

National Research and Innovation Strategy

20 20

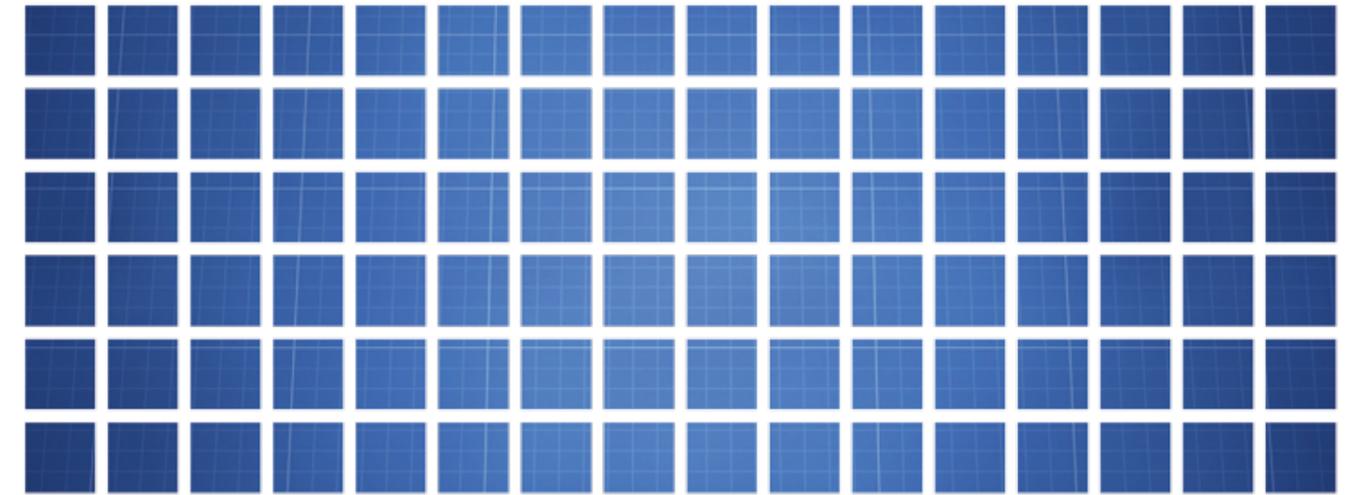
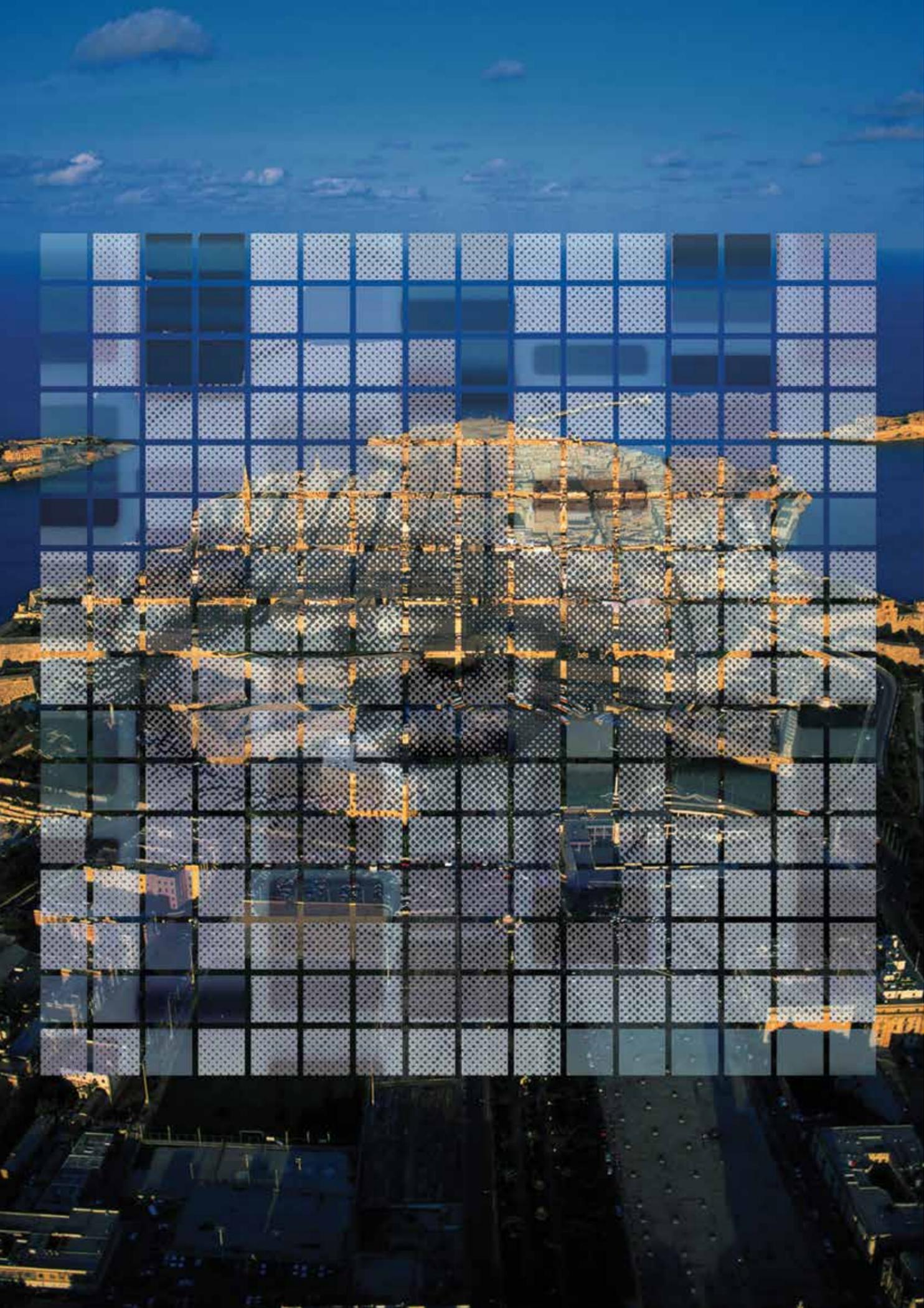
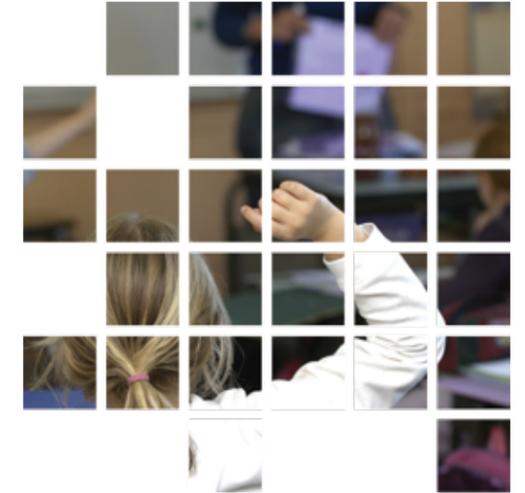


Table of Contents

Forewords	5-7
Acknowledgements	8
1. Our Vision	9
2. The Maltese economy and its R&I system – an overview	10
3. Malta in the international arena	12
4. SWOT analysis of the Maltese R&I system	13
5. Our goals	15
5.1 Linking our vision, mission and goals	
6. Achieving a comprehensive R&I support ecosystem	16
6.1 Increasing the effectiveness of the delivery system	
6.2 Strengthening the capacity of entrepreneurial actors to innovate	
6.3 Ensuring a seamless chain of support	
7. Achieving a stronger knowledge base	18
7.1 Investing in human capital	
7.2 Investing in research infrastructures	
8. Achieving smart, flexible specialisation	20
8.1 Identified specialisation areas	
8.2 Actions and action lines	
8.3 ICT as a horizontal enabler	
8.4 R&I opportunities in Rural Development	
9. Reviewing and updating this Strategy	24
9.1 Setting targets and measuring progress through indicators	
9.2 Communication management, co-design and coordination	
9.3 Knowledge-based policy design	



Message from the
Hon. Evarist Bartolo
Minister for Education and Employment



Education as an Enabler of Innovation

I truly believe in more awareness at all levels, in government, business and society, of the role of innovation in improving the quality of life and competitiveness.

The concept of the knowledge triangle is a widely known model representing the valorisation of interactions between research, education and innovation. Despite this, while the linkages between research and education and between research and innovation are the subject of much discussion and debate in both academic and public policy circles, the linkage between education and innovation seems to receive a lower degree of attention.

However, education plays a crucial role in innovation, as amply demonstrated by this Strategy, which places emphasis on the importance of an education system which nurtures a mindset that is receptive to novelty and creativity.

