese and non-Maltese employees leaving the sector during this period. This corroborates the staffing challenges that many operators in the catering industry are claiming to be facing as they eagerly open for business. Other sectors which experienced significant reductions in the number of non-Maltese employees were the gambling & betting sector and the professional services sector. All other sectors registered growth in the number of non-Maltese employed during this period, notably the health sector and the financial services sector, with the latter undergoing a transformation in the face of impending sectoral reforms. In other sectors, such as manufacturing and wholesale & retail trade, the sustained increase in the number of non-Maltese workers during 2020 has compensated for supply shortfalls created by the reduction of Maltese employees because of retirement or churn to other sectors.

Public finances deteriorated sharply in 2020, mostly reflecting the introduction of pandemic-related fiscal support, which increased government expenditure and deferred tax revenues, as well as the general decline in economic activity (see Table 2.2). During 2020 the fiscal balance showed a deficit of €1.3 billion which is equivalent to 10.1 per cent of GDP. General government debt on the other hand rose to 54.3 per cent of GDP from 42.0 per cent in 2019, though remaining well below the Euro area target. The pandemic also left its mark on the current account balance, which is estimated to have registered a deficit for the first time since 2016.

Several policy measures which had been put in place to cushion the impact of the pandemic in 2020, were extended in 2021. Total Government expenditure related to Covid-19 measures is estimated to amount to €660.4 million in 2021.

Government introduced a host of temporary, timely and targeted measures supporting the economy during the pandemic, saving companies and jobs during the crisis.

TABLE 2.2 – PANDEMIC RESPONSE ACTIONS AND MEASURES, 2020

Actions / Measures	€ millions
Wage supplement scheme	373.2
Tax deferrals	215.0
Various medical supplies and equipment in relation to COVID-19	74.1
Economic regeneration voucher scheme	43.4
Reduced tax on the transfer of immovable property	50.1
Cargo transportation and repatriation costs	50.0
Additional funds to the education sector	10.3
Short-term social measures	14.5
Quarantine leave	3.6
Interest subsidy scheme	0.7
50% utility bill/rent subsidy to businesses	3.0
7 cents reduction in the price of petrol and diesel	7.3
Refund of port charges and container discharge fees	1.0
Tax refund to workforce	12.3
Assistance for postponed weddings & voluntary organisations	1.1
Reimbursement of commercial licenses	4.4
Other (elderly care)	3.0
Other tourism related expenditure (incl. cancellation of licenses and fees)	6.5
Total estimated cost	**873.5**

Source: Ministry for Finance and Employment, 2021

As part of the NextGenerationEU financial package designed by the European Union, Malta will be benefitting from €316.4 million in grants under the Recovery and Resilience Fund. This financing will support the implementation of crucial investments and reforms which will allow Malta to emerge stronger from the COVID-19 pandemic.

Government launched various liquidity supporting measures to alleviate hard-hit businesses through a moratorium on loan repayments and a guaranteed loan scheme.

In August 2021, loans subject to a moratorium continued to decline, as the moratoria period is gradually expiring for many loans, and economic activity continued to normalise in most sectors. Indeed, as at the end of August, only 79 loans were subject to a moratorium on repayments compared to 135 loans a month earlier. The value of such loans declined by €15.6 million and stood at €63.3 million, or 0.5 per cent of total outstanding loans to Maltese residents (see Table 2.3). Loans subject to a moratorium have fallen consistently since August 2020. During August 2021, declines in both value and volume terms were observed across almost all sectors – with the largest drops in value terms registered in the construction and real sectors.

TABLE 2.3 – LOANS SUBJECT TO MORATORIUM AS AT END OF AUGUST 2021

	Volume of loans	Outstanding amounts (€ million)	Share in sector's outstanding loans
Households	31	3.6	0.1%
Manufacturing	1	0.1	0.1%
Construction	1	1.8	0.3%
Wholesale & retail trade	2	0.7	0.0%
Transportation & storage, Information & communication	1	0.1	2.7%
Accommodation & food services	16	15.9	0.7%
Real estate	11	6.6	1.7%
Other	16	34.4	0.5%
Total	**79**	**63.2**	**0.5%**

Source: Jobsplus, 2021

To further alleviate liquidity challenges, the Government launched the Malta Development Bank COVID-19 Guarantee Scheme (CGS) for the purpose of guaranteeing new loans granted by commercial banks for working capital purposes to businesses facing liquidity shortfalls because of the pandemic. The scheme enables credit institutions to leverage government guarantees up to a total portfolio volume of €777.8 million.

By end-August, 625 facilities were approved under the CGS, covering total sanctioned lending of €478.6 million (see Table 2.4). As the scheme provides guarantees on new loans for working capital and on loan repayments, the amount of loans disbursed under the scheme may be lower than the sanctioned amount. By the end of August, €401.5 million were disbursed, up slightly from the €395.7 million disbursed by the end of July. Thus, by the end of August, 61.5 per cent of the scheme was sanctioned, while 51.6 per cent was disbursed.

In terms of the number of facilities, the sector comprising wholesale and retail activities applied for the largest number of facilities and had €99.1 million in sanctioned loans. This was followed by accommodation and food service activities, with 149 facilities or €121.5 million in sanctioned loans.

TABLE 2.4 – MALTA DEVELOPMENT BANK COVID-19 GUARANTEE SCHEME AT END OF AUGUST 2021

	Total number of facilities	"Sanctioned amounts (€ million)"
Manufacturing	54	24.0
Construction	37	49.4
Wholesale & retail trade	170	99.1
Transportation & storage, Information & communication	41	50.3
Accommodation & food services	149	121.5
Professional, scientific & technical services	38	21.9
Administrative & support service activities	37	13.6
Real estate	18	6.7
Other	81	92.2
Total	**625**	**478.7**

Source: Central Bank of Malta, 2021

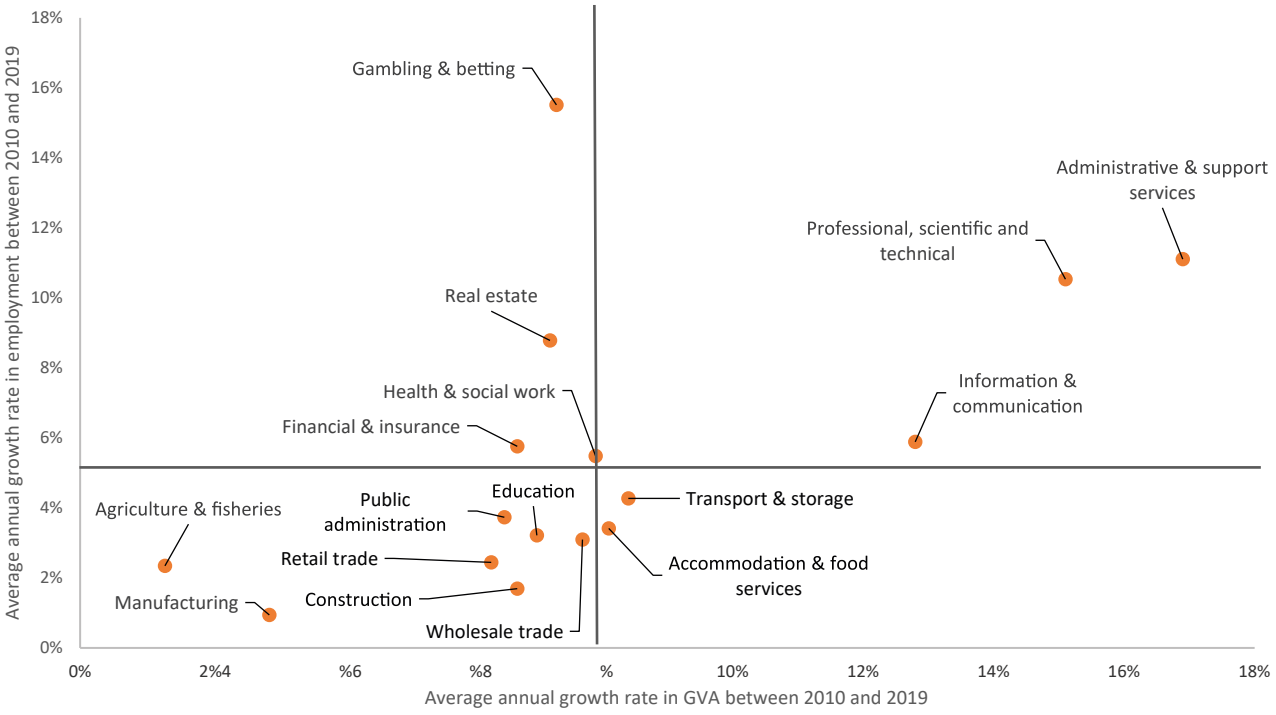
As part of the NextGenerationEU financial package designed by the European Union, Malta will be benefitting from €316.4 million in grants under the Recovery and Resilience Fund.

2.3 Malta's productivity & competitiveness: an internal analysis

Malta's buoyant economic performance was on the back of several sectoral developments. Over the years, Malta has been focused on diversifying its economy with a focus on establishing new niche sectors, primarily service based. Intersectoral diversification was also a key policy initiative with sectors being developed into ecosystems and new sub-sectors being established. A diversified economy is especially critical for a small open economy like Malta since the absence of a wide economic base can lead to excessive vulnerabilities and exposure to economic shocks.

Sectoral contribution to GVA and employment growth are two indicators that allow us to analyse the sectoral developments over the years. The sectoral growth in GVA also had significant implications on the demand for labour by the sectors (see Figure 2.11).

FIGURE 2.11 – GVA VERSUS EMPLOYMENT GROWTH BY SECTOR



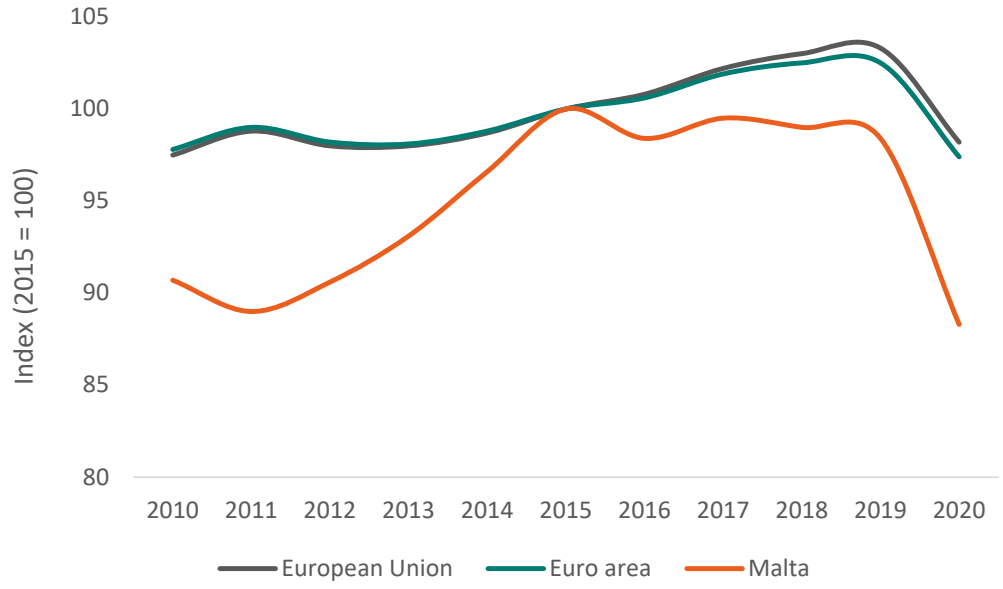
Source: NSO, Jobsplus, 2021

As evident in the above quadrants, not all sectors exhibited faster GVA and employment growth. In fact, over the period under review, three sectors (information & communication, professional, scientific & technical, and administrative & support services) all exhibited strong growth in employment and GVA indicating booming industries. On the other hand, industries in the top-left quadrant, such as gaming, financial & insurance services, and real estate, exhibited strong employment growth which was not fully translated into GVA growth. Reasons for this can be the need to enhance compliance functions with respect to financial services, the boom in the number of people entering the real estate market and a general plateauing of productivity in the gaming sector. The bulk of the sectors are all in the bottom-left quadrant displaying balanced growth between the two variables.

From a cursory analysis, productivity is a key challenge for Malta. By improving sectoral and national productivity, Malta can achieve higher growth rates, wealth, and employment.

Productivity is a key driver of economic activity, not simply in terms of generating higher levels of growth and output, but also in terms of improved wages and living standards. Malta's Total Factor Productivity (TFP), which is typically related to productivity from technological advancement, has grown significantly since the 2009 economic crisis and has risen at a much faster rate than the rest of the EU and Euro Area. This in fact peaked in 2015, when it converged to both EU27 and EA19 levels before reversing this trend and declining close to 2011 levels by 2020 (see Figure 2.12).

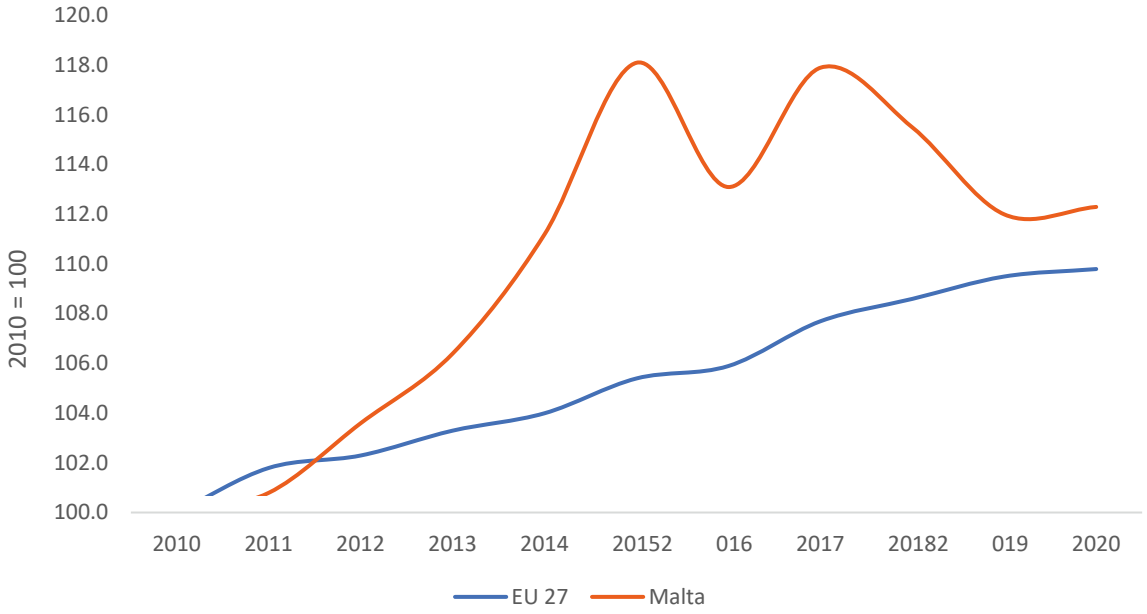
FIGURE 2.12 – TOTAL FACTOR PRODUCTIVITY



Source: European Commission, 2021

In terms of labour productivity, denoted in terms of hours worked to account for differences in working times across full-time and part-time workers, one can observe notable growth in Malta's labour productivity over recent years, such that aggregate labour productivity is now higher in Malta than the EU27 average (see Figure 2.13).

FIGURE 2.13 – REAL LABOUR PRODUCTIVITY PER HOUR WORKED



Source: Eurostat, 2021

However, there are wide disparities between sectors. By working out the nominal GVA per worker in each sector, one gets a good indication of the sectoral productivity. Based on average and aggregate productivity levels for the entire Maltese economy in 2020, Table 2.5 classifies each sector according to whether its productivity lies below (low) or above (high) this threshold. To chart the performance of the sectors over time, data is presented for 2010, 2019 and 2020 to highlight the structural changes already evident before the pandemic as well the impact this then had at a sectoral level.

TABLE 2.5 – SECTORAL LABOUR PRODUCTIVITY (NOMINAL GVA PER WORKER)

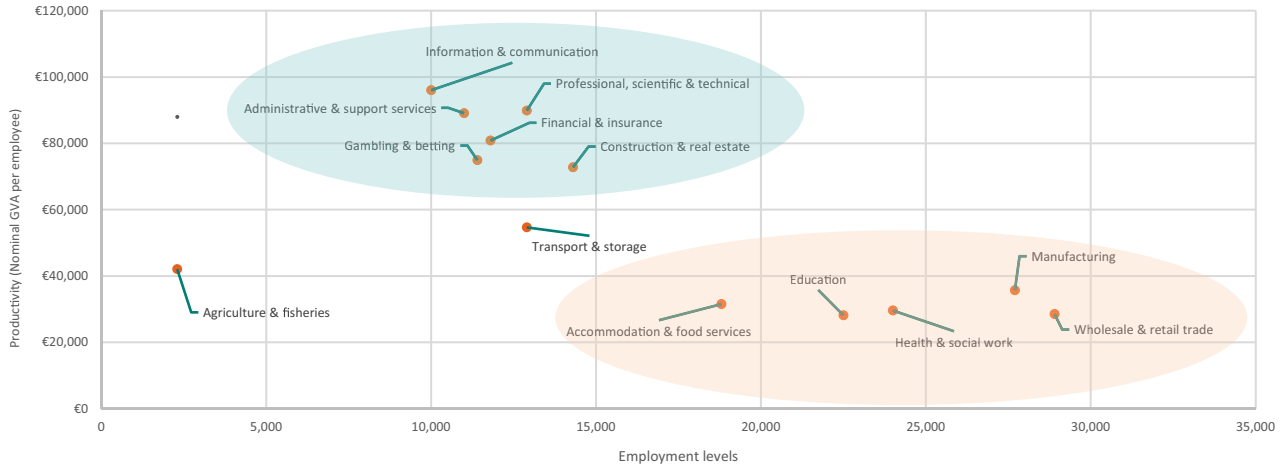
	2010 (€)	**2019 (€)**	**2020 (€)**
Country productivity	**37,427**	**48,520**	**45,199**
High productivity sectors			
Information & communication	67,604	106,690	118,763
Professional, scientific & technical	56,345	97,457	87,454
Financial & insurance	82,875	91,686	76,414
Gambling & betting	283,438	90,387	93,990
Administrative & support services	51,340	83,455	76,075
Construction & real estate	54,643	65,518	70,304
Transport & storage	37,615	54,512	28,562
Low productivity sectors			
Manufacturing	31,389	35,931	34,556
Accommodation & food services	24,057	34,330	11,491
Wholesale & retail trade	24,391	33,160	32,027
Health & social work	26,925	31,558	31,185
Agriculture & fisheries	41,095	28,565	23,885
Education	24,891	28,222	28,493

Source: Eurostat, 2021, Authors' calculations

From the data presented it is apparent that the high productivity sectors were services-based, and these led to the overall gains between 2010 and 2019. As a result of COVID-19, several sectors plateaued, except information & communication which shot up because of the pandemic-induced acceleration in digital transformation.

The analysis can be extended by analysing variations on the size of the workforce to understand the dynamics between productivity and employment. The relationship is depicted in Figure 2.14 for the year 2019, which is a better representation of sectoral productivity dynamics than 2020, which was distorted as a result of COVID-19

FIGURE 2.14 – EMPLOYMENT VERSUS PRODUCTIVITY (2019)



Source: Eurostat, 2021, Authors' calculations

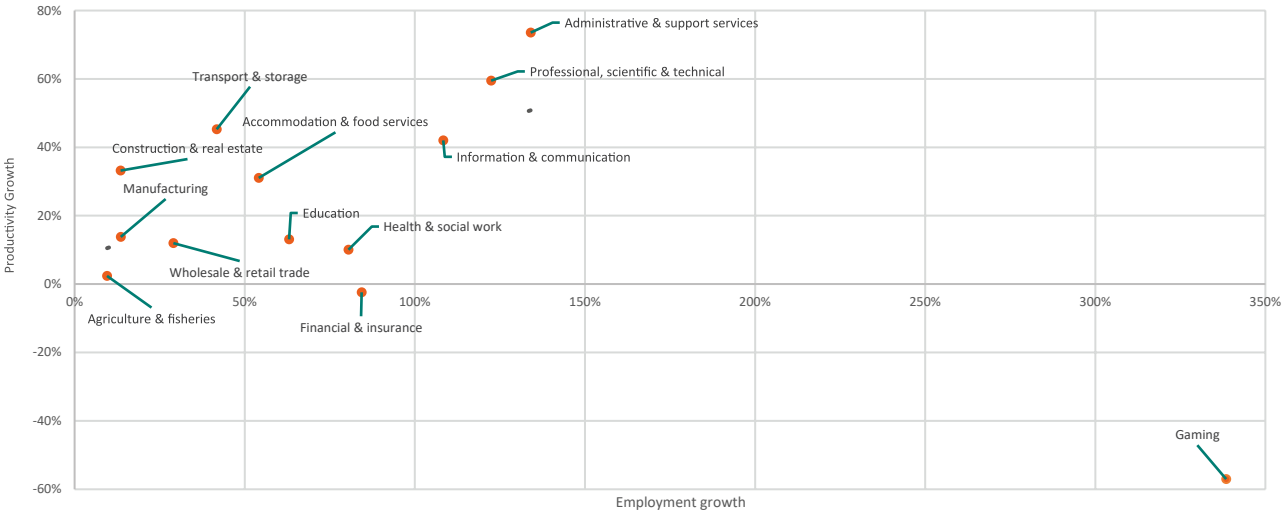
It is evident that two clusters exist in the economy. The first cluster, represented by the gambling, information & communication, and other service-based sectors, presents higher-than-average productivity which generated a high-level of value-added with a leaner workforce. In contrast, the second cluster of more labour-intensive sectors failed to generate high levels of productivity. In fact, a negative correlation is found between the two. An outlier is agriculture & fisheries which is highly dependent on the fate of the aquaculture industry and is highly dependent on its success. The above analysis is tabulated in matrix format for ease of reference in Matrix 2.1.

MATRIX 2.1 – EMPLOYMENT VERSUS PRODUCTIVITY

		Productivity	
		Low	**High**
Employment	**High**	Accommodation & food services, wholesale & retail, manufacturing, education, health & social work	
	Low	Agriculture & fisheries	Information & communication, Professional services, Administrative & support services, Financial services, Construction & real estate, Transport, Gaming

To capture the dynamic and the shifting nature of the economic fabric it is important to consider the relationship between employment growth and productivity growth. This analysis assesses whether those sectors experiencing higher levels of productivity growth have also been experiencing greater job creation. This relationship for the period 2010 to 2019 based on sectoral averages for both indicators is depicted in Figure 2.15. In 2020, productivity levels for most sectors, notably the accommodation and food services and transportation sectors, deteriorated significantly in line with the unprecedented decline in economic activity. To this end, 2019 is a better benchmark to use in assessing productivity developments over the past recent years.

FIGURE 2.15 – EMPLOYMENT GROWTH VERSUS PRODUCTIVITY GROWTH (2019/2010)



Source: Eurostat, 2021, Authors' calculations

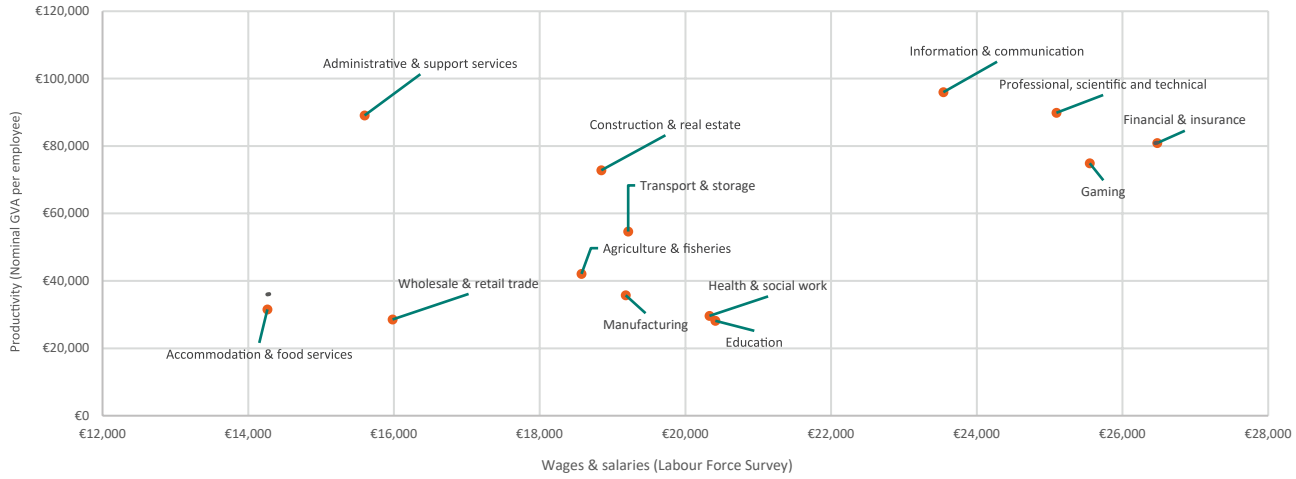
In this analysis we observe a positive correlation between employment and productivity growth, with the findings suggesting that low productivity growth and low employment growth remained in step over the period under review. Several sectors experienced both high job creation and productivity growth, indicating that they were booming – this applies particularly to services-based sectors such as professional & administrative services and information & communication. On the other hand, sectors such as gaming and financial services experienced low productivity growth but high employment growth. This shows that given that GVA in the sectors was already high, it could have plateaued. A further factor may be the increase in regulatory requirements, which may have necessitated operational changes as well as an expansion of more labour-intensive functions such as compliance. The relationship in matrix form is shown in Matrix 2.2.

MATRIX 2.2 – EMPLOYMENT GROWTH VERSUS PRODUCTIVITY GROWTH

		Productivity growth	
		Low	**High**
Employment growth	**High**	Gaming, Financial services, Education, Health & social work	Professional services, Administrative & support services, Information & communication
	Low	Agriculture & fisheries, Wholesale & retail, Manufacturing,	Transport, Construction & real estate, Accommodation & food services

It is important to analyse the relationship between wages and salaries earned by workers in each sector and whether these move in line with productivity developments. Figure 2.16 plots sectoral productivity against average annual wages and salaries per worker within each sector for 2019.

FIGURE 2.16– PRODUCTIVITY VERSUS WAGES & SALARIES (2019)



Source: Eurostat, 2021, Authors' calculations

The relationship between the two indicators is positive, indicating that wages and salaries could be correlated with productivity developments. It is evident that two distinct clusters exist from a sectoral perspective showing that although the economy is diversified, the sectors and wages within it are growing at different speeds. The first cluster is the strong services-based sectors and includes gambling, information & technology, professional, scientific & technical, and financial & insurance services. These all command higher-than-average salaries and are at the upper level of productivity levels in Malta. Most sectors all gravitate towards the average wage. However, the administrative & support services, which includes an array of activities that support general business operations such as leasing activities and office support, exhibit high productivity but low wages, which were dampened by the inflow of migrant workers who in turn contained upwards wage pressures. As can be evidenced from this cluster, there is scope for improvement in terms of productivity and, eventually, in wages and salaries.

MATRIX 2.3 – PRODUCTIVITY VERSUS WAGES & SALARIES

		Productivity	
		Low	High
Wages & salaries	High	Education, Health & social work	Information & communication, professional services, financial services, Gaming
	Low	Accommodation & food services, wholesale & retail trade, agriculture & fisheries, manufacturing	Construction & real estate, Administrative & support services, Transport

The 'Returns to Labour Income' (RLI) indicator is used as another measure of sectoral productivity, for each sector, defined as the value added generated by each worker for every euro spent on wages and salaries. This ratio provides a more succinct indicator of the value extracted from the labour force within each sector, and thus points towards potential sectoral competitiveness. The results are shown in Table 2.6, whereby each sector is classified as having either high or low RLI using Malta's aggregate RLI for 2019 of around €2.57. For comparative analysis Table 2.6 also gives the sectoral RLI for 2012.

TABLE 2.6 – RETURNS TO LABOUR INCOME (RLI)

	2012	2019
Aggregate RLI	€2.47	€2.57
High RLI Sectors		
Administrative & support services	€4.81	€5.35
Construction & real estate	€4.00	€4.79
Information & communication	€2.50	€4.54
Professional, scientific, and technical	€3.31	€3.88
Financial & insurance	€3.75	€3.53
Gambling & betting	€8.72	€2.89
Transport & storage	€2.45	€2.84
Low RLI Sectors		
Accommodation & food services	€1.88	€2.41
Wholesale & retail trade	€2.29	€2.37
Manufacturing	€2.39	€1.88
Health & social work	€1.67	€1.55
Agriculture & fisheries	€3.64	€1.54
Education	€1.48	€1.38

Source: Eurostat, 2021, Authors' calculations

The administrative and support services sector has the highest RLI in Malta with €5.35 generated per euro of wages and salaries, followed by the construction & real estate sector (€4.79), the information & communication sector (€4.54), and the professional services sector (€3.88). The classification of these sectors mirrors productivity developments highlighted above.

Meanwhile, most sectors have not experienced any drastic movements in their RLI when compared to 2012. The main exceptions are the agricultural sector which has been relegated to the low RLI sectors since 2012 because of the low productivity growth recorded during this period, and the gaming sector, which although still among the high RLI sectors, fell significantly from 2012 on account of growing salaries against plateauing GVA levels. The information & communications sector, which has been experiencing high productivity growth rates, increased its RLI from €2.50 in 2012 to €4.54 in 2019.

BOX 2.1 – LABOUR PRODUCTIVITY AND SECTORAL DECOMPOSITION

According to a Working Paper issued by the Central Bank of Malta earlier this year, real labour productivity growth in Malta averaged 1.2 per cent between 2000 and 2019, double that registered in the euro area, mostly on account of the large structural shifts and reforms that have occurred in Malta since the early 2000s . The contribution of within sector efficiency gains in Malta however was below that observed in the euro area and was the main driver of cyclical fluctuations in Malta's productivity growth since 2000. The Working Paper also notes that distortions such as government assistance and labour hoarding during recessions added to these fluctuations.

As intimated elsewhere in this report, the services sector was the main contributor to productivity growth in Malta over this reference period, largely driven by the arts, entertainment and recreation sector which also includes gaming, professional, scientific and technical activities, administrative and support services, and financial and insurance activities. In contrast, the manufacturing sector had the largest negative contribution.

Although similar sectoral developments were observed across the euro area, the Working Paper concludes that the absolute magnitude of these contributions was greater in Malta. In fact, the positive contribution of the services sector (1.9 percentage points) was significantly larger than that recorded in the euro area (0.6 percentage points). With the same conclusion, productivity within the local manufacturing sector stood at -0.6 percentage points as opposed to -0.1 percentage points registered in the euro area.

Overall, the results presented in this Central Bank analysis suggest that, while productivity levels in Malta remain below those observed on average in the euro area, convergence is ongoing. This development should provide the right impetus to continue encouraging increased efficiencies within the manufacturing sector, particularly through grants encouraging investment in new technologies and in research and development, which propels the continued development of high value industries and further diversifies the economic base.

[3] Utilising chain-linked sectoral GVA data.

[4] Labour productivity growth in Malta: A sectoral decomposition analysis, Roberta Montebello & Jude Darmanin, Central Bank of Malta, Working Paper, 2021.

2.4 Malta's productivity & competitiveness: an international analysis

In analysing Malta's competitiveness and productivity, international benchmarking plays a key role in analysing current performance and identifying key challenges in this regard. For the purposes of this analysis, this section will focus on the concept of Location Quotients as well as analyse Malta's performance in selected global indices.

Through Location Quotients (LQ), it is established that Malta ranks among the top three EU27 countries in the following five key economic sectors: gaming, financial services, information & communication, professional and administrative services. A location quotient is a ratio used to determine the concentration or dominance of a particular industry in a country in comparison to a larger reference or benchmark region, in this case the EU. For this review, LQs are applied to analyse Malta's sectoral performance, in terms of GVA, vis-à-vis respective sectors in the EU. LQ is a function of the following equation:

$$LQ = \frac{Xi / \sum Xi}{Ni / \sum Ni}$$

where LQ is the location quotient, Xi is the GVA of a particular sector (say manufacturing) in country i (Malta), ∑ Xi is the total GVA of all sectors combined in Malta, Ni is the total GVA comprising the manufacturing sector of all the 27 countries of the EU, and ∑ Ni is the sum of GVA comprising all economic sectors of the 27 Member States of the EU.

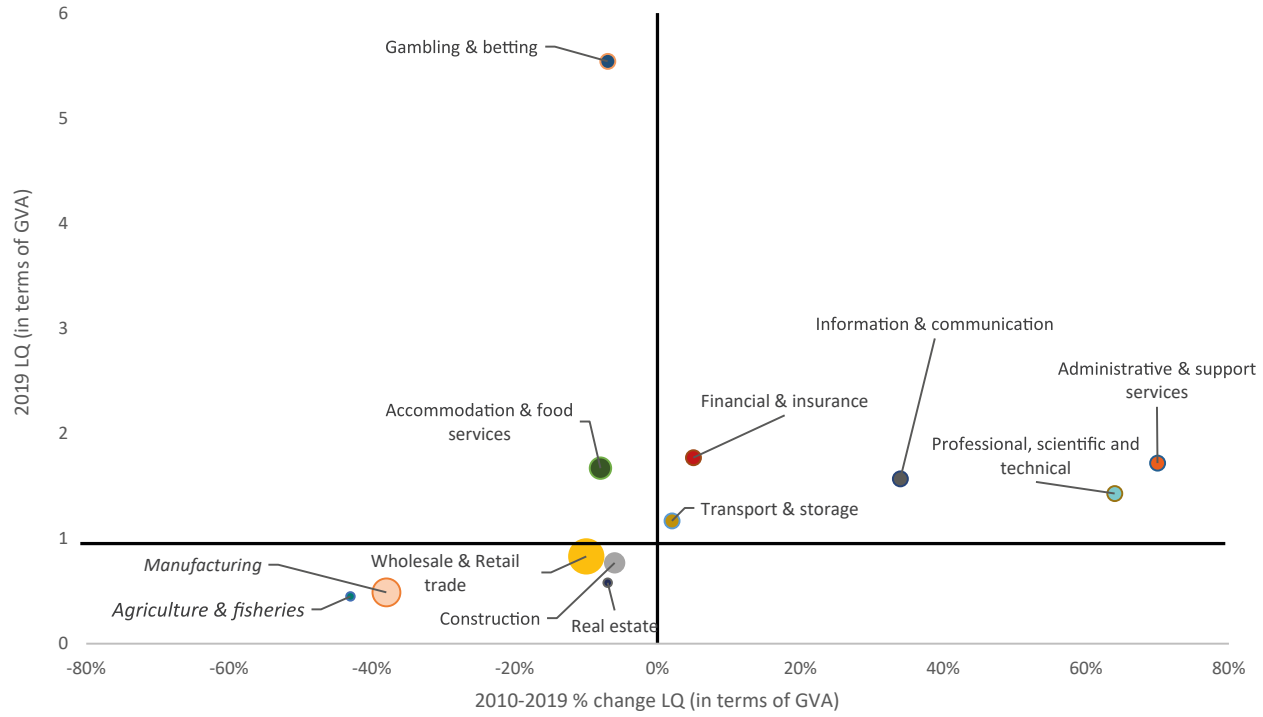
If the LQ for a specific sector in a country is 1.0 it means that the country and benchmark region are equally specialised in the particular sector. A LQ higher than 1 means that the country has a higher concentration in that given sector. The opposite rationale applies for an LQ measurement lower than 1.

Typically, LQs are useful to determine which industries epitomise the local economy, as well as identify the most export-oriented industries in the country on account that industries with high LQs are generally export-oriented industries. Industries which have both high LQs and relatively high total job numbers typically form a region's economic base. That said, it is important to keep in mind that certain sectors, such as the gaming sector in Malta, may not be a significant employer in relative terms but is then an important user of services provided by other sectors of the Maltese economy, such as professional services and the ICT sector. The effect of the gaming sector on employment is therefore higher than what is directly reported. The same applies for tourism which affects the livelihood of a significant number of employees working across different sectors and is not limited solely to accommodation and food services.

For this reason, LQs are augmented by two other pieces of information: the size of an industry in terms of jobs and percentage change in LQ over a given period. A high LQ industry with a small number of jobs may be an export-oriented industry but is not necessarily vital to the country's labour market. At the same time, a high LQ industry with declining LQ over time could be endangering the country's economy.

Figure 2.17 plots the LQ measurement on the vertical axis, while the horizontal axis shows the percentage change in LQ between 2010 and 2019. Sectors are plotted as bubbles with the size of bubbles corresponding to the relative size of employment in absolute terms. The figure is also split into four quadrants which is useful to categorize the various types of industries.

FIGURE 2.17 – LOCATION QUOTIENTS



Source: Eurostat, 2021, Authors' calculations

An industry in the upper right quadrant is more concentrated than the benchmark region and is also becoming more concentrated over time. Local industries falling in this quadrant comprise the financial & insurance sector, the information & communication sector, and the professional services sector, with Malta placing second in all of these sectors, following Luxembourg, Ireland and Belgium in the respective sectors (see Table 2.7). In the former, however, the disparity between Luxembourg and Malta is almost six-fold. These industries are standouts that distinguish the local economy and are doing so more every year—and they are especially important since they also provide for a relatively high number of good quality jobs with higher-than-average salaries.

TABLE 2.7 – LOCATION QUOTIENT ANALYSIS

	Malta					
Sector	**LQ GVA 2019**	**Rank in LQ GVA 2019**	**Change in LQ GVA 19/10**	**"Top Country LQ GVA 2019"**	**Top Performing EU Country 19/10**	**Lowest Performing EU Country 19/10**
Agriculture & fisheries	0.45	25	-43.1%	Romania	Slovakia	Malta
Manufacturing	0.49	25	-37.7%	Ireland	Ireland	Malta
Construction	0.77	25	-6.1%	Slovakia	Ireland	Greece
Wholesale & Retail trade	0.83	24	-10.3%	Poland	Romania	Slovakia
Transport & storage	1.17	11	2.3%	Lithuania	Slovakia	Ireland
Accommodation & food services	1.67	7	-7.6%	Greece	Romania	Ireland
Information & communication	1.57	2	33.8%	Ireland	Cyprus	Italy
Financial & insurance	1.77	2	4.9%	Luxembourg	Greece	Ireland
Real estate	0.58	26	-6.5%	Greece	Latvia	Bulgaria
Professional, scientific and technical	1.43	2	64.0%	Belgium	Romania	Greece
Administrative & support services	1.72	1	69.6%	Malta	Malta	Czechia
Gambling & betting	5.54	1	-6.6%	Malta	Lithunia	Ireland

Source: Eurostat, 2021, Authors' calculations

On the back of strong economic performance in the professional services sector, but also in other key sectors such as remote gaming and financial services, the administrative and support services sector, which includes an array of activities that support general business operations such as leasing activities and office support, also registered impressive growth during this period and stands out as an emerging sector. Due to growing maritime and aviation sectors, as well as warehousing and support services and logistics, the transport sector also has the potential to emerge as one of the leading industries for Malta.

The upper left quadrant contains industries that are more concentrated than the benchmark region, but whose concentration is declining. If a mid-size or large industry is in this quadrant, it is a critical warning that the economy is losing a major part of its export base and should form planning and investment priorities accordingly. If the economy does not bolster these industries or replace them with other export industries, it could enter a general recession if one of these industries fail.

Malta's gaming sector falls in this quadrant and while it remains Europe's regional hub with an LQ ratio five times higher than the second placed country, Slovakia, concentration fell by 6.6 per cent during the period between 2010 and 2019. Countries like Latvia and Spain have also started to close in and while they do not appear to be posing an immediate threat to Malta's position, they have increased their market concentration by 17.0 per cent and 4.6 per cent respectively during this period. As already intimated, gaming today is one of the main drivers of the Maltese economy. Despite these results, the sector continues to perform very strongly and has proved to be resilient during 2020, growing by 11.8 per cent over 2019 in terms of nominal GVA. Notwithstanding, the sector is known to be quite volatile, and it is therefore important to continue transforming the

sector through both regulatory and technological innovations to secure its long-term success.

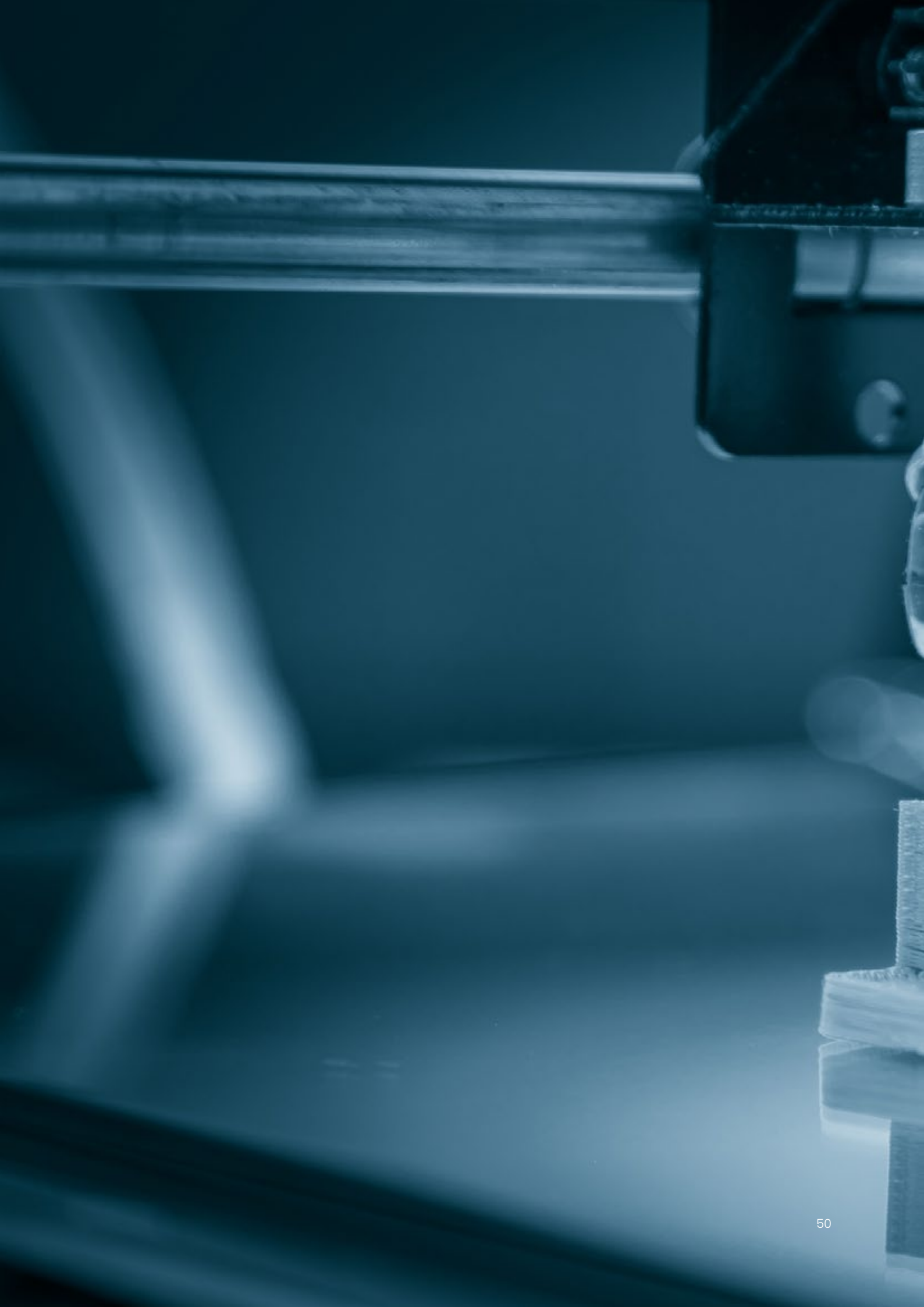
Another important pillar for the Maltese economy which falls within this quadrant is the tourism industry, best captured through the activities of the accommodation and food services sector. The sector was one of the worst hit during 2020 and has exposed some fault lines running through the local economy which remains heavily dependent on the tourism industry. The sector's position within this quadrant suggests that tourism was losing its relevance in comparison to other EU countries before 2020, with the LQ ratio decreasing by 7.6 per cent during the period between 2010 and 2019. Malta currently holds seventh place, with all its main competitors – Greece, Cyprus, Croatia, Portugal, and Spain – leading the charts.

Sectors falling in the lower right quadrant are not yet as concentrated locally as they are at the EU level but are becoming more concentrated over time. If they maintain this trajectory, they will eventually move across the horizontal axis into the upper right-hand quadrant. They are typically referred to as pre-emergent industries, having the potential to contribute more to the local economic base. No local industries currently fall in this quadrant.

Finally, the lower left quadrant contains industries which are locally less concentrated than the EU average and are also declining in their relevance when compared to other EU Members States. Industries falling within this quadrant are nonetheless critical for the local economy, either because they account for a significant share of the local labour force (wholesale & retail trade), are vital for the all-important food security of Malta (agriculture and fisheries) or have the potential to transform into high value-added industries (manufacturing) that would continue to sufficiently balance and diversify the economic base. As highlighted in Table 2.7 above, Malta was the lowest EU performing country in the agriculture and fisheries sector as well as in the manufacturing sector with the LQ ratio decreasing by 43.1 per cent and 37.7 per cent, respectively, during the period between 2010 and 2019. As will be described further on in this report, digital innovation and industrial transformation shall influence the key policy direction to spur productivity and growth within all industries, particularly those that are repeatedly falling behind.

To shed more light on Malta's competitiveness standing on an international level, the Global Competitiveness Index 2019 presented by the World Economic Forum offers insights into the economic prospects of 141 economies by integrating well established levers that drive productivity and growth.

With a score of 84.8 out of 100, Singapore is the country closest to the frontier of competitiveness. Among the G20 economies, the United States (2nd, down 1 place), Japan (6th), Germany (7th, down 4 places) and the United Kingdom (9th, down 1 place) feature in the top 10, but they all have experienced erosion in their performance. Led by Singapore, the East Asia and the Pacific region is the most competitive in the world, followed by Europe and North America.



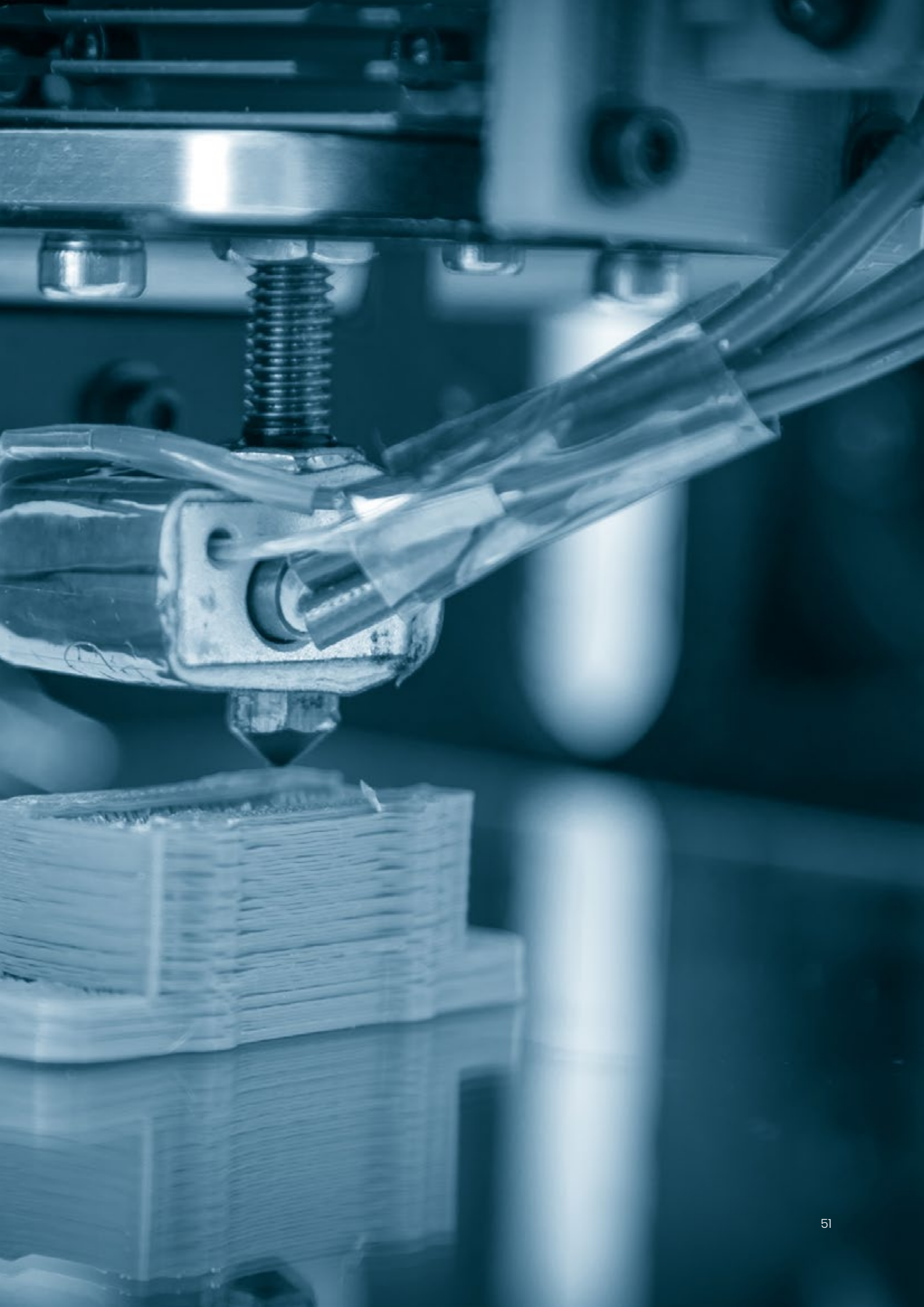
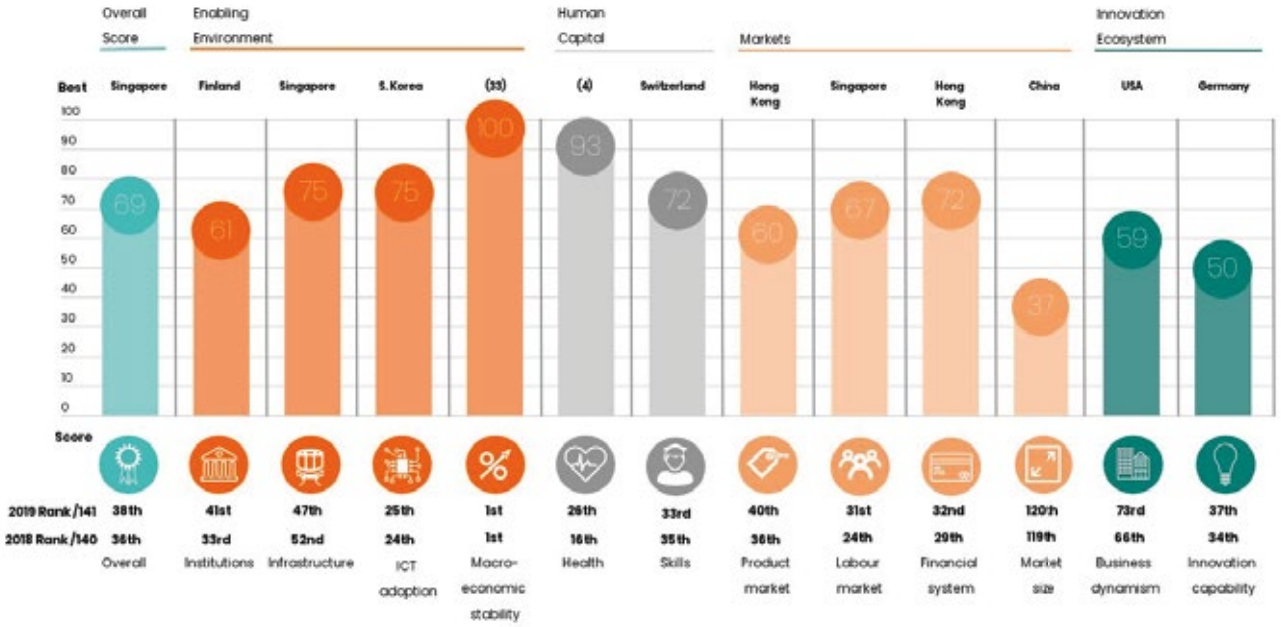


FIGURE 2.18 – GLOBAL COMPETITIVENESS INDEX 2019 - MALTA

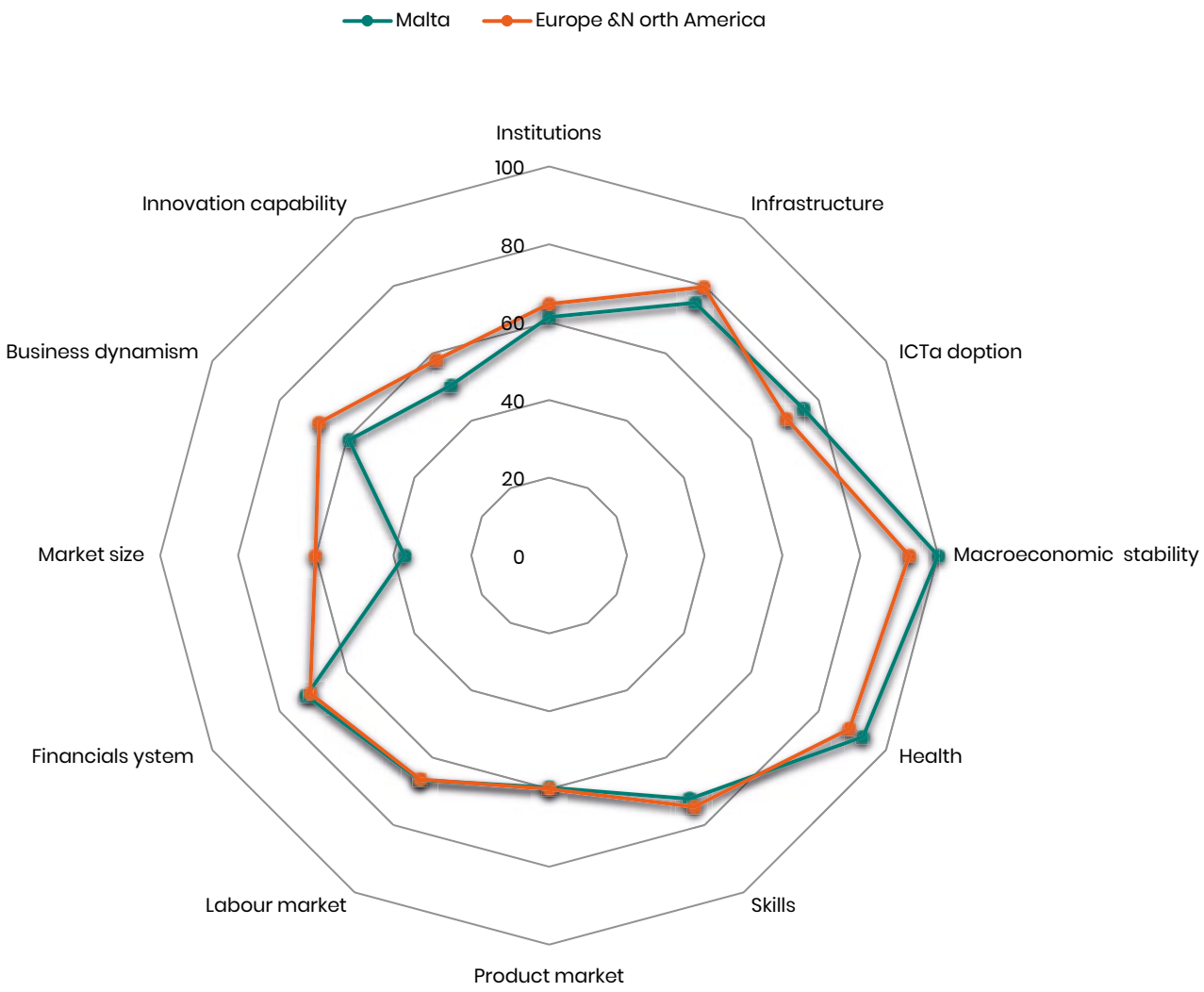


Source: The Global Competitiveness Report 2019

Malta, with an overall score of 68.5, ranks 38th on the global competitiveness scoreboard, down two places in comparison to 2018. The country registers better performance than the average of European and North American countries in terms of ICT adoption (particularly when it comes to internet and cellular connectivity), macroeconomic stability (where Malta obtains the maximum score on the back of low inflation and strong public finances), and in healthcare as has been amply demonstrated during this public health crisis.

In other areas, notably business dynamism and innovation capabilities, Malta is found lagging the average of European and North American countries. Issues related to the time required to start a business, insufficient growth of innovative companies and the low levels of R&D continue to impinge heavily on the respective scores achieved. As has already been intimated above, these issues are becoming a common theme for Malta's economic progress and inventiveness. It is therefore crucial for Malta to act on these areas if it wants to stay in its league and become a global hub for knowledge-based industries and high value-added sectors.

FIGURE 2.19 – GLOBAL COMPETITIVENESS INDEX 2019 – COMPARISON MALTA VERSUS EUROPE & NORTH AMERICA



Source: The Global Competitiveness Report 2019

From the above analysis, both the national and international analysis of Malta's competitiveness have highlighted the challenge Malta faces in productivity and competitiveness, with several sectors being more problematic than others. The following section tries to uncover some challenges Malta is facing.

2.5 Malta's economic challenges

The country faces several challenges in the short and medium-to-long run. This section shines a spotlight on the challenges facing Malta and which are directly related to both productivity and competitiveness.

IMMEDIATE CHALLENGES

Supporting the still delicate recovery

Although the recovery has started to gather momentum, with Malta expected to have the fastest growth rate in 2022, it remains fragile. Tourism remains highly dependent on the spread of the virus and although numbers are picking up, they are still far away from pre-pandemic levels. It is imperative that Government continues to enhance Malta's connectivity with major airports to restore seat capacity to Malta whilst ensuring that Malta is marketed as a safe country for travellers.

Scaling back business support

As discussed earlier on, the Government has invested heavily in supporting business through the pandemic and the ensuing recession. Liquidity support measures as well as direct wage subsidies have provided an important lifeline to several companies. Although the indicators indicate that there has not been an increase in Non-Performing Loans, there is the risk that as the financial support starts to taper off, some businesses might not be able to recover. Here, the Government might have to design specific schemes to support such enterprises as well as update the legislation to deal with company insolvency as Malta still lacks a robust and accessible framework in this regard.

Supply logistics & cost-push inflation

Currently, supply-side constraints are being felt across various industries on a global level, and coupled with higher energy prices, costs of goods are on an upwards trend. Being a small and open island economy, Malta is vulnerable to such effects, and this can further dent Malta's competitiveness from a cost push factor due to the increased freight costs.

Grey listing and its adverse effects

Following FATF's decision to grey list Malta and put in under enhanced surveillance due to shortcomings related to AML, the Government needs to not only ensure that the action plan that was agreed with FATF is implemented swiftly but it needs to be vigilant for any adverse effects that might impact Malta's economy. The key areas that the authorities should focus on are: (i) ensuring the availability of accurate and up to date beneficial ownership information and applying appropriate sanctions for non-compliance by companies and gatekeepers; (ii) enhancing the use of financial intelligence to support tax and money laundering cases; and (iii) increasing the focus of the Financial Intelligence Unit's analysis on criminal tax offenses. It is also important to ensure that ongoing AML/CFT reforms are sustainable in the long term.

Corporate insolvency framework

Malta's insolvency framework needs to be urgently strengthened to address existing shortcomings, including a lengthy liquidation process, low recovery rates, weak creditor rights, and an inefficient judicial system. The authorities have already initiated a comprehensive insolvency reform plan in line with the European Directive on Restructuring and Second Chance, including (i) establishing an early warning system; (ii) introducing new preventive restructuring procedures; (iii) revamping insolvency laws; and (iv) modifying the liquidation procedure. This should be completed by mid-2022 as planned.

MEDIUM-TO-LONG TERM CHALLENGES

Ensure fiscal buffers are rebuilt

Once the economic recovery kicks in and aid is scaled back, it is important that the Government rebuilds its fiscal buffer which really allowed it to invest in temporary, targeted support to companies in distress. Fiscal sustainability is key, and the Government needs to aim at achieving a stable reduction in both its deficit and debt levels over the medium term to ensure it retains the capacity to intervene in the economy.

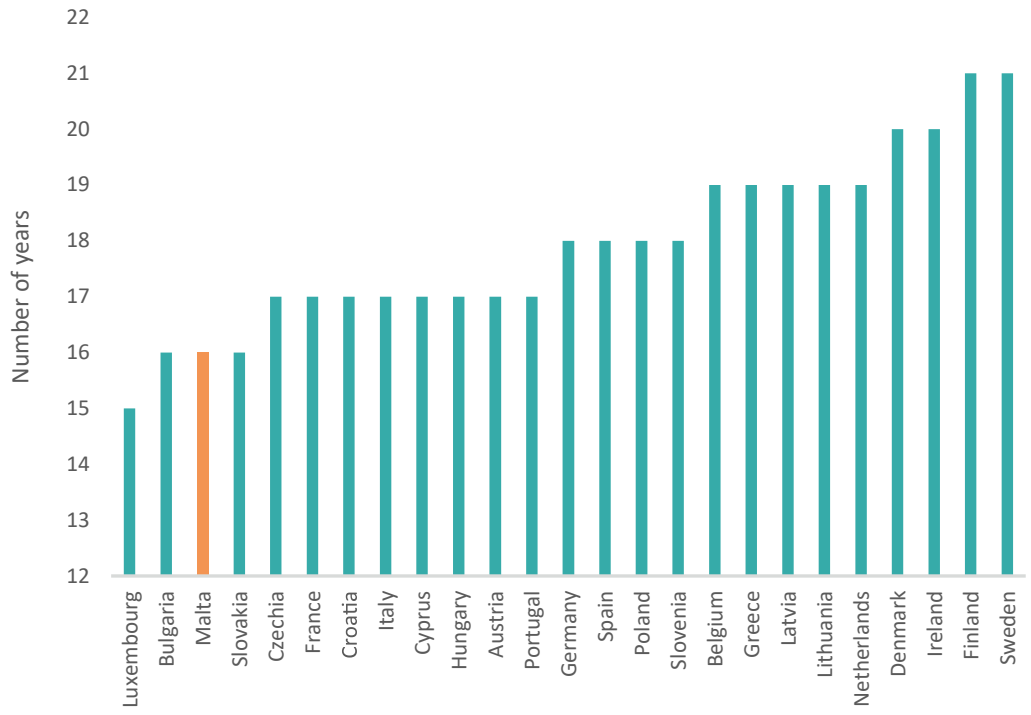
Enhance capacity to absorb EU grants

Malta is about to start benefitting from both the new Multi-Annual Financing Package as well as the Recovery and Resilience Fund. The investment projects that the grants will support are critical for Malta to further engage in investment in green and digital transformations as well as in infrastructural projects. It is critical that the Government ensures that it has the right capacity to maximise grant absorption and project implementation.

Address structural challenges in education

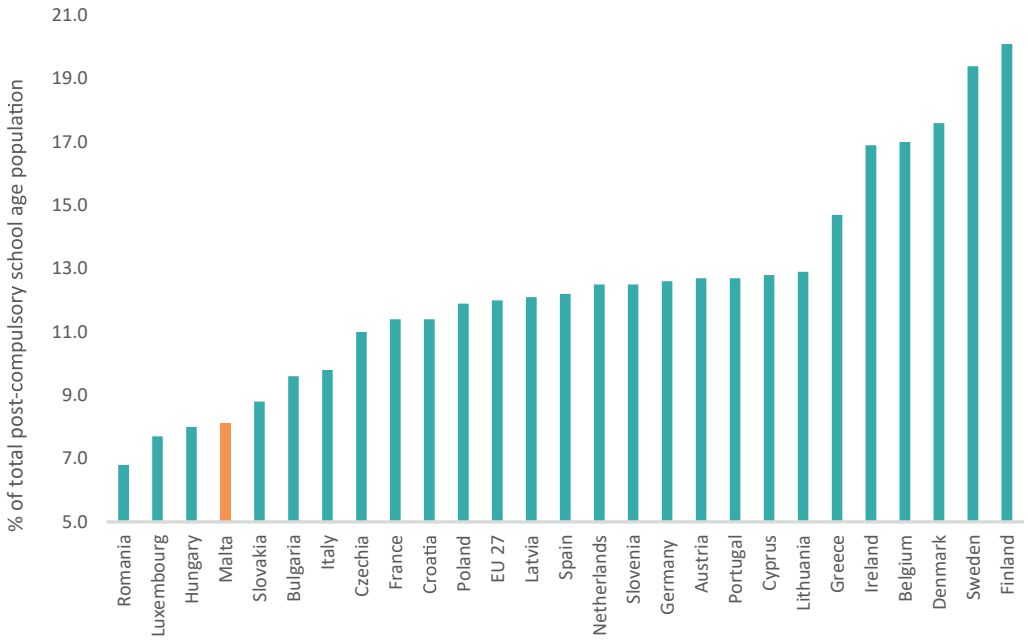
Malta's educational success continues to be plagued by a high degree of early school leavers reflected in Figure 2.20, where Malta ranks third from last with respect to the expected number of school years. Additionally, Figure 2.21 shows the low uptake of post-compulsory education in Malta when compared to other EU Member States.

FIGURE 2.20 – EXPECTED YEARS OF SCHOOLING (2018)



Source: Eurostat, 2021

FIGURE 2.21 - STUDENT IN POST-COMPULSORY EDUCATION AS A PERCENTAGE OF TOTAL POST-COMPULSORY SCHOOL AGE POPULATION (2018)



Source: Eurostat, 2021

Given Malta's dependence on human resources and the expected demand for skilled resources, it is imperative that the Government, in close collaboration with key stakeholders, prioritises policy action and investment in this area.

Malta's demographic challenges will impact productivity and potential growth

Naturally, demographic developments hold significant implications for the future labour market. As is the case with other developed economies, Malta has been experiencing lower fertility rates and a growing trend towards older women having children. Malta's fertility rate, which measures the number of live births per 1,000 women of reproductive age (ages 15 to 49 years) per year, had improved slightly from 1.4 in 2010 to 1.5 in 2011, then stabilised at around 1.4 in the years that followed, until it fell from 1.4 in 2016 to its lowest recorded level of 1.1 in 2019. Correspondingly, the average age of women giving birth increased from 28.9 to 30.6 during this time. Against this backdrop, Malta is also experiencing an ageing population, reflected by an increasing old-age dependency ratio. The old age dependency ratio, which measures the number of old dependents (i.e. those aged 65 and over) per 100 people in the workforce (i.e. 15-64 years old), has in fact increased from 21.4 in 2010 to 28.1 in 2017. It is important to point out that since 2014, the ratio's rate of growth has moderated, and the trend has also been reversed between 2017 and 2020, where it now hovers around 27.1. This is due to the growing influx of non-Maltese which has boosted the size of the current labour force and helped ease the dependency pressures on the local labour force.

Entrench an innovation ecosystem

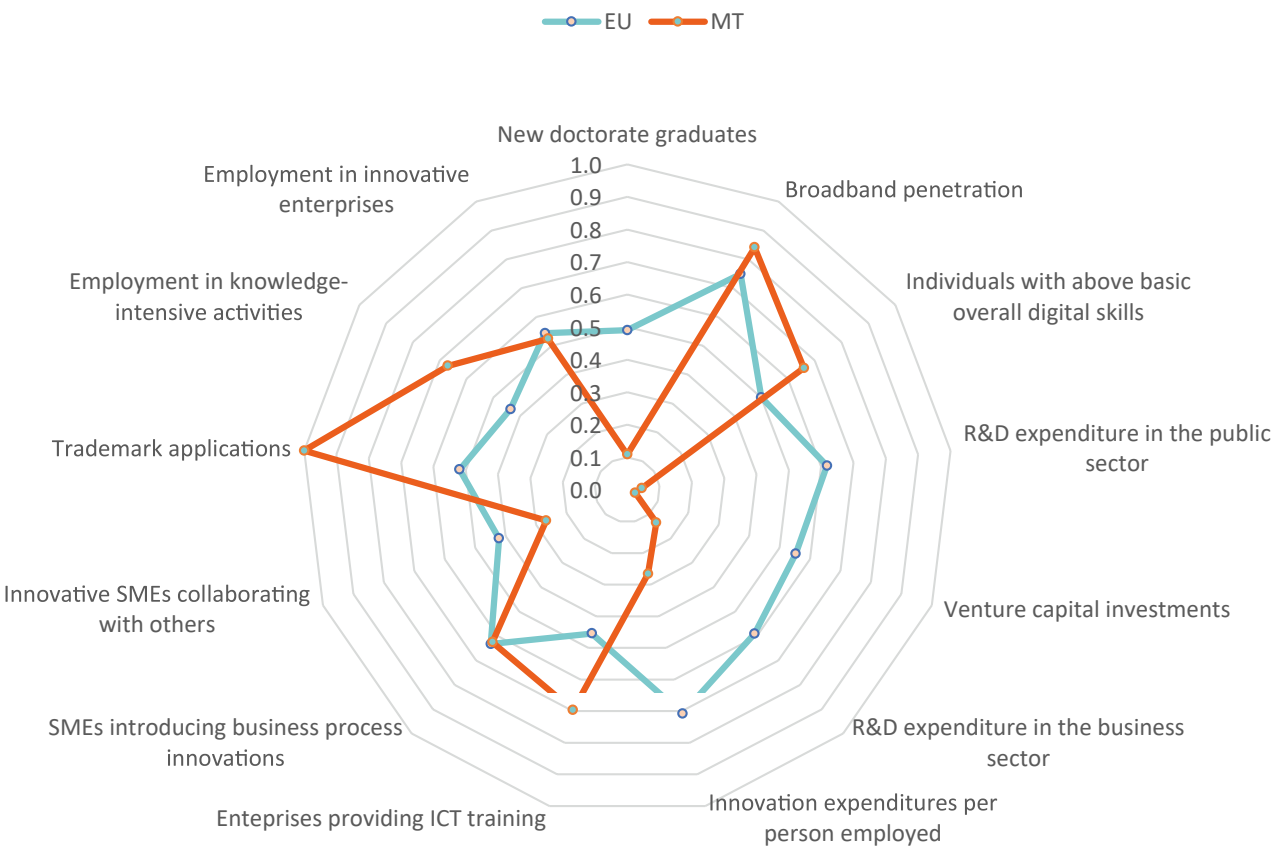
According to the European Innovation Scoreboard (2021) Malta is a classified as a moderate innovator though important gaps remain. Based on scores for 32 separate indicators, including innovation activities in companies, investment in research and innovation, human resource and employment elements, and digitalisation countries that aspire to achieve a high level of innovation performance need to have a balanced innovation system which performs well across all dimensions. Typically, they would need to have an appropriate level of public and private investment in education, research and

skills development, effective innovation partnerships among companies and with academia, as well as an innovation-friendly business environment, which includes strong digital infrastructure.

Malta scores high on broadband penetration, trademark applications, SMEs introducing business process innovations, employment in fast-growing enterprises of innovative sectors and employment in knowledge-intensive activities. It also scores above average in the provision of ICT training by private enterprise and with reference to the number of individuals with above basic overall digital skills.

These positive developments set the right pretext for further innovation gains and digitalisation. Significant gaps however remain in areas such as doctorate graduates, R&D expenditures in both the public and business sector, innovative SMEs collaborating with others, and venture capital expenditures which together with private equity support are becoming more fundamental to accompany the private sector, particularly start-ups, in the transformation of economies. Addressing these pain points is going to be central for the Maltese economy to chart out its recovery post COVID-19.

FIGURE 2.22 – KEY INNOVATION PERFORMANCE INDICATORS 2021: MALTA VERSUS EU27



Source: European Innovation Scoreboard 2021

2.6 The road ahead

As in other developed countries, Malta faces several challenges with respect to productivity growth. Demographic trends, unless supplemented with inward migration, will lead to a reduction in the workforce and will further lead to skill shortages. With a need to continue pursuing growth, the focus needs to be on how to boost productivity growth across the various economic sectors.

Productivity growth is the main driver of sustained economic growth. Therefore, in the long run, increasing productivity is the only way to maintain income growth and access to essential goods and services. Since the first industrial revolution, the introduction of new technologies has contributed to higher productivity in firms and in the economy. On this basis the development and incorporation of new technologies into production processes is essential for growth.

The ongoing digital transformation of the economy and society holds many promises to spur innovation, generate efficiencies and improve services, and in doing so boost more inclusive and sustainable growth as well as enhance wellbeing.

It is precisely for this reason that the focus of this year's National Productivity Report is on digital transformation and its impact on productivity with a focus on an assessment of sectoral readiness towards digital transformation.

Productivity growth is the main driver of sustained economic growth. Therefore, in the long run, increasing productivity is the only way to maintain income growth and access to essential goods and services.

3.

Digital transformation as a route to competitiveness

Digital transformation has been one of the latest trends across companies and countries. This section aims to lift the veil over this term and present the main characteristics, drivers and technologies that are underpinning this phenomenon. In addition, it also links the concept to national productivity and competitiveness and given the important role it plays, this section also presents a firm-level assessment of digital transformation. Before developing a Malta-specific Digital Transformation Readiness Index, this section also presents literature on international readiness and digital maturity indices.

3.1 Unbundling digital transformation

Since the late 1980s, the digital revolution has transformed the economy and society. First came the development of a connected economy, characterised by the mass take-up of the Internet and the roll-out of broadband networks. This was followed by the development of a digital economy via the increased use of digital platforms as business models for the supply of goods and services. Now the movement is towards a digitalised economy, in which production and consumption models are based on the incorporation of digital technologies in all economic, social, and environmental dimensions.

The adoption and integration of advanced digital technologies, such as fifth generation (5G) mobile networks, the Internet of things (IoT), cloud computing, artificial intelligence, big data analysis and robotics, means that we are moving towards an ever-connected world with digitalised economies and societies at its core. It is a world in which the traditional economy, with its organisational, productive and governance systems, overlaps or merges with the digital economy. This is resulting in new, digitally interwoven systems giving rise to more complex ecosystems that are currently undergoing deep organisational, institutional, and regulatory transformation (ECLAC, 2018).

These dimensions of digital development are constantly evolving. This makes the digital transformation process highly dynamic and complex, and thus challenging for public policies insofar as it requires constant adaptation and a systemic approach to national development. Within this framework, 5G networks will make the convergence of telecommunications and information technologies viable, changing the structure and dynamics of the sector, while the adoption of digital technologies and artificial intelligence (as general-purpose technologies) marks a new industrial revolution that will impact the economic fabric.

At the societal level, digital disruption leads to changes in communication, interaction and consumption models that are reflected in greater demand for devices, software with more functionalities, cloud computing and data traffic services and the basic digital skills needed to use the associated technologies. In turn, the digital economy represents an opportunity for consumers to access information and knowledge of all kinds in various formats, goods and services, and more streamlined forms of remote consumption. The move towards the digital economy should mean that consumers' needs can be met with smart products, often associated with advanced services that are highly customised. All this means an increase in consumer welfare, accompanied by a reconfiguration of the digital skills needed for more advanced digital consumption and for the new labour requirements resulting from the new production models.

At the same time, the new forms of consumption are associated with potential benefits from reduced material use and more sustainable environmental choices, insofar as these are based on more and better information (about the environmental footprint of a product, for example) or reward more environmentally friendly practices.

The development of the digital economy has radically changed the value proposition of goods and services via the reduction of transaction and intermediation costs and the exploitation of information from data generated and shared on digital platforms. These digitally enabled models facilitate the generation and capture of data which, when processed and analysed with smart tools, can be used to improve decision-making, and optimise supply.

This results in more streamlined operating processes and market segmentation, as well as in ever more targeted product customisation and transformation. Data and digitalised knowledge become a strategic production factor (ECLAC, 2016). All this entails a need for regulatory changes in a variety of areas, ranging from telecommunications to trade, taking in competition and data protection and cybersecurity policies.

The digital transformation of the production sector is taking the form of new management, business, and production models, that are disrupting traditional industries even as they facilitate innovation and the introduction of new markets. The expansion of the industrial Internet, smart systems, virtual value chains, and artificial intelligence in production processes is speeding up innovation and generating productivity gains, with positive effects on economic growth. In addition, all this is driving the transformation of traditional industries through automotive technology (autotech), agricultural technology (agritech) and financial technology (fintech), among others. Smart production models can bring increased competitiveness with a smaller environmental footprint, as companies are using digital tools to map and reduce their footprint to assess their impact on climate change and modify their production processes.

A similar process is underway in the public management models of state and government bodies, to better meet citizens' demands and improve government action. The adoption of these technologies by such institutions would increase the efficiency and effectiveness of service provision in sectors such as health care, education, and transport. It would also improve citizen participation in democratic processes, increase transparency in government operations and facilitate more sustainable practices.

Despite all this potential, digital development that is not governed by principles of inclusiveness and sustainability can reinforce patterns of social exclusion, as well as unsustainable exploitation and production practices. Although digitalisation can make a major contribution to the three dimensions of sustainable development - growth, equality, and sustainability - its net impact will depend on the extent to which it is adopted and on its system of governance.

The next section will focus on the link between digital transformation and productivity and trace the ways in which digitalisation can improve productivity and competitiveness.

3.2 Key drivers and technologies enabling digital transformation

Digital technology is evolving from playing a mere support role in the process system into a strategic role in the decision-making system. This evolution will become a key factor for companies pursuing higher quality and efficiency. To unbundle digital transformation and what firms need to do, it is important to trace the key technology drivers that are enabling this transformation:

- Bandwidth-hungry services continue to drive up network speeds as the internet becomes like electricity: essential, ubiquitous, and invisible. Light years ahead of its predecessors, 5G is a major network revolution that will deliver unprecedented levels of capacity and efficiency.
- Low cost, high scalability and rapid deployment of cloud computing has helped unlock innovation. The cloud means easy access to world-class technology and a reduced carbon footprint for a wider user base.
- Advanced analytics using Big Data is becoming increasingly powerful as a tool to drive business decisions.
- Hundreds of billions of devices connected to the Internet of Things (IoT) will extend the digital economy to every sector of the economy. Open source is driving IoT Platform interoperability.
- Artificial Intelligence (AI) enables people to leverage tools and data with minimal technical expertise. The increased capabilities of intelligent robots and advanced manufacturing methods will redefine the nature of jobs and rearrange the location of factories.

For the purposes of this analysis, several key technologies were selected as key drivers of firm and sectoral productivity. A brief definition is provided below for each technology.

Artificial Intelligence (AI)	Artificial intelligence (AI) applies advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate decisions, and take actions
Big Data	Big data is high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation.
Cloud Computing	Cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using internet technologies.
Augmented Reality/Virtual Reality	Virtual Reality is the technology that provides almost real and/or believable experiences in a synthetic or virtual way, while Augmented Reality enhances the real world by superimposing computer-generated information on top of it.
Blockchain	A blockchain is one architectural design of the broader concept of distributed ledgers which ensures that data and digital processes are tamperproof, verifiable and auditable, and transparent to involved stakeholders. Blockchain can be used to both provide trusted systems as well as to make digital processes that require intermediaries or trusted parties to provide assurances more efficient.

Robotics	Robotics is the intersection of science, engineering and technology that produces machines, called robots, that substitute for (or replicate) human actions.
Business Intelligence & Analytics	Business Intelligence & Analytics is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance.
Internet of Things	The internet of things, or IoT, is a system of Internet-connected computing devices, that monitor and/or can interact with their environment, users, animals, appliances, or any other object or space to provide added value to users.

Apart from being general purpose technologies, crosscutting across different industries and sectors, these identified technologies also have various sector-specific applications. Several such technologies and general-purpose applications have been identified below. A more detailed analysis of their sector-specific opportunities is presented in Chapter 4.

CROSS-SECTORAL TECHNOLOGIES

Technology is crosscutting and many of the emerging technologies being investigated will disrupt diverse aspects of business operations. While some tech applications are very sector-specific, other applications cover more generic tasks that can benefit all or most sectors. Some key examples of these horizontal applications are presented below.