Not all students go on to become researchers. Not all innovation requires research. But all innovation requires questioning the current thinking and practices, challenging the status quo, looking at things from a new perspective, trying something new and having the courage to introduce change.

When looking at innovation in this wide context, two drivers of innovation become obviously apparent: first, the importance of creating a culture in our education system to support this way of thinking, and second, the role that all academic disciplines, be they the traditional sciences, the social sciences or the humanities, play in making innovation happen.

Our education system must reflect new social and economic models, with less focus on quantity, uniformity and learning through 'knowledge delivery' to focus more on differentiation, quality and fast learning and adaptability as a transformative process.

I see this Strategy as an opportunity to embrace a paradigm shift in the way we invest in our future citizens and workforce. We need to ensure an education system which adequately shapes future human capital to respond to new challenges and opportunities through an innovative mindset.

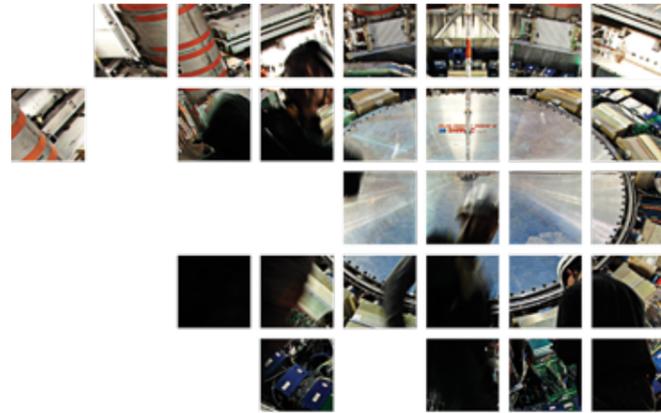
Education, in all its forms and at any stage, is a major driver of cultural change. I truly believe in more awareness at all levels, in government, business and society, of the role of innovation in improving the quality of life and competitiveness.

I therefore welcome this new National Research and Innovation Strategy 2020 and look forward to its implementation in the coming years in order to truly embed innovation in our national culture.

We all stand to gain from it.



Message from the
Hon. Chris Agius,
Parliamentary Secretary for Research, Innovation, Youth and Sport



Malta's Innovation Capability: Crucial for an Emerging Economy

We are living in a world that is constantly changing.

Over the last few decades, we have witnessed emerging new economies rise to become leaders, diversify, and innovate and creating new models and high quality jobs.

The one thing that these economies have in common is their ability to innovate and create a culture that encourages continuous change.

Malta's innovation capability is crucial to realising our vision to become leaders and continue to compete with these emerging economies.

We need also to recognise that innovation is critical for achieving sustained growth, in delivering consistent value in this changing economic environment and in creating the best conditions for

policy and by strengthening our innovation climate that will transform Malta into a leading global knowledge society and into one of the most innovative countries in the Mediterranean.

This will require strong commitment, collaboration and leadership from the government, business and academia. As the Parliamentary Secretary responsible for Innovation, I want to be part of this transformation and invite all stakeholders to join me and be part of this long-term goal.

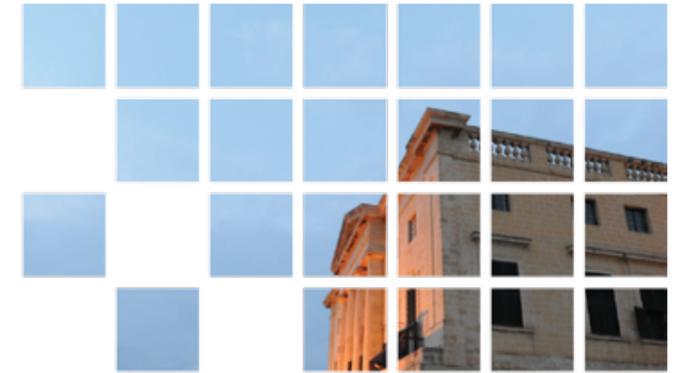
individuals, businesses, public sector and civil society to be more creative and innovative.

This strategy presents a strong long-term commitment on how we can create this climate, one that contributes to a more innovative society through collaboration, knowledge; skills and creativity. The strategy has been developed in a broad dialogue with many stakeholders including public entities, the industry and social partners.

This is not an end in itself: this is just the start of a long journey. Our commitment as a government is to continue to encourage and support innovation through public



Message from
Dr Jeffrey Pullicino Orlando,
Executive Chairman of the Malta Council for Science and Technology



The Role of The Malta Council for Science and Technology in making this Strategy's Vision a Reality

We need to work together to provide a seamless support network for R&I. We cannot afford to duplicate efforts.

In the development of this Strategy we have been supported in different ways. The Council's Board of Directors provides an array of representation among the various stakeholders. Bilateral meetings with over twenty public entities and social partners as well as numerous focus groups with the private sector have helped shape this document. We are particularly happy with the extent of involvement and participation of the private sector in the development of this Strategy.

These industry representatives, from micro-enterprises to large companies and from a variety of sectors, took time out of their busy schedules to speak to us about their experiences, their insights and the kind of future they see for their economic sector. We are grateful for their invaluable contribution, and we want to repeat these structured exchanges every few years as we believe they are of mutual benefit.

This collaborative spirit needs to be maintained and strengthened in the coming years as we endeavour to put in place the activities, programmes and projects necessary to realise the objectives of this Strategy.

It is with great pleasure that The Malta Council for Science and Technology is launching this new National R&I Strategy 2020. This document is the culmination of years of hard work by The Malta Council for Science and Technology and many other players (both public and private), who are truly deserving of our gratitude for their continued support and collaboration.

This Strategy is a national one, providing a common strategic direction. Its realisation depends on the commitment of time, money and resources by all stakeholders. The Malta Council for Science and Technology cannot achieve the objectives set by this Strategy alone. Research and innovation span across a wide array of contexts and issues – education, entrepreneurship, intellectual property management and access to finance, to name a few. Therefore initiatives to address bottlenecks and stimulate innovation need to address this array of policy areas holistically.

In the coming years, The Council's role will be to champion this Strategy, supporting its implementation by key players as well as taking direct responsibility for part of its implementation. The Malta Council for Science and Technology will also drive the evaluation of the Strategy and its regular update. Other entities will also play a crucial role in achieving the goals of this Strategy. We need to work together to provide a seamless support network for R&I. We cannot afford to duplicate efforts.

I truly look forward to working with all players in order to achieve the mission of this Strategy, that of providing an enabling framework for strengthening Malta's economy in the years ahead through research and innovation.

Acknowledgements

The Malta Council for Science and Technology would like to thank all the Ministries and public entities who provided input to this Strategy through bilateral meetings with The Council and through the submission of feedback to the draft Strategy.

The Malta Council for Science and Technology extends its gratitude to the many social partners and industry representatives who were consulted on a bilateral basis.

The Malta Council for Science and Technology is very grateful to all private individuals and companies who participated in the various focus group meetings. The commitment and dedication shown (with some participants being present for numerous sessions) is greatly appreciated. The Council extends its gratitude to all public representatives and academics for their participation in the focus groups.

The Malta Council for Science and Technology is also thankful for the feedback received through the public consultation and for the willingness of respondents to engage further with The Council to provide additional clarifications and information when this was sought.

Finally, The Malta Council for Science and Technology would also like to thank the S³ Platform of the Joint Research Centre, DG REGIO (European Commission) and Prof. Luke Georghiou for their support.

1 - Our Vision

Knowledge- and innovation-driven economies are sustained through a long-term, ambitious vision based on sustained investments in research and innovation. This entails the engagement of all players and stakeholders to ensure coherence and coordination of efforts undertaken.

Experience has shown that countries with consistently high investments in research and innovation (R&I) tend to cope better with economic turmoil and are generally more able to sustain a high standard of living. Malta has still a long way to go before it reaches this level of investment in R&I, however efforts are being stepped up to boost investments in line with its absorptive capacity and through efficient use of funding.

The aim of this document is to set out Malta's research and innovation strategy for the forthcoming seven year period. Recognising the progress made over the last years and acknowledging that there is still a way to go in achieving the objectives set out in the 2007-2010 R&I Strategic Plan, the ultimate goal of this Strategy remains that of embedding research and innovation at the heart of the Maltese economy to spur knowledge-driven and value-added growth and to sustain improvements in the quality of life. The more that our public and private enterprises invest in research and innovation in the delivery of more innovative, eco-efficient products and services, the more the economy can develop and grow in a sustainable manner which protects human health and the environment, whilst becoming more resource-efficient, competitive, and attractive to foreign investors. Strengthening the link between national investments in R&I and efforts to address the challenges which our society is facing is thus also critical.