Digitisation of business processes

Many businesses still rely excessively on paper-based processes. In other cases, where enterprises have opted for some degree of digitisation, this is done with inadequate preparation and re-engineering leading to sub-optimal results in terms of increased productivity and efficiency. Digitisation, defined as the process of changing from analog to digital format (Gartner), is the prerequisite for digital transformation and the essential springboard for increased productivity and innovation. It is vital to avoid treating digitisation as a simple conversion from paper-based processes to ICT-based systems. Rather, 'smart' digitisation can leverage AI, automation, and other emerging technologies to maximise benefits across the value chain, particularly in the enhanced use of data and analytics. Maltese businesses should therefore immediately consider how their businesses could benefit from digitisation, approaching this strategically with a view to further, future transformation.

Automated and Assisted Task Scheduling

The scheduling of jobs, tasks and any other work involving scheduling resources is a complex activity which involves many different variables. While humans can use their judgement to create schedules based on constraints and their intuition, this is a labour-intensive task and results can often be sub-optimal. AI can provide a solution that outputs an optimal schedule. Examples of where this could be used is in creating rosters, allocating machinery and material for jobs, deliveries, and any other task which requires scheduling.

Supply chain management and logistics optimisation

Most business involve some form of supply chain with many stakeholders which may include different material, product, or service providers. When a product or service is dependent on multiple parties, the end-consumer is inherently trusting each involved party, and the reputation of each stakeholder may depend on other parties in the supply chain. Visibility across the supply chain is therefore a significant competitive advantage, ensuring that this functions as effectively and efficiently as possible, with immediate mitigation of any emerging issues or bottlenecks. This is where technologies such as Blockchain or IoT can be transformational:

- A Blockchain and Smart Contract based system can bridge the trust gap to ensure that processes are transparent and tamper-proof, enabling the tracking of the various processes across the supply chain. While it does not solve issues related to the trustworthiness of individual parties, it provides a solution to irrefutably identify each party's acceptance of the product or service and its condition before it reaches the next stage of the chain. Checks and audits can also be logged in a tamperproof manner providing assurances to the end-user.
- In addition, supply chain processes can be automated with guarantees that automatically execute based on the fulfilment or otherwise of designated tasks by any stakeholder in the chain. For example, payments could automatically be released, or deposits forfeited.
- For any supply chains that involve physical activity or objects, IoT devices could be used to automatically feed in data to associated systems (e.g., temperature monitoring of pharmaceutical products that require strict storage temperature conditions).

Automated and Assisted Customer and Stakeholder Interaction

Most businesses require some form of interaction with customers or other stakeholders, some of which is repetitive and does not necessarily involve complex thought. Support and other form of engagement involving two-way communication can be automated using virtual assistant software and chatbots. Customer engagement and outreach is often applied across the entire customer base. As a business learns more about its customers, it can use customer data to target communications more strategically. Chatbots are becoming increasingly popular with customer support communication channels across a variety of industries and sectors.

Such applications not only lead to firm-level productivity gains, but such improvements will also lead to enhanced national-level competitiveness and productivity if a critical mass of adoption is achieved.

Technology is crosscutting and many of the emerging technologies being investigated will disrupt diverse aspects of business operations.

3.3 Linking digital transformation to productivity

Digital transformation of our economies holds the promise of improving productivity performance by enabling innovation and reducing the costs of a range of business processes (Goldfarb and Tucker, 2017). However, despite the rapid rise of digital technologies starting in the mid-1990s, aggregate productivity growth has slowed over the past decade or so, sparking a lively debate about the actual potential for digital technologies to boost productivity. Today, as in the 1980s, when Nobel Prize winner Robert Solow famously quipped, 'You can see the computer age everywhere but in the productivity statistics' (Solow, 1987), there is again a paradox of rapid technological change and slow productivity growth.

The current literature points to several possible factors that may contribute to the new productivity paradox (including inadequate measurement: see, for example, Ahmad, Ribarsky and Reinsdorf, 2017). Together, these provide clues to possible avenues for policy action that could strengthen future productivity growth based on digital transformation.

First, there are still important differences in digital transformation across industries that affect the overall state of digital transformation and its impacts on productivity (see McKinsey Global Institute, 2018). Recent OECD analysis shows that some sectors are less advanced than others in terms of the pace of digital transformation (Calvino et al., 2018; OECD, 2017). For example, even if new technologies are being integrated here too, agriculture, mining and real estate still rank low in the distribution of digital intensity across the available indicators. Conversely, telecommunication and IT services rank consistently at the top. Other sectors display a large heterogeneity in the adoption of different digital technologies, suggesting that they are engaged in only some aspects of digital transformation.

Micro-level studies reveal that the aggregate productivity slowdown masks a widening performance gap between more productive and less productive firms, especially in ICT services sectors (Andrews, Criscuolo and Gal, 2016). Throughout the economy, this divergence is driven not just by frontier firms pushing the productivity frontier but also by the stagnating productivity of laggard firms, related to the limited capabilities of, or lack of incentives for, such firms to adopt best practices. Together, these signs illustrate that the main source of the productivity slowdown is not so much a slowing of innovation by the most globally advanced firms, but the uneven uptake and diffusion of these innovations throughout the economy (OECD, 2015b).

OECD data also show that the diffusion of digital technologies across OECD countries is far from complete. While most firms now have access to high-speed broadband networks, more advanced, productivity-enhancing digital tools and applications, such as enterprise resource planning systems or big data analytics, have diffused to far fewer firms in OECD countries. Moreover, significant cross-country differences emerge – even among the most advanced economies – raising important questions about why some countries are more successful at adopting digital technologies than others.

The diffusion of so-called 'general purpose technologies' (GPT) like other digital technologies typically follows an S-shaped curve, where technologies are initially adopted only by some leading firms and later diffuse to all firms, as they become more established, prices fall, and markets grow. Moreover, technology development and adoption depend on a host of economic, legal, ethical, and social factors, as well as on the availability of the requisite skills and organisational changes. Consequently, there is a significant gap

between what can currently be implemented from a technical point of view (and what may be implemented by frontier firms), and what is currently being implemented by firms on average.

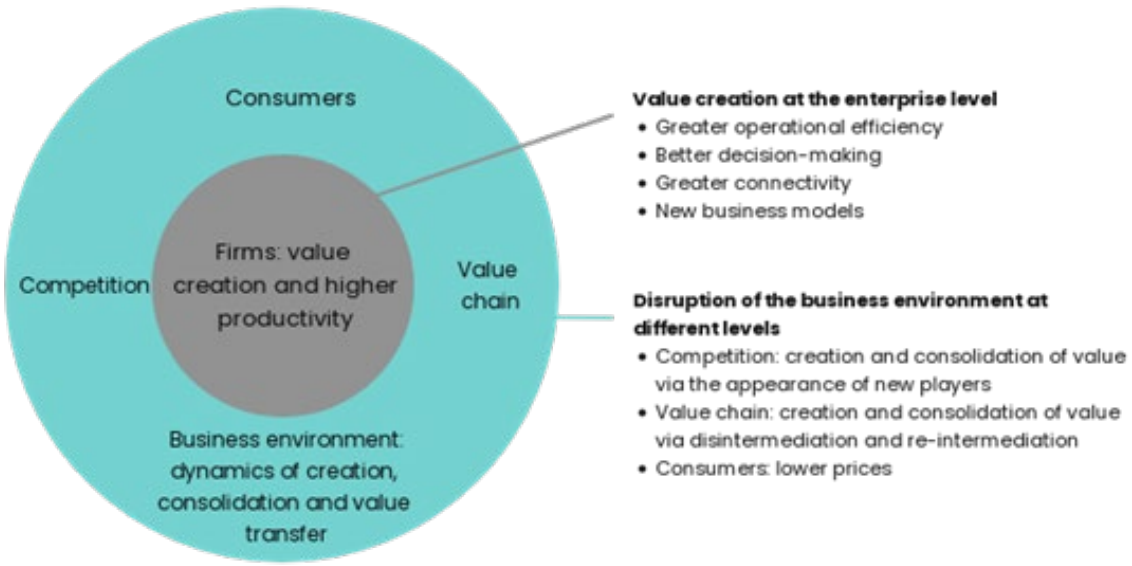
The history of technological change also demonstrates that the successful implementation of new technologies involves much trial and error, and that it takes time to reorganise production processes, introduce new business models, and provide workers and management with new skills. Digital transformation is not just about the diffusion of technology, but increasingly about the complementary investments that firms need to make in skills, organisational changes, process innovation, new systems, and new business models (Haskel and Westlake, 2017).

Some recent research suggests that the scale and complexity of these complementary investments is growing, which may make digital transformation particularly difficult for non-frontier firms, such as traditional small-to-medium enterprises (SMEs). During this process of adjustment and experimentation, productivity growth may be low and can even turn negative (Brynjolfsson, Rock and Syverson, 2017).

On a positive note, the slow diffusion of digital technologies and related processes across firms and industries in OECD countries suggests that its impacts on productivity are likely to emerge in the years to come, as digital intensity in firms and sectors increases further and the economy adjusts (Van Ark, 2016). This might also be affected by the current business cycle. To get a better understanding of how digital productivity can lead to productivity gains, a micro-foundational analysis is necessary.

The cost-effective adoption of new technologies depends on the capabilities and factor endowments of firms and countries. The production structure, technology intensity in industry and enterprise dynamics are vital in determining whether the full potential of digital technologies is exploited. Although the impact of digital technologies on productivity depends on the production structure and the structural characteristics of firms, digital transformation generates major changes in the organisation of firms and market dynamics (see Figure 3.1).

FIGURE 3.1 – THE IMPACT OF DIGITALISATION ON FIRMS AND THE BUSINESS ENVIRONMENT



Most recently, disruptive changes in firms and the business environment resulting from advances in digitalisation have accelerated with the increased use of digital technologies in response to the COVID-19 pandemic. The adoption of digital technologies has now become even more of a priority to boost productivity and quality employment.

Technical change has many potential impacts, and there is a strong positive correlation between the technology intensity of the production structure and the economy's productivity (ECLAC, 2018); at the microeconomic level, digital transformation affects productivity and growth through four mechanisms that improve the efficiency and effectiveness of firms (see Figure 3.2).

FIGURE 3.2 – CHANNELS THAT TRANSLATE DIGITAL TRANSFORMATION INTO PRODUCTIVITY AND GROWTH

Transmission channel	Mechanism	Example
Operational efficiency	The digitalization of process enables business operations to be optimised through cost reductions and efficiency improvements	Digitalisation of customer service using chatbots
Better and more effective decision-making	The use of data at scale and advanced analytics algorithms can optimize decision-making and increase profitability	Algorithms for optimised credit scoring
Greater connectivity	Digital channels and the use of digital marketing and procurement tools can expand the customer base and improve customer acquisition, increase access to suppliers and optimise the supply chain	Publicity to capture new customers in social networks
New business models	The virtualization of goods and services and the digitalization of product delivery are fostering new business models that reduce risk and increase profits	Consumption of music via digital applications

Besides the direct impacts on business, digitalisation is leading to major changes in the competition dynamics of the value chain and in consumers. New business models are giving rise to increasing participation by new players who are "digital natives" and bring with them numerous implications for market dynamics and the economy in general. In some sectors, such as retail, there is direct competition between traditional offerings and digital disruption. When digital channels play a greater role, traditional players and channels may be displaced and must adapt, develop their own digital channels, and integrate with other players' digital platforms. In some activities, the level of digital disruption may reach the point where digitalisation becomes a matter of survival given the demands of the "new consumer."

In addition, there is also a horizontal spill over of digitalisation on a sectoral level. The horizontal channel describes the process by which an innovation by one company is emulated by others, leading to productivity gains across a wider sector. This is the hallmark of a competitive market. The horizontal spill over is traditionally best understood as a within-sector phenomenon, but digital technologies extend its scope. The ubiquity of networked computers means that companies across all sectors are increasingly technology-dependent and data-intensive. Information about a technological innovation by one company, in one sector, can be quite valuable across a whole host of sectors, where its success might be emulated. Furthermore, the low cost of information transfer that has been established by global internet coverage and cloud technologies means that implications of any given technology innovation are now rapidly global.

Digital transformation can lead to value consolidation and greater concentration of profits

through intensification of economies of scope. The combination of these factors, together with changes in consumer habits (such as a preference for digital channels and an expectation of rapid delivery) is driving the boom in digital platforms. At the same time, digital transformation is also optimising the supply chain and bringing it closer to users by reducing transaction, distribution, and marketing costs. This process entails an increase in the disintermediation of the chain and in the importance of direct sales channels. Vertical spill overs can occur in any supply chain, but the effect is particularly powerful with digital innovations. This is because firstly, digital technologies are now so broadly embedded in a wide range of sectors and business activities, and secondly, improvements have the potential (via systems upgrades or infrastructure improvements) to roll out extremely quickly across a large network of users. In this new era, the sources of technological innovations are widening and growing more complex, and the benefits can then extend to other companies, up and down the supply chain.

Lastly, in some sectors digitalisation is resulting in a transfer of value to consumers in the form of larger consumer surpluses, thanks to lower prices, greater transparency, and lower search costs.

The coexistence of value creation mechanisms and transfer dynamics means that a positive and significant relationship between digitalisation and productivity growth is not always observed at the macro level, particularly in periods of transition and disruption, however the effects at the micro level will start accumulating within and across sectors, finally leading to improvements at the national level. In fact, the Global Competitiveness Index (GCI, 2021) describes this process as the digital spill over. The digital spill over happens when technology accelerates knowledge transfer, business innovation, and performance improvement within a company, across supply chains and amongst industries, to achieve a sustainable development economic impact. GCI (2021) modelled the impact that technology investments have had on GDP across a sample of around 100 countries over three decades. It was found that their full impact on the economy was much greater than what might be inferred from the direct gains. The analysis shows that every US $1 invested in digital technologies over the past three decades has added, on average, US $20 to GDP. This is an enormous return compared to non-digital investments, which delivered an average return of around US $3 to US $1 invested. This result shows that for every US $1 investment, the average return to GDP is 6.7 times higher for digital investments than for non-digital investments, implying the significant productivity gains.

Given the potential productivity gains discussed above, potential this report developed a Digital Transformation Readiness Index to gauge sectoral preparedness for digital transformation at a micro level. The objectives are two-fold: to understand the current local situation with respect to digital transformation, and, more importantly, to identify gaps and recommendations for policy action.

3.4 Gauging the digital maturity and readiness of firms

The previous sections have highlighted the potential of digital transformation in elevating firm, sectoral and national level productivity. To truly assess the nature and level of digital transformation, it was felt that a purpose-built Digital Transformation Readiness Index was the best research tool to assess and capture sectoral readiness, while also indicating areas of potential improvement. This section begins with presenting the theoretical framework concerning maturity models in general before focusing on the current digital maturity models. With this crucial context in mind, this final section outlines the framework of the Digital Transformation Readiness Index being used in this study.

MATURITY MODELS

Maturity modelling is a tool widely used to map out and measure a firm's performance and maturity level with the aim of improving it (Simon, Schoeman & Sohal, 2010; Santos & Martinho, 2019). It allows a firm to quantify its performed activities to measure them and make them mature over time (Santos & Martinho, 2019), with the ultimate aim of increasing the firm's effectiveness (Simon, Schoeman & Sohal, 2010). The most widely referenced process maturity model is the Capability Maturity Model Integration (CMMI), which was inspired by a quality management maturity grid, but with the emphasis on improving the quality of information in systems and processes (Williams et al., 2019; Simon, Schoeman & Sohal, 2010). Maturity models support firms in the following business process improvement methods by providing:

- a standard for assessing and improving processes,
- a means for modelling, defining, and measuring the maturity of processes,
- an evolutionary path to progress moving from ad-hoc, chaotic processes to mature, disciplined processes,
- a set of recommended practices in key process areas that when adopted enhance process capability,
- differing levels of process maturity, and
- several processes that need to be internalised within each level of maturity.

Maturity models have in general five different levels of maturity, each level entails processes that a firm must adopt while using the model (Simon, Schoeman & Sohal, 2010). Szelagowski and Berniak-Wozny (2019) on the other hand, claims that the numbers of levels in a maturity model may vary and implies that levels between four and seven are common. The levels form a desired and reasonable path from an initial to mature state. Later, the firm can benchmark these maturity levels of the process either internally or against competitors and industry standards, since each process is set with goals (Simon, Schoeman & Sohal, 2010; Santos & Martinho, 2019). Benchmarking is used by a firm to identify improvement areas (Kumar, Antony & Dhakar, 2006), and can be described as an improvement process, where firms measure and compare their performance with their industry's best-in-class firms in relation to the industry's most important success factors (Motwani & Sower, 2006; Simon, Schoeman & Sohal, 2010).

According to Szelagowski and Berniak-Wozny (2019) there are three different reasons for using a maturity model:

- Descriptive purpose, when it can be applied for as-is assessments;
- Prescriptive purpose, when it indicates how to identify desirable future maturity levels and when it provides guidance on how to implement the according improvement measures; and
- Comparative purpose, when it allows for internal or external benchmarking.

Maturity models should clearly outline the individually defined concept of maturity as it varies across models and industries, the maturity dimensions for defined levels of maturity, and the assessment approach for appraising maturity. The maturity dimensions should include specific criteria and characteristics for each level of maturity (Krol& Zdonek, 2020).

Sehlin, Truedsson and Cronemyr (2019) explain that digitalisation improves the way processes operate within firms, however this will be dependent on the level of maturity. Diverse levels of digitalisation influence processes relying on the process's maturity level. Digitalisation maturity is measured by the obtained business benefits, and it is reliant on the development and implementation of resources and competences within a firm (Gurumurthy & Schatsky, 2020). These resources and competences comprise different activities to be performed, including the sharing of resources and innovation with external firms, constantly supervising, evaluating, and improving business processes, and updating business models. However, the key competences to achieve digitalisation maturity are capacity flexibility and ensuring data security, integrating data to be used in processes and operations and training the firm's workforce to ensure the needed skills.

Digital maturity models are more difficult to operationalise than general maturity models due to the various and inconsistent terminology used (Williams et al. 2019). Common terminology for capabilities in digital maturity do not exist. While digital maturity models still focus on current and future capabilities, they are more specific to areas of technological activity including information technology and business intelligence, and include specific terms such as digital, Industry 4.0, smart, data driven, cloud, etc. Peter, Kraft and Lindeque (2019) emphasize that while there is still limited material for practical guidance on digitalisation, consulting firms have generated some whitepapers and models, and some models and frameworks have been developed from academic research. Some maturity models that are related to general digital readiness and progress of firms are also available

The following maturity models have been summarised for relevance to this study, as they relate to digitalisation, process performance improvement and productivity improvements.

(i) Digital Maturity Model – TM Forum & Deloitte

An example of a digital maturity model developed by a consulting firm includes the Digital Maturity Model (DMM) by TM Forum & Deloitte. This is referred to as the first communications industry standard digital maturity assessment tool (Anderson & William, 2018). The DMM covers digital maturity across five business dimensions, broken down into 179 digital criteria, and may be applied as a benchmark and tool for digital transformation.

The five business dimensions are shown in Table 3.1.

TABLE 3.1 – DIMENSIONS OF THE DMM

Dimension	Description
Customer	Providing an experience where customers view the organisation as their digital partner using their preferred channels of interaction to control their connected future on and offline.
Strategy	Focuses on how the business transforms or operates to increase its competitive advantage through digital initiatives; it is embedded within the overall business strategy.
Technology	Underpins the success of digital strategy by helping to create, process, store, secure and exchange data to meet the needs of customers at low cost and overheads.
Operations	Executing and evolving processes and tasks by utilising digital technologies to drive strategic management and enhance business efficiency and effectiveness.
Organisation & culture	Defining and developing an organisational culture with governance and talent processes to support progress along the digital maturity curve, and the flexibility to achieve growth and innovation objectives.

Source: Deloitte

The DMM is to be used across the varying sequential stages of transformation, as follows:

- The 'Imagine' stage for assessing the current state and identifying the gaps, opportunities, and vision for digitalisation.
- The 'Deliver' stage for prioritising capabilities per specific business objectives and assessing impact of digital maturity per an initiative's roadmap.
- The 'Run' stage for measuring the value and impact of initiatives to digital maturity and evaluating process improvements and effectiveness.

Firms are to utilise the DMM survey, which comprises 179 criteria, and apply the results to an internal assessment to determine the current level of maturity, following which the appropriate digital capabilities can be identified on the basis of the individual business strategy, business model and operating model.

Deloitte's research methodology for developing a digital maturity benchmark within the banking services industry involved a self-assessment survey and one-to-one interviews with senior executives in seven firms (De Groote, Peters & Nuyts, 2017).

(ii) Forrester's General Maturity Model

Forrester developed a publicly available maturity model that measures digital maturity across four dimensions' (Gill & VanBoskirk, 2016). These four dimensions are:

- 'Culture' relates to the firm's approach to digital innovation and use of technology.
- 'Technology' relates to the actual use and adoption of emerging technology.
- 'Organisation' relates to how a firm supports and governs its digital strategy.
- 'Insights' relates to how a firm uses both client and business data to measure success and inform their strategy.

This model was developed for three primary applications, including:

- defining strategy and measurements and assessing business functions to IT relationship effectiveness,
- determining how digital supports brand strategy, and
- evaluating how digital supports sales and service interactions.

A self-assessment survey is provided per dimension to self-score a firm into one of the four segments of digital maturity. The survey includes seven questions for each digital maturity dimension, a total of 28 questions.

(iii) IT Department Readiness Model

Isaev, Korovkina and Tabakova (2018) developed an index and model for the evaluation of IT department digital readiness and transformation. They summarise that a firm's ability to apply digitalisation is generally contingent on the capabilities and management practices of its IT Department. This model is intended for use in the following scenarios:

- A firm's management decides to develop business models related to entering the digital market.
- A firm that conducts digital business understands bottlenecks in the use of digital technologies and aims to localise problems.
- A firm's competitors appear with higher performance indicators.
- A firm's consumers of digital products complain about the quality of the products.

The model involves a quantitative assessment of the maturity levels of the IT department processes and considers the integration of IT processes with other department processes within the firm and with partners. The maturity segments are defined as Researchers, Beginners, Advanced, and Innovators. The model considered other maturity models developed, including Forrester and the standard maturity model of CMMI. The levels of maturity were assessed based on seven dimensions, including strategy, organisation, relationship with users, partnership, operations, technologies, and innovation. These are further defined in Table 3.2.

TABLE 3.2 – DIMENSIONS OF THE IT DEPARTMENT READINESS MODEL

Dimension	Description
Strategy	Assesses how management represents the role of IT in the implementation of the digital strategy of the organization.
Organisation	Changes in communications, culture, and knowledge management in the IT departments of the company are assessed.
Relationships with users	The IT department, like the business, should be oriented to the consumer, which primarily implies the provision of services to the business.
Partnership	Digital business and the digital economy are built not only within a specific company, but also within the framework of a common ecosystem where companies form alliances and other partnerships. Therefore, the processes of the IT department should be organized in such a way as to make the simple integration with the partners of the company.
Operations	The IT department will not be flexible in providing services to the business unless it can dynamically reconfigure its internal processes for the most effective solution of internal tasks.
Technologies	To increase the speed of service delivery to the business and reduce the probability of errors in the provision of services, there is a necessity to automate the functions of the IT department everywhere - both in the processes of supporting current services and in the deployment and integration of changes.
Innovation	The IT department of the company must constantly be in search of new solutions that will increase the flexibility of the provision of services to the business.

Source: Isaev, Korovkina and Tabakova (2018)

The model takes the form of a questionnaire, including 29 questions across the seven dimensions. Each of the questions has multiple answers that aligns with one of the four maturity levels, or with the complete absence of that level. Only one answer can be selected. The results of the maturity model questionnaire provide an estimation of the average state of the IT department's processes.

(iv) Developing and building a Digital Transformation Readiness Index

All different versions of maturity models are composed in the same way, and all are designed to describe how a firm can improve the maturity of its processes by using the model (Simon, Schoeman & Sohal, 2010). The advantage of using an existing maturity model is that it is tested and validated, thus, ready for the firm to use. But the downside is that those existing models often are too general and inflexible (Santos & Martinho, 2019).

Williams et al. (2019) prepared a literature review of existing theoretical approaches to developing digital maturity models, resulting in a recommended research design to support the preparation of digital maturity models and operationalisation of concepts. The research was specific to small and medium sized enterprises as there is a lack of maturity models for smaller firms, although it is assumed the theory is still applicable for development of a digital maturity model of larger firms.

The scope of the maturity model should be clearly defined to ensure it is clear how it differentiates from other existing models. However, it should also be noted that there are some characteristics common to all digital maturity models (Williams et al. (2019), and these should be considered when conducting related research. These are:

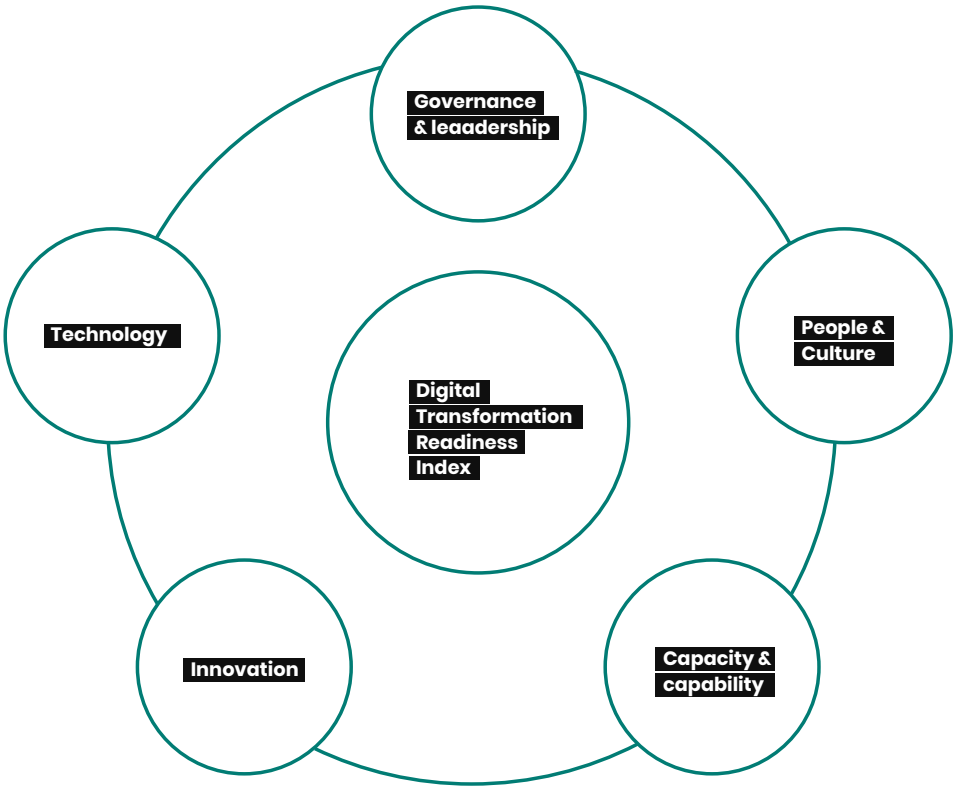
- Metalevel: broad surveys conducted in numerous firms and reported results to create a meta maturity model.
- Development: detailed description of a specific maturity model, based on theories derived by a top-down approach, bottom-up approach, industry standards or pre-determined organisational silos.
- Application: models are implemented and evaluated within a real business context.
- Validation: the model is validated to determine the accuracy of the research findings.

Researchers of maturity models should be clear on their operationalisation of the concept as well as its focus. There is a lack of common terminology for categorising levels of digital maturity, therefore an individual maturity model should develop a clear capabilities taxonomy to be able to make inferences across cases and perform the cross-case analysis.

Williams et al. (2019) identified the following six maturity model dimensions to be essential: strategy, products/services, technology, people and culture, management, and processes.

Based on the research and literature, the Index was built around five dimensions which are shown in Figure 3.3 and described in further detail on the next page. These are broadly in line with the dimensions that are recommended by Williams et al (2019).

FIGURE 3.3 – THE DIMENSIONS OF THE DIGITAL TRANSFORMATION READINESS INDEX



GOVERNANCE & LEADERSHIP

Gill and VanBoskirk (2016) heavily influenced this dimension as they state that it is important that as firms develop their digital strategy, effective governance of all ensuing digital activities is vital to achieving operational excellence within the execution of the digital strategy.

Gurumurthy and Schatsky (2020) state the importance of continuously evaluating and improving business processes and updating business models. But also, to ensure that there no silos within the organisation but that strategic collaborations exist when it comes to the digital strategy between all units. The dimension of digital governance was inspired by the statement made by De Groote, Peters and Nuyts (2017) that an organisation needs to be aware of its digital skills. This was reaffirmed by Gill and VanBoskirk (2016) who expressed the importance of governing the digital activities of a firm. This sub-dimension relates to digital technologies by ensuring they are being properly supported and obtain the intended performance benefits.

From the above literature, several statements were drawn up to capture the Governance & Leadership dimension and these are shown in Table 3.3.

TABLE 3.3 – GOVERNANCE & LEADERSHIP INDICATORS

Leadership in digital transformation, strategy, and readiness
Integration of Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction
Understanding, monitoring, and reporting of benefits of digital transformation
Understanding importance of digital transformation of the organisation for internationalisation & competitiveness
Constant business re-engineering process to digitise and to transform products and services
Strategic collaboration between all departments/units

PEOPLE & CULTURE

Culture, according to Gill and VanBoskirk (2016), conveys the firm's approach towards digital technology use and its outlook to digital innovation. Gill and VanBoskirk (2016) explain that one important dimension of culture is how a firm uses its available digital technology, and whether there is a general openness to its application. This simultaneously relates to performance, as the user engagement and adoption defines if the digital technologies are applied properly and if they bring the expected benefits. This indicates that for companies to be digitally mature, the digital culture and strategy should not be a separate element but an integral part of the corporate culture. If this is the case, companies will also investigate digital fit when recruiting. Finally, Isaev, Korovkina and Tabakova (2018) explain that within a firm the digital technology use and implementation should be focused on providing a good service to the client. For example, in this context Gill and VanBoskirk (2016) focus on how digital supports sales and service interactions.

The indicators under the People & Culture dimension are shown in Table 3.4.

TABLE 3.4 – PEOPLE & CULTURE INDICATORS

Digital Savviness in staff recruitment
Digital culture as part of the overall corporate culture
Digital solutions are used to improve digital service delivery and internal productivity via digital solutions
Strong customer-focused culture

CAPACITY & CAPABILITY

De Groote, Peters and Nuyts (2017) state that a firm's digital ambition should be communicated clearly to all staff members to ensure their buy-in, based on a clear understanding of the importance and relevance of digital technologies and ambitions. This will improve attitudes to any necessary adaptation process and deliver on the intended benefits and changes. The importance of digital training was influenced by Gurumurthy & Schatsky (2020), who expressed that a firm must provide their workforce with the required digital training to ensure the desired level of skill to run company operations. Gurumurthy & Schatsky (2020) state that higher levels of maturity are associated with firms that have integrated the data to be used in processes and operations. Isaev, Korovkina & Tabakova (2018) highlight their belief that for higher levels of digital maturity there is a necessity to automate the functions of IT, both throughout processes supporting the current services and in deploying and integrating the changes.

From the above literature, several statements were drawn up to capture the Capacity & Capability dimension and these are shown in Table 3.5.

TABLE 3.5 – CAPACITY & CAPABILITY INDICATORS

Digital policies, procedures and digital activities are in place and are core to everyday business activity
Staff training supports the current digital strategy and anticipates future skills and knowledge requirements
Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery
Staff have the resources to anticipate and respond to new technologies and digital innovation

INNOVATION

Isaev, Korovkina and Tabakova (2018) explain that a firm should continuously research new digital solutions that impact the level of service provided. This inspired the sub-dimension of continuous improvement and the statements of researching and investing into new digital technologies. Digital innovation is highly related to digital technologies that are used to digitally transform the firm, even from an operational and business model perspective. In addition, innovation also has a strong bearing on ways of thinking and imagining the future requirements and the need to transform business models and organisational structures (Ries, 2011; Vaz, 2020)

The indicators used to capture the Innovation dimension are shown in Table 3.6.

TABLE 3.6 – INNOVATION INDICATORS

The whole organisation seeks ways to use digital channels and technologies
New management practices and organisational structures emerge to align with the digital organisation
Common practice to imagine future needs and technologies and explore and experiment with methods and solutions

TECHNOLOGY

Technology according to Gill and VanBoskirk (2016) refers to the actual use and adoption of emerging digital technologies. Gurumurthy & Schatsky (2020) recommend that digital maturity be measured by the resulting business benefits. Firms experience variance in usage, application, and performance when digital technologies are more undefined and unstructured in terms of their use within the firm's processes, as against disciplined and well-defined integrations where processes have been restructured to optimise with digitalisation. Cybersecurity remains one of the world's biggest risks and it is critical for companies to ensure that they have built their resilience and safeguards vis-à-vis this increasing corporate and global threat. As Internet of Things becomes more common, internet connectivity is going to play a central role in ensuring that devices are always connected and therefore having a reliable, stable, and strong internet connection is also critical.

TABLE 3.7 – TECHNOLOGY INDICATORS

Digital policies, procedures and digital activities are in place and are core to everyday business activity
Staff training supports the current digital strategy and anticipates future skills and knowledge requirements
Resources and budgets are appropriate for supporting the digital channels, activities and service delivery
Staff have the resources to anticipate and respond to new technologies and digital innovation

To truly assess the nature and level of digital transformation, it was felt that a purpose-built Digital Transformation Readiness Index was the best research tool to assess and capture sectoral readiness, while also indicating areas of potential improvement.

3.5 Creating a Malta-specific Digital Transformation Readiness Index

The five dimensions identified above, and their respective indicators, were merged to create the Digital Transformation Readiness Index.

Williams et al., (2019) highlight the importance of clearly defining the scope of a maturity model to provide clear context on how it differentiates from other models, as well as a clear operationalisation of the concept and focus. This study developed a metalevel type of model, aimed at assessing the foundation of levels of digital maturity and readiness of firms across the economy.

The developed digital maturity model is a self-assessment to self-score the firms and is based on the work of Gill and VanBoskirk (2016), Isaev, Korovkina and Tabakova (2018), and Williams et al. (2019) who describe self-assessment as a good technique. The self-assessment is based on a 4-scale Linkert Scale approach defined in Table 3.8 below, whereby firms have been asked to rate their digital preparedness and their appreciation to digital transformation with respect to all five dimensions identified above and the relating underlying indicators. These have been presented to firms in the form of 22 statements by means of an online survey which was carried out between August and September 2021. More on the survey methodology is presented in Box 3.1 below.

TABLE 3.8 – LINKERT SCALE

Score	Description
1	Completely disagree
2	Somewhat disagree
3	Somewhat agree
4	Somewhat disagree

BOX 3.1 – SURVEY METHODOLOGY AND DEMOGRAPHICS

The survey designed to incorporate the first Digital Transformation Readiness Index for Malta was carried out through online interviews between the months of August and September 2021. The questionnaire was sent out to a database of 305 companies with 115 respondents across several companies and public entities having then participated in the survey.

From the total sample collected, 37.4 per cent have been in operation for more than ten years and another 37.4 per cent have been in operation between five and ten years. 33.9 per cent of respondents employ between 10 to 49 employees, while 33.0 per cent employ less than 10 employees. 20.0 per cent employ between 50 and 250 employees and the remaining 13.0 per cent of respondents employ more than 250 employees. 30.4 per cent claim their business to form part of a family business.

With a confidence level of 95 per cent the sampling margin of error falls between +/- 9.1 per cent. From the

table below researchers are confident that the majority of economic sectors are overall well represented by the sample quota. In cases where industries have been under-represented, such as the wholesale and retail trade, transportation and storage, accommodation and foods services activities sector, every effort has been made by the researchers to drive participation in these sectors to ensure a better representation of respondents in the final sample.

Economic activity	Population	Sample	Difference
Agriculture, forestry and fishing	0.8%	0.0%	-1%
Manufacturing, mining and quarrying and other industry	12.7%	7.0%	-6%
Construction	6.2%	5.2%	-1%
Wholesale and retail trade, transportation and storage, accommodation and food service activites	23.4%	10.4%	-1.3%
Information and communications	3.8%	10.4%	7%
Financial and insurance activites	6.1%	7.0%	1%
Real estate activites	1.3%	3.5%	2%
Professional, scientific, technical, administration and support service activities	10.5%	16.5%	6%
Public administration, defence, education, human health and social work activities	25.5%	27.8%	2%
Other services	9.7%	12.2%	2%

Every effort has also been made to ensure that respondents on behalf of the company or business participating in this study are responsible for technology related decisions taken within the company and are thus best placed to self-assess the companies' digital readiness in relation to technologies already available and ongoing developments in this realm. At best researchers have tried to ensure that respondents have a very good digital appreciation and a broad understanding of technological developments taking place within their own respective industries and the economy in general. For most respondents, this has been the case, however, there could have been instances, particularly with the smaller firms where lack of digital aptitude may prove to be a limitation for this study.

The developed index is designed to offer a 'descriptive purpose' according to the categorisation developed by Szelagowski and Berniak-Wozny (2019), since it will be applied as an 'as-is' scenario assessment. It is also intended to identify gaps, opportunities, and vision for digitalisation for firms, as implied by Anderson and William Mariángeles Bravo Guerrera, Annie Snöberg & Laurie Tetzlaff (2018).

Several limitations can be highlighted with respect to the survey and Index. Care must be taken when interpreting the results, especially when drawing up sectoral conclusions, given the sample size of the survey. However, the focus of the Index is not to rate sectors but more to inform policy surrounding digital transformation and inferences on the actual state of digital transformation can still be made. The survey is also based on perceptions and the replies are not validated with any other data or evidence at company level. As discussed in the Box, the survey introduces an element of respondent bias given that they are rating their own company. In addition, inter-sector comparability is difficult given that respondents will rate their company in relation to the sector which in turn might have different levels and standards of digital transformation. Although the questions were derived based on a literature review, it is being recommended that additional validating techniques are used to ensure that all dimensions captured are robust in their explanatory power.

Chapter 4 presents the results of the Digital Transformation Index on a national sectoral level.

4.

Productivity & digital readiness: sectoral analysis

This chapter presents a detailed sectoral analysis including a sector-specific productivity assessment together with the relevant results of the Digital Transformation Readiness Index. By shedding light on productivity developments, one can understand the challenges and opportunities for each sector with a focus on digital transformation. Each sectoral section highlights productivity developments in 2019 and 2020, whilst looking ahead to the anticipated trends that may impact the sector into the medium term.

4.1 Agriculture and fisheries

Sectoral Overview

The agriculture and fisheries sector has somewhat stagnated in recent years. Between 2010 and 2019 the sector's nominal GVA decreased by 23.9 per cent despite the general economic performance and the increased demand for food products by locals, foreign residents, and tourists alike. During 2020, when the brunt of the COVID restrictions were in effect, the sector contracted further by 5.5 per cent.

This sector is internally diversified, with aquaculture playing an even more important role as a key contributor to the sector's GVA. Nonetheless, the sector continues to lose its relative importance in the overall make-up of the economy with its share now below 1.0 per cent.

The sector's sluggish growth in output is also reflected in employment dynamics. Over the past ten years, employment in the sector grew by less than 1,000 people with a good percentage of them being registered as part-timers – this may be indicative of a growing trend of landowners buying agricultural land and registering themselves as part-time farmers. On the other hand, the number of non-Maltese workers grew significantly in the industry confirming that Maltese workers are exiting the industry as they seek other sectors for employment. This is also reflective of numerous other challenges that the industry faces, highlighted in Table 4.1 below.