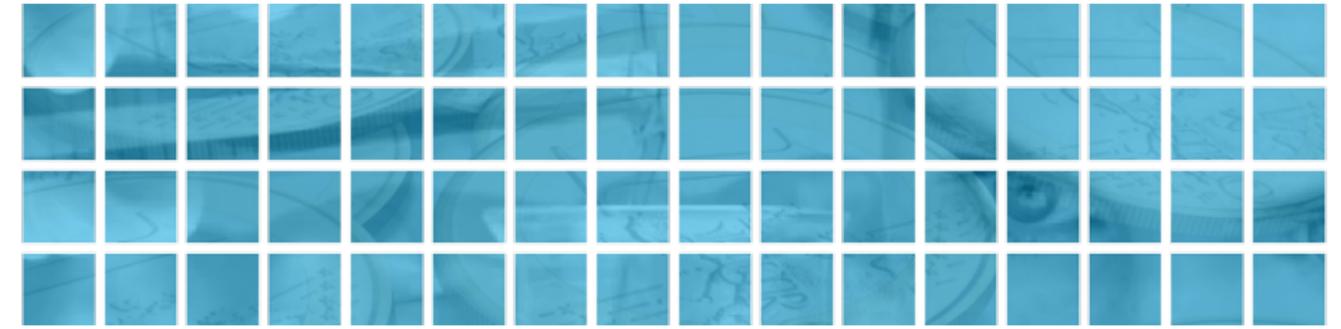
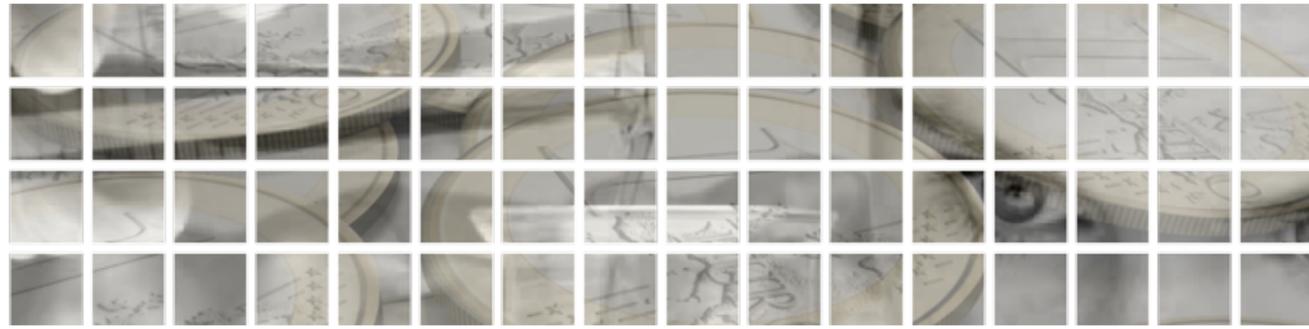
In this vision, research and innovation are placed as central pivots of our drive to become a knowledge-based economy and society. In order to do so, Malta needs to graft R&I within its economic and supporting institutional fabric. This vision also acknowledges that R&I are not end goals in themselves but a means to address social and economic challenges and to improve Malta's economic competitiveness. This approach is in turn dependent on a clear policy framework which identifies Malta's economic, social and environmental goals as well as the role of innovation and research to achieve these.

The mission of this Strategy is to provide an enabling framework for achieving this vision, building on past achievements as well as lessons learnt along the way. This Strategy and its implementation do not, by themselves, provide all the building blocks of a knowledge-based economy but are a crucial step towards this goal.

Initiatives over the past years can be largely categorised under one or more of the following headings: framework conditions, capacity building and specialisation.

Measures to improve 'framework conditions' include tax incentives and grant schemes for industry; capacity building measures include investments in laboratories and equipment and postgraduate and doctoral scholarships. Initiatives falling under the last category include the National R&I Programme, the Life Sciences Park and the Digital Gaming Strategy among others.

Throughout the implementation timeframe for the present Strategy, the overarching mission will remain that of building and sustaining an enabling framework for R&I.



2 - The Maltese economy and its R&I system - an overview

With a Gross Domestic Product (GDP) of €6.58 billion (in 2011) and a population of just over 416,000 living in an area of 316 sq. km., Malta is one of the smallest and most densely-populated countries in the world. With an average trade-to-GDP ratio of 82% since EU membership in 2004, it has the second most open economy in the European Union. Coupled with its narrow export base, this makes the country highly susceptible to external shocks caused by changing levels of demand and economic fluctuations.

Over the last decade, the Maltese economy underwent a gradual change from manufacturing towards services. While tourism and electronics remain important pillars of the local economy, other sectors have emerged over time, such as aircraft maintenance, financial services, on-line gaming and pharmaceuticals, indicating a shift in the economy towards higher value-added sectors and sectors which are more knowledge intensive.

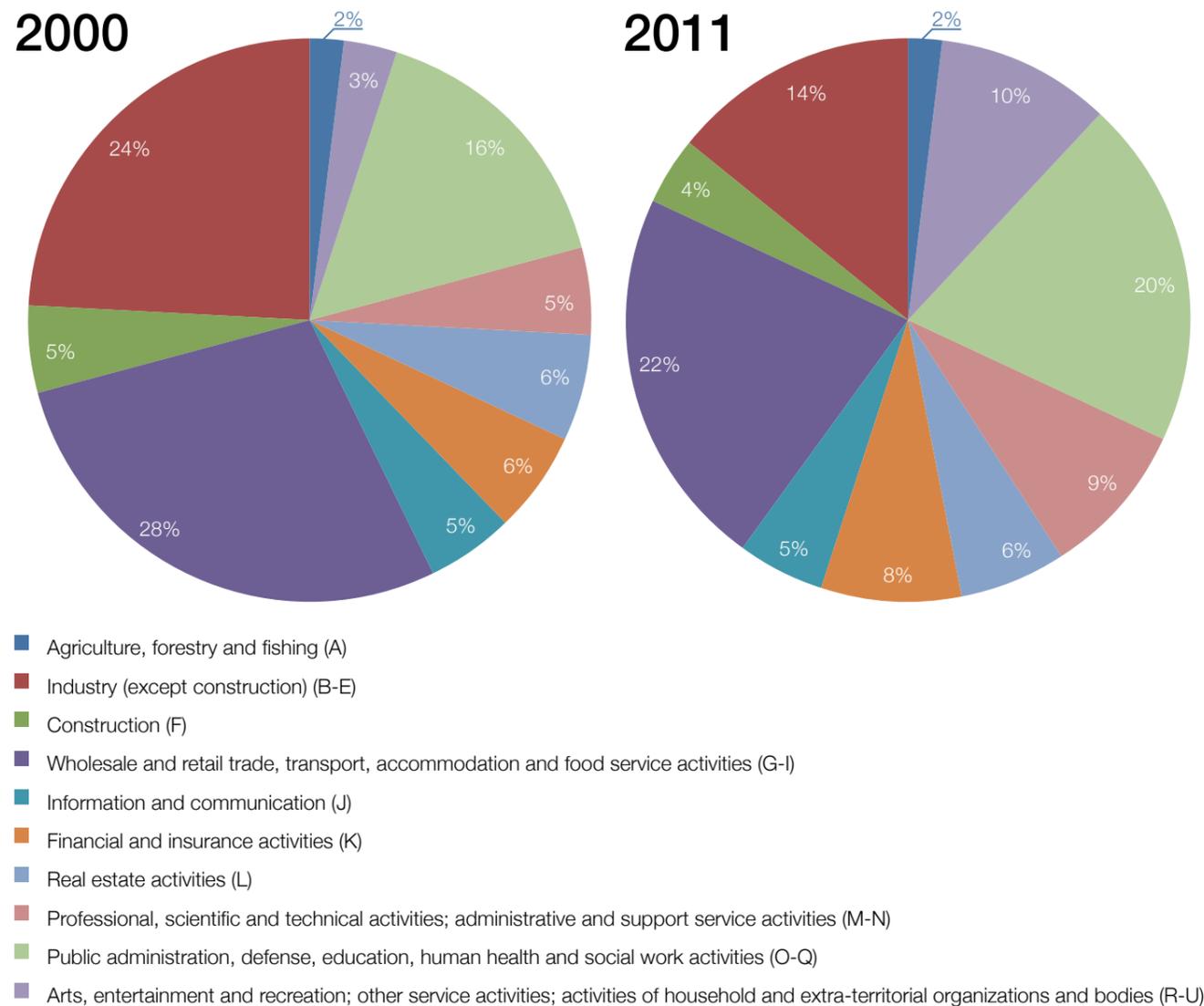


Figure 1. Change in share of gross value added over time in the Maltese economy

Gross value added (GVA) in the Maltese economy increased by 45% over the period 2000-2011, however there were significant shifts in the contribution of different sectors to this overall growth, with an increasing contribution from the services sector and a decreasing contribution from industry, wholesale and retail trade, transport, accommodation and food services. Looking at the distribution of the registered employed over the 2000-2011 period, there was a shift in employment levels in the different sectors, in particular away from the industrial sector to the professional, scientific and technical activities as well as to the art, entertainment and recreation activities. Sectoral trends in employment are similar to trends noted for GVA figures.

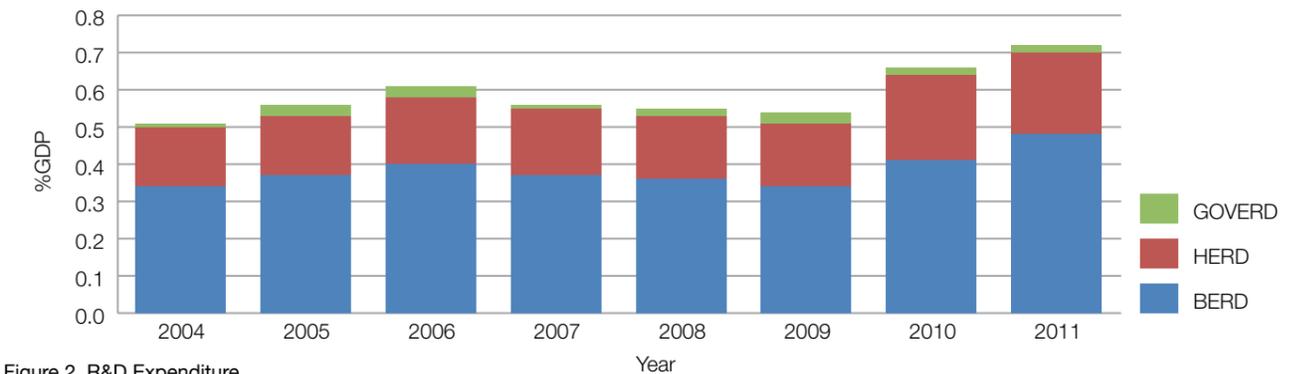


Figure 2. R&D Expenditure

As illustrated in figure 2 above, gross research and development (R&D) expenditure as a percentage of GDP remained largely stable over the 2004-2009 period, averaging around 0.55% until 2010 (and again in 2011) when it increased significantly (to 0.66% and 0.72% respectively) due to capital and recurrent expenditure increases in the higher education sector. In addition, provisional data for 2012 indicates a gross R&D expenditure of 0.84%. Business R&D expenditure accounts for roughly two thirds of total R&D expenditure, with the public sector (of which the academic sector contributes the largest portion) accounting for the rest. Cross-funding of R&D between the public and private sectors remains very limited.

Data on PhD holders is collected through the National Labour Force Survey. Figures indicate significant increases over the past years (from 375 in 2006 to 858 in 2012). However, these numbers are still likely an under-representation of PhD holders in Malta.

The private enterprise sector remains characterised by a high predominance of micro-enterprises (97% in 2011), whose disposition towards R&D and innovation investment is often hampered by issues of economies of scale, limited cash flows and vulnerability in the face of riskier R&D and innovation activities. In fact, private sector R&D activity in Malta is largely confined to a small number of large foreign direct investments (FDI) and foreign enterprises play a significant role as innovation investors. In the manufacturing sector, the majority of enterprises (91.69% in 2011) are engaged in medium to low and low tech activities, with only 8.32% (in 2011) of manufacturing enterprises falling within the high-tech or medium to high-tech categories.

In the services sector, the number of enterprises classified as 'knowledge intensive' increased from 31% in 2006 to 35% in 2011. Local studies highlight the limited capacity and readiness of the majority of local firms for research and innovation, and the primary focus on improvements in existing rather than developing new products/services, and targeting the local rather than the international market. The majority of firms are still reluctant to invest in collaborative R&I activity with other firms and knowledge suppliers due to concerns over loss of intellectual property as well as a lack of internal capacity (trained human capital and resources) to manage these collaborations.

Most research in the higher education sector takes place at the University of Malta. In 2011, this research accounted for 0.22% of Malta's R&D expenditure. The University of Malta caters for around 11,000 students, including 650 international students from 77 countries. Around 3,000 students graduate in various disciplines annually.

At just over €1.5 million expenditure in 2011, research in the central government sector is negligible, and accounts for only 0.02% of Malta's R&D expenditure.



3 - Malta in the international arena

Various scoreboards, indices and reports which seek to measure competitiveness and innovation are published on a regular basis at European and international level.

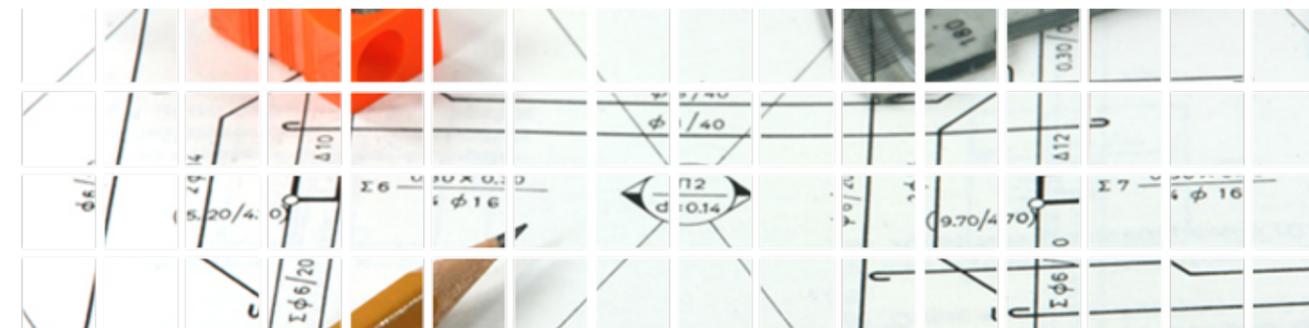
The World Economic Forum Global Competitiveness Report 2013-2014 ranks Malta among the 37 economies classed as being in the innovation-driven stage of economic development and is ranked 41st (out of a total of 148 countries) in the Global Competitiveness Index (up from 47th place in 2012-2013). Services account for 65% of GDP in contrast with 13% linked to the manufacturing industry, 19% linked to the non-manufacturing industry and 2% linked to agriculture. When compared to other innovation-driven economies, Malta's main shortfalls relate to market size and innovation. Malta ranks 42nd on innovation factors compared to all other countries. When compared to the other EU Member States, Malta ranks 18th on innovation factors. Comparing Malta's innovation score to that of other countries bordering the Mediterranean Sea (for those where data is available), Malta is ranked in 6th place. Attempts to compare Malta's innovation to other microstates in the world (assuming a microstate to be one with a land area of less than 1000km² and fewer than 500,000 people) were unsuccessful, as data was available for only a small number of such states.

The EU Innovation Scoreboard 2013 ranks Malta among the moderate innovators (placed 22nd out of 27 Member States), largely due to shortfalls on the supply side in relation to human capital and R&I investments. While innovation performance needs to improve substantially for Malta to catch up with other small European member states, Malta is among the top 5 European countries registering a considerable growth in innovation performance (over 3%) between 2008 and 2012.

When compared to larger countries, small countries show a higher level of internationalization which impacts on their policy development and R&I collaborative activities. International rankings often serve as the sole reference point for small countries when designing their policies and strategies. In recent years, the international aspect of R&I in Malta is increasingly being shaped by membership of the European Union (EU). The latter's drive towards common European goals in R&I often contrasts with the diversity among EU member states in terms of size, geographical location, economic structure and maturity of the R&D system and restricts the direct applicability and transferability of R&I policy approaches from one country to the other. In many cases, each country has to find its own way to contextualise the EU-level policy dimension into national policy and strategy and tailor its responses and activities accordingly.

As a country which is still developing its R&D activity, Malta's collaborations are largely 'under construction' and the collaboration profile is evolving over time. An important component of Malta's international R&D collaboration activity is its participation in the EU's Framework Programme for Research and Technological Development (FP). To date, Malta has obtained over €17 Million in funding from FP7 which is a very significant figure compared to the national funding available for R&I. Nevertheless although Malta has a very high participation per capita, the funding received is one of the lowest per capita from EU Member states with few roles and tasks being of a significant or strategic nature. Also, Malta participates very actively in the COST programme which allows for participation in top research networks and which gives the opportunity to local researchers to actively engage with some of the best researchers in Europe.

As a member of the European Union, Malta is committed to the achievement of the European Research Area and to the Innovation Union objectives because these represent an opportunity to capitalise on the strengths of the single market by extending its freedoms to knowledge and innovation. In playing its role towards these visions for research and innovation, Malta actively participates in several forums at European level and endeavours to translate the European goals and vision into actions which fit Malta's contextual framework.