TABLE 4.1 – AGRICULTURE AND FISHERIES SECTOR ANALYSIS

Sector Related	
Challenges	*Opportunities*
Land ownership & transfer issues	EU Budget and Green Deal for financing
Imports	Opportunity to introduce technology in the sector
Water-use	Potential for Gozo to act as an agri-tech hub
Low yield of crops due to lack of technology	Increased processing and value-chain climbing in aquaculture
Fisheries sector is highly seasonal	Further internationalisation of aquaculture
Aquaculture lacks critical infrastructure to scale	More research & innovation
Environmental considerations of aquaculture	New breed of young, dedicated farmers
Limited interest in sector due to physical hardship & lack of returns	
Future Trends	
Sustainable, minimising negative environmental impacts, conserving scarce natural resources, and strengthening resiliency against future shocks	Growing use of agri-tech and digital transformation of the sector
Efficient, producing adequate quantities of food while minimising post-harvest loss and consumer waste	Sustainability of fishing stocks
Nutritious and healthy, enabling consumption of a diverse range of healthy, nutritious, and safe foods	Labelling & traceability of fish
	Greater research & innovation in aquaculture, especially onshore farms

Productivity analysis

The challenges faced by the agriculture and fisheries sector are also impinging on productivity levels within the sector, with very few improvements registered in recent years. Notwithstanding its low relative economic contribution in terms of GVA, the sector however continues to play a vital role in the country's socio-economic development particularly from a food security standpoint. To this end, the agriculture and fisheries sector deserves the same level of political and entrepreneurial commitment afforded to other key economic sectors, enabling it to innovate, transform and tap into the growing opportunities of emerging technologies and green financing.

TABLE 4.2 – AGRICULTURE AND FISHERIES SECTOR PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€65.7	€62.1
Employment			2,300	2,600
Sectoral level productivity				
National			€50,347	€46,256
Agriculture & fisheries sector			€28,565	€23,885
Returns to Labour Income				
National			€2.57	€2.45
Agriculture & fisheries sector			€1.54	N/A
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
Low	Low	Low	Low	Low
Productivity analysis				
• Inherent sectoral challenges impinging on productivity levels • Political and entrepreneurial commitment is critical for the sector to innovate, transform and tap into the growing opportunities				

Source: Eurostat, Labour Force Survey, Authors' calculations

Digital Transformation Readiness

This primary sector is ripe for digital transformation. Several technologies have sector-specific applications that are transforming the industry giving rise to the terms such as 'foodtech' and 'agritech'. Several significant disruptions are happening all over the world to support key policy challenges such as sustainability, provenance, and certification of produce.

Despite its small share in the economy, COVID-19 has highlighted the strategic importance of this sector and its contribution to food security. Several productivity enhancements and technology innovations can help the industry regain its importance within the general economic context. To assess the readiness of market actors operating in this sector, the detailed indicators for all dimensions are given in Table 4.3 on the next page.

TABLE 4.3 – AGRICULTURE AND FISHERIES SECTOR PRODUCTIVITY INDEX INDICATORS

Dimension	Description	Score
Government & Leadership	Leadership in digital transformation, strategy, and readiness	2.0
	Integration of Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	2.0
	Understanding, monitoring, and reporting of benefits of digital transformation	3.0
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	4.0
	Constant business re-engineering process to digitise and to transform products and services	2.0
	Strategic collaboration between all departments/units	3.0
People & Culture	Digital Savviness in staff recruitment	3.5
	Digital culture as part of the overall corporate culture	1.5
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	1.5
	Strong customer-focused culture	3.0
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.5
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	1.5
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	1.5
	Staff have the resources to anticipate and respond to new technologies and digital innovation	1.5
Innovation	The whole organisation seeks ways to use digital channels and technologies	2.0
	New management practices and organisational structures emerge to align with the digital organisation	3.0
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	2.0
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	2.0
	Cybersecurity is seen and treated as one of the most critical risks the company faces	2.5
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	1.5
	Internet connectivity is a priority amongst all company sites and locations in which it operates	2.0
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	3.5

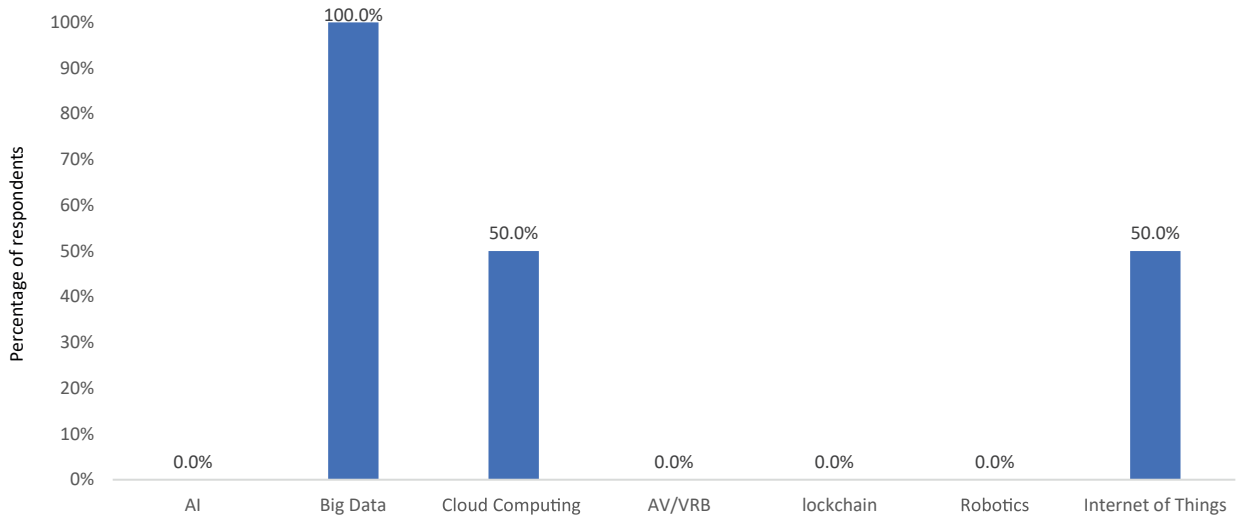
From an analysis of the indicators above, there are evident shortcomings in all dimensions, resulting in the sector lagging in terms of digital readiness. Starting with the Governance and Leadership dimension, the sector has a good understanding of the benefits of digital transformation and its importance for internationalisation and competitiveness. In fact, the sector allocates resources towards the monitoring and reporting of these benefits. There is also generally good strategic collaboration between departments and units within entities in the sector, even though digital strategy is typically not integrated into departmental planning processes and has limited influence on the overall organisational strategy and direction. Finally, the results indicate that the sector does not regularly engage in re-engineering processes to digitise and to transform the sector's products and services.

Moving on to the People and Culture as well as the Capacity and Capability dimensions, the sector scored poorly in terms of the level of integration of digital culture with overall corporate culture, potentially stemming from the fact that digital policies, procedures, and digital activities are not typically in place and forming a core part of everyday business activity. Interestingly, the latter point may also explain the previously mentioned point regarding the lack of integration and influence that digital readiness has on the sector's organisational strategy.

Another important factor impinging this sector's digital readiness is the notion that despite the importance given towards recruiting staff who are digitally savvy, the sector unanimously agrees that its deficit in technical skills is one of the most pressing barriers for its digital transformation, as depicted in Figure 4.1 below. This issue, paradoxically, is further amplified by the inadequate budgeting and insufficient resources allocated to supporting staff anticipate and respond to new technologies and digital innovation, as well as to support the sector's digital channels, activities, and service delivery.

It is also important to note that the sector unanimously agrees that another barrier to its digital transformation is the fact that digital transformation itself is not seen as a priority.

FIGURE 4.1 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE AGRICULTURE AND FISHERIES SECTOR



Finally, similar conclusions to the above may be derived from the Innovation and Technology dimensions, with the sector facing challenges of IT strategy and corporate strategy alignment, lacking initiative to imagine future needs and technologies and explore and experiment with methods and solutions as well as not monitoring and evaluating the latest trends and technologies from a cost and benefit perspective. Nonetheless, the sector does prioritise internet connectivity, deeming it an important component to digital readiness.

All in all, as sectors, globally, embrace technology further, digital transformation is an inevitable requirement to remain competitive. To this end, the challenges presented above do not only pose risks to the agriculture and fisheries sector's digital readiness but also inadvertently to its present and future capacity to remain competitive, rendering the minimisation of such risks and the prioritisation of digital transformation critical going forward.

Relevant Technologies

The Agriculture and Fisheries sector can be transformed through the interplay of various technologies with very sector-specific applications as shown in Box 4.1.

BOX 4.1 – TECHNOLOGY APPLICATIONS IN THE AGRICULTURE AND FISHERIES SECTOR

Automated and Precision Farming

Many tasks required in the agriculture and fisheries sectors can be automated (partially or fully) to improve efficiency, cost-effectiveness, and productivity. This may involve both monitoring the environment using IoT, drones, satellite imagery and other sensory inputs, as well as actuating, interacting, and manipulating in the physical world using robotics. For some tasks which require decisions and/or input to be made based upon past data, history, or known ideal targets (e.g., ideal colour and shape of particular produce), then AI based techniques could be used to help refine and implement precision farming by proposing ideal conditions (e.g., temperature, location, etc) and/or intervention required.

These are some potential areas of application:

- Harvesting: Robotics and automated processes could be used for produce retrieval and product preparation.
- Irrigation and pesticide precision and automation: Moving beyond timer-based automation systems and with added external sensory input (from IoT, drones and satellite imagery), automated irrigation and pesticide systems could be controlled to optimise use of resources.
- Crop planning: Providing insights to achieve optimal yield through the processing and analysis of sensory inputs from sensors in the ground and historical data.
- Livestock contentedness monitoring: Studies show that livestock contentedness correlates to product quality and quantity. IoT devices can be used to monitor contentedness and strategies can then be put in place to raise the levels of contentedness where required.

Trusted Agricultural Supply Chains

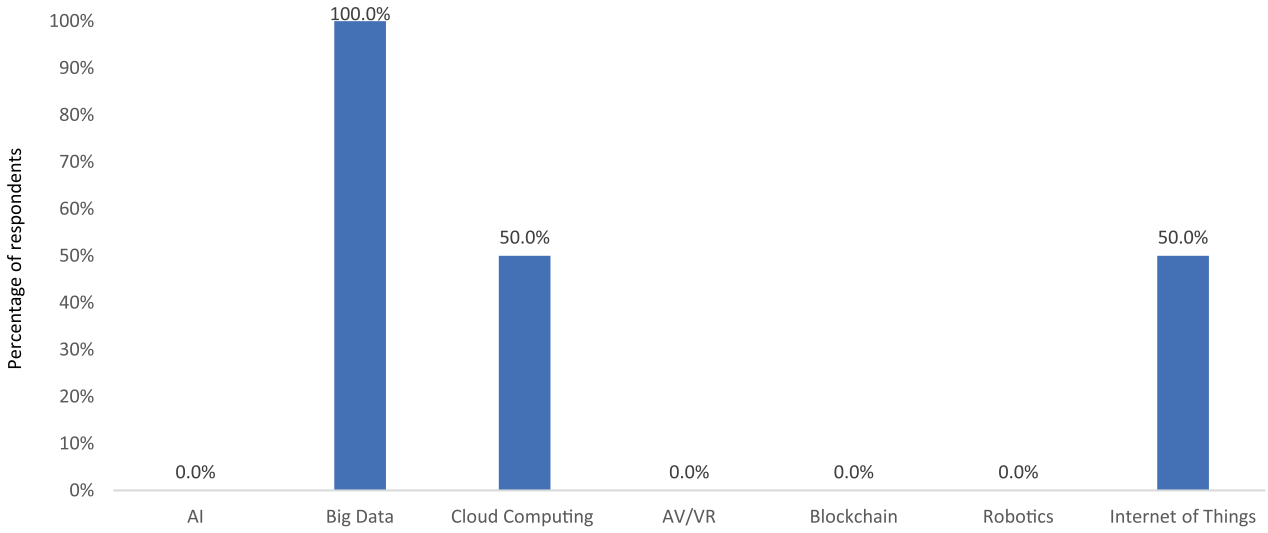
As they move from farm to table, food products often pass through an extensive supply chain involving many different processes and stakeholders. Food health and safety standards require a high degree of visibility and monitoring along this chain. Associated with this is an increasing consumer demand for transparency to allow them to make informed choices. Information regarding the quality of food, its provenance, and the level of processing to which it is exposed is therefore critical. Blockchain-based food tracking systems are gaining traction in this context, providing transparent supply chains that ensure accountability at every stage of the process while eliminating any possible data tampering.

Intrusion detection systems

Farms located in accessible areas are subject to damage, theft of produce and harming of livestock. IoT and camera-based systems can be implemented with intrusion detection systems to act against such costly incidents. AI algorithms could be used to detect intrusion and characterise intruders (whether human or other animals).

When asked about which technologies are deemed to be most relevant for the sector in the coming years, the most mentioned technology by survey participants is big data. This is followed by cloud computing and IoT, whilst blockchain, robotics and AV/VR are not deemed relevant at all.

FIGURE 4.2 - RELEVANT TECHNOLOGIES FOR THE AGRICULTURE & FISHERIES SECTOR



There is a bit of disconnect between sector-specific technologies and what respondents believe. AI and blockchain are two technologies that can really disrupt and transform the sector however participants are not fully aware or aligned with this potential. This misalignment is interesting especially given the fact that blockchain can truly support traceability efforts as well as sustainability. Given that these themes are central to European policy, especially to concepts such as farm-to-fork, it is interesting to note that market participants are not aware of such technologies that can support these policy goals.

4.2 Manufacturing

Sectoral Overview

As Malta's transformation into a services-based economy continues, the manufacturing sector's share of total output generated by the Maltese economy fell from 12.8 per cent in 2010 to 7.9 per cent in 2019. This said, manufacturing still grew by more than €200 million over this period and remains an important employer with roughly 27,000 employees or the equivalent of 11.1 per cent of the total share in employment. The sector has also been an important source of increased female participation over the past few years as more female workers joined the labour market. The sector continues to be an important source of foreign direct investment into Malta.

The outbreak of the COVID-19 pandemic has had its impact on business operations and conditions within the manufacturing sector, as it faced some serious supply chain disruptions as well as the postponement and cancellation of orders from both the local and international markets. However, it appears that the sector is today more prepared to deal with crises following the 2008 global financial crisis, and firms operating in the industry seem to have built-up their internal resilience and contingency plans

At the same time, the pandemic has served to underline several pressing challenges faced by the sector in Malta in the medium to long term. The first issue relates to competitiveness being undermined by rising costs and stronger international pressures. The challenges are further heightened by Malta's insularity which leads to higher transportation costs for both inputs and outputs.

Table 4.4 presents an overview of the sector from a challenges, opportunities, and future trends perspective.

TABLE 4.4 – MANUFACTURING SECTOR ANALYSIS

Sector Related	
Challenges	*Opportunities*
Cost-competitiveness	Industry 4.0, 3D printing and new technologies
Low productivity	Further diversification of manufacturing clusters
Modest growth over the period 2010 – 2019, despite booming economy	Additional regulatory-driven manufacturing niche sectors
Low R&D expenditure	Reduction in supply-chain dependence
Logistics issues especially post-BREXIT	New export markets
Increased costs of freight and logistics	Further incentives to support local manufacturing companies
Future Trends	
Industry 4.0 increasing automation	Circular economy and zero-waste
3D printing allowing for mass customization	IoT will open new opportunities
Supply-chain disruption is a key concern	

Productivity analysis

The manufacturing sector locally is plagued by low levels of productivity when compared to national averages. Being an island economy, manufacturing is burdened with additional transportation costs which can be mitigated if manufacturing focuses on high value-added. The sector faces productivity challenges and opportunities as shown in Table 4.5.

TABLE 4.5 – MANUFACTURING SECTOR PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€995.3	€981.4
Employment			27,700	28,400
Sectoral level productivity				
National			€50,347	€46,256
Manufacturing sector			€35,931	€34,556
Returns to Labour Income				
National			€2.57	€2.45
Manufacturing sector			€1.88	€2.14
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
Low	High	Low	Low	Low
Productivity analysis				
• Endemic and structural issues with productivity as a sector • Much weaker performance than national averages on main productivity indicators • Highlights challenges of islandness • Opportunities for manufacturing sector to reap productivity gains				

Source: Eurostat, Labour Force Survey, Authors' calculations

Despite these challenges, the sector is ripe for productivity enhancements as evident in the results presented in Table 4.6. From a cursory look at the data, it shows that the sector is still increasing its labour force yet decreasing its gross value-added – an indication of productivity issues. Its classification is mainly on the low side and points to various opportunities for increasing its productivity performance, especially through a continued digital transformation of the sector through Industry 4.0.

Digital Transformation Readiness

The sectoral results of the respondents in this sector are detailed in this section where the detailed indicators for all dimensions are given in Table 4.6 on the next page.

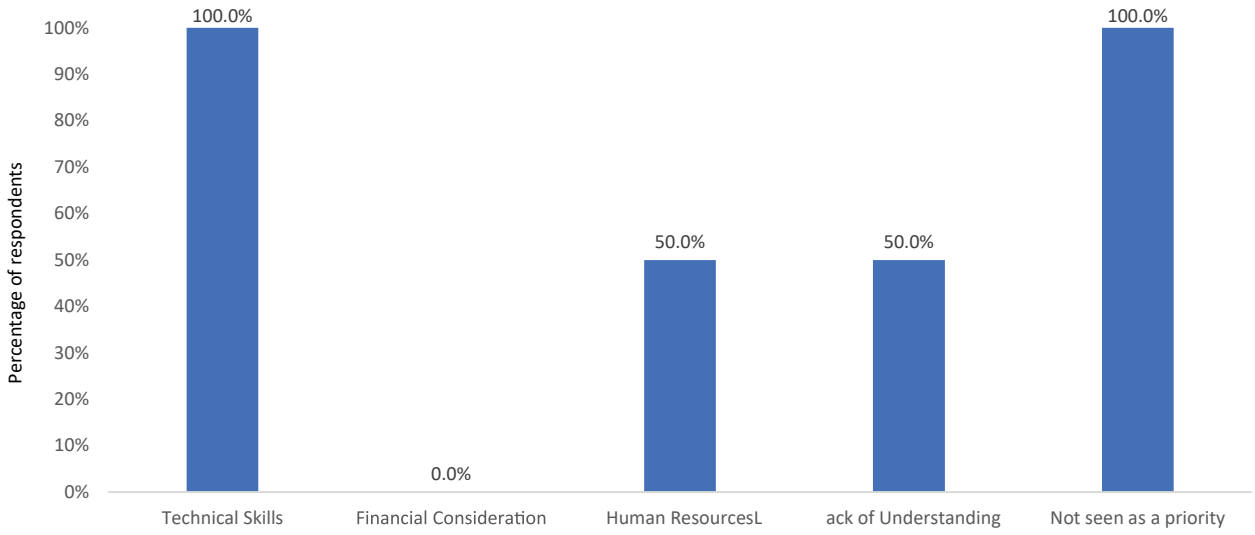
TABLE 4.6 – MANUFACTURING SECTOR PRODUCTIVITY INDEX INDICATORS

Dimension	Description	Score
Government & Leadership	Leadership in digital transformation, strategy, and readiness	3.3
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	2.6
	Understanding, monitoring, and reporting of benefits of digital transformation	2.8
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.5
	Constant business re-engineering process to digitise and to transform products and services	2.5
	Strategic collaboration between all departments/units	3.0
People & Culture	Digital savviness in staff recruitment	3.3
	Digital culture as part of the overall corporate culture	3.0
	Digital solutions are used to improve digital service delivery and internal productivity	2.8
	Strong customer-focused culture	3.3
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.5
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	3.1
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	3.0
	Staff have the resources to anticipate and respond to new technologies and digital innovation	3.0
Innovation	The whole organisation seeks ways to use digital channels and technologies	2.5
	New management practices and organisational structures emerge to align with the digital organisation	3.0
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	3.1
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	3.0
	Cybersecurity is seen and treated as one of the most critical risks the company faces	2.8
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	3.4
	Internet connectivity is a priority amongst all company sites and locations in which it operates	4.0
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	2.8

The results above highlight several challenges faced within the manufacturing sector across the dimensions analysed. Firstly, as outlined in the Governance & Leadership dimension, the benefits of digital transformation are not widely understood, monitored, and reported across the sector, despite there being a strong understanding of the importance of digital transformation of the organisation for internationalisation & competitiveness. As a result, this challenge may play a role in the fact that digital strategy does not typically have a strong influence on the overall organisational strategy and direction across the sector, leading to various other challenges pertaining to the integration of a digital strategy into departmental planning processes, as well as re-engineering business processes to digitise and transform products and services.

Secondly, from a People & Culture perspective, the results indicate that the sector gives importance to digital savviness in staff recruitment and instilling a strong customer-focused culture. This is especially important because technical skills and human resources are the two most pressing barriers companies within the industry face in terms of their digital transformation, as highlighted in Figure 4.3 below.

FIGURE 4.3 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE MANUFACTURING SECTOR



Nonetheless, the utilisation of digital solutions to improve digital service delivery and internal productivity remains a challenge. Interestingly, the latter may be tied with the notion that digital policies, procedures, and digital activities may not always be in place and are not core to everyday business activity, as highlighted in the Capacity & Capability dimension, further substantiating the weak influence a digital strategy has across the sector, as previously inferred. Moreover, the results also depict challenges for organisations within the sector to seek ways to use digital channels and technologies.

Finally, from a technology standpoint, monitoring new trends and cybersecurity are also seen as challenging areas, whilst the importance of internet connectivity is also highlighted, confirming the need for the country to have strong, reliable, and fast internet connectivity. The latter is especially important given that the Internet of Things is expected to continue increasing in importance and the factory of the future is very much dependent on connected devices, in turn requiring strong and fast internet connectivity.

Relevant Technologies

Examples of sector-specific applications of digital transformation in the manufacturing sector are given in Box 4.2.

BOX 4.2 – TECHNOLOGY APPLICATIONS IN THE MANUFACTURING SECTOR

Automation of Repetitive Tasks

Manufacturing involves many processes that are repetitive, and this makes them natural candidates for automation. Processes that involve manipulating physical objects or spaces can be automated using robotics and IoT. Such tasks may require differing levels of AI to facilitate the automated process, depending upon the nature of the process. Automated Inventory Management, as discussed above, is also relevant here.

Predictive Maintenance

Data collection on the usage and condition of equipment can be automated using IoT or via user input to ensure effective monitoring. This allows issues and maintenance requirements to be flagged automatically and scheduled effectively, minimising the risk of equipment breakdowns or failures. Depending upon the complexity of machinery and processes, AI may be required to be utilised to make such predictions.

Automated Worker Health and Safety Monitoring

Aspects of monitoring employees' health and safety within manufacturing processes could be automated using IoT devices. Depending upon the task at hand, different non-invasive IoT devices could be used including camera and wearable sensors. For various reasons an employee may not be fit to undertake their role and this technology identifies these instances and triggers an alert before an accident happens.

Assisted and Automated Design

The design of both manufacturing processes as well as end-products can be automated or assisted using AI. Assessing a wide range of design options, an AI system can evaluate the appropriateness of a particular design and ultimately deliver an optimal solution. Simulations and digital twins (digital models of real-world objects) can also be used to evaluate expected performance or outcomes of various designs under investigation.

Demand and supply forecasting

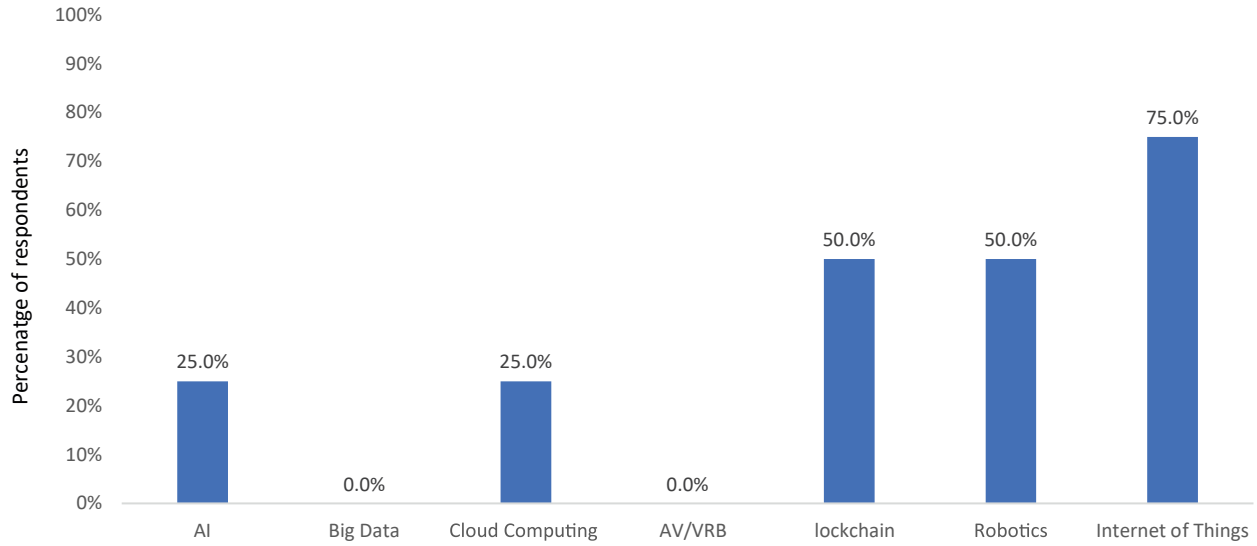
Using data analytics, big data and AI, predictive planning techniques can be used to forecast demand and supply, allowing for better informed decisions with regards to purchasing materials or ensuring available human resources.

Trusted manufacturing supply chains

The manufacturing supply chain is also a complex one involving many different stakeholders and therefore a blockchain-based supply chain solution can help bridge trust gaps and maximise cost-efficiency.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, the three most mentioned are IoT, blockchain and robotics, followed by cloud computing and AI respectively.

FIGURE 4.4 – RELEVANT TECHNOLOGIES FOR THE MANUFACTURING SECTOR



From a manufacturing perspective, Internet of Things is expected to drive the factories of the future through a web of connected and interconnected devices, robotic machines and other devices needed in the manufacturing process. However, market players are also aware of the other technologies and their impact on manufacturing and on enhancing productivity.

4.3 Construction sector

Sectoral Overview

The construction industry has long been seen as an important economic driver. Over the past few years, the sector has experienced an unprecedented boom with an increase in construction sites and a resulting rise in the supply of dwellings. Between 2010 and 2019 the sector's nominal GVA grew by 85.8 per cent or an annual average of 7.1 per cent. In comparison to other key sectors, construction only accounts for 4.2 per cent of the total economy. However, the sector is also an important user of services provided by other sectors, namely real estate which grew by 7.3 per cent annually between 2010 and 2019, and professional services such as architects, notaries, tax advisors and financial planners, which saw their collective nominal GVA grow by an annual average of 16.1 per cent during this period.

From an employment perspective, growth has been at the rate of 4.3 per cent which is slightly lower than the economy average growth of 5.0 per cent. Foreigners, namely non-EU nationals, in 2020 accounted for roughly 40.7 per cent of total registered employed in the sector, with the number of registered Maltese employees working in the construction sector falling by around 1,258 between 2010 and 2020.

On a macro level, the issue of planning and spatial planning, including estimation through demand and supply models, is becoming more critical to ensuring the long-term sustainability of the sector and the broader economy. Intra-sectoral consolidation is also expected to happen between operators, with larger players crowding out smaller firms, pointing further towards the need for the sector to reinvent and transform itself. In view of the public's negative perception of the industry there also needs to be a greater emphasis on quality rather than quantity, together with a greater commitment towards sustainability and environmental protection. To achieve this, the sector will have to focus more of its energies towards regeneration rather than new developments, as well as the importance of circular economy concepts for the construction industry.

TABLE 4.7 – CONSTRUCTION SECTOR ANALYSIS

Sector Related	
Challenges	*Opportunities*
Public perception of industry	Smarter buildings
Environmental impact	Greening the sector through new construction methods and material
Health & safety concerns	Promotion of circular economy
Waste management	EU Green Deal and funds
Dampened investor confidence and consumer sentiment	Potential of regeneration in certain localities
Growing concerns regarding oversaturation	
Future Trends	
Smarter & greener buildings	Modular construction methods and buildings
Move towards more sustainable building methods	3D printing for building

Productivity analysis

Despite its contribution to the Maltese economy and its strong linkages to other key economic sectors, the local construction sector has remained relatively habitual in its approach; this often being cited as one of the main reasons for the public's negative perception towards the industry. As shown in Table 4.8 on the next page, this situation is also afflicting the sector in terms of productivity, which ultimately translates into lower quality and higher social costs. In view of the challenges facing this sector, productivity improvements remain a top priority and technology has a role to play in bridging these gaps to ultimately spur the sector's much needed transformation.

Despite its contribution to the Maltese economy and its strong linkages to other key economic sectors, the local construction sector has remained relatively habitual in its approach.

TABLE 4.8 – CONSTRUCTION SECTOR PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€530.7	€546.9
Employment			17,100	15,300
Sectoral level productivity				
National			€50,347	€46,256
Construction sector			€31,035	€35,745
Returns to Labour Income				
National			€2.57	€2.45
Construction sector			€1.67	€1.93
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
Low	Low	Low	Low	Low
Productivity analysis				
• The industry has consistently scored low in productivity • As an industry it continues to increase its contribution and value generated however remains lower than the national average • Potential to increase its productivity				

Source: Eurostat, Labour Force Survey, Authors' calculations

Digital Transformation Readiness

The Index was rolled out amongst participants in the construction sector and the results for the indicators of all dimensions are given in Table 4.9 on the next page.

TABLE 4.9 - CONSTRUCTION SECTOR PRODUCTIVITY INDEX INDICATORS

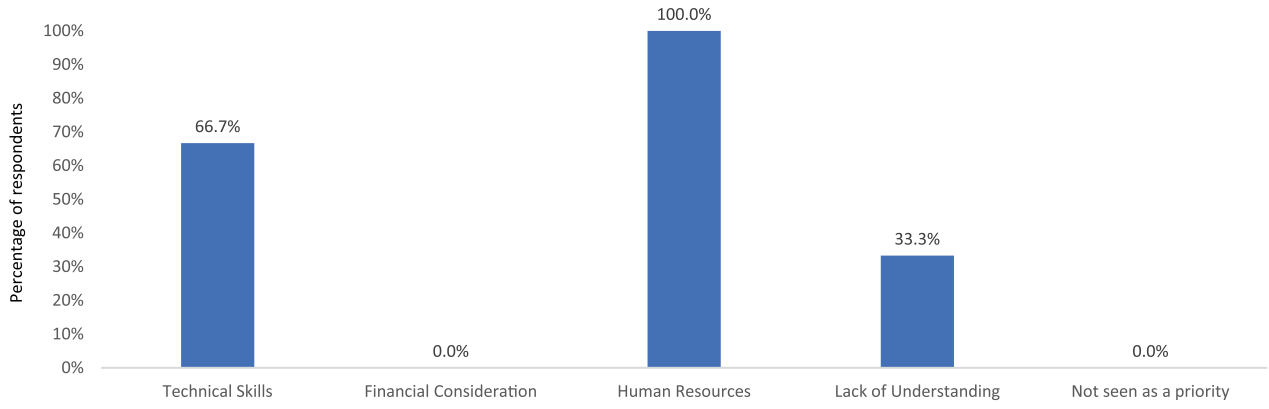
Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	2.8
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	2.8
	Understanding, monitoring, and reporting of benefits of digital transformation	3.0
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.5
	Constant business re-engineering process to digitise and to transform products and services	3.0
	Strategic collaboration between all departments/units	2.8
People & Culture	Digital Savviness in staff recruitment	3.3
	Digital culture as part of the overall corporate culture	2.8
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	2.8
	Strong customer-focused culture	2.8
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.8
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	2.8
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	2.7
	Staff have the resources to anticipate and respond to new technologies and digital innovation	3.0
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.0
	New management practices and organisational structures emerge to align with the digital organisation	2.7
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	2.2
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	2.7
	Cybersecurity is seen and treated as one of the most critical risks the company faces	3.3
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	3.5
	Internet connectivity is a priority amongst all company sites and locations in which it operates	3.7
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	2.7

From a Governance & Leadership perspective, the construction sector has a good understanding of the importance of digital transformation of organisations for internationalisation & competitiveness, and is also privy to understanding, monitoring, and reporting of the benefits stemming from digital transformation. However, the sector faces challenges in so far as the integration of a digital strategy into departmental planning processes and lacks influence on the overall organisational strategy and direction. Strategic collaboration between all departments/units is also seen as a challenge for the sector, potentially contributing to the challenges discussed above.

Similar challenges are also seen in other dimensions. For instance, digital culture may not always form part of the overall corporate culture, leading to issues related to the inappropriate allocation of resources and budgets towards supporting digital channels, activities, and service delivery. Moreover, digital policies, procedures and digital activities are not always in place and part of an organisation's everyday business activity.

When analysing staff recruitment, the sector gives importance to the digital savviness of new recruits. However, training given to existing staff does not always support the current digital strategy in place in organisations and does not always anticipate future skills. This ties in particularly well with the main barriers companies within the sector face with regards to their digital transformation, whereby human resources and technical skills were the two most mentioned barriers, followed by a lack of understanding, as portrayed in Figure 4.5

FIGURE 4.5 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE CONSTRUCTION SECTOR



As highlighted in the Innovation dimension, it is typically not common practice within the sector for organisations to imagine future needs and technologies and to explore and experiment with methods and solutions. In fact, the sector also faces a challenge in monitoring and evaluating the latest trends and technologies from a cost and benefit perspective. This is particularly interesting because staff tends to have adequate resources to anticipate and respond to new technologies and digital innovation, highlighted in the Capacity & Capability dimension.

Finally, the Technology dimension highlights that the sector priorities the importance of internet connectivity with importance also directed towards having periodic IT and digital audits carried out to see how both hardware and software can be improved to optimise performance. Having said this, cybersecurity is seen as a challenging area for the sector, potentially posing a critical risk for companies.

Relevant Technologies

Technology advancements can support the construction sector through several sector-specific applications that are described in Box 4.3.

BOX 4.3 – TECHNOLOGY APPLICATIONS IN THE CONSTRUCTION SECTOR

Generative design

For any planning and design tasks that involve a range of creative or subjective perspectives, generative design techniques can be used to automatically explore, rate and propose different options. For example, when designing a property layout, many different options exist, and a designer is typically limited in their assessment by time and other constraints. Generative design is a methodology that automates the creation of design options, allowing architects or engineers to input design goals into the generative design software, along with parameters such as performance or spatial requirements, materials, manufacturing methods, and cost constraints. The software explores all the possible permutations of a solution, quickly generating design alternatives.

Automated and assisted land surveying and monitoring

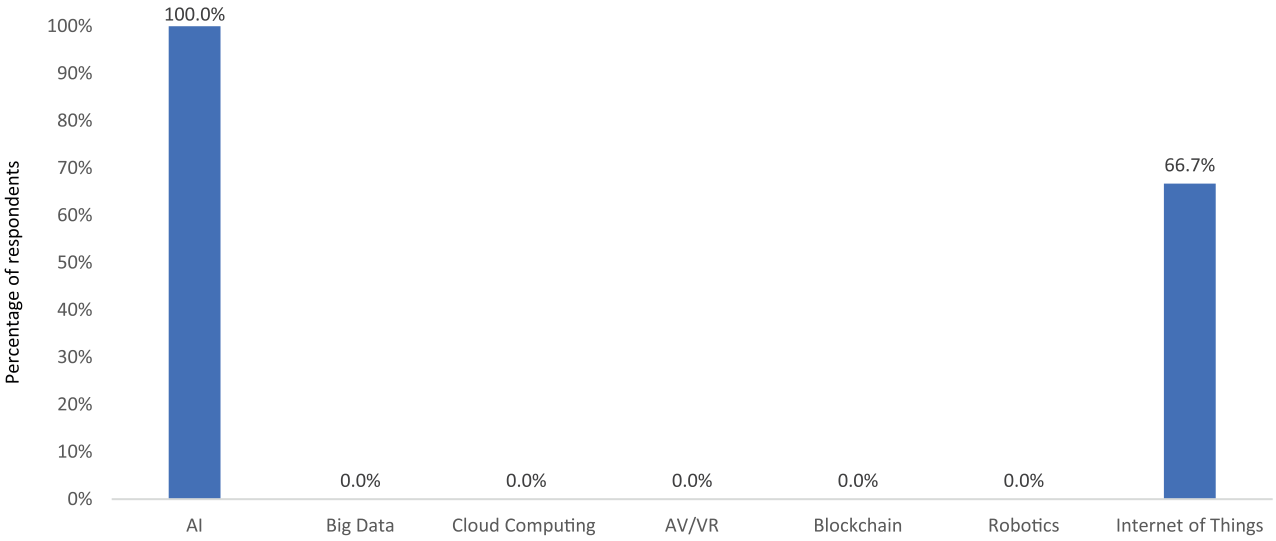
Land surveying typically involves manual intervention and the use of equipment. Using IoT devices, drones and satellite imagery can automate the process to provide a more cost-efficient process. Such technologies can subsequently be used for ongoing surveying or monitoring if required. Construction progress monitoring can also be automated remotely using such technologies.

Wearable devices and cameras to ensure the safety and security of workers, premises, materials and tools

IoT devices can be used to automatically monitor worker activity to ensure timely intervention in the case of any accident. Static IoT cameras can also be installed to ensure accountability, and alignment with quality and safety standards and procedures. Beyond static IoT cameras, other forms of IoT devices can be used to track usage of material and tools.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, AI and IoT were the most mentioned.

FIGURE 4.6 – RELEVANT TECHNOLOGIES FOR THE CONSTRUCTION SECTOR

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20 6

4.4 Wholesale and retail trade, transport, accommodation and food services

Sectoral Overview

The wholesale and retail trade, transport, accommodation, and food services sectors are universal economic sectors, accounting for more than 20.0 per cent of the total Maltese economy and for close to 25.0 per cent of the total services sector in 2019. The wholesale and retail sector is an important driver of consumption activity in Malta, while also serving key intermediate goods and services to a variety of other sectors. Similarly, the transportation sector incorporates several subsectors including land transport as well as maritime and aviation, asset registration and management (primarily aircraft and ship), as well as warehousing and support services and logistics. Thus, the transportation sector plays an important role in Malta's development as a modern economy. Thanks to the strategic location of the island, Malta is also a major regional transhipment hub. Meanwhile, tourism has long been established as one of the main pillars of the Maltese economy and in recent years experienced unprecedented levels of growth, with all key players reporting strong performances which were ultimately reflected in the country's overall economic development.

In view of these developments, the wholesale and retail trade, transport, accommodation, and food services sectors had collectively been growing in nominal terms by an annual average of 8.0 per cent between 2010 and 2019. In employment terms, there were more than 67,000 people employed in these sectors by 2019, up from 46,900 in 2010.

Inarguably, all three sectors have taken the full brunt of the COVID-19 pandemic and the resulting health related measures, travel bans, and social distancing rules implemented to help stop the spread of the virus. The impact on these sectors has been significant, with GVA collectively contracting by 34.5 per cent when compared to 2019. Contrastingly, employment levels have been sustained, clearly suggesting that the Government's support measures to prevent large scale layoffs have so far paid off. However, business sentiment among operators in these sectors remains low amid lingering uncertainty concerning new virus variants and the threat of resurgence, muted demand conditions, and changing business models underpinned by the growing shift towards digitalisation and a more discerning consumer. Policies aimed at curtailing emissions from the transportation sector are also expected to be ramped up, especially considering climate change goals and the expected impact these will have on air traffic and freight costs.

Table 4.10 presents a broader overview of the challenges and opportunities facing these three sectors, as well as trends that will shape sectoral developments.

TABLE 4.10 – WHOLESALE AND RETAIL TRADE, TRANSPORT, ACCOMMODATION AND FOOD SERVICES SECTORS ANALYSIS

Sector Related	
Challenges	*Opportunities*
Wholesale & retail trade	
Foreign chains are disrupting local market	Sector consolidation and pooling in delivery
Global e-Commerce firms are also disrupting the market	Further digitalisation of the sector to improve back-end operations
Increased transportation & logistics costs	Improved use of existing e-Commerce technologies to drive sales and target new markets
Rising last mile and delivery costs	Regional markets as North Africa picks up
Possibly an over-supply of outlets, with more being planned with every large-scale development	Emergence of low-cost, direct marketing channels for customer engagement like social media
Strong reliance on population growth fuelled by the increase in foreign workers as well as record tourist arrivals	
Concept of retail might change post-COVID	
Transport	
Growing cost elements for companies	Digital transformation
Last mile delivery is becoming an issue	Logistics & delivery aggregation models
Disruption in the industry through platform economy	Infrastructural capital investment
Possibility of taxes and EU directives which will impinge on costs	Move to cleaner and electric vehicles
Emission targets & carbon lock ins	Need for a centralised logistics hub
Accommodation & food services	
Recovery to reach pre-COVID numbers is long	Change in business models to survive including take-outs and home-kits
Learning to live with COVID and the social distancing rules which might become habitual	Consolidation within the sector
Possibly an over-supply of beds and establishments	Need to find new niches areas to develop competitive advantages
Buy-to-let boom had an impact on collective accommodation	Increase in quality and standards especially with respect to rating of properties
Environmental pressures including climate change	
Critical shortage of staff	

Future Trends		
Wholesale & retail trade	**Transport**	**Accommodation & food services**
Digital marketplaces becoming key forces	Move towards technology-driven apps	Platform economy for accommodation
Greater dominance of foreign websites	Move to cleaner and electric / hybrid vehicles	Growing shift towards pay per service model
Sector consolidation	Last mile delivery is going to be critical due to online shopping	Tourism and perception towards it might change particularly in light of climate change debate
Increased use in technology to achieve efficiencies	Multi-modal transport models will be central	People are after experiences and becoming more discerning
Changing role of retail shops and how it co-exists with online		Increased use of Augmented Reality (AR) and Virtual Reality (VR) in tourism
Customer journey and experience are going to become even more important		Market off-peak tourism with a focus on culture, history, outdoor activities etc.

Productivity analysis

The wholesale and retail trade, transport, accommodation and food services sectors are characterised by high employment and low productivity levels. That said, certain niche segments within the transport sector, particularly those relating to aircraft and ship registration and the logistical side of transhipment, are significantly more productive. Furthermore, productivity levels in the period between 2010 and 2019 appear to have improved, notably in the accommodation and food services sector on account of record tourist arrivals and spend, and growing returns reported by operators. On the other hand, the wholesale and retail trade sector, which has been slow to transform and embrace digital advancements, continues to fall short on productivity targets in comparison to other service sectors.

As already intimated, uncertainty in these sectors persists. COVID-19 served to highlight the continued importance of digitalisation within these sectors, which even before the crisis was a key disruptor and which during lockdown served as a vital cog to business continuity. Continued investment in digital technologies, technology-driven apps and e-commerce platforms therefore remain a top priority for these sectors, not just as a business survival tool to improve back-end operations and improve efficiency but as a driver of sales and a platform to unlocking new markets, both locally and abroad. Technology developments will also prove critical for the transformation and advancement of these sectors in the face of challenges emanating from the climate change debate.

TABLE 4.11 – WHOLESALE AND RETAIL TRADE, TRANSPORT, ACCOMMODATION AND FOOD SERVICES SECTORS PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€2,529.1	€1,655.6
Employment			67,300	64,400
Sectoral level productivity				
National			€50,347	€46,256
Wholesale & retail trade, transport, accommodation & food services sectors			€37,579	€25,708
Returns to Labour Income				
National			€2.57	€2.45
Wholesale & retail trade, transport, accommodation & food services sectors			€2.32	€1.89
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
Low	High	Low	High	Low
Productivity analysis				
• Mixed productivity results with certain niche transport segments operating at higher-than-average productivity levels and accommodation and food services registering some improvements in recent years • COVID-19 served to highlight the continued importance of digitalisation within these sectors • Disruption in the industry through platform economy persists • Continued investment in digital technologies remains a top priority for these sectors, not just to improve back-end operations and efficiency but as a driver of sales and a platform to unlocking new markets • Technology developments will also prove critical in the face of climate change challenges				

Source: Eurostat, Labour Force Survey, Authors' calculations

Digital Transformation Readiness

The sectoral responses with a detailed breakdown of the individual indicators for all dimensions are given in Table 4.12 below.

TABLE 4.12 – WHOLESALE AND RETAIL TRADE, TRANSPORTATION AND STORAGE, ACCOMMODATION AND FOOD SERVICES SECTORS PRODUCTIVITY INDEX INDICATORS

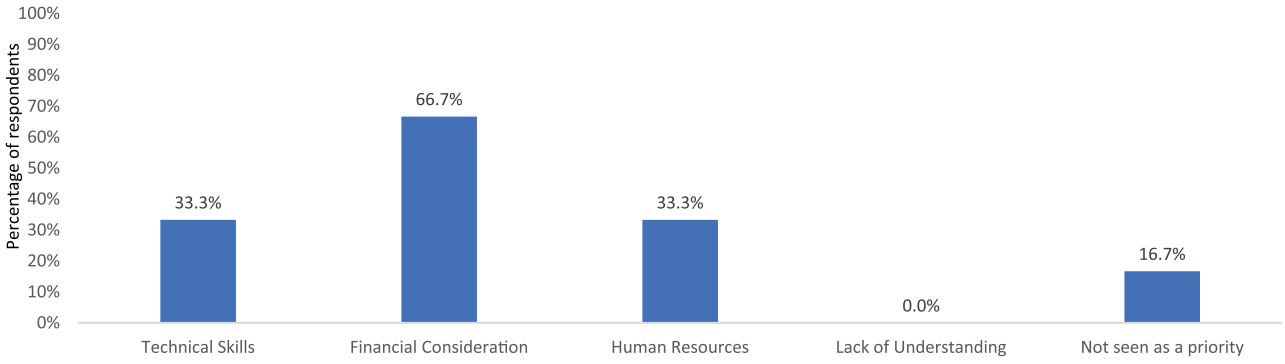
Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	2.4
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	2.4
	Understanding, monitoring, and reporting of benefits of digital transformation	2.9
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	2.8
	Constant business re-engineering process to digitise and to transform products and services	2.8
	Strategic collaboration between all departments/units	2.7
People & Culture	Digital Savviness in staff recruitment	3.3
	Digital culture as part of the overall corporate culture	2.8
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	3.2
	Strong customer-focused culture	3.2
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.9
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	2.9
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	3.0
	Staff have the resources to anticipate and respond to new technologies and digital innovation	2.9
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.0
	New management practices and organisational structures emerge to align with the digital organisation	2.8
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	3.1
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	3.0
	Cybersecurity is seen and treated as one of the most critical risks the company faces	2.8
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	2.3
	Internet connectivity is a priority amongst all company sites and locations in which it operates	3.4
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	3.1

When analysing the indicators across the above five dimensions, it appears that the sector is faced with numerous challenges impacting its digital readiness. From a Governance & Leadership perspective, the sector scored relatively poorly across most indicators, especially in terms of showing leadership in digital transformation, strategy, and readiness, as well as in terms of integration of digital strategy into departmental planning processes and influence on overall organisational strategy and direction. Moreover, there is a lack of strategic collaboration between departments/units in organisations within the sector, coupled with a below average understanding of the importance of digital transformation for internationalisation & competitiveness as well as understanding monitoring and reporting of benefits of digital transformation.

The results also indicate that digital culture does not always form an integral part of corporate culture. However, the sector does prioritise digital savviness in its staff recruitment and has a strong customer-focused culture which utilises digital solutions to improve digital service delivery and internal productivity.

From a Capacity & Capability perspective, the sector does not always have digital policies, procedures, and digital activities in place within the organisation and these are not core to everyday business activity. Moreover, the sector faces challenges pertaining to allocating adequate resources to staff to anticipate and respond to new technologies and digital innovation as well as in providing staff training that supports the current digital strategy and anticipates future skills and knowledge requirements. In fact, this may be tied with the fact that the sector views financial constraint as the largest barrier to digital transformation, followed by technical skills and human resources constraints, as shown below.

FIGURE 4.7 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE WHOLESALE AND RETAIL TRADE, TRANSPORTATION AND STORAGE, ACCOMMODATION AND FOOD SERVICES SECTORS



Finally, from an innovation and technology standpoint, it is common practice within the sector to imagine future needs and technologies and to explore and experiment with methods and solutions. However, the alignment of new management practices and organisational structures with the digital organisation is seen a challenge area. Other challenges faced include having periodic IT and digital audits carried out to see how both hardware and software can be improved to optimise performance as well as seeing and treating cybersecurity as one of the most critical risks the company faces. On the other hand, however, the sector monitors and evaluates the latest trends and technologies from a cost and benefit perspective and prioritises good internet connectivity amongst all company sites and locations in which organisations operate.

Relevant Technologies

This sector covers a number of industries with different operational and technology requirements and potential for disruption. Box 4.9 highlights key applications of such technologies.

BOX 4.4 – TECHNOLOGY APPLICATIONS IN THE WHOLESALE AND RETAIL TRADE, TRANSPORT, ACCOMMODATION AND FOOD SERVICES SECTORS

Wholesale & Retail Trade

Recommendation Systems

AI can categorise similar products or artefacts based on predetermined characteristics or attributes. These can then be recommended to consumers based on their personal preferences.

Predictive Analytics for Planning

The use of big data and AI can unlock significant potential for managing resources and enhancing customer experience in this sector. These technologies provide a greater understanding of consumer shopping habits and how to attract new customers. The use of big data in particular enables companies to create customer recommendations based on their purchase history, resulting in personalised shopping experiences and improved customer service. AI systems can also forecast product demand, anticipate change, and predict trends.

Automated Inventory Monitoring and Management

Various IoT devices can be used to automate inventory monitoring including cameras, RFID tags, and other IoT sensors. Alerts can be configured to automatically alert or initiate a process to replenish inventory if required.

Virtual Try Before You Buy

Augmented reality and 3D technologies are changing how customers shop both online and in-store. Referred to as 'augmented shopping,' this technology enables customers to engage with brands and products via digital experiences that allow them to try on, try out, interact, or personalise their product virtually; these experiences help deliver more detailed, intuitive product information than standard web experiences. This emerging trend aligns with changing consumer trends, in which consumers still appear to prioritise quality, value and choice in parallel with a rising demand for convenience.

Transport & Storage

Automated Fleet Management

A company's fleet can be tracked and monitored using IoT services while also providing data for future analysis or predictive models.

Automated Route Planning

This technology automates the planning of optimal routes for pick-up and deliveries to drastically increase efficiency and decrease costly delays.

Optimal Storage Placement

Storage space is a limited resource and items requiring to be stored vary drastically in terms of shape, size, and weight. Storage strategies also must factor in other requirements such as delivery and collection times. Solutions are often done manually by staff based on their intuition and experience, at times resulting in space wastage and inefficiencies. These processes can be automated using AI to optimise the use of storage in a cost-effective manner.

Drone Deliveries

Lightweight deliveries can be made over short distances using drones.

Accommodation and food services

Voice activated and interactive waiter and concierge systems

Many waiter and concierge services could be transformed into interactive, software-based systems which continue to give the perception of human interaction. This can be achieved using both voice activated and enabled systems as well as chat-bot like interfaces. Not only is this a solution to the issue of human resources, however it also provides a more efficient service for clients. Different IoT devices and interfaces can provide different means of interacting with clients and automating processes.

Live translation tools

The accommodation and food services sectors require staff that are ideally versed in various languages. However, beyond å general human resourcing problem, it is even harder to find staff able to communicate in languages often required to ensure effective communications with customers. Live translation tools and systems could be used to automatically translate between clients and staff, thus widening the pool of potential staff.

Inventory Monitoring and Management

As with the application of inventory monitoring within the Wholesale & Retail Trade sectors, IoT devices can also automate such processes in the Accommodation and Food Services sectors.

Demand prediction and pricing optimisation

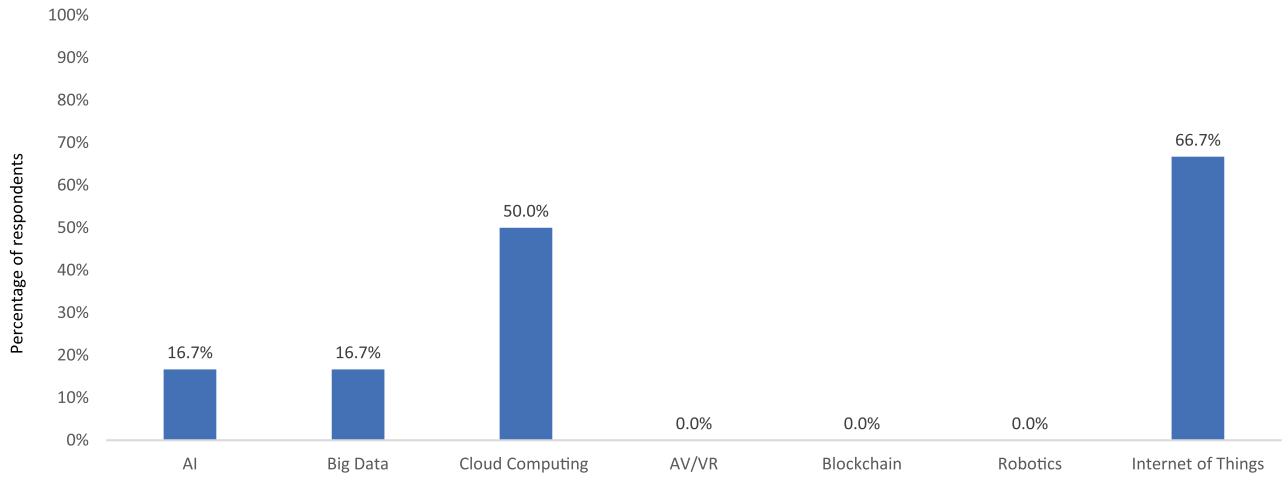
Prediction models can be used to determine stocking and staffing requirements. In the accommodation sector AI could be used to optimise pricing levels based on a range of modelling techniques.

Shift scheduling optimisation

AI can automate scheduling to find optimal schedules and rosters for staff - a crucial operational aspect of this sector.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, the most mentioned technology is IoT. This is followed by cloud computing, big data, and AI and finally blockchain, robotics and AV/VR are not considered relevant at all. The AR/VR is surprising as this offers some unique possibilities for the sector embrace, especially retail.

FIGURE 4.8 – RELEVANT TECHNOLOGIES FOR THE WHOLESALE AND RETAIL TRADE, TRANSPORTATION AND STORAGE, ACCOMMODATION, AND FOOD SERVICES SECTORS



The wholesale and retail trade, transport, accommodation and food services sectors are characterised by high employment and low productivity levels.

4.5 Information and communication

Sectoral Overview

The information and communication sector is one of the relatively new sectors that Malta successfully targeted as part of its strategy to transform the economy towards a diversified base of service sectors. The sector has picked up significantly since Malta joined the EU, also because of other emerging sectors, such as remote gaming and fintech. Between 2010 and 2019 this sector grew by more than €740 million in nominal terms, which translates into an annual average growth rate of 14.1 per cent. By the end of 2020, the sector accounted for 9.7 per cent of the total economy, second only to the professional services sector which also experienced significant growth on the strength of elevated economic conditions.

Malta's economic transformation into sectors such as this has also provided the economy with some much-needed resilience in the wake of the COVID-19 crisis. The pandemic and related social distancing restrictions have brought to the fore the role of digital transformation. This has had a positive impact on the sector, with a surge in demand to support companies in a makeshift and emergency digital transformation. Numerous companies required solutions for employees to work remotely, and several client-facing businesses have sought to transform their brick-and-mortar shops into eCommerce platforms. As a result, the sector registered the highest growth in 2020 when compared to other sectors of the Maltese economy, with the sector's nominal GVA growing by 14.1 per cent.

Another important element of this sector is that it has translated into high value employment with annual growth rate standing at 8.5 per cent and with higher-than-average salaries, providing for stronger spending powers which boosts private consumption at household level.

Looking ahead, the sector expects to maintain a strong level of activity as more companies continue to focus on digital transformation in the wake of the permanent changes emerging in the working world because of the COVID-19 pandemic. The sector expects to see an increase in demand for cloud services and services relating to remote working. Also retail outlets are focusing more on their online presence by not only improving their social media presence but also the customer experience on their online platforms.

Malta's economic transformation into sectors such as this has also provided the economy with some much-needed resilience in the wake of the COVID-19 crisis.

TABLE 4.13 - INFORMATION AND COMMUNICATION SECTOR ANALYSIS

Sector Related	
Challenges	*Opportunities*
Lack of resources	Strong demand for technology services
Need a greater pipeline of students	Regulatory innovation to support new niches, also in other sectors such as FinTech
Workers are becoming more expensive with a reliance on foreign workers	Ability to employ remote workers
Infrastructure related to emerging technologies including cyber security	Digital nomads can attract key talent
Need a more conducive ecosystem	Malta is building a reputation in the sector
Future Trends	
Digital transformation will remain pervasive across all sectors	Cybersecurity will be critical for companies and countries
AI will be a key technology together with AR and VR and will impact daily lives and jobs	Digital infrastructure will be a key competitiveness driver
Data will be the new gold	

Productivity analysis

Not surprisingly the information and communication sector scores high across most productivity indicators. Malta continues to build a reputation in this sector and is well positioned among the leading EU member states. Despite these hard-earned achievements, no success should be taken for granted particularly in the face of competition from emerging economies in the European bloc, which have a strong IT and software development talent pool which is cheaper to employ. Overall, operating costs in these emerging economies are also relatively lower, thus presenting locally based operators with an attractive competitive alternative. Furthermore, barriers to relocation are relatively low, therefore enhancing this threat of emerging economies.

Against this backdrop, it is therefore very important for Malta to continue positioning itself among other leading countries in this sector through sustained investment, direction, and support.

Not surprisingly the information and communication sector scores high across most productivity indicators. Malta continues to build a reputation in this sector and is well positioned among the leading EU member states.

TABLE 4.14 – INFORMATION AND COMMUNICATION SECTOR PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€2,529.1	€1,655.6
Employment			67,300	64,400
Sectoral level productivity				
National			€50,347	€46,256
Information & communication sector			€37,579	€25,708
Returns to Labour Income				
National			€2.57	€2.45
Information & communication sector			€2.32	€1.89
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
High	Low	High	High	High
Productivity analysis				
• Highly productive sector • Considered to be a regional hub among other leading EU member states • Digital transformation will remain pervasive across all sectors, further bolstering this sector • Strong competition from emerging EU economies and thus productivity remains a central tenant of the local digital sector				

Source: Eurostat, Labour Force Survey, Authors' calculations

Digital Transformation Readiness

The results from the survey carried out amongst market participants operating in this sector are given in Table 4.15 on the next page.

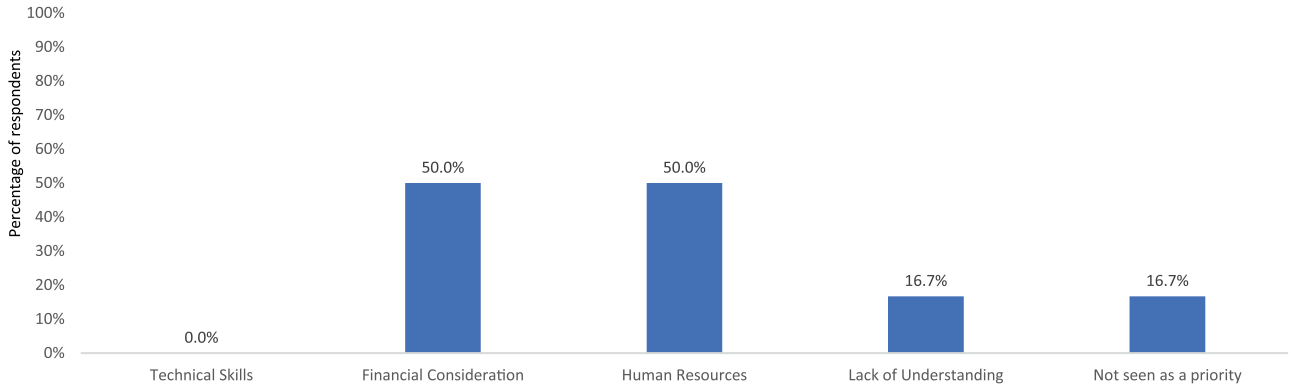
TABLE 4.15 – INFORMATION AND COMMUNICATION SECTOR PRODUCTIVITY INDEX INDICATORS

Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	2.8
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	3.3
	Understanding, monitoring, and reporting of benefits of digital transformation	3.2
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.5
	Constant business re-engineering process to digitise and to transform products and services	3.3
	Strategic collaboration between all departments/units	3.3
People & Culture	Digital Savviness in staff recruitment	3.4
	Digital culture as part of the overall corporate culture	3.0
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	2.9
	Strong customer-focused culture	3.1
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	3.3
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	3.2
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	3.0
	Staff have the resources to anticipate and respond to new technologies and digital innovation	2.8
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.2
	New management practices and organisational structures emerge to align with the digital organisation	3.3
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	3.3
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	2.9
	Cybersecurity is seen and treated as one of the most critical risks the company faces	3.3
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	2.8
	Internet connectivity is a priority amongst all company sites and locations in which it operates	3.7
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	3.3

From the indicators displayed above, the IT and communications sector can be characterised as a sector which prioritises digital readiness. Firstly, the Governance & Leadership indicators show that the digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction. This stems from multiple factors such as having good strategic collaboration between all departments/ units, engaging in constant business re-engineering process to digitise and to transform products and services as well as understanding the importance of digital transformation of the organisation for internationalisation & competitiveness and finally monitoring and reporting of benefits of digital transformation. Having said this, the sector views leadership in digital transformation, strategy, and readiness as a challenging area.

Secondly, like other sectors, digital savviness is given importance when it comes to staff recruitment. In fact, staff training is seen to support the current digital strategy and anticipates future skills and knowledge requirements. This is possibly because digital culture is viewed as part of the overall corporate culture, with digital policies, procedures, and digital activities in place and which are core to everyday business activity. In fact, when analysing the main barriers, the sector faces to digital transform itself, technical skills is unanimously perceived as not being a barrier in this regard, as opposed to financial constraints and human resources constraints, as highlighted below. The latter inference coincides with the fact that staff do not always have the resources to anticipate and respond to new technologies and digital innovation.

FIGURE 4.9 - MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE INFORMATION AND COMMUNICATION SECTOR



Finally, the Innovation and Technology dimensions depict a sector where the main challenges faced pertain predominantly towards not always having the IT strategy and performance aligned with the organisational vision and strategy, as well as needing more periodic IT and digital audits to see how both hardware and software can be improved to optimise performance. Another challenge mentioned is that cybersecurity is also seen and treated as one of the most critical risks the sector faces. Having said this, it is common practice within the sector to imagine future needs and technologies and explore and experiment with methods and solutions. Moreover, the sector also aims to seek ways to use digital channels and technologies, with the latest trends and technologies monitored and evaluated from a cost and benefit perspective.

Relevant Technologies

As one can imagine, various sector specific technologies can be identified as having a strong potential impact on this tech-driven sector. These are shown in Box 4.5.

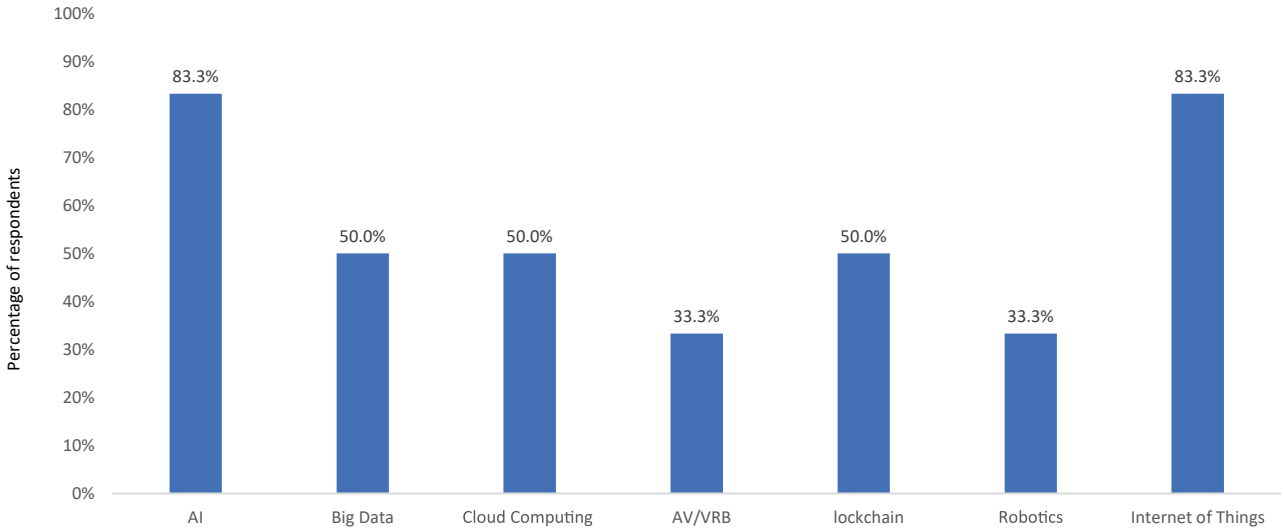
BOX 4.5 – TECHNOLOGY APPLICATIONS IN THE INFORMATION AND COMMUNICATION SECTOR

AI Assisted Software Development and IT Operations

Software development and IT operations have traditionally been solely guided by human programmers and administrators. AI-assisted software development tools are gaining more traction and will undoubtedly play an increasing role over time. Such tooling includes: (i) AI based coding suggestions; (ii) automated and assisted quality assurance and testing; (iii) bug detection; (iv) efficiency analysis; and (v) automating certain aspects of software development/IT operations (DevOps).

When analysing which technologies are deemed to be most relevant for the sector in the coming years, the two most mentioned are IoT and AI followed by big data, cloud computing and blockchain and finally AV/VR and robotics.

FIGURE 4.10 – RELEVANT TECHNOLOGIES FOR THE INFORMATION AND COMMUNICATION SECTOR



4.6 Financial and insurance services

Sectoral Overview

The financial and insurance services sector has emerged as one of the most important economic sectors developed in Malta over the past two decades. In recent years the sector has continued to grow at an average of 8.2 per cent each year between 2010 and 2019, reaching a nominal gross value added of €1,081.9 million or 8.6 per cent of the total economy in 2019. Over the years, the sector developed beyond traditional banking services and today includes a strong capital market and the offering of several digital financial instruments. Growth was also driven by insurance and pension funding which more than doubled over this period, with innovative regulations governing the establishment of Protected Cell Companies proving key to attracting several captives and cell companies to Malta.

The financial services sector is built around dealing with volatility and the sector has an in-built resilience to exogenous shocks. Companies operating in the sector have long been at the forefront of digitalisation and have likewise been quick to adapt to the changing realities brought about by COVID-19. As a result, the sector still registered a nominal growth of 7.4 per cent in 2020.

In line with the above developments, the sector continued to generate new jobs and attract talent. Employment levels during the period between 2010 to 2019 increased by more than 5,400 at an average annual rate of 7.0 per cent. In the face of impending sectoral reform and the ensuing transformation, employment levels in the sector continued to be bolstered throughout 2020, growing by 28.8 per cent over 2019.

Table 4.16 presents an overview of the sector from a challenges, opportunities, and future trends perspective.

TABLE 4.16 - FINANCIAL AND INSURANCE SERVICES SECTOR ANALYSIS

Sector Related	
Challenges	*Opportunities*
Regulatory and compliance impact	Mature sector with significant FDI
Administrative delays in processing and excessive bureaucracy	Increased use of technology and digital tools
High staff turnover at authorities impacting service delivery	Sector has potential to further transform itself and attract new business through innovative regulation
Reputation issues surrounding the jurisdiction	
Corporate tax developments	
Future Trends	
Regulatory innovation is key	Digital services will also transform the industry and create new niches requiring finance and non-finance skills
Compliance and AML will continue dominating the industry	

Productivity analysis

Traditionally this sector has always been at the forefront of productivity developments, embracing technology to drive growth and create new niche offerings. Challenges relating to reputational issues and requirements for additional reforms remain pressing and have started to impinge on productivity growth (see Table 4.16), particularly in the wake of the increased resource requirements to support and fulfil compliance functions. The critical shortage of resources that are industry ready further erodes productivity levels and it is therefore vital for this sector to continue investing in digitalisation to facilitate administrative processes and supplement core functions.

TABLE 4.17 – FINANCIAL AND INSURANCE SERVICES SECTOR PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€1,081.9	€1,161.5
Employment			11,800	15,200
Sectoral level productivity				
National			€50,347	€46,256
Financial & insurance services sector			€91,686	€76,414
Returns to Labour Income				
National			€2.57	€2.45
Financial & insurance services sector			€3.53	€2.69
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
High	Low	High	Low	High
Productivity analysis				
• Higher performance than national averages on main productivity indicators • Lower productivity growth as a result of compliance, compounded by the critical shortage of skills • Emerging technologies will continue to transform the industry				

Source: Eurostat, Labour Force Survey, Authors' calculations

Digital Transformation Readiness

The sector is moving fast towards deepening its digital transformation. The spread of technology and information in this sector is transforming regulatory processes with the advent of regtech, whilst the legal requirements, especially those dealing with compliance, are being transformed even further. The synergies that technology can exploit means that the sector can truly be transformed digitally. The detailed indicators for all dimensions are given in Table 4.18 on the next page.

TABLE 4.18 – FINANCIAL AND INSURANCE SERVICES SECTOR DIGITAL TRANSFORMATION READINESS

Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	3.0
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	3.1
	Understanding, monitoring, and reporting of benefits of digital transformation	3.3
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.3
	Constant business re-engineering process to digitise and to transform products and services	3.0
	Strategic collaboration between all departments/units	3.0
People & Culture	Digital Savviness in staff recruitment	3.1
	Digital culture as part of the overall corporate culture	3.4
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	3.4
	Strong customer-focused culture	2.8
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.8
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	2.9
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	3.3
	Staff have the resources to anticipate and respond to new technologies and digital innovation	2.8
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.0
	New management practices and organisational structures emerge to align with the digital organisation	3.1
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	3.4
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	3.3
	Cybersecurity is seen and treated as one of the most critical risks the company faces	2.9
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	3.3
	Internet connectivity is a priority amongst all company sites and locations in which it operates	3.5
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	3.3

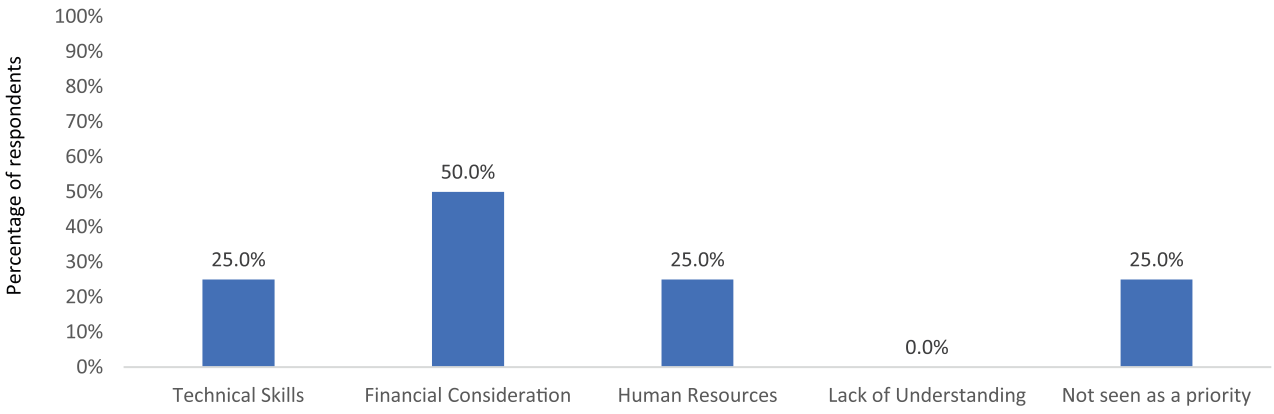
The above results denote a financial and insurance services sector that appears to be amongst the most digitally ready industries on the island, having above average scores across all the five dimensions analysed. From a Governance & Leadership standpoint, the sector has a good understanding of the benefits of digital transformation and through strategic collaboration between all departments/ units, is effectively able to monitor and report the benefits that digital transformation provides. In fact, the sector shows that digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction. Moreover, the sector also understands the importance of the digital transformation of the organisation for internationalisation & competitiveness, and adequately seeks to engage in a constant business re-engineering process to

digitise and to transform products and services.

The above characteristics are also reflected in the People & Culture dimension, whereby digital culture is part of the overall corporate culture for many within the sector, and digital solutions are also used to improve service delivery and internal productivity. On the other hand, a stronger customer-focused culture is required and may pose as a challenge for the sector.

In terms of Capacity & Capability, the challenges cited pertain mainly to the need to have digital policies, procedures, and digital activities in place within the organisation and at the core of day-to-day business activity. Moreover, whilst resources and budgets are generally appropriate for supporting the current digital channels, activities, and service delivery in place within the sector, staff may not always have the adequate resources to anticipate and respond to new technologies and digital innovation. This may stem from several barriers highlighted by the sector as the main deterrents to digital transformation, such as financial constraints, insufficient technical skills, and human resources constraints as well as the fact that it may not be prioritised, as highlighted below.

FIGURE 4.11 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE FINANCIAL AND INSURANCE SERVICES SECTOR



Another challenge the sector faces is that staff training needs also to be more aligned with the current digital strategy of the organisation and needs to cater for future skills and knowledge requirements.

Finally, from an Innovation and Technology perspective, the sector scores favourably across most indicators, portraying for instance that it is common practice to imagine future needs and technologies and explore and experiment with methods and solutions. In fact, the sector appears to also engage in periodic IT and digital audits to see how both hardware and software can be improved to optimise performance, whilst also monitoring and evaluating the latest trends and technologies from a cost and benefit perspective. Moreover, the sector views the importance of having strong Internet connectivity as an integral part to digital readiness.

Relevant Technologies

As already mentioned, the sector has several specific technology applications which can support it in its productivity gains. These applications are described in Box 4.6.

BOX 4.6 – TECHNOLOGY APPLICATIONS IN THE FINANCIAL AND INSURANCE SERVICES SECTOR

Automated compliance, profiling, and alerts

Many compliance and profiling tasks involving searching, filtering, and processing of text, whether involving online sources or private repositories, which can be automated. Some aspects would require the use of Natural Language Processing (NLP - a type of AI) which enables such systems to analyse retrieved data. Examples of this could be to automate adverse media checks which are often done manually by staff as part of AML/KYC and onboarding processes. Credit scoring systems could make use of both publicly available data as well as data from private repositories to build an entity's profile to support credit scoring decisions. AI can also be used to detect fraudulent activities, including automated and assisted signature forgery detection (through image manipulation detection), as well as fraudulent transaction detection. Vehicle, object and health monitoring and automated inspection or diagnosis.

Aspects of risk assessment can be automated using IoT devices which can collect health data contributing to an informed risk assessment. Through the application of continual IoT device monitoring, insurance companies could: (i) be alerted of any behavioural change that could affect associated risks; and (ii) ascertain whether statements provided by claimants are true, e.g., an in-car IoT monitoring device could help determine travelling speeds and when the brake was pressed and to what extent.

Automated and assisted trading

Trading can be automated to any required extent using AI, which can be applied to provide insights based on a multitude of data sources and types. This can range from using sentiment analysis to monitor public perception to attempting to identify potential correlation between stocks and periods. Furthermore, using Blockchain-based cryptocurrencies and smart contracts, new types of decentralised trading models will emerge.

Decentralised Finance and Peer-to-peer Lending

Blockchain and cryptocurrencies have not only brought about new types of trading paradigms, but also other decentralised finance operations including peer-to-peer lending.

Planning and forecasting

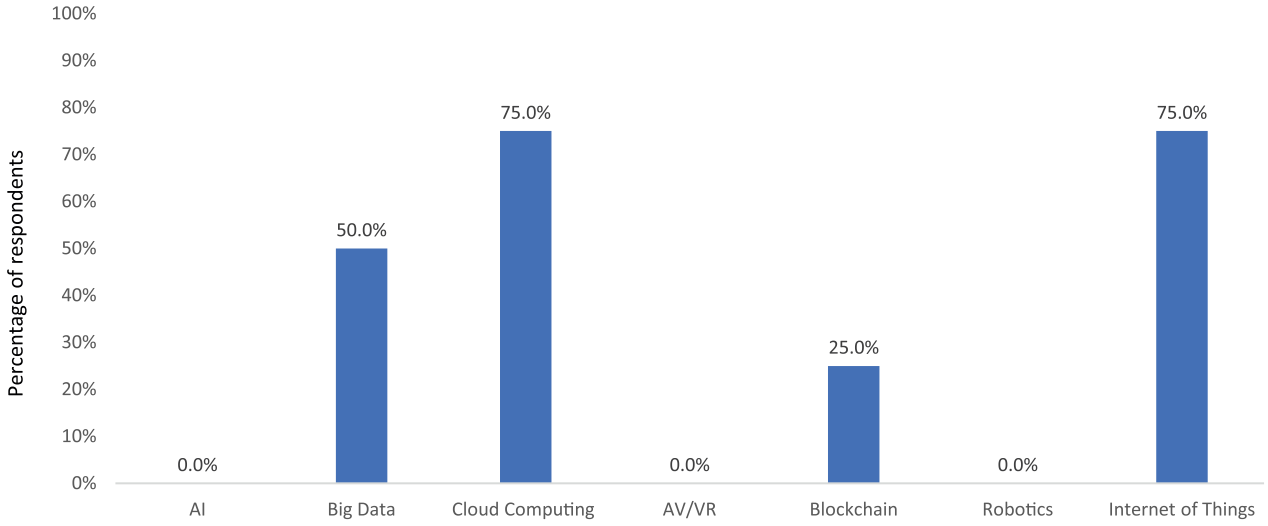
Planning and forecasting tasks can make use of AI to make better informed decisions on a wealth of historical data that may be available. This could allow various institutions to better forecast risk and expected exposure.

Automated Routine Task Reviewing

Routine tasks that produce some form of digitised output may have the possibility to generate automated reviews. This could be highly effective in the audit function with resources then used to provide added value on potential operational improvements to improve financial performance.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, the two most mentioned are IoT and cloud computing followed by big data and finally blockchain. It is surprising that, given the compliance requirements, especially transaction monitoring, AI is not seen as relevant. This may indicate that players might not be sufficiently aware of such technologies and their potential.

FIGURE 4.12 – RELEVANT TECHNOLOGIES FOR THE FINANCIAL AND INSURANCE ACTIVITIES SECTOR



What is interesting to note is that participants did not see the relevance of AI to financial services, even though as a technology it can really support and complement the use of big data.


DARK
LIGHT
DRY
MOIST
WET
ALKALINE
ACIDIC
MOIST
PH
LIGHT

4.7 Real estate

Sectoral Overview

In line with improved economic performance over the past few years and on the back of larger number of foreigners working in Malta, this sector experienced an unprecedented boom. With stronger demand for properties to rent and an increasing supply of units and new developments to sell, the real estate market went through a renaissance and today accounts for just over 6.1 per cent of the total economy.

The sector grew considerably over the past ten years, with nominal GVA increasing on average by 7.3 per cent each year between 2010 and 2019. Employment grew at a faster rate of 12.5 per cent each year during this period. However, the composition is peculiar to the industry with a high percentage of self-employed and part-time workers, the majority of which have another full-time job in another sector.

Notwithstanding the above results, the sector remains heavily reliant on developments in the labour market, especially those concerning the non-Maltese population who are seen to be bolstering the rental property market. It also continues to depend on general consumer confidence which remains somewhat overshadowed by the economic uncertainty that currently prevails, and which will ultimately determine consumer propensity to save as opposed to invest in illiquid assets. Tourism performance could also have a bearing on this sector with several property investments targeting Airbnb and short-term lets. The correction that could happen in the market because of these dependencies, affecting rental and possibly sales, will impinge on the sector and consolidations and retrenching will be expected.