4 - SWOT analysis of the Maltese R&I system

The overview of Malta's R&I system and its international context, as outlined in the previous chapters, provides various insights of Malta's strengths and weaknesses in R&I.

Strengths

At a macro level, Malta's stable political, economic and financial system is an important asset. The establishment of a number of high value-added economic sectors such as pharmaceutical manufacturing, gaming and financial services is a positive development which, however does not necessarily translate automatically in an increase in innovation activity. This economic shift is therefore a strength which needs to be exploited wisely in order to increase indigenous innovation activity in Malta.

Weaknesses

Malta's R&I system is very young and very small, two characteristics which are reflected in fragmentation and sub-optimal critical mass. There is also a lack of home-grown, R&I-intensive private sector companies. Public research institutes are largely inexistent, and there are no large scale research infrastructures. This means that, while efforts at increasing human resource capacity in R&D have been ongoing for a number of years, there is still little to attract local and foreign researchers. Private financial support remains a major concern. The lack of an R&I culture and a 'quick-win' mentality mean that R&I is perceived as something extraneous or ancillary, the value of which is highly overlooked.

Opportunities

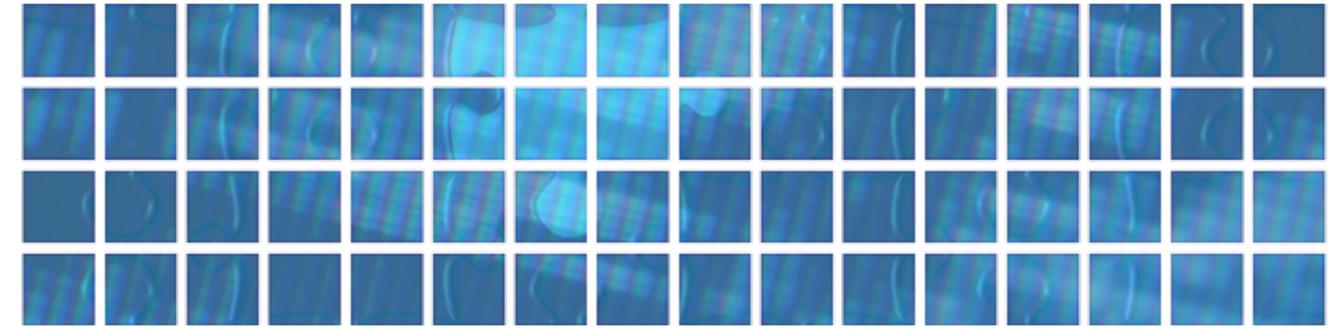
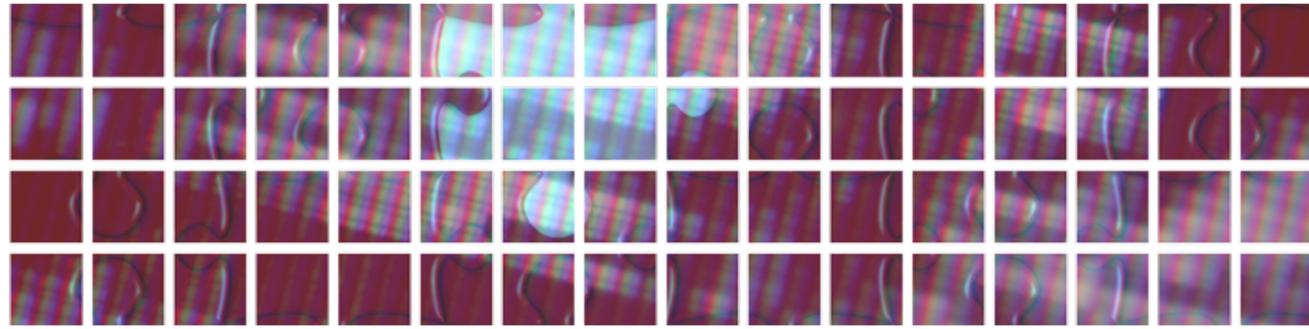
The dichotomy of established high value-added economic sectors with low indigenous, private-sector R&I investment provides an opportunity to be explored in terms of bridging the gap between these two realities. Malta's geographic location and its EU membership provide an opportunity to build and foster more international linkages with foreign research groups and R&I intensive companies. The magnitude of the internal market also allows for improved economies of scale. Malta's small size is often recognised as an opportunity for promoting Malta as a test-bed for new technologies prior to roll out on a larger scale. Diasporas of Maltese researchers, innovators and entrepreneurs are another opportunities to be harnessed in strengthening international linkages.

Threats

Because of its open economy and susceptibility to external shocks, international economic, political and financial instability is a threat to Malta's economy in general and to its R&I system as risk aversion increases further in such

circumstances. Brain drain remains an ever-looming threat as larger countries, with more established R&I systems, better facilities and resources remain a more favourable avenue for local researchers willing to relocate abroad. Another important threat remains the general skew of EU policy approaches towards larger countries or countries with more established R&I systems, making it very difficult to scale these policies down to a micro-state level.

Over the last decade, a number of measures have been introduced to address Malta's challenges in R&I using both national and European funding. The present Strategy aims to further elaborate a framework for the achievement of this Strategy's mission within the context of identified strengths and opportunities as well as threats and weaknesses. The mission of this Strategy is to provide an enabling framework for embedding R&I in Malta's economic and social fabric. It aims to build on past and present efforts and their outcomes, available statistics and studies as well as extensive input from government entities, academia and the private sector.



5 - Our goals

This Strategy is the product of consultation and coordination between all relevant ministries, bodies and agencies as well as the private sector, private sector representatives, academia and social partners. There is general consensus that:

1. There are building blocks of an R&I ecosystem which Malta still needs to put in place or strengthen, for the benefit of all actors.
2. The business focus and innovation orientation of Malta's R&I system is largely supported. However, it is also acknowledged that achieving the longer-term vision of this Strategy requires more investment in Malta's core knowledge base.
3. Malta should seek R&I specialisation in a number of areas where it has a clear competitive advantage. Given Malta's small size, it is however important to retain flexibility to respond to the dynamic economic and social landscape.

Our goals are therefore three:

1. A comprehensive R&I support ecosystem

Over the past years, several measures have been put in place to provide support to R&I activities. These range from grant schemes to tax credits to cluster support and competitive funds for collaborative projects. Yet consultations still indicated that either some of the building blocks (venture capital funds and support for patenting were often mentioned) remain missing, insufficiently adequate and/or insufficiently accessible. This Strategy recommends a thorough evaluation of the existing support system in consultation with the private sector. This will be pivotal to ameliorate existing support systems and augment them so as to obtain a seamless support framework from one stage to the next in the innovation process. The pursuit of a comprehensive R&I support ecosystem mitigates the risks of specialisation by ensuring an adequate framework is in place to support all opportunities, wherever they arise. The establishment of a continuous monitoring and evaluation process would also ensure that as this support framework gives rise to new specialisations, these will be rapidly captured and capitalised upon.

2. A stronger knowledge base

As a country which recognises that its human capital is its most important resource, Malta must continue its economic transformation to a knowledge-based economy in order to sustain its living standard and employment levels. To this end, important outcomes of the 2007-2013 programming period for Structural Funds included the strengthening of research infrastructures and the investment in human capital at postgraduate and doctoral level. These investments have provided a basis for the academic sector in Malta to upgrade its research capacity. Consultations with academia indicate a need for further investment in infrastructure, doctorates as well as post-doctorate positions in order to gradually build the necessary critical mass to better compete internationally. Furthermore there continues to be a problem of fragmentation within

the academic sector, which the country simply cannot afford. Efforts should be made to consolidate and valorise research within strong academic disciplines, particularly through future investments to be undertaken.

Consultations with the private sector indicate a high degree of support towards investment in the local knowledge base as the source of Malta's future workforce, innovative ventures and solutions to local challenges. This Strategy therefore recommends increased efforts towards collaboration within and between academic disciplines in order to garner the level of critical mass needed to be successful in the international arena. This effort at collaboration should be done through further investment in infrastructures as well as doctorate and post-doctorate support.

3. Smart, flexible specialisation

As a small country with a young R&I system characterised by very limited resources, Malta needs to balance the establishment of a fully-fledged R&I support system with the need to focus its resources on a reduced set of priority niche areas selected on the basis of unique selling points and indigenous strengths. In principle, such a framework enables a country to build capacity in certain areas which in turn creates a comparative advantage over other regions. This is the process of smart specialisation, which is a business-driven process encouraging investment in areas complementing the country's other productive assets in order to create future capability and comparative advantage. A small country can however become particularly vulnerable if it 'overspecialises' because high specialisation can be the result of R&I activities conducted by one or a few companies. This can make the country's economy particularly vulnerable to the activities of one or a few companies as well as external shocks which affect the competitive position of these companies.