TABLE 4.19 – REAL ESTATE SECTOR ANALYSIS

Sector Related	
Challenges	*Opportunities*
Environmental concerns and public perception	Smarter buildings and greener infrastructure
Market has been bullish	Use of technology to transform sector
National infrastructure needs to be upgraded in line with quality of developments	Improved service in government departments through technology
	Blockchain can assist in property transactions
	Improvements in general infrastructure
	Promote Malta more to international investors
Future Trends	
Move towards smarter and greener buildings	Increased use of technology-driven services

Productivity analysis

On the back of a lucrative property market and a buoyant rental market, the real estate sector generates a very high economic value-added with a relatively low number of employees. As a result, productivity levels registered by the sector are notably higher than the national average or any other economic sector. That said, productivity fell by 34.7 per cent between 2010 and 2019, as the number of people working in the sector more than doubled during this period, from roughly 900 employees in 2010 to more than 2,600 by 2019. Despite the challenges listed in Table 4.19 above, the sector is ripe with opportunities for further growth and productivity enhancements especially through a continued digital transformation of the sector.

TABLE 4.20 – REAL ESTATE SECTOR PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€760.0	€746.7
Employment			2,600	3,100
Sectoral level productivity				
National			€50,347	€46,256
Real estate sector			€292,308	€240,871
Returns to Labour Income				
National			€2.57	€2.45
Real estate sector			N/A	N/A
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
High	Low	High	Low	N/A
Productivity analysis				
• Higher than national average productivity levels • Blockchain technology can prove to be a game changer in property transactions and the deposit of contracts • Growth potential for technology-driven services				

Source: Eurostat, Labour Force Survey, Authors' calculations

Digital Transformation Readiness

The Index was rolled to the Real Estate sector that the results of the detailed indicators for all dimensions are given in Table 4.21 on the next page.

TABLE 4.21 – REAL ESTATE SECTOR PRODUCTIVITY INDEX INDICATORS

Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	3.5
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	3.5
	Understanding, monitoring, and reporting of benefits of digital transformation	2.8
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.5
	Constant business re-engineering process to digitise and to transform products and services	3.3
	Strategic collaboration between all departments/units	3.5
People & Culture	Digital Savviness in staff recruitment	2.8
	Digital culture as part of the overall corporate culture	3.3
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	3.5
	Strong customer-focused culture	3.5
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	3.5
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	3.5
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	3.5
	Staff have the resources to anticipate and respond to new technologies and digital innovation	3.5
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.3
	New management practices and organisational structures emerge to align with the digital organisation	2.3
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	3.3
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	2.3
	Cybersecurity is seen and treated as one of the most critical risks the company faces	3.0
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	3.0
	Internet connectivity is a priority amongst all company sites and locations in which it operates	4.0
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	2.8

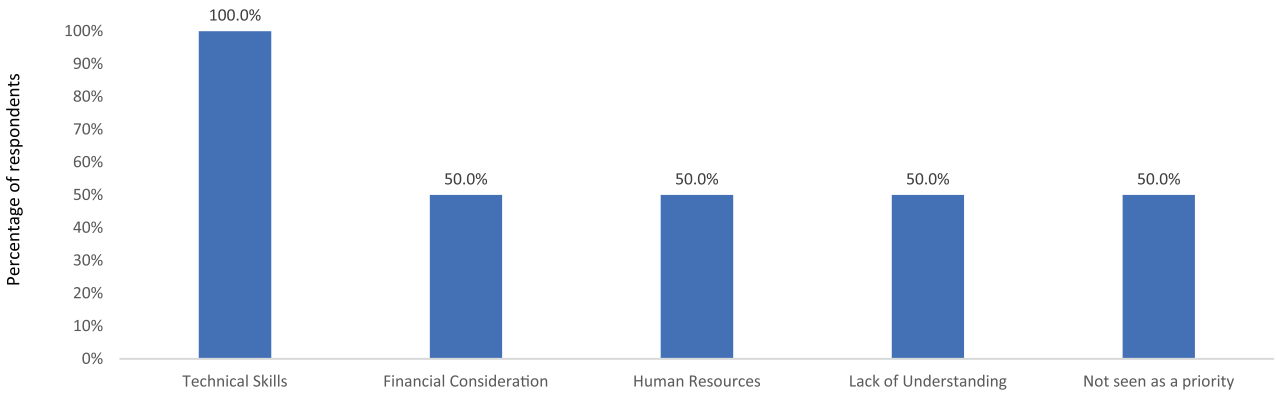
From an analysis of the above indicators, the real estate sector can be viewed as one which is above average in terms of digital readiness when compared to other sectors, with the majority of the 22 indicators analysed having favourable scores. Having said this, challenges are still present across various dimensions.

Firstly, the Governance & Leadership dimension indicates that the sector has good leadership in digital transformation, strategy, and readiness, because of a strong strategic collaboration between all departments/units and a good understanding of the importance of digital transformation for internationalisation & competitiveness. It also

depicts the sector as having a constant business re-engineering process to digitise and transform products and services, as well as good integration of digital strategy into departmental planning processes, with the digital strategy influencing overall organisational strategy and direction. On the other hand, however, the sector currently finds the understanding, monitoring, and reporting of benefits of digital transformation a challenge.

Another challenge the sector faces is that of not always giving importance to digital savviness when it comes to staff recruitment. This can in turn potentially explain the fact that a technical skills constraint is most cited as the biggest barrier that companies within the sector face to digitally transform themselves, as highlighted below. Interestingly, the sector has adequate allocation of resources, both in terms of supporting the digital channels, activities, and service delivery as well as in terms of allocating resources to staff to anticipate and respond to new technologies and digital innovation. Moreover, the sector scored favourably in terms of providing training to anticipate future skills and knowledge requirements. In contrast, however, financial constraints and human resources are also amongst the main barriers mentioned.

FIGURE 4.13 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE REAL ESTATE SECTOR



From an Innovation and Technology perspective, there are challenges from three main facets, namely, alignment of new management practices and organisational structures with the digital organisation, alignment of IT strategy and performance to the organisational vision and strategy, as well as monitoring and evaluating latest trends and technologies from a cost and benefit perspective.

Relevant Technologies

An insight into sectoral specific technology applications in the real estate sector is given in Box 4.7 which, if implemented, can support productivity in this sector.

BOX 4.7 – TECHNOLOGY APPLICATIONS IN THE REAL ESTATE SECTOR

Automation and semi-automation of property management related tasks

Many property management tasks are done manually, including billing, renewals, routine maintenance, and inspection scheduling. Many of these tasks can be automated using software.

Virtual Glance of Property

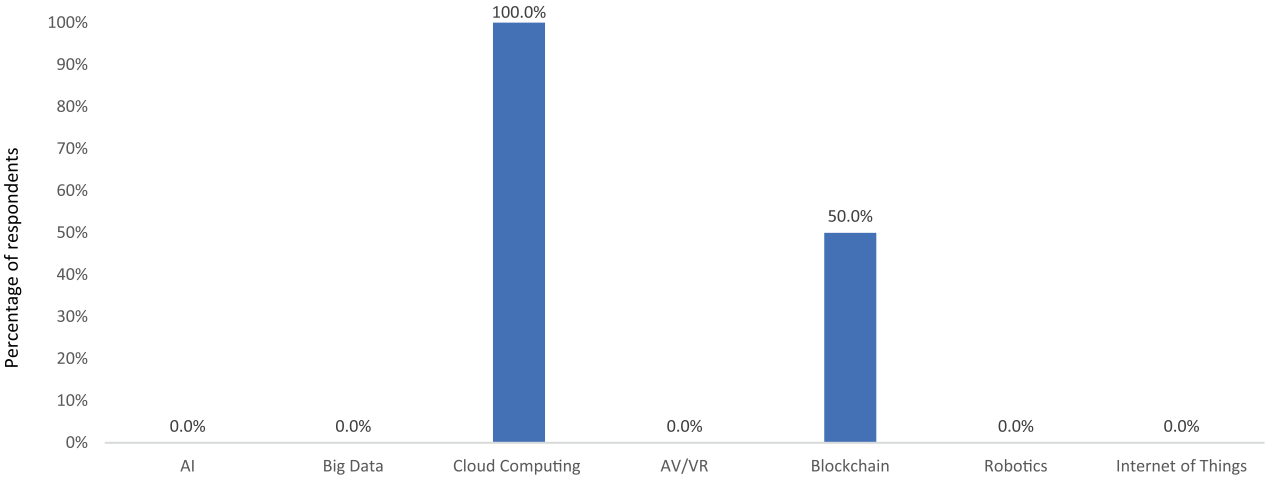
This technology can be a significant asset to operators within this sector, enabling clients and other stakeholders to 'walk through' prospective developments or properties. In design and build projects this also provides the possibility of testing potential design options at the planning stage.

Property Deposit Smart Contracts

The use of blockchain and smart contracts to secure deposits for property purchases can safeguard all parties involved parties, only releasing the deposit once negotiations are completed. This provides sellers the guarantee that the funds are locked in a smart contract. Such a guarantee could also provide banks with the necessary assurances to provide liquidity to the seller. With Central Bank Digital Currencies (CBDCs) being developed, this may become standard practice if such CBDCs support this type of functionality.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, cloud computing is the most mentioned technology followed by blockchain, with the other technologies not deemed to have any relevance. It is surprising that respondents do see the potential of AR/VR in real estate as this technology can support companies in this sector. Also, IoT has the potential to support in the development of smart buildings.

FIGURE 4.14 – RELEVANT TECHNOLOGIES FOR THE REAL ESTATE SECTOR



4.8 Professional, scientific, and technical; administrative and support services

Sectoral Overview

The professional services sector which encompasses a wide range of key business support functions, including legal and accountancy services, advertising, consultancy and other scientific and technical services, and the administrative and support services sector which includes an array of activities that support general business operations such as leasing activities and office support, have been the top contributors to GDP growth in recent years. These sectors have grown by more than €1.6 billion between 2010 and 2019 - an average annual growth rate of 16.1 per cent. By the end of 2020 the two sectors combined accounted for 17.3 per cent of the total Maltese economy. The sectors' performance during this period mirrors elevated levels of growth recorded in other sectors of the Maltese economy, such as construction, remote gaming, and financial services, which have strong sectoral linkages to the professional and administrative services sectors as users of intermediate inputs.

Sectoral growth in both the professional services and administrative and support services has directly translated into more jobs which collectively increased by more than 13,400 since 2010 to reach a total of 24,800 employees by the end of 2020. Both sectors also employ a good number of non-Maltese workers, again an important source of revenue for other critical sectors of the Maltese economy.

In 2020, the professional and administrative services sectors jointly contracted by 5.9 per cent, mainly due to the slowdown in other key sectors. This further confirms the strong links that these two sectors have to the performance of the overall economy. In employment terms, both sectors continued to build on their 2019 position. The outlook for both sectors remains averse to the potential after-effects of the pandemic and is closely tied to the swift recovery of other key sectors of the economy. There are however other growing prospects on the horizon for these sectors, as highlighted in Table 4.22 below, particularly those relating to near-shoring and the transition towards a digital and greener economy.

TABLE 4.22 – PROFESSIONAL, SCIENTIFIC, AND TECHNICAL; ADMINISTRATIVE AND SUPPORT SERVICES SECTORS ANALYSIS

Sector Related	
Challenges	*Opportunities*
Regulatory and compliance impact	Increased use of technology and digital tools
Administrative delays in processing and excessive bureaucracy	Sectors have the potential to further transform themselves and attract new business through innovative regulation
High staff turnover at authorities impacting service delivery	Various opportunities to support transition to digital and green economy
Reputation issues surrounding the jurisdiction	Near-shoring can be an opportunity for the island in an era of enhanced remote working
Significant reliance on non-Maltese workers	
Future Trends	
Sectors will continue being transformed through technology	Regulatory innovation will be key for the sector

Productivity analysis

The professional services sector has long enjoyed high productivity levels, generating high economic value-added and creating good quality jobs that pay significantly higher than average salaries. The administrative and support services sector too enjoys a high degree of productivity levels, although this has not translated into an overall improvement in salaries within the sector, owing mostly to the fact that most skills employed within this sector are low. As already intimated above, both sectors rely heavily on the activity of other key sectors of the Maltese economy and this could prove to be a threat to the sectors' productivity in the face of mounting economic uncertainty in some of these linked sectors. For this reason, it is essential for the professional and administrative services sectors to continue transforming themselves through digitalisation and continued investment in human capital, which are both critical to untapping the potential that lies in new emerging niches and other opportunities.

TABLE 4.23 – PROFESSIONAL, SCIENTIFIC, AND TECHNICAL; ADMINISTRATIVE AND SUPPORT SERVICES SECTORS PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€2,175.2	€2,047.1
Employment			23,900	24,800
Sectoral level productivity				
National			€50,347	€46,256
Professional, scientific & technical, administrative & support services sectors			€91,013	€82,544
Returns to Labour Income				
National			€2.57	€2.45
Professional, scientific & technical, administrative & support services sectors			€4.50	€4.47
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
High	High	High	High	High
Productivity analysis				
• Highly productive sectors • Productivity growth in the professional services sector translated into good quality jobs and higher than average salaries • Strong reliance on other key economic sectors could threaten productivity levels • Continued sectoral transformation key for diversification into new untapped business opportunities				

Source: Eurostat, Labour Force Survey, Authors' calculations

Digital Transformation Readiness

The detailed indicators for all dimensions are presented in Table 4.24 on the next page.

TABLE 4.24 – PROFESSIONAL, SCIENTIFIC, AND TECHNICAL ACTIVITIES; ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES SECTORS PRODUCTIVITY INDEX INDICATORS

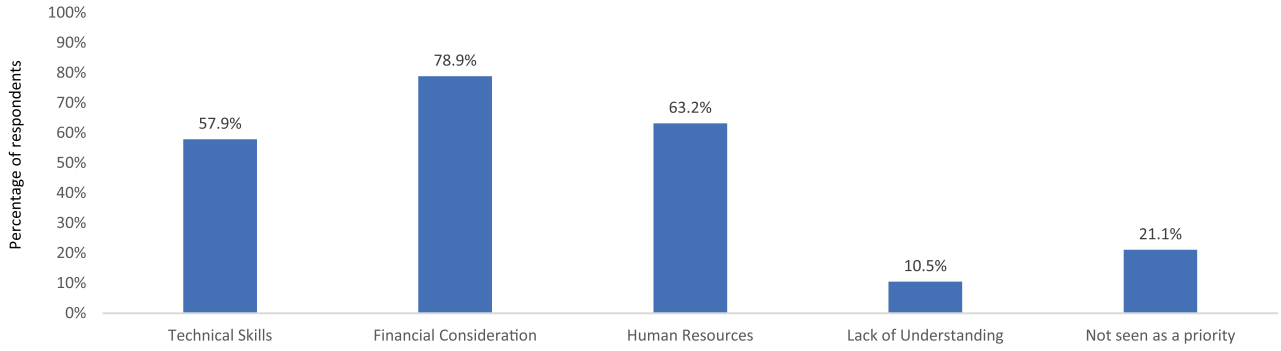
Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	2.8
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	3.1
	Understanding, monitoring, and reporting of benefits of digital transformation	2.8
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.5
	Constant business re-engineering process to digitise and to transform products and services	3.0
	Strategic collaboration between all departments/units	3.1
People & Culture	Digital Savviness in staff recruitment	3.4
	Digital culture as part of the overall corporate culture	3.3
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	3.0
	Strong customer-focused culture	3.2
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.8
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	3.0
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	2.8
	Staff have the resources to anticipate and respond to new technologies and digital innovation	2.8
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.3
	New management practices and organisational structures emerge to align with the digital organisation	3.1
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	2.9
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	3.1
	Cybersecurity is seen and treated as one of the most critical risks the company faces	3.3
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	2.5
	Internet connectivity is a priority amongst all company sites and locations in which it operates	3.6
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	2.8

Based on the analysis of the indicators above, the sector faces various challenges across several dimensions. From a Governance & Leadership point of view, the sector finds the understanding, monitoring, and reporting of benefits of digital transformation and having leadership in digital transformation, strategy, and readiness as challenging areas in this regard. On the other hand, however, the sector has a good understanding of the importance of the digital transformation of organisations for internationalisation & competitiveness. Moreover, there is a general perception that digital readiness is also predicated on having strong strategic collaboration between all departments/units and adequate integration of digital strategy into departmental planning

processes with digital strategy influencing overall organisational strategy and direction.

With regards to the People & Culture dimension, the sector scored relatively well in all indicators, particularly in terms of prioritising digital savviness when recruiting staff, having a customer-focused culture, and integrating digital culture as part of the overall corporate culture. Having said this, the sector faces some challenges in the Capacity & Capabilities dimension, predominantly from a resources standpoint, both in terms of resources allocated to staff to anticipate and respond to new technologies and digital innovation as well as in terms of not always having adequate resources and budgets to support the digital channels, activities, and service delivery. This may be further explained by the most cited barriers by the sector to digital transformation, which include primarily financial constraints followed by human resources and technical skill constraints, as highlighted below. Moreover, whilst staff training supports the current digital strategy and anticipates future skills and knowledge requirements, the sector does not always give importance to having policies, procedures and digital activities in place and being core to everyday business activity.

FIGURE 4.15 - MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE PROFESSIONAL, SCIENTIFIC, AND TECHNICAL ACTIVITIES; ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES SECTORS



From an Innovation and Technology perspective, the main shortcomings of the sector pertain mainly to not necessarily having periodic IT and digital audits to see how both hardware and software can be improved to optimise performance. This certainly impacts the digital readiness of the sector and is further exacerbated by the fact that it is also not common practice within the sector to imagine future needs and technologies and to explore and experiment with methods and solutions. On the other hand, the sector deems and treats cybersecurity as a critical risk for the sector and gives priority to having a strong internet connectivity as integral to digital readiness.

Relevant Technologies

Various technology developments have the potential of transforming this sector and several sector specific technologies are given in Box 4.8.

BOX 4.8 - TECHNOLOGY APPLICATIONS IN THE PROFESSIONAL, SCIENTIFIC, AND TECHNICAL; ADMINISTRATIVE AND SUPPORT SERVICES SECTORS

Voice and Language Analytics

Support services can make use of voice and language analytics when receiving calls, emails, or texts. AI can then be applied to assess the end-user's issue and inform the agent, who can then identify the appropriate action.

AI Automated and Assisted Guided Support

Although many routine tasks are scripted for support agents, at times they must use their discretion to decide on the best path to take in providing support. Using historical or expert data, an AI-based system could assist support agents to take a decision best suited to the situation at hand. Agents could also make use of responses that are fully or partially generated by AI systems to provide optimal service. Any issues raised could be automatically handled and tracked by an AI system based upon any communication that takes place between external parties and internal agents.

Automated Routine Task Reviewing

This technology can be used to generate automated reviews of routine yet critical tasks, such as billing. For example, an AI system could 'learn' what correct invoices and quotations look like based on the input data, and thereafter attempt to detect errors in future invoices and quotes.

Automated Talent Identification

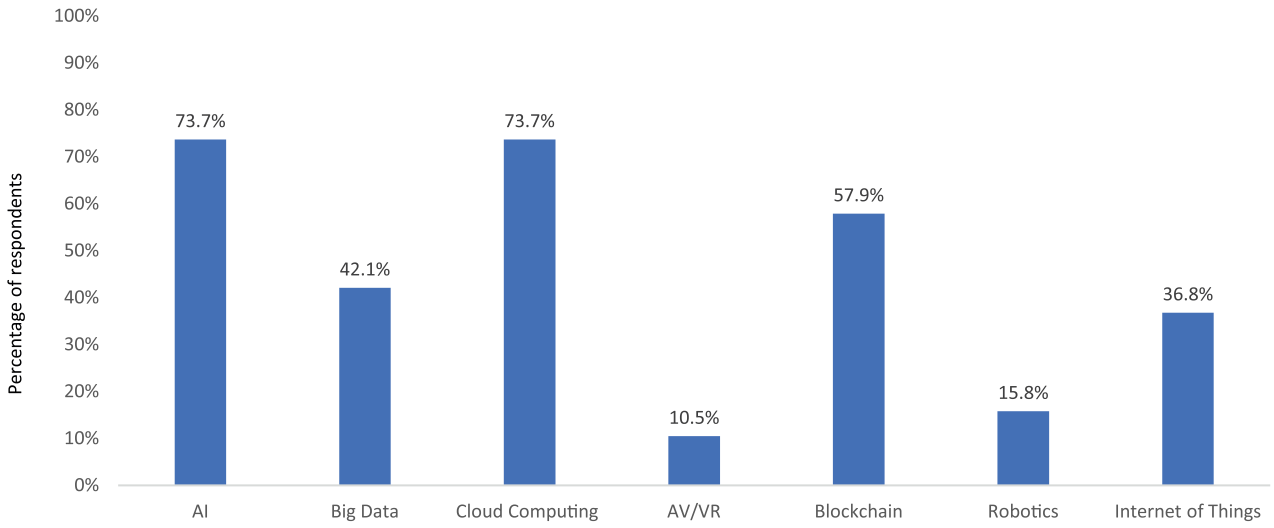
Potential candidates for open roles or projects could be identified automatically by browsing professional profile sites with the use of AI to determine candidates that would make a good fit.

Automated Summarising of Content

In certain administrative and professional services, staff are often required to filter through large amounts of texts with the aim of summarising key outputs and takeaway messages quickly. Natural Language Processing techniques can be used to automate such tasks.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, the two most mentioned are AI and cloud computing followed by blockchain, big data, IoT and finally robotics and AV/VR.

FIGURE 4.16 – RELEVANT TECHNOLOGIES FOR THE PROFESSIONAL, SCIENTIFIC, AND TECHNICAL ACTIVITIES; ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES SECTORS



4.9 Arts, entertainment, and recreation

Sectoral Overview

The arts, entertainment and recreation sector comprises the all-important gaming sector, which although still novel when compared to the more established industries, has grown into one of the largest contributors to the economy and today hosts a number of prestigious names in its portfolio of companies based in Malta. Between 2010 and 2019 the sector grew by 85.4 per cent in nominal terms, or an average annual growth rate of 7.1 per cent, and by the end of 2020 accounted for roughly 94.5 per cent of the arts, entertainment, and recreation sector and close to 7.0 per cent of the total Maltese economy. The gaming sector is an important user of services provided by other sectors of the Maltese economy, namely professional services, and information & communications, boosting further economic activity. To this end, the sector's contribution goes up to more than 12.0 per cent of the economy if one considers the indirect and induced effects.

Employment growth has been similarly impressive, with the total workforce, according to the labour force survey, increasing by an annual average of 21.6 per cent between 2010 and 2019. Employment levels have been sustained throughout 2020, however with M&A (mergers and acquisitions) transactions becoming increasingly more prevalent, the gaming sector remains highly volatile and thus it is important to continue innovating the sector by way of new regulatory practices and a renewed vision for the sector.

As for the rest of the local creative sector, this is still very much in its infancy employing just over 3,400 people, of which a significant number are on a part-time basis. Notwithstanding these numbers, the sector is ripe with opportunity to become one of Malta's novel niche markets, especially post recovery. As already highlighted, the sector is already a major contributor to key economic sectors such as gaming, which banks on a number of creatives for the artistic design of games, as well as the tourism industry, which draws on activities, festivals and other cultural events organised by homegrown artists to promote an authentic Maltese experience. The creative sector also comprises the film industry which has over the years attracted film producers of international repute and presented Malta as a backdrop for several Oscar nominations and award-winning movies.

The gaming sector is an important user of services provided by other sectors of the Maltese economy, namely professional services, and information & communications, boosting further economic activity.

TABLE 4.25 – ARTS, ENTERTAINMENT, AND RECREATION SECTOR ANALYSIS

Sector Related	
Challenges	*Opportunities*
Compliance and KYC	New niche sectors such as esports
Responsible gaming requirements	Technology developments such as machine learning, AI & blockchain
Multi licensing requirements	New gaming markets to conquer such as Africa
Reputational issues	Development of a holistic ecosystem around the industry
Supporting infrastructure which is at times inadequate	Need for a holistic vision and transformation of sector
Beyond gaming, arts & creative sector is not yet seen as important as other economic sectors	The film industry in Malta continues to present a lucrative niche for Malta's economy
Lack of funding for arts sector; dependent on subventions and not self-financing	
Future Trends	
New areas such as esports will dominate	Increased use of technology such as AR & VR
New gaming markets such as Latin American (LATAM) and Africa will launch	Arts being used in various other sectors especially skills related to creativity & design
Regulatory developments will continue	Arts becoming increasingly important to teach soft skills so much required by professions employed in other economic sectors

Productivity analysis

On the back of a buoyant gaming sector, the arts, entertainment, and recreation industry registers higher than average productivity levels, resulting in significantly higher salaries, whilst still managing to generate high returns to labour income. However, notwithstanding this performance, the gaming sector has recently started to experience low productivity growth, partly explained by the fact that GVA levels, which were already high, could now be plateauing. A further factor may be the increase in regulatory requirements, which may have necessitated operational changes as well as an expansion of more labour-intensive functions such as compliance. Going forward, technology developments and regulatory innovation will continue to dominate the agenda for enhanced productivity.

Meanwhile, the arts and creative industry in general also has the potential to become a strategic sector to boost competitiveness, productivity, employment, and sustainable economic growth. Companies related with creativity and new communication methods are in continuous expansion and over time their social and economic role is becoming more important. The value of a product is becoming increasingly more reliant on its originality, uniqueness, performance, and appearance. For this reason, the creative industry is seen as a tool for innovation which can be implemented in many other industries, creating synergies with these sectors. The sector however continues to face diverse challenges which relate to financing constraints, limited vocational training, lack of knowledge in other sectors on how to create synergies with the creative sector and other structural problems that continue to need investment within the parameters of a holistic vision for the sector.

TABLE 4.26 - ARTS, ENTERTAINMENT, AND RECREATION SECTOR PRODUCTIVITY ANALYSIS

				2019	**2020**
GVA (€ Millions)				€889.8	€976.6
Employment				13,300	13,400
Sectoral level productivity					
National				€50,347	€46,256
Arts, entertainment & recreation sector				€66,902	€72,881
Returns to Labour Income					
National				€2.57	€2.45
Arts, entertainment & recreation sector				€2.95	€3.46
Classification in productivity matrices					
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries	
High	Low	High	Low	High	
Productivity analysis					
• The gaming sector continues to be a blueprint for the successful development of niche sectors • Productivity levels remain higher than average, but the sector recently started to register lower productivity growth • Sectoral innovation by way of new regulatory practices and enhanced use of new technologies are key to enhance productivity • Arts has the potential to become a strategic sector to boost competitiveness, productivity, employment, and sustainable economic growth					

Source: Eurostat, Labour Force Survey, Authors' calculations

On the back of a buoyant gaming sector, the arts, entertainment, and recreation industry registers higher than average productivity levels, resulting in significantly higher salaries, whilst still managing to generate high returns to labour income.

Digital Transformation Readiness

The detailed indicators for all dimensions are given in Table 4.27 below.

TABLE 4.27 – PROFESSIONAL, SCIENTIFIC, AND TECHNICAL ACTIVITIES; ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES SECTORS PRODUCTIVITY INDEX INDICATORS

Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	2.7
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	2.8
	Understanding, monitoring, and reporting of benefits of digital transformation	2.9
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.5
	Constant business re-engineering process to digitise and to transform products and services	3.0
	Strategic collaboration between all departments/units	3.1
People & Culture	Digital Savviness in staff recruitment	3.4
	Digital culture as part of the overall corporate culture	3.1
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	2.6
	Strong customer-focused culture	2.9
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.5
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	2.6
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	2.4
	Staff have the resources to anticipate and respond to new technologies and digital innovation	2.6
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.0
	New management practices and organisational structures emerge to align with the digital organisation	3.0
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	2.9
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	2.5
	Cybersecurity is seen and treated as one of the most critical risks the company faces	2.4
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	2.4
	Internet connectivity is a priority amongst all company sites and locations in which it operates	3.9
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	3.5

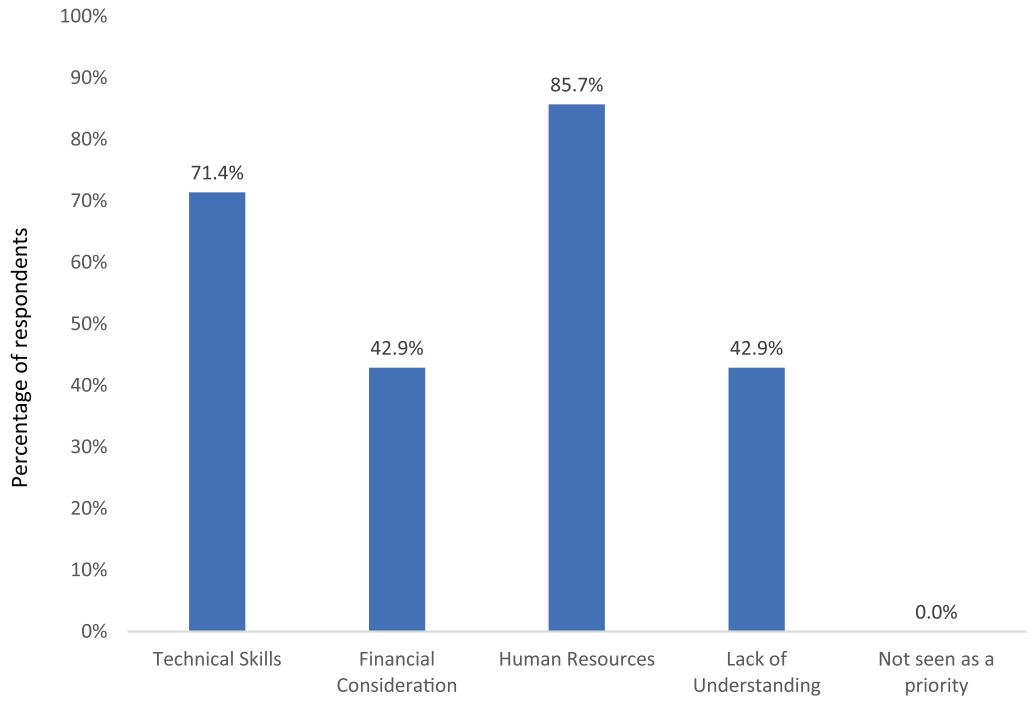
When analysing the indicators within each of the five dimensions, the sector appears to have a good overall understanding of the importance of digital readiness and transformation across numerous facets, be it from an internationalisation & competitiveness standpoint, integrating digital culture into the overall company culture, staff recruitment as well as when assessing the latest trends and technologies available currently. However, below average scores across several indicators depict a handful of challenges which need to be rectified to further improve the sector's digital readiness Despite being an online-oriented and digital business, the results are on the low side, and this can reflect the fact that the people compiling the survey have very high standards of digital transformation which reflects the sector and therefore their assessment might be more critical than in other sectors. They might also reference themselves against other players in the sector that are more focused on digital transformation. Cognisant of the limitations, various key takeaways and analysis can still be made from the results to inform policy recommendations.

As shown in the Governance & Leadership dimension, digital strategy is not always integrated into an organisation's departmental planning processes and may not have a strong influence on the overarching strategy and direction. In fact, the sector also scores relatively poorly in terms of organisations having digital policies, procedures and digital activities in place and not always aligning IT strategy and performance to the organisational vision and strategy. This in turn plays a role in the sector lacking a sense of leadership in digital transformation, strategy, and readiness and faces challenges when it comes to understanding monitoring and reporting of benefits of digital transformation.

Whilst digital savviness is seen as important when recruiting new staff, the sector is lacking in terms of utilising digital solutions to improve digital service delivery and internal productivity via digital solutions, as highlighted in the People & Culture dimension.

The Capacity & Capability dimension highlights the most significant challenges faced in the sector, with insufficient support and resources to train staff to anticipate the necessary future skills and knowledge often cited as a common issue. In fact, the most common barriers companies within this sector face to digitally transform themselves revolve predominantly around a lack of technical skills and human resources, followed by financial constraints and lack of understanding, as highlighted on the next page.

FIGURE 4.17 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE ARTS, ENTERTAINMENT, AND RECREATION SECTOR



Finally, from a Technology standpoint, having periodic IT and digital audits to see how both hardware and software can be improved to optimise performance is perceived as a challenge by the sector. On the other hand, high priority is displayed towards good internet connectivity with importance also directed towards the evaluation and monitoring of latest trends and technologies from a cost benefit perspective.

Relevant Technologies

The technologies being discussed also offer several sector specific applications that are highlighted in Box 4.9.

BOX 4.9: TECHNOLOGY APPLICATIONS IN THE ARTS, ENTERTAINMENT AND RECREATION SECTOR

Automated compliance and profiling

Regulation of the online gaming industry is ramping up across all global markets and Malta is no exception. This increases the need for effective KYC and compliance processes, many of which are relatively new to this previously under-regulated industry. As with the financial services sector, automation can be key here, particularly for compliance and profiling tasks where AI can be applied to analyse data and build accurate and reliable client profiles and credit scoring systems.

Increased security and transparency of online gambling

Blockchain is frequently being mentioned as an emerging disruptor in the industry, with vast potential to advance the critical objectives of the online gambling industry, including the security, validity, anonymity, and cost-efficiency of its core transactions. Market adoption of this technology is still in its earliest phases and regulation will inevitably follow – it is therefore important to align development and implementation with regulatory trends.

AR and VR Gaming to enhance user experience

In terms of user experience Augmented Reality (AR) and Virtual Reality (VR) are emerging as the technology trends of the future. Both provide players with an immersive experience that is likely to see steep demand as younger tech-savvy gamers reach adulthood. AR requires less specialised hardware with less complex software development and may therefore lead the surge, however VR will likely follow closely given the unique user experience this can provide.

Improvement of mobile gambling

Mobile gambling is becoming more prevalent with further growth anticipated over the next five years, particularly since this niche saw a significant uptick in popularity during the COVID-19 pandemic. Cloud gaming technology and AI are prominent in this wave: cloud services allow players to enjoy more games online without the need to download extra apps, while AI, particularly via chat bots and mobile virtual assistants, is driving customer service support improvements.

Cultural Heritage Management

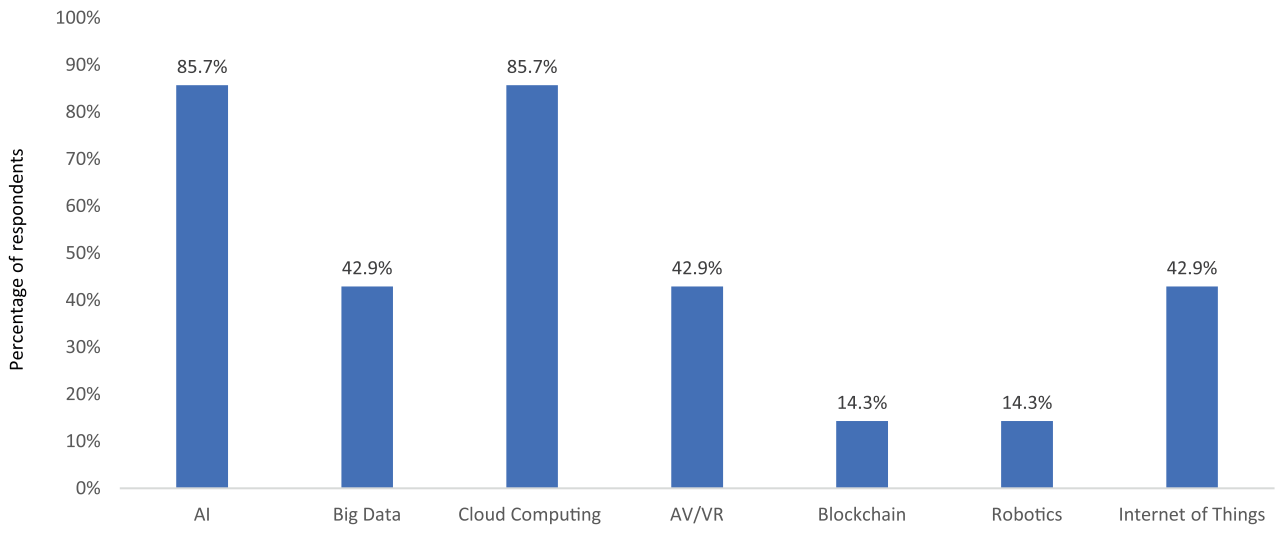
Virtual reality (VR), augmented reality (AR) and mixed reality (MR) have immense potential within the cultural sphere, particularly in museums, with the capacity to attract a whole new generation of visitors. This technology can provide an innovative and immersive experience which is increasingly sought after by consumers.

Creative Sector

Creative technology (CreaTech) is the term being used to describe new tech that aims to innovate the production and delivery of new services, products, and experiences in the creative sector. AI, 5G, VR and machine learning are key trends in this space. 3D modelling and printing are also an emerging growth niche.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, the two most mentioned are AI and cloud computing followed by big data, AV/VR and IoT and finally blockchain and robotics.

FIGURE 4.18 - RELEVANT TECHNOLOGIES FOR THE ARTS, ENTERTAINMENT, AND RECREATION SECTOR



4.10 Public administration, education, and health

Sectoral Overview

In an economy, a government seeks to fulfil several main roles through its resources and administrative capacity, either to ensure that the economy continues performing and generating wealth, especially in times of crisis, or to allocate resources to correct market failures and support society's most vulnerable, or to create the right conditions for business to thrive. In conjunction with the private sector, government is also an important provider of health and education services.

Consecutive governments have invested heavily in the country's educational system and allocated resources towards increasing the knowledge and skills of its labour force. In this regard, government expenditure on education as a percentage of GDP in Malta exceeded the EU average throughout the years. From a private investment point of view, the education sector is also prospering, largely due to the presence of several English Language Teaching (ELT) schools for foreign students, as well as the establishment of a number of education institutes and training centres with affiliations to reputable universities and industry leaders abroad. Schemes such as the free childcare support and the increase in the number of non-Maltese working in Malta have also motivated private investment in this sector. The sector continues to be well placed to create opportunities for UK-based institutions facing the EU as well as serve as a centre for specialised areas and as a regional hub for North Africa once the region picks up.

The health sector too is seen as one of the foundational elements of economic and human development. Total government expenditure on healthcare, as a percentage of GDP, has also been increasing over the years. In fact, according to the 2019 World Health Organisation (WHO) report on Malta, the country has recorded "one of the largest increases in per capita health expenditure in the EU over the last decade", increasing by over 60.0 per cent in 2017 when compared to 10 years earlier, which in nominal terms equates to an additional €2,732, spent per individual (European Commission,2019).

However, Malta has recently experienced some very rapid socio-economic and demographic shifts presenting new challenges to the sector, not least from a human capacity point of view. With a growing population, primarily triggered through the influx of migrant workers, demands for health services have risen sharply. Demographically, Malta is also experiencing an ageing population, and this has long been imposing pressures on some sectors of the health care profession, particularly nurses and carers. Changes to our lifestyles are also starting to leave their mark on the country's overall state of health, particularly mental wellbeing, which despite all efforts by key stakeholders continues to fall under the radar.

In line with the above developments, the combined nominal GVA of public administration, education and health sectors increased on average by 7.6 per cent annually between 2010 and 2019. Collectively the sectors employ more than 64,000 people which account for roughly 25.2 per cent of the total Maltese labour force. To complement existing human resource shortages, particularly amongst the health care profession, the sector also employs a significant number of non-Maltese nationals.

Table 4.28 presents a broader overview of the challenges and opportunities facing these the health and education sectors, as well as trends that will shape sectoral developments.