For small economies, specialisation can be a double edged sword between the need to specialise and the dangers of specialisation, as there is no clear cut point indicating when 'enough' specialisation has been achieved. It is also important to support research and innovation at the interface between areas of existing strength by supporting cross-fertilisation of ideas, methods and outputs between the different areas. In identifying areas where Malta has potential to grow because of existing strengths, it will be important to support effective interaction between different priority areas. This may mean steering away from being over-prescriptive as to which specific, narrow niches within priority areas will be supported, but rather incentivise collaboration within and between different identified areas.

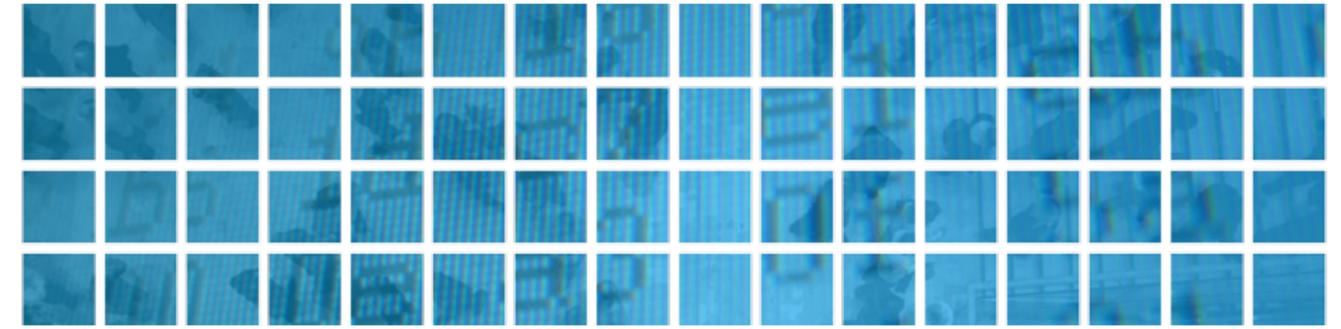
5.1 Linking our vision, mission and goals

Our Vision of embedding research and innovation as a central pivot of Malta's economy is a long-term objective which goes beyond the timeframes of this Strategy. Within the timeframes of this Strategy, the mission to be achieved is that of putting in place the necessary building blocks for achieving this long term vision. These building blocks are the three goals identified throughout the process of preparing this document. Each goal contributes to the achievement of the vision and mission in its own way:

- A comprehensive R&I support ecosystem in place would be an important building block towards Malta's transformation to a knowledge economy as it would facilitate innovative ventures to take shape and flourish. This support ecosystem would be independent of thematic specialisations, thus providing a baseline level of support for all players and embedding flexibility to support any new specialisation areas which emerge over time.
- Investing in a stronger knowledge base is to be seen as a longer-term investment, the fruits of which may or may not be reaped within the timeframes of this Strategy. This goal balances the overarching orientation of this Strategy towards close-to-market R&D and innovation by building capacity and excellence in the earlier stages of the R&D process. Given the magnitude of investments required and resource limitations, priority should be focused on identified thematic specialisations.
- Smart, flexible specialisation targets the establishment of a knowledge-based economy by prioritising its achievement in a number of thematic areas. It is a very innovation-oriented approach which however does not exclude the involvement of research activities. In addition, the prioritisation of long-term investments in a stronger knowledge base within identified thematic areas serves to embed stronger foundations over the longer term, thus consolidating the knowledge base of these thematic areas. Figure 3 below illustrates the relationship between the vision, mission and goals of this Strategy.



Figure 3. Schematic representation of the vision, mission and goals of this Strategy.



6 - Achieving a comprehensive R&I support ecosystem

Building a knowledge and innovation-driven economy requires a long-term vision based on sustained investments in research and innovation by both the public and private sectors. This entails coordinating public and private sector efforts and resources to develop an ecosystem for innovation-driven growth both to encourage local R&I and to attract R&I-based foreign investment. There is evidence that investments in R&I are increasing primarily in the public sector and our drive up to 2020 is to use national (public) and European resources strategically to leverage more effectively private sector investments and efforts in research and innovation. The ultimate goal is to generate innovation-based growth through the development of local and international partnerships as well as to attract more R&I based foreign investment into Malta.

While actions implemented over the past years have been rather successful and innovation performance has improved, the extent of innovation activity is still limited when compared with other small European member states. This is due to the scale and extent of investment, the design of the measures, the complex bureaucracy faced by local enterprise in accessing European and local support, and the light level of coordination between key players at all phases of implementation. The limited monitoring and evaluation of the overall impacts of these measures on the performance of the R&I ecosystem prevents the key players from learning more systematically how to improve the package and address gaps and shortfalls in assistance provided. These factors have led certain enterprises to consider carefully before engaging further in public sector initiatives to promote innovation (evident during business sector consultations). On the positive side, the academic sector has developed a more proactive approach in working more directly with business in the area of knowledge transfer, skills development, entrepreneurship and commercialisation. The actions to achieve the goal of 'a comprehensive R&I ecosystem' will focus on:

- increasing the effectiveness of the delivery system;
- strengthening the capacity of entrepreneurial actors to innovate;
- ensuring a seamless chain of support.

The implementation of measures arising from these action lines will be funded through national funds, European funds as well as other funds as appropriate and will seek to support innovation in its broadest sense, without any prioritisation to thematic specialisation areas and with particular focus towards indigenous R&I activities.

6.1 Increasing the effectiveness of the delivery system

Increasing the effectiveness of the delivery system will be based on three action lines:

1. *Up-scaling, extending and coordinating the level of support provided to business:* The level and extent of support provided to business needs to be up-scaled and extended to cover all phases from ideas to commercialisation. This requires more effective coordination between the key players responsible for the measures in order to target the appropriate level of support in each phase and ensure a smooth transition between phases, with reduced bureaucracy for business. The entities need to be better networked to allow them to work closely together in co-designing the plans and measures for this extended support framework. Joint initiatives to address human capital and skills requirements, access to market intelligence in R&I and access to knowledge and networks (local and abroad) are also requirements towards a seamless support network for business. Capacity-building for the key players involved in delivering these support services is a critical pre-requisite for proper levels of delivery and coordination to be achieved.

2. *Evaluation and monitoring:* Mechanisms for evaluation and monitoring of the support provided for R&I are to be introduced, in order to ameliorate and fine-tune existing support systems over time, with the aim of obtaining a seamless support framework from one stage to the next in the innovation process.

The pursuit of a comprehensive R&I support ecosystem mitigates the risks of specialisation by ensuring an adequate framework is in place to support all opportunities, wherever they arise.

3. *Embedding a culture for innovation, creativity, risk-taking and entrepreneurship:* A major driver of innovation is the local demand for and appreciation of innovative products, processes and services. A number of activities to instil a national culture for innovation have been introduced in recent years. However there are still areas of the economy which could benefit from innovative products, processes and services. There needs to be a stronger awareness at all levels, in government, business and society, of the role of innovation in improving the quality of life and competitiveness, thereby generating increased demand for innovation, particularly through public procurement.

Local experience to date indicates that whilst it is often more complex and time-consuming, procurement for innovation generates considerable benefits in terms of leveraging private sector R&I and providing greener, innovative and potentially cost-effective, public services.

4. *Using inward investment to leverage indigenous R&I:* Prioritising inward R&I investment to leverage indigenous R&I can also provide a means for increasing R&I demand. Foreign direct investment, estimated at €12.5 billion in 2011, accounts for a substantial part of the Gross Domestic Product. R&I based FDI can serve as a key driver in promoting innovation-driven growth. The demand for local R&I should also stem from existing and new FDI, who should be encouraged to liaise with Maltese academia and businesses to provide for at least part of their R&I demands.

6.2 Strengthening the capacity of entrepreneurial actors to innovate

Strengthening the capacity of entrepreneurial actors to innovate will be based on two action lines:

1. *Improved access to knowledge:* The readiness of businesses to invest in research and innovation depends primarily on the knowledge they can access, in-house and outside. Access to knowledge entails both the availability of skilled personnel (hence the importance of joint planning and adequate responses by the public and academic sector), and continued training in innovation management and investment readiness. Small local enterprises are often unclear as to what investors are looking for, how to 'sell' their innovative business opportunities to potential investors and how to manage innovation proactively. The poor quality of investment opportunities on offer detracts investors from investing more and this compromises the effectiveness of supply-side interventions such as initiatives to stimulate business angels or the creation of venture capital funds. Efforts are to focus not only on increasing the supply of such funds, but also on improving the investment readiness of the firms, in particular seed, start-up and early growth companies offering highly innovative business opportunities.

2. *Improved transfer of knowledge:* Knowledge transfer mechanisms enable the transformation of knowledge into innovative products and services. This results in increased interaction between businesses and academic institutions, as well as increased awareness of the contribution which academia can make to business development and growth. Support for the protection of intellectual property is critical as a means for incentivising investments in R&I, securing the commercial value from such investments and facilitating knowledge transfer. Efforts are to focus on awareness-raising, training and financial support for filing, granting and validation of patents as well as licensing.

3. Open access to publications resulting from publicly-funded research remains a principle which Malta supports as a means to achieve optimal circulation of knowledge. Malta is therefore in favour of the need to adopt open access principles and invest in open access to publications, while safeguarding the interests of the research community, the general public as

well as potential investors. Nonetheless, the aim of most researchers is to publish in high-impact journals (irrespective of whether these allow open access or not), therefore it is imperative that efforts are made at supra-national level to convince the best journals to allow open access publishing. At the national level, an improved framework to support open access publishing (such as, inter alia, local repositories and support for publication in open access journals) would help the achievement of this objective.

6.3 Ensuring a seamless chain of support

Ensuring a seamless chain of support will be based on two action lines:

1. *Financial support for enterprises:* Each phase of the innovation process requires tailored support for entrepreneurs to successfully introduce innovation in the way they operate or the services or products they develop, based on reduced bureaucracy/risk for businesses. While the diversity among different types of local enterprises and between different sectors is acknowledged, there are a number of challenges which are common to most. The package of funding schemes for business must be better tailored to address the needs of local enterprises. It is however also important that as far as practicable, co-financing by the business sector is leveraged. Financial support for R&I should be regarded as assistance on the way to eventual self-sufficiency in pursuing and financing further innovation.

2. *Internationalisation support for enterprises:* A more strategic approach to the financing and take-up of international opportunities is needed in order to leverage and strengthen local business R&I. This extends from Foreign Direct Investment to more effective participation in European business-driven programmes and initiatives, in particular the Horizon 2020 programme, the Programme for the Competitiveness of Enterprises and SMEs (COSME), Eureka, Knowledge and Innovation Communities within the European Institute of Innovation and Technology, Joint Technology Initiatives, Joint Programming Initiatives and European Innovation Partnerships.



7 - Achieving a stronger knowledge base

The achievement of this goal entails a longer-term perspective based on investments which yield returns over a prolonged period of time but which provide the building blocks of a knowledge-based economy constructed on a highly-skilled, innovative workforce. Investing in young people and attracting them to science nurtures a questioning mind and a 'can-do' attitude which enables them to think strategically and exploit opportunities and knowledge. Highly-qualified human resources are fundamental to the development of an enabling framework for R&I to flourish in a knowledge-based society. Investing in researchers means supporting the current cohort of (young and older) researchers, as well as investing in today's students as future human capital in research. Besides investing in human resources, investing in local R&I infrastructures is particularly important for Malta as a means of offering an attractive work and study base for local researchers as well as attracting back and retaining those who undertake studies abroad. When considering that the majority of doctoral degrees are obtained from foreign universities, giving rise to a potentially higher degree of brain drain from the country, it is clear that public investment in infrastructures needs to go hand-in-hand with public investment in human resources. Therefore the actions to achieve the goal of 'a stronger knowledge base' will focus on human resource capacity-building as well as increased investment in research infrastructures with priority given to investments which support the identified thematic specialisation areas.

7.1 Investing in human capital

Investments in human capital will be based on five main action lines:

1. *An education system which adequately shapes future human capacity in R&I:* This Strategy assigns central importance to sustained investment in human capital at all educational levels from primary through to tertiary education and lifelong learning. This Strategy's broad approach to innovation requires adequate levels of human capacity in a broad range of areas, encompassing the social sciences, humanities, natural sciences, engineering and technology subjects. Available data indicates a greater shortfall in human capabilities in science, technology, engineering and mathematics (STEM) subjects which needs to be addressed through a holistic approach to science education in terms of content and process, covering all levels of education to ensure a seamless transition from primary to secondary education and on to tertiary level.

Creative thinking and other skills and attributes which foster an entrepreneurial culture should pervade the educational system from the earliest stages to the later ones, adapting activities to students' cognitive development over time.

A better understanding of sector-specific skills requirements for R&D and innovation, with primary focus on the areas of greatest innovation potential identified under the third goal of this Strategy, would

greatly ameliorate the policy actions implemented in the future to ensure a good match between skills supply and demand.

2. *Supporting graduates to become researchers:* Significant investments have been undertaken over the past years to support continued education at postgraduate and doctoral level. Continued investments are required to sustain and consolidate achievements to date and realize improvements on the basis of the outcomes of past/present measures and lessons learnt from these. The drive towards increasing the number of doctoral and post-doctoral graduates needs to be coupled with a drive to attract research initiatives to Malta to provide career opportunities for new researchers. In addition, public employers and funders of researchers are encouraged to officially endorse the European Charter for Researchers & the Code of Conduct for their recruitment.
3. *Strengthening linkages between the academic and the private sector for effective knowledge transfer:* It is important that cross-fertilisation of knowledge between business and academia is supported. Nurturing a researcher pool with awareness, expertise and experience in both camps is therefore an important objective which benefits both the individual's career path as well as further industry development. Policy learning and feedback mechanisms arising from the actualisation of the thematic specialisation should, over time, further inform actions on strengthening linkages with industry.
4. *Supporting international collaboration:* The European drive towards increased collaboration between research teams coupled with Malta's small researcher pool calls for a support framework for local researchers to build and sustain an international profile which facilitates collaboration with foreign partners. Whilst knowledge generated in one place can nowadays in theory be easily accessed anywhere round the world, proximity to knowledge is an important factor in accessing local and tacit knowledge. For this reason, there is still an advantage in training local researchers in key centres of excellence abroad in spite of the challenge of attracting them back to the home base. In order to retain top-class researchers in Malta, these scientists must remain well connected to international research.

At a policy level, Malta reiterates its commitment to the completion of the European Research Area and free movement of knowledge. At a programme level, Horizon 2020 will be the main European vehicle for collaborative R&D over the period 2014-2020. Malta will endeavour to make full use of instruments such as Teaming, Twinning and ERA Chairs to build strong partnerships which will pave the way towards excellence in Malta's R&I. Opportunities for combining different funding sources will be explored and, where possible, exploited. Such opportunities may include, inter alia, the utilisation of national

and European Structural and Investment Funds (ESIF) to build capacity and critical mass to better participate in Horizon 2020, the funding of above-threshold proposals submitted under Horizon 2020, as well as the use of ESIF and national funds for the commercialisation of Horizon 2020 project outcomes.

Conscious of the importance of adequate critical mass in R&D built on focussed efforts, Malta will prioritise its international cooperation efforts, including participation in Horizon 2020 initiatives, on the identified specialisation areas and/or initiatives with a Mediterranean dimension.

5. *Embedding a culture which is supportive of science, research and innovation:* Awareness raising and communication on the role of science, research and innovation in everyday life should form part of the country's drive towards a better knowledge-base for its economy. The planned National Interactive Science Centre should be at the core of science outreach and communication and should be established as a vibrant hub for showcasing science and technology and bringing it closer to the general public.

7.2 Investing in research infrastructures

Investment in research infrastructures will be based on two main action lines:

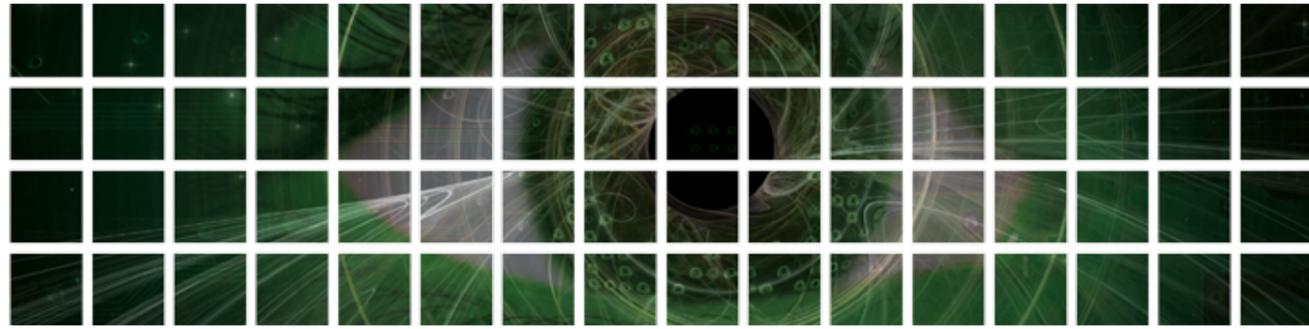
1. *Strengthening local research facilities:* Investments undertaken to date have provided a much-needed upgrade of the local landscape in research infrastructures. It is necessary for upgrading and maintenance to be undertaken to retain the necessary standards and ensure long-term sustainability. Further investments will focus primarily on identified thematic specialisations. In so doing, such investments should be backed by a clear economic and/or social rationale and clear plans of how these investments will support the path towards excellence and increased international cooperation, such as increased participation in Horizon 2020.
2. *Increased international cooperation:* Malta will adopt a strategic approach towards participation and collaboration with major research infrastructures, focussing primarily on those infrastructures which are closely linked to specialisation areas identified. Nonetheless, at least a core sub-set of local research infrastructures should be able to form part of corresponding European and/or international networks. Through the European Strategic Forum on Research Infrastructures (ESFRI), Malta will endeavour to participate in the development of pan-European research infrastructures by linking with identified priority themes and investments in national research infrastructures.