TABLE 4.28 – PUBLIC ADMINISTRATION, EDUCATION AND HEALTH SECTORS ANALYSIS

Sector Related	
Challenges	*Opportunities*
Education	***Education***
Rising accommodation costs for ELT students	Digital transformation of the sector
Lacks international schooling facilities especially for expats	Brexit can create opportunities for UK-based institutions to target EU
Not enough resources being devoted to technical and vocational skills	Malta can be a regional hub as North Africa picks up
Wages and employment packages are not attracting students to the teaching profession	Establish Malta as a center for specialised areas
Not enough resources for ancillary positions such as LSEs, childcare assistants, etc	Schemes such as the childcare support have allowed private investment
Online education requires new approaches to teaching	Need for international schooling facilities
	New markets through online learning
Health	***Health***
COVID has put a strain on the system	Medical tourism
Mental health remains a key challenge	Additional Public-Private Partnership in the sector
Additional investment is required in community and primary care	Growing focus on well-being
Health prevention is a key concern	Telemedicine can open up export markets too
Lack of local resources for some professions	Use of technology can help reduce the stress on the system
Conditions remain challenging especially in public sector	
Future Trends	
Education	***Health***
Online learning will remain pervasive	Personalised medicine
Executive education increasing in importance	Growth of telemedicine around the world
Industry-led certifications will play a key role	Greater interest in well-being and heath care
Important to cater for upskilling of current workforce through tailor-made courses	Role of technology and AI in healthcare and prevention

Productivity analysis

Productivity within these sectors is characteristically low, as these sectors are more concerned with the provision of critical services which the private sector may fail to provide because of market imperfections owing to resources that could be allocated inefficiently from a social benefit perspective. Notwithstanding these dynamics, the public administration, education, and health sectors should still aspire to achieve higher efficiency and productivity levels by banking on emerging technologies that help reduce the stress on the system and relieve stretched human resources to instead focus on providing better personalised services. At the same time, these technologies create opportunities for new services, such as online learning in education and telemedicine in health, as well as extend the sectors' potential to grow beyond the local market.

TABLE 4.29 – PUBLIC ADMINISTRATION, EDUCATION, AND HEALTH SECTORS PRODUCTIVITY ANALYSIS

			2019	**2020**
GVA (€ Millions)			€2,098.7	€2,158.4
Employment			62,700	64,500
Sectoral level productivity				
National			€50,347	€46,256
Public administration, education & health sector			€33,472	€33,464
Returns to Labour Income				
National			€2.57	€2.45
Public administration, education & health sector			€1.64	€1.57
Classification in productivity matrices				
Productivity level	Employment level	Employment growth	Productivity growth	Wages & salaries
Low	High	High	Low	High
Productivity analysis				
• Expectedly these sectors are characterised by low productivity levels • Should still aspire to achieve higher efficiency and productivity levels by banking on emerging technologies • New markets through online learning • Telemedicine can open up export markets				

Source: Eurostat, Labour Force Survey, Authors' calculations

Productivity within these sectors is characteristically low, as these sectors are more concerned with the provision of critical services which the private sector may fail to provide because of market imperfections owing to resources that could be allocated inefficiently from a social benefit perspective.

Digital Transformation Readiness

This sector was included in the survey and the results collated from the respondents are presented in Table 4.30 below.

TABLE 4.30 – PUBLIC ADMINISTRATION, EDUCATION AND HEALTH SECTORS PRODUCTIVITY INDEX INDICATORS

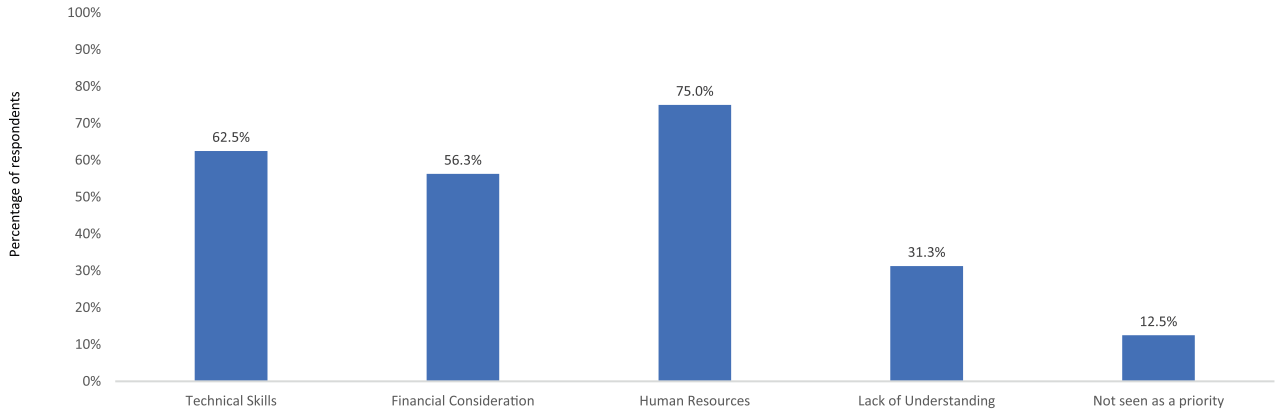
Dimension	Description	Score
Governance & Leadership	Leadership in digital transformation, strategy, and readiness	3.2
	Digital strategy is integrated into departmental planning processes and influences overall organisational strategy and direction	3.1
	Understanding, monitoring, and reporting of benefits of digital transformation	3.2
	Understanding importance of digital transformation of the organisation for internationalisation & competitiveness	3.4
	Constant business re-engineering process to digitise and to transform products and services	3.0
	Strategic collaboration between all departments/units	3.0
People & Culture	Digital Savviness in staff recruitment	3.2
	Digital culture as part of the overall corporate culture	2.9
	Digital solutions are used to improve digital service delivery and internal productivity via digital solutions	3.2
	Strong customer-focused culture	3.2
Capacity & Capability	Digital policies, procedures and digital activities are in place and are core to everyday business activity	2.7
	Staff training supports the current digital strategy and anticipates future skills and knowledge requirements	2.8
	Resources and budgets are appropriate for supporting the digital channels, activities, and service delivery	2.8
	Staff have the resources to anticipate and respond to new technologies and digital innovation	2.6
Innovation	The whole organisation seeks ways to use digital channels and technologies	3.0
	New management practices and organisational structures emerge to align with the digital organisation	3.1
	Common practice to imagine future needs and technologies and explore and experiment with methods and solutions	2.9
Technology	Alignment of IT strategy and performance to the organisational vision and strategy	3.0
	Cybersecurity is seen and treated as one of the most critical risks the company faces	2.8
	IT and digital audits are carried out periodically to see how both hardware and software can be improved to optimise performance	2.8
	Internet connectivity is a priority amongst all company sites and locations in which it operates	3.5
	Latest trends and technologies are monitored and evaluated from a cost and benefit perspective	2.9

Through an analysis of the above indicators, the sector has a good understanding of the importance of digital transformation in the sector for internationalisation and competitiveness and sees value in engaging in a continuous re-engineering process to digitise and to transform products and services. Moreover, the sector understands, monitors, and reports the benefits derived from digital transformation and in fact, shows adequate integration of digital strategy into departmental planning processes, with digital strategy also having an influence on overall organisational strategy and direction.

From a People & Culture perspective, the sector gives importance to digital savviness in staff recruitment, utilises digital solutions to improve digital service delivery and internal productivity via digital solutions and has a strong customer-focused culture. However, this contrasts with the fact that digital culture is not always seen as part of the overall corporate culture. This can be further explained through the Capacity & Capability dimension whereby digital policies, procedures and digital activities are not always in place and may not always be core to everyday business activity. Moreover, there is also a challenge of inappropriate resources allocated to staff, limiting their ability to anticipate and respond to new technologies and digital innovation as well as anticipate future skills and knowledge requirements.

The above challenges in fact coincide with the biggest barriers cited by the sector, hindering companies from digitally transforming. The main barrier is human resources, followed by a lack of technical skills and financial considerations, a lack of understanding of what a digital transformation entails and finally not seeing digital transformation as a priority by the sector. The results of the latter are highlighted below.

FIGURE 4.19 – MAIN BARRIERS TO DIGITAL TRANSFORMATION FOR THE PUBLIC ADMINISTRATION, EDUCATION AND HEALTH SECTORS



When it comes to Innovation and Technology, results point to an overall alignment of IT strategy and performance with the organisational vision and strategy within the sector, and that new management practices and organisational structures emerge to align with the digital organisation. Moreover, the industry deems having strong internet connectivity to be an important component to the digital readiness of the sector. On the other hand, however, the sector has challenges in terms of seeing and treating cybersecurity as one of the most critical risks the company faces which may be particularly harmful given that digital audits may not always be carried out periodically to see how both hardware and software can be improved to optimise performance. Finally, another challenge is that it is not common practice in the sector to imagine future needs and technologies and explore and experiment with methods and solutions.

Relevant Technologies

This sector too can benefit from various technologies that can be applied to the respective industries within it. The technologies that can be applied to the sector will also support it in achieving productivity gains. The technology applications specific to the sector are presented in Box 4.10.

BOX 4.10 – TECHNOLOGY APPLICATIONS IN PUBLIC ADMINISTRATION, EDUCATION AND HEALTH SECTORS

Education

Verifiable credentials

Education credentials are a primary requirement for potential recruits in many sectors. The verification of such credentials has traditionally been through the provision of a paper based, scanned or digital document. This system, which is labour-intensive and open to abuse, can be replaced by blockchain-based credentials. The use of this technology ensures a tamper-proof, efficient, and transparent system.

Administration Automation, Efficiency, and Auditability

Many processes within the educational sector are still paper based; in situations where digitisaton has taken place this has tended towards digital versions of the manual paper-based process. Many administrative tasks can be automated with greater efficiency whilst at the same time lowering the potential for errors. Educational institutions could make use of software systems and automation to achieve this. Questions sometimes may arise regarding the trustworthiness of such systems and/or if processes or data can be manipulated - and in such cases blockchain and smart contracts could provide a solution guaranteeing the verifiability and auditability of processes used.

Automated Security and Access Control

Security and access control mechanisms are vital for schools for various reasons, including the safety of students and staff and ensuring orderly behaviour. IoT-based automated security and access control systems can: (i) provide the security requirements to ensure that only permitted students and staff are allowed into the school and areas based on respective restrictions; and (ii) automatically take student attendance and alert guardians when non-attendance is detected.

Learning through virtual and physical object interaction

Interaction with physical objects can help students appreciate the importance of the digital world and may also entice them to take a further interest in the sector. Robotics and IoT education programmes could help in this regard. Furthermore, interactive learning experiences can be developed that immerse students into any given subject matter through the creation of virtual worlds using Virtual Reality as well as Augmented Reality.

Health & Social Work

Wearable Sensors

The use of IoT wearable devices and mobile apps can be used to encourage healthier lifestyles which ultimately helps reduce costs on the health system. Such devices and apps can also provide benefits for the insurance sector discussed below in the Financial & Insurance section. Augmented by AI, these devices can also help with early detection and diagnosis. Hospitals could make use of wearables for the remote monitoring of non-critical patients, freeing up hospital beds for the care of more vulnerable patients. Such monitoring need not only be based on wearable IoT devices but can also be delivered through specific software on smartphones.

Automated Training

Augmented and virtual reality training systems could be used to help train medical students and prepare medical professionals for upcoming procedures or surgeries.

Robotic Surgery Assistance

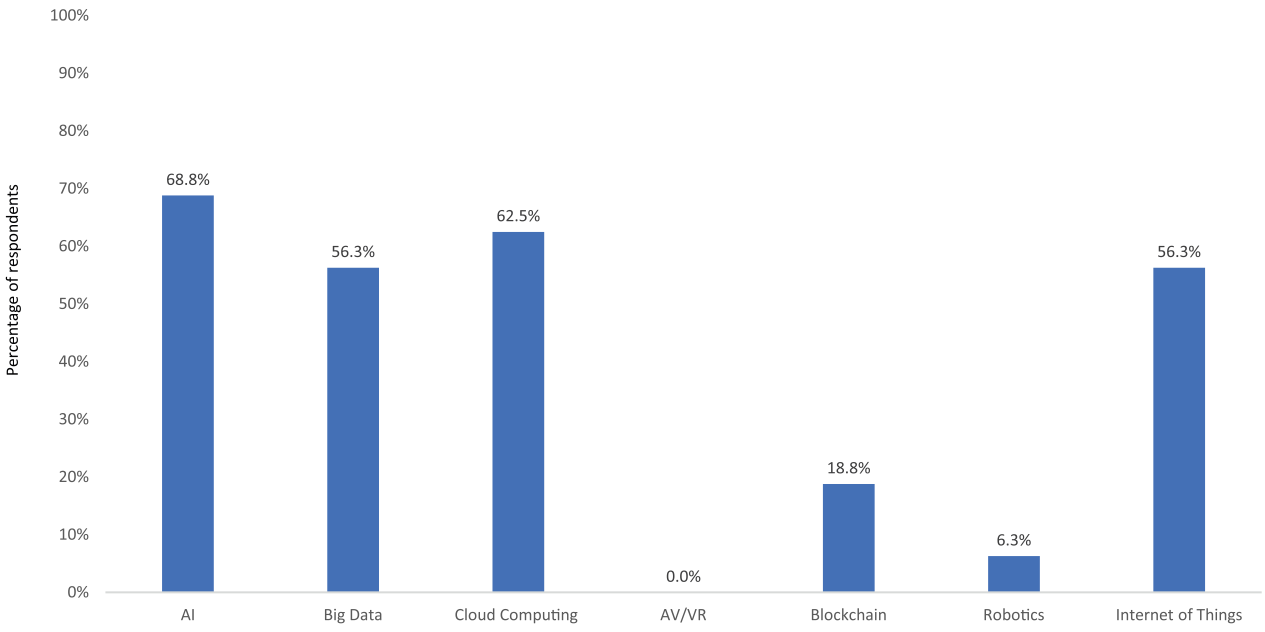
Some types of surgical procedures could be supported by surgical robotics that can be utilised by surgeons to achieve better precision.

Supporting diagnosis and detection

With more and more data being collected worldwide with respect to various symptoms, diagnoses and medical scans and records, AI can be used to support diagnoses by providing insights based on large amounts of such historical data. This technology can also support medical staff in analysing medical scans and proposing suitable actions.

When analysing which technologies are deemed to be most relevant for the sector in the coming years, the most mentioned technology is AI. This is followed by, cloud computing, big data and IoT and finally blockchain and robotics. AV/VR is not deemed relevant at all even though there are clear use cases for this technology especially from a training and educational perspective.

FIGURE 4.20 - RELEVANT TECHNOLOGIES FOR THE PUBLIC ADMINISTRATION, EDUCATION, AND HEALTH SECTORS



4.11 Concluding remarks

This chapter presented the results of the roll-out across various economic sectors of the Digital Transformation Readiness Index.

The Index shed light on the current readiness of the sectors to digitally transform themselves and several key points can be highlighted from the analysis undertaken. Constructed with the aim of shedding light on the micro foundations and state of readiness of digital transformation in sectors at firm level, the main sectoral challenges emanating from the survey are highlighted in Table 4.31.

TABLE 4.31 – MAIN SECTORAL HIGHLIGHTS OF THE DIGITAL TRANSFORMATION READINESS

Main Challenge	Main Challenge
Governance & Leadership	Leadership in digital transformation, strategy, and readiness
Agriculture & fisheries	The sector lags across all dimensions in digital readiness as digital transformation is not seen as a priority, despite the potential benefits that it can give to the sector. This shows a general structural weakness in the sector which remains plagued by low productivity.
Arts, Entertainment & Recreation (including Gaming)	Insufficient human resources and a lack technical skills in current staff and the need to further integrate and digitally transform company policies.
Construction	Lack of integration of digital strategy and culture into overall organisational culture which in turn leads to inadequate allocation of resources and budgets towards increasing human resources and technical skills of current staff. Moreover, the industry may lack the capacity and appetite to explore and utilise new digital solutions to improve their current processes.
Financial and Insurance Activities	Inadequate resources allocated towards staff training to improve digital readiness, along with an increased need to ensure that all digital policies, procedures, and digital activities are in place and are core to everyday business activity.
Information and Communication	Sub-optimal improvement in performance and internal productivity due to a lack of periodic IT and digital audits aimed at improving hardware and software capabilities within the sector.
Manufacturing	Digital strategy is not fully integrated into departmental planning processes and lacks influence on overall organisational strategy and direction. This may be due to a lack of understanding, monitoring, and reporting of benefits of digital transformation and the fact that digital policies, procedures, and digital activities are not always in place and are not core to everyday business activity.
Professional, Scientific and Technical Activities; Administrative and Support Service Activities	Increased need of adequate resources and budgets to support digital channels, activities, and service delivery as well as staff, resulting in limited capacity to anticipate and respond to new technologies and digital innovation. This is important because human resources and technical skills are two common barriers to digital transformation for the sector.
Public Administration, Education and Health	Digital culture is not at the core of business activity and lacks integration with overall corporate culture, leading to several challenges such as not always having digital policies, procedures and digital activities in place, and inadequate allocation of resources to support staff with the required training to anticipate future skills, knowledge requirements, new technologies and digital innovation.
Real Estate	Prioritising digital savviness in staff recruitment is the main challenge, especially since technical skills is unanimously mentioned as a key barrier to digital transformation of the sector.
Wholesale and Retail Trade, Transportation and Storage, Accommodation and Food Services	Insufficient resources allocated to staff in terms of new technologies and training; there is also a lack of digital policies, procedures, and digital activities, amidst an increased need for a greater understanding of the importance of the effective integration of digital strategy and culture with the overall company strategy, direction, and culture.

In addition, the Index allows the analysis of the data obtained on a dimensional level highlighting common challenges across sectors. The main challenges are summarised in Table 4.32.

TABLE 4.32 – COMMON CHALLENGES ACROSS THE DIMENSIONS OF THE DIGITAL TRANSFORMATION READINESS INDEX

Dimension	Common challenge
Governance & Leadership	Lack of integration of digital strategy in departmental planning processes, lacking influence on overall organisational strategy and direction and insufficient drive to engage in a constant business re-engineering process to digitise and to transform products and services.
People & Culture	Greater need for integration of digital culture with overall corporate culture and increased use of digital solutions to improve digital service delivery and internal productivity.
Capacity & Capability	Increased need to have digital policies, procedures and digital activities in place which are core to everyday business activity. Moreover, better allocation of resources and budgets to support digital channels, activities, service delivery and staff training is essential for digital readiness.
Innovation	Lack of alignment of new management practices and organisational structures with the needs of a transformed digital organisation.
Technology	Sectors need to increase the implementation of periodic IT and digital audits to see how both hardware and software can be improved to optimise performance and ensure that cybersecurity is seen and treated as one of the most critical risks the company faces.

After having analysing Malta's sectoral readiness for digital readiness through the roll-out and interpretation of the Index, the focus of the report will shift towards discussing various recommendations for the country to truly embark on a productivity-enhancing digital transformation. However, prior to jumping into the recommendations, the discussion will be anchored around the policy context surrounding digital transformation both on a European and local level.

5.

The policy context of digital transformation

Over the past few years, with an acceleration over the past few months following COVID-19 and the ensuing recovery, digital transformation has been a key item on the policy agenda of various countries and international institutions. This section traces the latest policy developments at a European and local level on digital transformation. Once the policy parameters would have been identified and highlighted, the report will move onto discussing the recommendations to support digital transformation in Malta.

5.1 Digital transformation trends at EU level

Without purporting to be a complete policy analysis at the EU level on digital transformation, this section aims to highlight the strategic policy trends in relation to digital transformation that are most relevant to the Maltese economy.

Digital transformation is at the heart of the EU's new industrial strategy

As the EU headed towards the new 2021-2027 budget cycle, the Commission issued a new industrial strategy for Europe in March 2020[5] . Starting with a strong statement that 'industry is the power of the European economy,' the strategy emphasises the crucial importance of digital transformation in driving the Union's competitiveness, describing the scale and necessity of this required transition as being 'unprecedented.' The proposed Plan integrates digital innovation and transformation within every aspect of the EU's economic strategy going forward, particularly in terms of the green transition which is also envisaged under the European Green Deal.

The proposed strategy frames the need for digital transformation as vital for retaining and improving the competitiveness and productivity of the Union, and of the individual Member States within it, at a time of 'global economic uncertainty.' It points to the global geopolitical and economic trends that are impacting European industrial competitiveness, such as global competition, protectionism, market distortions and trade tensions, as well as the emergence of new competitive forces in emerging markets.

In this context, the Strategy pivots on enhancing the EU's position as a digital leader, transitioning the European Single Market to a new, digital platform. Key actions include:

- Speed up investment in tech research and deployment in areas such as AI, 5G, data and metadata analytics.
- Set up a framework to allow businesses to create, pool and use data to improve products and compete internationally.
- Enhance industrial capacity in critical digital infrastructure, particularly a secure and state-of-the-art 5G network as a major enabler for future digital services and the 'industrial data wave.'

Finally, it stresses the urgency of establishing the above enablers, citing the next five years as the critical period in which these must be established and strengthened, so that an effective digital transformation can take place.

Industrial Innovation to drive growth and productivity

The Industrial Strategy highlights the fact that the share of European companies in global research and development spending has declined over the past five years, while that of the US and China has increased. This trend needs to be reversed through more focused investment in tech innovation and digital transformation.

In this context, the Commission calls for a consistent and strategic attitude to innovation based on a clear understanding of the competitive landscape and the most direct and effective pathways to market. SMEs, which make up over ninety percent of enterprises across all Member States, need to be incentivised and supported to innovate and commercialise competitive products and services.

Within the cohesive, Single Market approach that marks this Strategy, the Commission also recognises the value of 'place-based innovation.' This calls for enterprises in individual Member States to draw on their own competitive strengths and characteristics to forge new products and services. Digital Innovation Hubs, supported and facilitated by national governments, could be key to unlocking and sustaining this potential.

[5] European Commission (2020), A New Industrial Strategy for Europe, COM(2020) 102 final, Brussels, 10 March 2020

Competitiveness in this area will depend greatly on the supply of a qualified workforce, and Member States are urged to develop and implement the right education and training frameworks to ensure this. In terms of industry, digitisation, automation, and advances in AI will require a major shift in the skills profile of employers, employees, and entrepreneurs. At the same time, education and training in STEM subjects needs to be reinforced and upgraded where necessary, aligning skills more closely with future jobs.

Post COVID-19: Directing the EU's new industrial strategy towards recovery

The Commission's Industrial Strategy of March 2020 highlighted the need for the EU to build competitiveness in technologies identified as strategically important for Europe's industrial future. In May 2021, the Commission issued an updated Strategy following a close analysis of the impacts of the pandemic on trade and industry at a global level. In common with the views of all other leading international fora, the Commission stated plainly that COVID-19 had underlined the digital future of any thriving and competitive industry, with tech being fundamental to resilience and productivity particularly when considering the rapid growth of other global players in the market.

On this basis, the updated 2021 Strategy reiterated the Commission's firm stand in terms of prioritising digital transformation in the context of the Union's recovery. The emphasis will remain on building competitiveness in technologies that are strategically important for the EU's industrial future.

The updated Strategy also incorporated the deployment of the Recovery and Resilience Facility in providing an important step-up in investments in digital technologies. The following section will detail how this spending will align with the EU's focused Digital Europe strategy, itself updated to reflect post-COVID realities.

EU's strategic direction for a 'Digital Europe'

Following the release of the Industrial Strategy in March 2010, the Commission also issued the results of a comprehensive research study carried out on its behalf by McKinsey Global Institute as part of the 'Shaping the Digital Transformation in Europe' initiative[6] . This landmark study assessed the potential impact of disruptive digital technologies on the EU economy, including at individual Member State level, and key focus areas included:

- a comprehensive analysis of high impact, disruptive digital technologies;
- a survey of European business executives on digital and technology strategies;
- a simulation of the macro-economic impact of these technologies; and
- identification and analysis of high impact areas, strategies, and actions for Europe.

The findings of this research were issued in September 2020 and reflected the impact of the COVID-19 pandemic which were already very apparent in the digital sphere. In fact, the report highlighted the deep economic impact of the ongoing crisis and stated that this made the need for digital transformation "larger than ever." It stressed that an emphatic and effective transformation can "be an engine for Europe's recovery, growth and increased global competitiveness."

Digital transformation across the EU will have a strong positive economic impact

In their report, McKinsey concluded that Europe's social and economic digital transformation are accelerating and were already doing so before the onset of the pandemic. High-impact technologies were in place to disrupt business models and would progressively mature for at-scale deployment.

Based on the macroeconomic simulations carried out, it was estimated that the cumulative additional contribution of new digital technologies could increase the EU's GDP by 14.1 per cent or an equivalent €2.2 trillion by 2030. This off-sets all technological investment required and is a direct positive return to the EU economy. Moreover, the simulations show that early, effective efforts to increase the technological

[6] European Commission Directorate-General for Communications Networks, Content & Technology (2020), Shaping the Digital Transformation in Europe, Luxembourg, September 2020.

maturity of individual Member States can result in significant economic rewards. For example, a simulated scenario where the EU27 Member States achieve a 10.0 per cent improvement to their technology readiness by 2023 is estimated to result in a cumulative GDP growth of 17.4 per cent by 2030, which is 3.3 percentage points higher than the 14.1 per cent growth in GDP calculated under the base scenario.

The study found that achieving this goal rests on raising the investment in digital technologies and digital skills. This investment need is unlikely to be covered by the private sector alone and will require highly targeted public funding, particularly in ICT investment as well as education and training to cover labour market implications.

Europe's digital transformation will drive competitiveness

In their report, McKinsey identified overarching 'signature initiatives' with the potential to shape EU's digital transformation, providing a competitive edge versus other global leaders and equipping the economies at Member State level to rise to the disruption challenge.

In terms of the economy and competitiveness, these include:

- Developing and scaling EU tech ecosystems to match the global best. This initiative positions Europe as a leader in key new frontier digital technologies around Centres of Excellence enabled by the collaboration between universities, public authorities, established industries and vibrant start-ups.
- Creating a digital leadership instrument for innovation procurement of digital technologies of European strategic importance. This initiative centres on close collaboration between innovation funding and public procurement.
- Leading the way towards trustworthy AI worldwide by promoting AI-based innovation to fuel economic growth and social innovations while ensuring transparency and a positive social impact. This can include social measures to counter potential adverse effects and would differentiate European AI solutions as ethical and trustworthy.
- Building EU data platforms for strategic B2B sectors. This can enable, for example, the Europe-wide sharing of health data (or similarly utilities or transport data) to improve healthcare outcomes, research and fuel innovation while respecting privacy and citizen trust.
- Promoting digital solutions for climate risks. This initiative can include promoting the positive potential of digital technologies to reduce CO2 emissions and resource use in other industries, as well as reducing the growing contribution of ICT to CO2 emissions and material use (particularly rare metals) due to both infrastructure (e.g. data centres) and ICT devices.

As the EU gears up for recovery, funding is earmarked for digitalisation

As the EU enters a new Multiannual Financial Framework (MFF) period in 2021, the European Commission has clearly prioritised investments in digital transformation. The key financial instruments are:

- The proposed new Digital Europe programme, with a proposed allocation of €9.2 billion for the 2021-2017 MFF period, aims at boosting high-performance computing and data, artificial intelligence, cybersecurity and advanced digital skills.
- The Connecting Europe Facility targets another €3 billion for digital infrastructure.
- The proposed €100 billion Horizon Europe programme focuses on advanced digital research and innovation.
- The InvestEU programme aims at generating €650 billion in additional investment, targeting areas that include digitalisation, skills and SMEs.
- Finally, given the COVID-19 crisis, the European Commission has presented the Next Generation EU instrument, a proposed €750 billion fund to support the resilience and recovery of the Union – with a large emphasis on green and digital infrastructure investments.

Together, these funds and programmes target all stages of digital development and aim to address digital gaps within and between Member States, preparing Europe for the next wave of digital transformation.

Digital transformation is central for Europe and its recovery plans, and this is also translated into generous funding opportunities that can prove to be a turning-point for Member States keen on embarking on a digital transformation journey.

5.2 A snapshot of Malta's policy context on digital transformation

This section will briefly outline the key elements of Malta's current digital policy, providing some insight into the emerging strategic framework within which a concentrated digital effort can be developed and implemented. Focus will be given to Malta's plans under the Recovery and Resilience Plan as well as an analysis of the digital element within the previous National Productivity and Competitiveness Reports.

The digital dimension is already recognised as essential to Malta's competitiveness

There appears to be a broad national consensus on Malta's digital priorities, one which has followed the global and EU trends outlined above and gathered momentum as attention turns to post-pandemic recovery.

At Government level, a number of policy documents have been issued in the digital space.
A foundation document was 'Digital Malta 2014-2020.' Launched in 2014, this strategy focused on ICT innovation across three main pillars:

- Digital Citizenship
- Digital Business
- Digital Government

It also identified regulation, human capital, and infrastructure as critical enablers for the effective implementation of this strategy. On this basis, although this early strategy embraced a narrower definition of technology in terms of 'ICT innovation' in contrast to the more holistic digital transformation model that has emerged more recently, it did take a broad approach to the issue and included elements such as role of the public sector in driving change, the need for inclusive change, and the critical need for building the required skills to make change possible.

This early strategy also emphasised the digital link to competitiveness for the business sector, stating that "digital Malta will increase competitiveness and boost the attractiveness of local industry." It particularly emphasised the advantage technology would provide in internationalisation, particularly within the European market.

The realisation that digital disruption is now impacting various economic sectors and should no longer be viewed narrowly as an ICT sectoral issue has taken hold since the launch of the 2014 Digital Strategy. This is reflected in the launch last year of Malta's first think tank on the Digital Economy. Taking a multi-stakeholder approach, this covers expertise in blockchain, AI, quantum high performance computing and other fields, and has been tasked with generating ideas and guidelines on how Malta can diversify its economy by leveraging digital technologies.

This more comprehensive vision is also articulated in several recent strategy and policy documents. The most salient developments are reviewed below.

AI and Blockchain as key tech enablers for Malta's strategic digital advantage

Amongst the new technologies, AI and, to a lesser degree blockchain, have probably received the most policy attention to date.

In 2019, the 'Strategy and Vision for Artificial Intelligence in Malta 2030' was launched. This Strategy aims to "map the path for Malta to gain a strategic competitive advantage in the global economy as a leader in the AI field."

The Strategy essentially works towards enabling Malta to thrive as a hub for AI application and R&D, mainly built on three main pillars:

- Driving investment, start-ups, and innovation
- Driving public sector adoption
- Driving private sector adoption

The contribution of AI solutions to enhanced competitiveness and productivity is highlighted. The Strategy presents this technology as a key enabler for enterprises to enhance operational performance and deliver better services, arguing that this can apply to all Malta's key sectors. An interesting angle of the Strategy is that it promotes a mixed approach to AI implementation in Malta's particular economic landscape that factors in both established sectors, where investment and innovation would be directed towards AI-enabled improvement and diversification, as well as potential new niche activities.

Following an intense focus in conjunction with cryptocurrencies in 2016-2017, blockchain technology somewhat receded from local view for a brief period, however this technology's potential to drive innovation is fast gaining traction at a policy and strategy level. A legislative and regulatory framework is already in place to facilitate the application of blockchain in various fields, particularly where new business models are required to retain competitiveness. The main advantages offered by the technology are greater transparency, enhanced security, improved traceability, increased efficiency and speed of transactions and reduced costs. These advantages have been highlighted in relation to Malta's maritime sector, where blockchain has the potential to revolutionise core systems, including logistical, contractual and registration processes.

Cybersecurity capacity must advance in line with digital transformation

As the pace and complexity of digital transformation has intensified, and more organisations operate in cyberspace, the need for effective cybersecurity capacity has risen sharply in both the public and private sectors. Cybersecurity is increasingly a priority area across all technology applications, and it is fast expanding in scope and sophistication due to the following factors:

- Technical evolution: Enterprise IT infrastructures are growing in size and complexity, while new technologies are in the digital mix that bridge the digital and physical spheres, such as IoT. While these developments can enhance productivity, they also broaden potential vulnerabilities.
- Regulatory complexity: Heightened regulation is impacting various industries and imposing greater compliance requirements. Cybersecurity systems are evolving to support organisations align with changing regulations.
- Sophistication of attacks: Cybersecurity threats are increasing in sophistication and are becoming less predictable, requiring a greater capacity to withstand attacks and safeguard business continuity.

Following the launch of the Digital Malta Strategy 2014-2020, the Government also issued a national Cyber Security Strategy in 2016 which remains the current policy and strategic framework in this area. This Strategy identified six main goals:

- Establish a governance framework, including delineations of responsibilities, coordination systems, and a national cyber risk exercise.
- Combat cybercrime by establishing a forum on Internet safety and by strengthening investigative capabilities.
- Strengthen national cyber defence by establishing a collective approach to information gathering and sharing across sectors.
- Secure cyber-space through regulation, stimulation of shared use of standards and best practices, and assisting the private sector with taking the lead on cybersecurity.
- Increase cyber security awareness and education by building specialist educational curricula and integrating digital citizenship education in primary schools.
- Enhance national and international cooperation.

This Strategy is coordinated by a National Cyber Security Committee appointed by the Government.

The public sector is well positioned to drive digital transformation

The Digital Malta Strategy identified the importance of the public sector as a key driver of digital transformation. This aspect was the focus of the 'Strategic Plan for the Digital Transformation of the Public Administration 2019-2021.' This Strategy focuses on the 'transformative role' of technology in public service design and delivery, stating that

the public sector should no longer view technology merely as an automation tool but as an opportunity for radical renewal. This ambitious plan highlights the potential of technologies such as AI, Distributed Ledger Technologies (DLTs), Business Intelligence and Analytics, Immersive Technologies, and the Internet of Things.

The Malta Budget 2022 appears to reinforce this approach and includes four major digital transformation initiatives within the public sector. These are:

- Further investment in Identity Malta's e-ID platform to strengthen and facilitate electronic service delivery. Work is also underway on an integrated digital platform covering all related employment and residency services for European and Third Country nationals.
- The implementation of a new digital system in the Searches Unit at the Public Registry enabling notaries to digitally submit registration notes using qualified electronic signatures.
- The development of an online portal providing template employment contracts containing all minimum standards and requirements established by law to ensure that workers' rights are protected.
- The digitalisation of Transport Malta's land and sea vehicle registries, including the enhancement of tracking systems to improve port security.

A consistent focus is needed on improving the quality and quantity of Malta's eSkills supply

Enhancing Malta's digital skills has consistently been identified as a priority at all points of Malta's digital journey

To consolidate efforts at a national level, and to ensure a multi-sectoral approach, the Government launched the sSkills Foundation in 2014. This entity, made up of representatives from government, industry, and education, was tasked with bringing together all stakeholders in a bid to upgrade industry-ready digital skills in Malta and has been working to build the requisite quality digital skills with a primary focus on the ICT sector. In 2017 the Foundation carried out the first national ICT skills audit. This uncovered an escalating skills crisis, with over 66.0 per cent of respondents highlighting ongoing issues with sourcing suitably qualified staff. The overall conclusion was "*an overwhelming consensus that the current tech talent pipeline in Malta is a depleting resource, resulting in escalating skills shortages in tech related sectors, and as a result, impeding business development.*"

In 2018, based on the Audit's findings, the Foundation issued a National eSkills Strategy looking ahead to 2021. A fundamental recommendation was an overhaul of the education system to embed digital skills in every aspect of learning, with appropriate systems in place to ensure that this content is continually updated in line with ongoing developments. This, in the view of the strategy document, would ensure a more robust skills pipeline in the future particularly when complemented by effective curriculum design at tertiary level together with financial incentives to boost take-up. Another important element of the Strategy, also emanating from the previous year's Audit, was a recalibration of Malta's eSkills framework in line with that of the EU. The European e-Competence Framework was in fact established as a tool to "*support mutual understanding and provide transparency of language through the articulation of competences required and deployed by ICT professionals.*"

In 2021 the Foundation issued its 'ICT Skills Demand and Supply Monitor,' launched as an update to the 2017 Audit. Key findings include:

- The sourcing and retention of ICT resources remains a major issue for the majority of demand organisations.
- Tech advancements are driving an industry demand for greater specialisation right up to expert level.
- While industry was indeed keen to explore the potential of new technologies, AI and Machine Learning in particular, the lack of suitably qualified and certified skills is a significant barrier. The Foundation highlights this finding as a "constraint on businesses operating in Malta to gain competitive advantage."
- Existing training and certification frameworks are not fully in step with emerging technologies, with areas

such as AI being inadequately covered.
- Apart from technical skills, the lack of the right soft skills is also increasingly an issue for employers.

This 2021 Monitor concludes that the "current local ICT student pipeline will not be sufficient to meet ICT market demand growth." Although not explicitly stated in the report, it is logical to further conclude that this skills shortfall in the ICT sector is also a factor in other sectors, such as manufacturing, that are increasingly reliant on technology for innovation and competitiveness.

From eSkills to future skills: a subtle but telling shift in approaching the problem

The National Employment Policy 2021-2030, launched last month by the Government
marks a subtle but key shift in the strategic approach to digital skills formation. No longer framed as an issue particular to the ICT sector, this Policy identifies such skills as vital 'future skills' that are, and will increasingly continue to be, indispensable to Malta's growth and competitiveness in virtually all economic sectors. In line with the EU policies discussed above, the Policy points to the radical change in the skills and competencies required in a global economy that is "more automated, digital, and dynamic," identifying digital transformation as the main driver. It emphasises the integrated nature of this transition, with developments in different and previously siloed technology fields now building on and amplifying each other and disrupting every economic activity and industry.

The Policy therefore defines closing or at least narrowing the digital skills gap as an 'immediate economic priority.' It recommends several measures to improve the quality and relevance of training and skills frameworks, as well as to support and incentivise technological adoption and innovation in the private sector. It also recommends establishing a clear baseline for comprehensive action by launching, as soon as possible, a National Skills Census. A reinforced and revamped Skills Policy Council will also be created to define and drive future skills strategies. Based on the momentum achieved by the eSkills Foundation and drawing from lessons learned from successful initiatives in other Member States, this Council will bring together government, education, and industry to ensure a cohesive approach that is fully aligned with industry needs.

Targeted support for business tech innovators to encourage a 'digital mindset'

A key development in Malta's preparations for digital transformation was the creation of Tech.mt in 2019. This is a public-private partnership between the Government and the Malta Chamber of Commerce, Enterprise and Industry aimed at driving the growth of Malta's tech sector through two main paths:
- Supporting local businesses to export their services, products, and intellectual capital abroad; and,
- Attracting foreign tech investment to Malta.

The entity is positioned to play a vital role in directing businesses to grants and incentives to support digital innovation. These include the Business Enhance grant schemes (funded by the European Regional Development Fund) as well as the support measures offered by Malta Enterprise. Measures such as 'Research and Development 2020' are explicitly designed to support R&D and innovation in the private sector.

Going digital can also be key to Gozo's economic transformation

The potential for digital innovation to create new economic niches for Gozo has also been highlighted in a recent public consultation document issued by the newly launched Gozo Regional Development Authority. This document, entitled the 'Regional Development Strategy for Gozo 2021-2030' proposes the development of a 'digital and innovative eco-system' on the island to drive economic growth and productivity. This aim is presented as a potential game-changer in closing the development gap between Malta and Gozo through the creation of higher value-added activities.

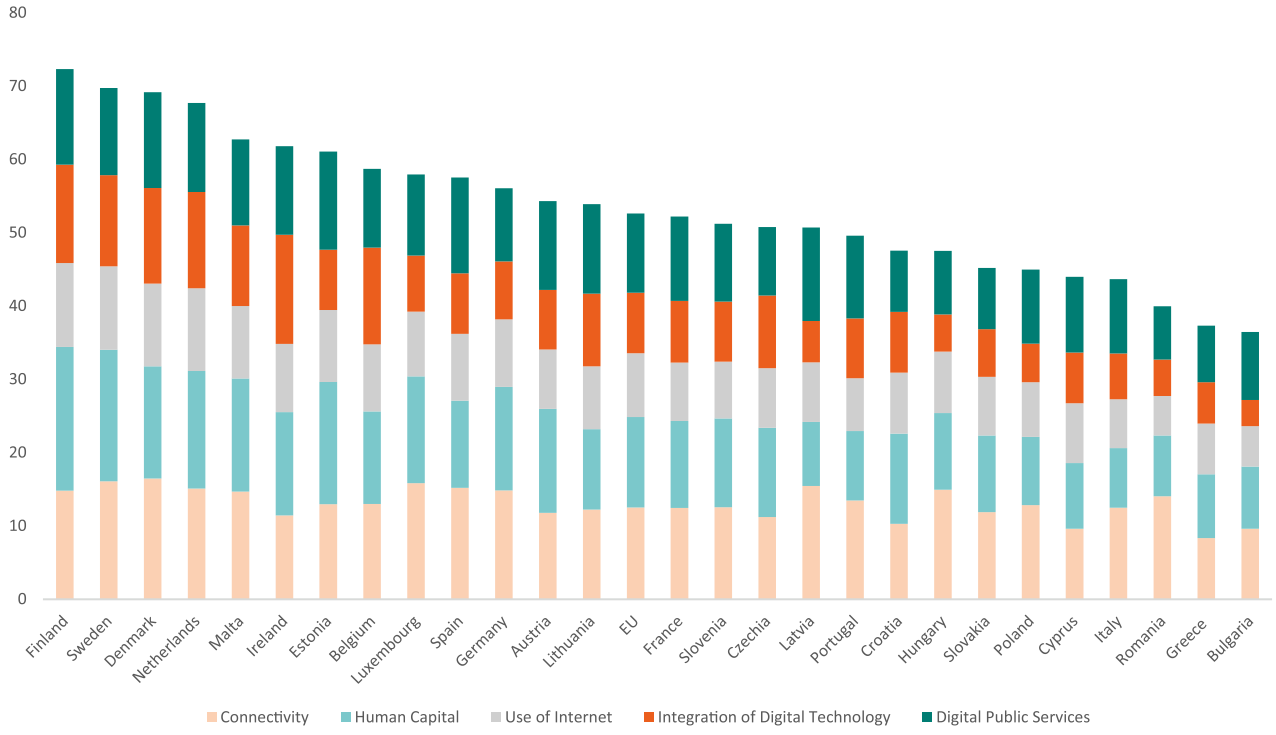
The document recommends a series of measures to advance this goal. A number of these centre on the fundamental building-blocks that need to be put in place to increase Gozo's digital capacity,

including addressing the digital skills gap and providing targeted support measures and funding opportunities for SMEs. Beyond that the Authority also sees potential for the island in two key digital verticals, namely agritech and fintech.

This multi-faceted digital strategy framework is reaping some results

This focus on digitalisation and placing the digital economy at the core of Malta's policies and strategies is already bearing fruit. In the latest Digital Economy and Society Index (DESI) for 2020, published by the European Commission, Malta ranked fifth out of the 27 EU Member States, up two places over 2018. DESI is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness. All EU countries improved their digital performance when compared to the previous year. Malta performed above the EU average in all five dimensions of the index, these being connectivity, human capital, use of internet services, the integration of digital technology and digital public services.

FIGURE 5.1 – THE DIGITAL ECONOMY AND SOCIETY INDEX 2020



Source: European Commission, 2021

Malta performs well on broadband connectivity. The country also records good scores on human capital, especially because of the high share of ICT specialists and ICT graduates, while the involvement of women in the digital sector is gradually increasing. More and more people in Malta use the internet and engage in several activities. Maltese businesses rank first on the use of big data, and the overall level of business digitisation is relatively high. At the same time, the country's performance in digital public services continues to be negatively affected by the low use of e-government services by the public. Low progress on open data policies is another reason for Malta falling behind other EU Member States. Comparatively, Malta also has a low take-up of SMEs selling online, placing 13th on the e-Commerce Index.

These latest results show that Malta has made good progress in the digital space, however several challenges remain. Malta's attractiveness hinges on its capacity to continue transitioning to a digital society. Digital transformation needs to remain a central tenet of the country's recovery plan and national vision.

CONSOLE
STANDBY
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POWER
10G 1
LNK
ACT
LNK
ACT
10G 2
RESERVED
MGMNT 1
LNK
ACT

5.3 Digital transformation and past National Productivity and Competitiveness Reports

The 2019 National Productivity and Competitiveness Report

The first National Productivity and Competitiveness Report (NPCR) was commissioned by the National Productivity Board in 2019 and took a holistic view of competitiveness and productivity, with the review taking an economy-wide approach. The report provided an understanding of the development of the economy over the years and emphasised the country's economic expansion and structural changes particularly with respect to the rise of several technology-based industries, including that of videogaming, distributed ledger technologies and artificial intelligence.

In this context, and considering the trajectory of Malta's economy towards services-based sectors with two highly productive sectors being information & communication and gaming, the report recommends that this trend is further encouraged through the provision of the right environment in highly productive sectors and the supporting of these highly productive sectors through adequate skills supply.

To this end the report recommends the development of sound measures for skills forecasting as a basis for policy development. The report also highlights the movement towards the digital revolution within the context of research and development. The movement towards the 'new economy' has spurred greater research and development in the ICT sector, together with the above EU average percentage of enterprises providing ICT skills training to their employees (as recorded in the Innovation scoreboard). This report states that it is also a reflection of the economy's focus on ICT-driven innovation as an avenue for competitive advantages and its drive towards digital innovation.

In this context the ICT sector, with this report, is understood to be part of the larger system of technological and organisational change that increases firm productivity and thereby also a precursor to productivity growth. This is argued as follows:

- 'Price reductions and quality improvements in ICT capital goods can lead to increased ICT firm investment, hence enhancing productivity.
- By increasing transparency and the information available to economic agents, ICT may render markets more efficient and thereby improve the allocation of resources.
- ICT may bring people closer together and create network effects, for instance through social media.
- By increasing knowledge diffusion ICT may accelerate the R&D spillover effects, making knowledge produced in one sector available more quickly to another sector, which can then be used to produce new knowledge.
- ICT can also improve productivity indirectly by boosting the productivity of research and development.'

This ICT-driven innovation also holds the potential of creating more inclusive and sustainable growth by facilitating access to these innovations to larger segments of the population. Yet, the authors of the report caution that given the disruptive nature of this digital transition more focus is to be placed on the inclusiveness of digital technologies in terms of its access, adoption, and uptake.

ICT is identified as an enabling technology for all the identified economic sectors through its role as a tool for technological change. The importance of continued ICT investment in sectors such as digital gaming, financial services, health, and tourism product development is also emphasised. ICT is thus placed as a key enabler to R&I together with human capital development and developing an ecosystem for innovation-driven growth (R&I support ecosystem). The identification of ICT as a horizontal enabler to R&I and as a smart specialisation is also reflected in the first NCPR.

In this regard, the 2019 report positions ICT and the digital transformation as part of a wider ecosystem, with investments in ICT often forming part of investments in R&I, for a long-run oriented version of growth.

The recommendations for the development of this framework for R&I include an understanding that innovation activities in ICT are part of a larger chain. Therefore the authors of the report recommend the introduction of targeted funding mechanisms that address research gaps, such as research funds with no requirement for industry participation. R&I funding and support measures specifically targeting the development of technologies that address priority areas such as the environment and climate change should be evaluated.

Although the 2019 report does not focus directly on technology adaptation and digital transformation, this was a theme which flowed through all the analysis and was taken to be a precursor to most of the future investment.

Table 5.1 presents a summary of the recommendations which have the closet link to the digital sector and its status.

TABLE 5.1 – DIGITAL TRANSFORMATION RECOMMENDATIONS IN THE NCPR 2019

Recommendation	Status
Low productivity sectors should benefit from interlinkages with other sectors with the aid of technology.	Further action is to be pursued to promote not only the physical adoption of technology across all sectors, including the low productivity sectors.
Evaluate the possibility of further developing the capacity of existing innovation hubs and setting up sectoral specific innovation hubs (e.g. digital innovation hubs).	Strides in the right direction have been made, with the development of the Gozo Innovation Hub, which seeks to promote clusters in the ICT and other knowledge intensive services sector being one of them. Similar projects are to be encouraged which focus more on the effective collaboration between sectors, for the development of transversal knowhow.
Introduce targeted funding mechanisms that address research gaps, such as research funds with no requirement for industry participation. R&I funding and support measures specifically targeting the development of technologies that address priority areas such as the environment and climate change should be evaluated.	Further action is required for effective and substantial results to be achieved.
Set up educational programmes to address the demand for new skills in highly productive sectors.	As per the latest recommendations put forward in the 2021 National Employment Policy, more investment in skills forecasting, skill matching, and agile skills development is to be pursued as several sectors report facing both labour and skills shortages.

The 2020 National Productivity and Competitiveness Report

Like the 2019 report, the 2020 NPCR adopted a wider economy analysis to productivity, whilst taking also a post-Covid recovery approach.

The relationship is immediately drawn to the link between gross fixed capital formation and productivity via technological improvements. Innovative actions in ICT and gaming are amongst the factors which have contributed to sustained intellectual property products over the past years, as a critical component of GFCF.

The authors of the report ascertain also that the gaming industry is a high productive sector with a comparatively smaller workforce.

- The report outlines in detail the determinants to competitiveness, which include the quality of infrastructure. Investment in ICT is considered as a sub-category, whereby it is noted that Malta is above average in terms of the ICT infrastructure quality and on an aggregate level in the digital scoreboard when compared to EU member states, however fares below average in terms of the digital adoption in public services. The report thereby proposes the following actions for this sector:
- 'Facilitate the attraction of foreign workers that have high digital and ICT skills.
- Improve education and training of ICT and digital skills of Maltese workers.
- Ensure the effective implementation of the public service ICT infrastructure funds.
- Ensure the constant update of the national ICT infrastructure.
- Ensure constant firm human and capital investment in ICT and digital infrastructure'.

As the relationship between ICT and innovation is critical, the 2020 report explains that the bulk of R&D investment (92.0 per cent) in industry is undertaken by the manufacturing, wholesale and retail and ICT sectors. The analysis explains also that firms' investment in upgrading of ICT skills in Malta exceeds the EU average and that the ICT infrastructure in Malta is a strong one.

In this regard the report proposes:

- Encourage start-ups that focus on innovation and digitalisation.
- Address the technology-related skill shortages among Maltese workers.
- EU response on digitalisation. Implementation of the Digital Europe Programme.

Finally, the report puts forward the recommendations shown in Table 5.2 related to the adoption of technology and the digital economy. A status update of each recommendation following consultations and the gathering of feedback from all Government Ministries is included.

TABLE 5.2: DIGITAL TRANSFORMATION RECOMMENDATIONS IN THE NCPR 2020

Recommendation	Status
There needs to be a willingness to embrace the digital future in industries that have proved to be more resilient to economic shocks (such as construction).	No specific action noted.
Quality in work and availability of skilled labour must be improved so that the benefits of new technology, innovation and research and development can be more readily exploited.	No specific action noted.

A forthcoming digital strategy for the Maltese economy should further embrace and foster the recent technological developments in blockchain and distributed ledger technologies, artificial intelligence and digital games, the internet of things, big data and quantum computing, cyber security, and the application of Industry 4.0, to further increase the standing and reputation of Malta as a centre of excellence in digital and technological innovation.	No specific action noted.
Introduce a Tech Visa which acts as a fast-track residence permit scheme for non-EU employees, start-up employees, founders and investors operating within the tech related knowledge intensive sectors.	Identity Malta Agency is working with other stakeholders to facilitate VISAs for nomad workers and other niche applicants like e-sports and e-gaming.
Increasing the type and range of tech training provision to bridge existing skill gaps identified across the various dimensions of the of the European e-Competence Framework (e-CF) and promote an industry certification framework to complement national awards in the form of 'blended' certification.	No specific action noted.
Identify basic digital skill gaps currently present across industry, government and society and upgrade the digital skills of the Maltese workforce to address the current tech skills deficit.	The Ministry for Education is currently pursuing the following actions: - Developing a Postgraduate Certificate in Digital Competences in Education - Increase the online provision of courses to meet the needs of adults to strive in the labour market and society. - In line with Malta AI strategy, the Ministry is undertaking a pilot project (creation of a digital programme) in compulsory schools. This project is being carried out in cooperation with University of Malta Faculty of ICT students. - A new strategy on Digital Literacy Strategy launched.
Provide further support to SMEs to help them become more competitive in their business/production processes, and products or services using digital technologies.	Funding schemes - The Business Enhance Grant Schemes, part-financed by the European Regional Development Fund 2014-2020, support enterprises when undertaking investment projects aimed at securing sustainable business growth, by becoming more competitive, innovative, and become more resilient to market challenges. Use of digital platforms - An online reservation system was established for all licensed Gozo-based accommodation units. This can be accessed through the VisitGozo portal. Use of digital platforms - Single Permit Digitisation - The aim of this service is to provide the public with a one stop shop approach towards the application process for single permit applicants. Companies needing to submit Still Abroad applications for work permits in respect of third country nationals need to apply through the new Identity Malta Single Permit Platform

Further support for SMEs in terms of access to finance to be able to invest in the process of digitalization as well as provide further support in terms explaining the possible costs and benefits of the various options available to them across the ecommerce ecosystem.	Funding schemes - The Business Enhance Grant Schemes, part-financed by the European Regional Development Fund 2014-2020, support enterprises when undertaking investment projects aimed at securing sustainable business growth, by becoming more competitive, innovative, and become more resilient to market challenges.
Leverage the use of technology in agriculture to ensure that water use is optimised and to also set-up testing centres in Malta which will also allow Malta to establish itself as a food-tech regional hub especially with its location between Europe and Africa but also to support food tracing mechanisms. Meanwhile it is also important to enhance the skillset of the local farming community especially in new farming methods, organic farming, as well as on the use of pesticides to ensure that Malta's agricultural product becomes more premium.	***Establishment of a National Agriculture*** Research and Innovation Hub at the Ghammieri Centre- The AGRIHUB project is funded through the Rural Development Programme under Measure 16.2 and will operate on a research framework to support innovative agriculture research. The hub will also serve as a demonstration site to disseminate information on the studies and trails being conducted in the Centre. Two pilot studies will be carried out that will result in the development of new practices, processes, and products with the use of new technology that will result in lower use of plant protection products. Through field trials, the project will investigate which fodder and protein crops can be cultivated in Malta to substitute those that are imported into Malta by feed mills and importers. ***Upgrading the laboratory facilities at the Government Experimental Farm*** Through this project, the Ministry for Gozo shall upgrade the testing and laboratory facilities at the Government Experimental Farm at Xewkija. These facilities will be designated to assist in food tracing as well as quality protocols.

Malta's attractiveness hinges on its capacity to continue transitioning to a digital society. Digital transformation needs to remain a central tenet of the country's recovery plan and national vision.

5.4 The digital dimension of Malta's Recovery and Resilience Plan

In May 2020, the European Commission proposed the Recovery and Resilience Facility (RRF) as the main pillar under the NextGenerationEU, the Union's landmark instrument for recovery from the coronavirus pandemic. The RRF will provide €800 billion (in current prices) to support investments and reforms across the EU with the aim of supporting Member States emerge stronger from the social and economic impacts of the crisis. The RRF is also seen as a golden opportunity for countries to base their recovery on securing the green and digital transitions which the EU considers vital for future growth and resilience.

The Facility takes the form of a temporary recovery instrument in the form of loans and grants that cater for the decisive action needed in the short to medium term – this is viewed as the critical window for mitigating the impacts of the pandemic as well as to establish the necessary ecosystem for green and digital investment.

Once this Facility was launched, each Member State was expected to submit national recovery and resilience plans outlining the reforms and public investment projects they planned to implement with the support of the RRF.

Malta submitted its national Recovery and Resilience Plan (RRP) on 13 July 2021. The European Commission endorsed this Plan and issued its assessment on 21 September 2021.

Malta's RRP identifies digital transformation as a main component of its recovery strategy. This transformation is presented as key to economic resilience, based on a strategic transition to a smart digital economy. A key word in the reference to this strategy is 'fostering,' implying a recognition on the part of the Maltese government that taking a laissez-faire approach to this transition will not work. It must rather be treated as a national, systematic effort, enabled by a raft of policies, incentives, and measures to ensure its consistent and effective implementation.

Malta is proposing a budget allocation of 55 million to this component.

In its RRP, Malta commits to 'fast-tracking' digital transformation, essentially through three main strategic paths:

- Strengthening the national policy framework.
- Facilitating the further digitalisation of services in public administration and regulatory bodies.
- Supporting business investment in digitalisation.

The Plan identifies the key reforms and investments required to further these aims. These are presented below.

The reforms consist of two primary policy elements:

- The first priority is instituting the right policy mix to 'deepen' the transformation process; in this context specific reference is made to reducing the digital divide and generating the required digital skills – this emphasis on inclusion and human capital references the 'just transition' premise that underpins the EU's entire recovery plan.
- The second priority is finalising and implementing, without delay, Malta's Smart Specialisation Strategy[7]. This focus on one key policy document is important since, to date, there may have been several parallel national strategies in this space,

[7] Malta's Research and Innovation Smart Specialisation Strategy 2021-2027 has been issued for public consultation and proposes the smart specialisation sectors that could be supported through the next programming period of cohesion policy (ERDF 2021-2027). The Strategy includes an in-depth analysis of the findings from the stakeholder consultation process, analysis of the R&I and economic potential of Malta, the methodology used, and puts forward recommendations on how best to achieve the enabling conditions of the upcoming programming period.

with the risk of fragmenting investment, focus and effort. The scope of the SSS is mainly to drive R&D and entrepreneurship in the digital sphere in the short to medium term with a specific reference to strengthening public-private cooperation.

The following have been identified as the investments:

- Strengthening the resilience, security and efficiency of the government digital backbone and investing in appropriate digital solutions, devices and tools which will enable Government to provide proactive action, secure services and streamlined operations to citizens and the business sector.
- Investments in the digitalisation of the Merchant Shipping Directorate within Transport Malta, thus providing a more efficient regulatory service to operators in this important economic activity.
- Further digitalisation and modernisation of the public administration, including public and intra-facing services, through several solutions to improve the front-end customer experience, data sharing and reuse, virtual desktops, property transfer processes, National Single Window for customs purposes, and digital tools for remote working solutions.
- Investment grants to intensify the digitalisation of the private sector.

It should be noted that specific digital transformation programmes in the healthcare system as well as in the judicial system are presented separately under the relevant components of the RRP, which identify Health and the Judiciary as specific components. The digital investments in each sector are described as follows:

- Enhancing the resilience of the health system through digitalisation and new technologies including investments at the new outpatient facility, digitalisation of the pathology function and improved radiotherapy delivery to the benefit of patients.
- Further digitalisation in the Justice System, including the Courts, thus facilitating the interactions with different agencies.

Malta's RRP identifies the swift finalisation of the national 2021-2027 Smart Specialisation Strategy (SSS) as a policy priority and as the most effective framework for digital innovation during this period. This decision conforms to the EU's innovation and cohesion policy in recent years, which promotes 'smart specialisation' as the most effective path to sustained and effective innovation. Although this approach featured in the 2014-2020 programming period, it has been given even greater prominence in the new financial cycle.

Malta's adoption of this Strategy over the next few years will be a significant driver for digital transformation. Based on the model promoted by the European Commission, the core aim is to identify economic niches which have a strong potential for growth through innovation in the short to medium term, using a bottom-up 'entrepreneurial discovery' approach. Here, government, academia, civil society, and industry come together as key stakeholders to identify potential growth areas which are then prioritised for investment. This brings innovation policy closer to industry, facilitating the identification of niches and opportunities which are feasible from a production perspective and with stronger potential for commercialisation. Unlike more traditional R&D innovation policies promoted by the EU, smart specialisation can therefore be a more direct route to activities that generate productivity growth, boost competitiveness, and create quality jobs.

A further positive attribute is that this strategic policy is the antithesis of the 'one size fits all' approach that was sometimes criticized in previous EU R&D frameworks. Smart specialisation encourages investments that can complement a country's other productive assets and creates more diversity between regions. Therefore, this strategic approach promotes differentiation and specialisation across the Union.

In line with the EU-wide strategy, the necessary stakeholder consultation has taken place in Malta, and the following thematic areas have been proposed for innovation, with specific niche opportunities identified under each of these:

- health and wellbeing

• climate change mitigation and adaptation
• marine and maritime technologies
• smart manufacturing
• digital technologies

The focus on smart manufacturing in the SSS is significant. Despite Malta's shift towards a service-based economy in recent years, the inclusion of this sector in the Strategy is based on its contribution as a key employer in the public sector, as well as its increasing internationalisation in terms of exports. The Strategy also references the resilience of certain segments within the sector, which have successfully adapted production processes and diversified products in response to new opportunities. The SSS therefore highlights targeted investment in research and innovation in the manufacturing sector as a key theme in the short-to-medium term.

The local digital sector is also selected for intervention in the SSS on two levels. Firstly, the sector can serve as an indispensable enabler for innovation across all sectors. In this context, the SSS points to digital health products, big data & data analytics, open data, and smart manufacturing applications as possible areas of specialisation. Secondly, the SSS contends that the local digital industry has a high potential for innovation. Here, the Strategy selects AI, the Internet of Things, cybersecurity and blockchain as niches in which Malta has already consolidated some capacity and should therefore be developed further.

In its endorsement of Malta's RRP published in September 2021, the European Commission noted the Plan's intent to use the opportunity provided by the Recovery and Resilience Fund to develop and implement the island's digital transition on an unprecedented scale. The Commission therefore expressed satisfaction with the fact that measures supporting digital objectives represent 25.5 per cent of the Plan's total allocation, with one component fully dedicated to this aim stating,"the objective of the measures should be to improve not only the competitiveness, but also the resilience, agility and security of companies and public actors, all while ensuring inclusiveness."

Beyond this positive endorsement, the Commission reiterates several concerns relating to Malta's innovation track-record and capacity that have been raised in other recent appraisals, not least the 2020 European Semester Country Report. These include the digitalisation gap between larger and smaller enterprises as well as the lack of sufficient skilled resources. Despite this they point to the positive rankings recently achieved by Malta in the Digital Economy and Society Index as providing a sound basis for further progress.

In terms of research and innovation, the Commission notes that Malta has very recently articulated three landmark strategy documents that could provide a strong framework for digital innovation. These include the National Strategy for Artificial Intelligence and the Smart Specialisation Strategy, currently under review. The availability of a sound policy platform will provide guidance and direction, enabling efforts to move swiftly to implementation. The RRP's commitment to focus on the SSS as a springboard for targeted action is also highlighted by the Commission. Key here is the SSS' core objective of intensifying and directing business research and innovation through targeted support measures, one aspect being strengthened public-private cooperation.

This is further reflected in the Commission's positive assessment of the Plan's aim of driving digital innovation in the public and private sectors in parallel, with convergence, cooperation, and collaboration at key points to maximise efficiency and results. This can be seen in the investment objectives stated in the Plan, which include the further digitalisation of the public administration and public services in conjunction with targeted support schemes for businesses, particularly SMEs, to facilitate digital transition across the private sector.

The Commission in fact directly endorses Malta's plans to strengthen the resilience, security, and efficiency of the government digital backbone, together with investment in digital solutions to streamline services to the public. In addition to obvious service benefits to citizens, the expected quality leap in services to businesses, such as a

National Single Window for customs purposes, will further boost cost efficiency and capacity building in the private sector.

In terms of specific public sector projects named in the RRP in the public sector, the references to specific flagship projects, such as the digitalisation of the Merchant Shipping Directorate and particular health services, tie in with Malta's Smart Specialisation Strategy 2021-2027. This identifies the maritime and health sectors as potential growth areas for innovation. This indicates an element of policy continuity and alignment which is noted by the Commission.

In general terms the Commission has received Malta's RRP positively and has endorsed the strategy it presents. This means that the funds allocated to Malta will come online shortly, presenting a strong opportunity for Malta to gain real traction in its digital and green transitions.

A core element of the RRP that must be given due importance is the close cooperation between industry and government that it calls for. Establishing the right mechanisms for this at the very outset of the journey will be invaluable, together with the development of highly targeted support schemes for enterprises seeking to innovate. Based on the lessons learned from previous support programmes, this assistance should be user-friendly and direct, avoiding overly bureaucratic procedures that deter rather than attract businesses.

Equally if not more important is a concerted drive to generate the breadth and depth of technical skills that will be required at all levels to drive digital transformation. Failure to do so may severely diminish outcomes. Reliance on imported skills should not replace strategic investment in education and training to improve the quality and quantity of local skills.

Malta's RRP identifies digital transformation as a main component of its recovery strategy. This transformation is presented as key to economic resilience, based on a strategic transition to a smart digital economy.

5.5 Concluding remarks

There is no doubt that digital transformation is a key policy goal across many countries including the European Union and Malta as COVID has accelerated the push towards digital transformation.

The digital agenda strongly promoted by the EU, supported by a clear strategy and generous funding mechanisms, provides a strong framework within which Malta can operate; membership of the envisaged Digital Single Market will also strengthen Malta's competitive position.

Malta's digital readiness places it among the front-runners within the EU – Malta performed above the EU average across all five dimensions of the Commission's Digital Economy and Society Index (DESI) in 2020 and ranked 5th out of the 27 EU Member States.

With a strong policy vision, supported by an investment package of the European Union, particularly the Resilience and Recovery Fund, Malta is well-placed to capitalise and accelerate digital transformation. Against this backdrop, the next chapter outlines our recommendations to further support digital transformation in Malta.

With a strong policy vision, supported by an investment package of the European Union, particularly the Resilience and Recovery Fund, Malta is well-placed to capitalise and accelerate digital transformation.

6.

Recommendations

The pace of digital transformation is accelerating in a post-COVID world and economy. With the concept deeply entrenched in European and local policies, digital transformation is seen as a key instrument through which countries can boost productivity, improve service delivery, and gain economic efficiencies. Also, the pace of technological improvements is disrupting traditional companies, business models and entire sectors. This demands new skill sets and increased capacity and capabilities by organisations to harness the transformative power of digital transformation. Following the analysis of the Digital Transformation Readiness Index that was implemented across all sectors in Malta to gauge firm-level readiness, this Chapter presents recommendations for Malta to further embrace digital transformation as a way of boosting productivity.

6.1 ACT on digital transformation

The vision for Malta is clear: to be a leading digital economy with digitally transformed firms and sectors that reinvent themselves.

It is acknowledged that to achieve an ecosystem that enables digital transformation to cut across firms and sectors, a national strategy on digital transformation needs to be based on five policy goals. This transformation will be led by both existing and new firms, public and private enterprises, large and micro-enterprises, students entering the workforce and older workers already in the workforce. Given the strategic importance of digital transformation, Malta's National Productivity Board believes that the following goals describe the outcomes the Government wishes to achieve through the implementation of the strategic recommendations proposed in this report.

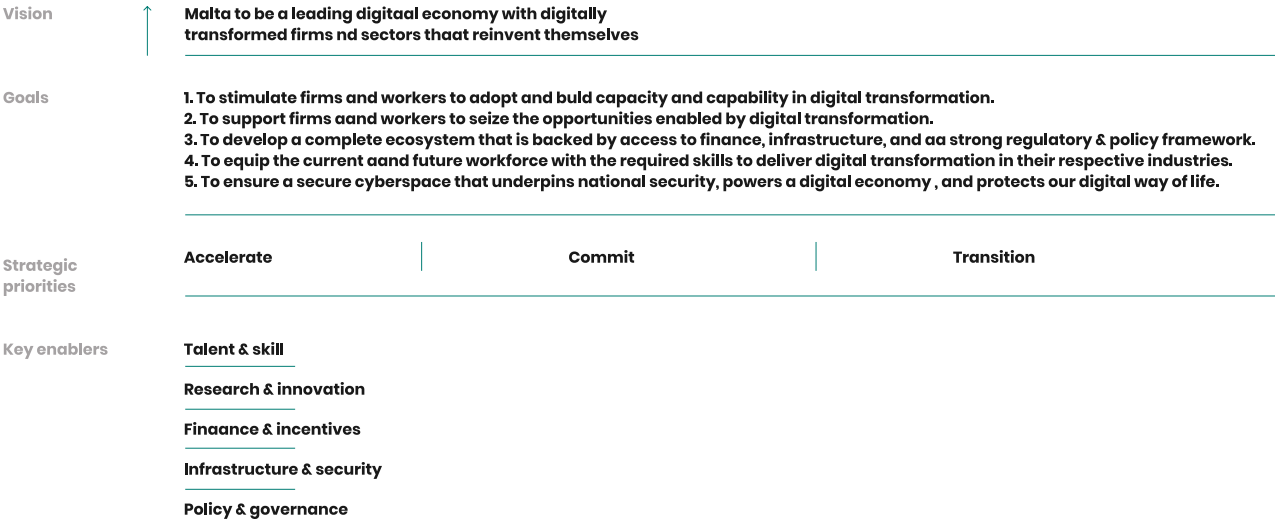
These goals are:

1. To stimulate firms and workers to adopt and build capacity and capability in digital transformation.
2. To support firms and workers to seize the opportunities enabled by digital transformation.
3. To develop a complete ecosystem that is backed by access to finance, infrastructure, and a strong regulatory & policy framework.
4. To equip the current and future workforce with the required skills to deliver digital transformation in their respective industries.
5. To ensure a secure cyberspace that underpins national security, powers a digital economy, and protects our digital way of life.

To achieve this vision, one that leads to enhanced productivity, higher economic growth and more quality employment, the National Competitiveness and Productivity Report for 2021 is proposing a framework of action that is informed based on the research presented thus far, including the sectoral productivity assessments and the Digital Transformation Readiness Index.

The framework that is being presented is represented by the acronym ACT [Accelerate | Commit | Transition] and aims to build a thriving ecosystem of digitally transformed companies and workers that are fully immersed in a digital economy and society. The framework is based on three main strategic priorities and five key enablers. In turn, the enablers incorporate twemnty-fifty recommendations to truly deliver a digitally transformed economy. The high-level ACT framework is shown in Figure 6.1.

FIGURE 6.1 – ACT ON DIGITAL TRANSFORMATION FRAMEWORK



The strategic priorities for digital transformation are outlined below.

Accelerate

Despite already being a key priority for Government, continued efforts across different stakeholders need to be geared to accelerating the digitalisation of businesses and industries. Government and other stakeholders, including educational institutions, need to support businesses, workers, and students in embracing technology more fully, and incorporating it in their operations and work. By accelerating such efforts to incorporate digital adoption across all economic sectors, Malta will be in a better position to seize the opportunities that the future will bring. More importantly, Maltese firms will be able to seize growth opportunities, reap efficiencies, boost productivity, and ultimately contribute to improved economic outcomes in the medium-term.

Commit

An accelerated digital transformation will require a significant commitment from Government as a prime mover and supporter of the process as well as from the firms themselves. Government has already committed a significant percentage of Malta's Resilience and Recovery Plan to enable the digital transformation. However, for it to be truly transformative, firms and industry leaders need to commit themselves too undergoing such a digital transformation and that is why Government needs to be a key catalyst and enabler to support them embark on such a journey through funds and incentives. The concept of digital transformation charters and toolkits should be considered to support and enable the commitment required from industries.

Transition

Digital transformation is all about a transition from a current to a future state. This requires resources to be able to manage this transition on an infrastructural, process and skill level. Given the deep shifts that digital transformation requires, the transition might not be so easy for several firms and workers and therefore Government needs to actively support such a transition by helping firms transform themselves through schemes and financial help. Upskilling programmes that allow workers to transition into the new realities and requirements demanded by a digital economy also need to be encouraged and incentivised.

The key enablers that have been identified as critical for Malta to lead with digital transformation across industries and to allow the country to achieve the above stated goal are:

1. Talent & skills
2. Research & innovation
3. Finance & incentives
4. Infrastructure & security
5. Policy & governance

The following sections will focus on the identified key enablers and the recommendations under each which are crucial in delivering on the strategic priorities for digital transformation.

Twenty-five recommendations covering five distinct key enablers are being proposed as strategic actions in transforming Malta into a digital economy.

6.2 Talent & skills

Digital transformation is driving changes in the skills profile required by industry across different sectors. As the results of the Digital Transformation Readiness Index show, the need to invest in people from basic digital literacy to sector and technology specific skill sets will be critical for Malta going forward. The demands on the current and future workforce will be significant and it is imperative that the workforce is well-prepared to be able to meet the challenges that transformation brings about as well as to seize its opportunities too.

For future workers, our educational systems need to be digitally focused and designed with the aim of equipping students and the future workforce with the digital savviness and tools required to succeed in a digital economy and society.

Upskilling and reskilling will be required to develop skills that are complementary to current and future technologies. This is the most effective way to protect people rather than just jobs, and industry-led courses will play a key role in this.

From the Index, it is also evident that management and leadership teams also need to be equipped to understand the potential benefits, opportunities, and challenges to allow them to envision and implement digital transformation journeys in their respective organisations.

Recommendation	Strategic Action
1	Provide support to firms that upskill their existing employees through digital transformation courses, at all levels, including managerial-level capacity.
2	Support industry-led training to ensure that courses are in line with industry requirements.
3	Introduce a sectoral digital skills audit across firms and employees as part of the announced skills census.
4	Launch schemes and popularization campaigns that incentivise students to follow STEM paths.
5	Leverage European funds, particularly the European Social Fund, to help employers and employees in their digital skill training requirements.

6.3 Research & innovation

In a digitally transformed era, research and innovation will no longer be a luxury but more of a necessity. For firms and the economy to remain competitive and attractive for investment and growth, research and innovation needs to be engrained in the business, industry, and economic fabric.

Research and innovation require ecosystems that are holistic in nature and that span across sectors. Therefore, a dedicated focus on research and innovation needs to be developed so that the right environment is conducive to such investments. In addition, research and innovation need to percolate throughout business structures including SMEs and microenterprises. Government needs to play a key role in ensuring that this ecosystem is a success and will contribute to enhancing productivity.

However, digital transformation also entails the softer side of innovation. The disruptions underway are already impacting business models and operations and therefore leadership teams of firms require the space to innovate business processes and models through iterative creative processes too.

Recommendation	Strategic Action
6	Given the lack of awareness of some of the main sector-specific technologies, sectoral demonstrator sites could be explored and aimed at allowing companies to learn about such technologies and how they can apply them to their operations.
7	Provide support to firms to develop technology-driven pilot projects such as automation processes, robotics, and artificial intelligence in collaboration with educational institutes that would also act as exemplars to other firms.
8	Enhance the awareness surrounding digital transformation opportunities for specific sectors that are encountering challenges such as agricultural and construction.
9	Develop more collaboration between academia and private sector especially through traineeships and dissertation projects which can serve as pilot transformation projects.
10	Gozo has the potential of becoming a living testing hub for new technologies including drones, agri-tech and relating to smart buildings and mobility. Establishing a dedicated research centre can support this potential.

6.4 Finance & incentives

Digital transformation is a costly exercise and the results of the Digital Transformation Readiness Index highlighted this as being a main barrier when it comes to implementing transformation projects.

To support such investments, the Government has already issued several schemes which have allowed companies to seek advisory services in relation to business transformation as well as additional schemes, including European funded ones, to support the investment required. Maltese companies have traditionally accessed internal funds and bank facilities for such investments.

European funding remains a critical source of investment support through the various schemes and programmes administered by the Maltese Government. The Recovery and Resilience Fund will be an important catalyst in this field given the commitment made towards digital investment support.

Having specific funding schemes and incentive packages aimed specifically at digital transformation will allow firms to engage in such projects and investments further contributing to improved productivity and economic outcomes.

Recommendation	Strategic Action
11	Develop a Digital Transformation Loan Scheme together with the Malta Development Bank to ensure access to financing for transformation projects.
12	Launch a multi-annual EU-funded grant scheme targeting digital transformation for companies to implement specific projects across several sectors.
13	Continue the current support packages aimed at providing technical advisory and expertise to organisations on digital transformation.
14	Line Ministries should invest on digital transformation with a view to catalyse this transition and to support the specific sector.
15	Support the Gozitan economy and enterprises through additional support packages as digital transformation can allow companies to enhance their resilience to double-insularity.

6.5 Infrastructure & security

Digital transformation requires a mixture of both general purpose and communication infrastructure and application-specific devices. As we become more interconnected through different devices, internet connectivity and communication is going to become ever more critical for individuals, firms, sectors and economies. Therefore, continuous investment in network connectivity and strength of connection will be critical for any country.

Apart from the need of having national infrastructure, sector-specific infrastructure will be central to deploying digital transformation and therefore Government needs to ensure that such sectors have the necessary infrastructural backbone to able to deliver on digital transformation too.

Finally, but critically important, is the need to have a strong focus on cyber security. As more of our daily lives, production and commerce are done digitally; there is going to be a large volume of critical and sensitive data generated which calls for stringent data security requirements and a robust cyber security framework given that the increased and heightened threat of cyber threat. Having national but also at firm level cyber security solutions will be critical going forward and considered to be of utmost priority.

Recommendation	Strategic Action
16	As operators continue to roll-out 5G networks across the island to tap into the potential of national digital transformation, Government should support the creation of testing environments for IoT technologies especially around the concept of smart localities.
17	Prioritise cyber security on a national level and treat it as a national security risk.
18	Create awareness at firm level on cybersecurity and launch schemes to support security audits and capacity enhancement in firms and industries.
19	Government needs to engage with economic operators to understand whether any sector-specific infrastructure is needed to facilitate digital transformation in specific sectors.
20	Facilitate digital infrastructure audits for industry to assess their infrastructural capacity to embark on digital transformation.

6.6 Policy & governance

The Government has a critical role to play in improving the business environment or framework conditions for digital transformation.

Given the pervasiveness of the digital transformation across our economy and society, there are a broad range of framework conditions that need to be in place to support an inclusive and sustainable transition.

In addition, given the broad transformation opportunities that are available, close alignment of various policies and strategies are needed to ensure sectoral synergies. To this end, a specific focus on implementation and support is required to ensure that the vision translates into action and results. Close coordination between different Government entities and Ministries will be critical going forward as well as deep stakeholder consultation to ensure that sectoral needs and challenges are not only understood but also addressed.

Recommendation	Strategic Action
21	Launch a national industry 4.0 strategy to truly leverage Malta's potential as a value-added manufacturing centre of excellence including areas such as 3D printing and additive manufacturing.
22	Together with the Local Council Association start a process to develop a smart city vision for Malta's villages and launch pilot projects.
23	Develop an open data portal on a national level to spur analysis and innovation that is evidence-based. This should be a government-wide project which brings together all data across different domains and satisfy the Once-Only principle criteria thus minimising the burden on business whilst maximising the use and re-use of publicly-held data for decision-making and analysis.
24	Digital public services are often a foundational element for broader digital transformation and Government needs to continue with the design and delivery of digital public services. Specifically, regulators need to truly embed Reg Tech in their operations.
25	Data governance and rights are critical. Government needs to continually review its legal framework and enforcement mechanisms to ensure that data governance is given the needed priority and focus by all public and private entities and authorities.

7.

Conclusion

Despite remaining fragile and with risks remaining on the downside, the economic recovery continues to gain momentum as countries focus on supporting investment, implementing reforms and on steering the economy towards a more productive path.

COVID-19 has highlighted the centrality and importance of building and sustaining digital economies and societies. To this end, in their focus to build back better, governments, heavily supported by the European Union and its Resilience and Recovery Fund, have focused on digital transformation together with greening the economy.

Digital transformation is being seen as having the potential of disrupting all economic sectors as various general-purpose technologies are coming together in a hyperconnected world and which can therefore support productivity gains.

This report is based on the premise that digital transformation, if embraced and harnessed, can transform companies, sectors, and economies. To this end a Digital Transformation Readiness Index was developed and rolled-out to capture the state of digital transformation across all economic sectors in Malta.

The Index has highlighted several gaps in this regard especially in relation to the skills required, the knowledge and awareness of the different technologies as well as the capability and capacity of firms to truly implement digital transformation projects and processes.

Through this granular data, the report twenty-five focused recommendations spread over five key enablers which will support Malta's path towards digital transformation. Supported by the EU's Resilience and Recovery Fund and Malta's specific Resilience and Recovery Plan, which is digitally focused, Malta has the potential to fully embrace and harness the power of digital transformation.

Improving productivity is not only an important economic goal, but it can improve the quality of jobs and lead to an improved quality of life. It remains an important concept that needs to be understood and analysed properly. To this end, it is also being recommended that apart from this annual report, the National Productivity Board establishes a research programme and collates supporting datasets to assess and benchmark the driving factors behind productivity differentials between firms, and particularly Maltese firms, to build a broad evidence-base for further enterprise policy intervention. One such stream of research will be to further refine the proposed Digital Transformation Readiness Index and to have an annual report which can benchmark and trace sectoral developments towards digital transformation.

Organisations, sectors, and countries are reimagining, reshaping and retooling for a new era driven by fast technology developments which are impacting our daily lives, employment, consumption behaviours, business models and production processes. Embracing digital transformation has become a matter of survival and if harnessed fully, it can lead to productivity enhancements, improved growth and employment opportunities and better economic outcomes that ultimately can lead to improved quality of life.

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