In addition, diplomatic efforts will endeavour to ensure access and availability of major research infrastructures to local Maltese researchers even in cases where it is not economically feasible for Malta to be a full member of these infrastructures.

7.3 Capacity building for excellence in climate change adaptation

Climate change and adaptation to it are major global concerns. However climate change impacts can be highly diverse and depend on, inter alia, geographical, hydrological and economic specificities. It is therefore important for Malta to invest in understanding climate change impacts within the local context in order to be able to adequately adapt to the changing environment by informing policy as well as business responses. Evidence-based adaptation to climate change is therefore necessary for long-term economic growth, competitive advantage, efficiency gains and cost savings. Investment in research into climate change adaptation is therefore identified by the present Strategy as an area of focus for building multidisciplinary research capacity and strengthening international cooperation, thus building a path towards excellence in this area. Given the existing (albeit somewhat fragmented) high degree of expertise in various facets of climate change adaptation, the time is ripe for Malta to consolidate its expertise, augment and valorise it through the development of a centre of excellence on climate change adaptation.

The need for climate change knowledge to guide policy as well as business decisions is widely acknowledged. The realisation of this Centre will include efforts to build and strengthen communication channels with private enterprise as well as policy makers since its outputs will undoubtedly shape many priority sectors in future years, such as tourism, health and aquaculture. This centre of excellence should also valorise the findings and recommendations contained in Malta's Climate Change Adaptation Strategy of 2012.



8 - Achieving smart, flexible specialisation

Smart specialisation is a business-driven process that aims to concentrate efforts on a few select areas chosen on the basis of unique selling points and indigenous strengths by building critical mass and capacity for innovation, giving a region or country a competitive edge over others. Through this goal, selected thematic areas will be the focus of investments additional to those needed to set up a comprehensive R&I ecosystem. Innovation endeavours both within and at the interface between areas of strength will be pursued and encouraged.

Malta's thematic areas for smart specialisation were identified through a rigorous process involving a variety of inputs. A desk based analysis of macro-level statistics, statistics on doctoral graduates, scholarships awarded, R&D expenditure, innovation expenditure, publications and participation in international programmes was undertaken. Around 20 meetings with top government officials, academia, public entities and social actors as well as one-to-one meetings with a number of private sector stakeholders were held. Focus group meetings with private-sector stakeholders and meetings at political level were also held. Malta was assisted in this work by the S³ Platform, part of the European Commission's Joint Research Centre. The S³ Platform has developed tailored methods for reviewing smart specialisation strategies and organises regular peer review workshops for registered regions and countries with the aim of sharing experiences and best practices. Malta submitted its work to a peer review in June 2013.

8.1 The role of ICT

ICT as an enabler: ICT is identified as an enabling technology for all economic sectors and disciplines through its role as a tool for technological change. Digital Malta, Malta's national ICT Strategy 2014-2020, provides a roadmap for ensuring that ICT remains a pivot of economic growth in Malta. Investments in people, infrastructures and regulation/legislation for the benefit of business, citizens and government provide a basis for growth through the digital economy.

ICT-based innovation: ICT plays an important role in R&D and innovation in all sectors by facilitating the development of new goods, processes and services to modernise the economy and transform it to a knowledge-based one. Computer and related activities constituted 11.7% of the intramural R&D expenditure recorded in 2010 and 5.4% of the total innovation expenditure for the same year. The main research expenditure was on software consultancy and supply. In addition, ICT is one of the areas where Malta's participation in FP7 is strongest (around 14% of FP projects involving a Maltese participant were in

the ICT field). Malta's participation in COST actions also indicates significant activity, with around 14% of Actions in which Malta participates being in the ICT Domain. All consultations undertaken in the preparation of the present Strategy acknowledged the crucial role of ICT innovation in all sectors of the economy.

This Strategy reconfirms the role of ICT as a crucial component of building Malta's knowledge economy and stresses the importance of continued investment in specialised skills coupled with extended integration of ICT-based innovation in the following sectors:

- Health
- Digital Gaming
- Financial Services
- Tourism product development

Other thematic specialisations will also be encouraged to identify and pursue ICT-based innovation. However, the above areas hold particular potential.

8.2 The Identified thematic specialisation areas

It is important to address two issues relating the identified specialisation areas at the outset: the number of areas selected, and the degree of specificity in each area. The notion of specialisation implies prioritisation of the most promising areas through increased allocation of resources. The logical consequence is the need to limit the number of 'promising areas', otherwise the whole rationale for specialisation is undermined. There are no hard and fast rules on the 'ideal' number of specialisation areas. Indeed specialisation in the case of Malta is particularly challenging because:

- a. Malta is still developing its national system of innovation and has a very short history of investment in innovation and research;
- b. specialisation patterns in innovation and research can change very rapidly due to the sensitivity of data to fluctuations by one or a few players;
- c. the risks of overspecialisation in a very open economy are particularly pronounced and can lead to loss of resilience.

With this in mind, a relatively broad range of specialisation areas were identified which is adequate for Malta's present stage of development of its national innovation system. It is possible that a number of these specialisation areas will not reach their full potential, while others will move forward more successfully to become key components of Malta's knowledge-based economy.



In relation to the degree of specificity within each area, there is a need once again to find a balance between being over-specific and being too generalist. This balance is based on two considerations:

- a. This Strategy avoids over-prescriptive, excessively-narrow niches and seeks to identify clear, well defined priority areas which still allow the possibility of collaboration both within and between the different areas identified.
- b. Thematic areas reflect the level of specificity that the sectoral consultations indicated. While some thematic consultations yielded relatively specific areas of specialisation, other consultations underlined the importance of the sector and its innovation potential but were unable to identify specific areas of specialisation. These areas will undergo a deeper analysis and identification of potential innovation niches as the first supporting step to these specialisation areas.

As a result of the analysis and consultations described above, the following thematic areas were identified.

a. Tourism product development

Tourism is a key pillar of economic activity in Malta. The sector is well established and mature and there is a good degree of collaboration among operators. The sector is not R&D intensive but must innovate in order to remain attractive and competitive. Consultations yielded several avenues for innovation activity, however innovation in tourism product development was repeatedly highlighted as a key niche where Malta has potential for growth through innovation. In addition to linkages with other specialisation areas such as ICT and health, this specialisation area should involve extensive collaboration with the creative industries.

b. Maritime Services

This is a mature economic sector in which Malta has a historic legacy and world-level profile. The sector has diversified over time to provide a wide range of services to the maritime sector, but the variety of services remain fragmented. There is therefore scope for improved clustering of maritime services in order to provide more integrated, new and improved services. Malta's drive towards becoming a maritime hub should include a drive to foster innovation in maritime engineering, ICT, design and services.

c. Aviation and aerospace

This is a relatively new economic sector which has grown rapidly, attracted several foreign investors, and has diversified to include a number of niches such as maintenance, repair and overhaul and aircraft registration among others. Malta has also built a strong portfolio in avionics research, a relatively high critical mass of human resources as well as numerous established international R&D links in the area. There is scope for further investment to raise the level of achievement to the next level by venturing into the high value-added engineering market in order to move up the value chain in specific niches within the aerospace sector.

d. Health with a focus on healthy living and active ageing, and e-health

Various data sources (such as public R&D expenditure, participation in the European Cooperation in Science and Technology – COST, and publications) indicate that 'health and medical research' is a significant component of Malta's R&D investment. However, there appears to be significant fragmentation within it and there is scope for further exploration of innovation potential in this area. Within this context and in line with this Strategy's approach to cultivate a multidisciplinary approach, innovative e-health solutions as well as solutions for active and healthy ageing will be given particular consideration because both of these focus areas benefit from the integration of medical sciences with other areas where Malta has a strong knowledge base; such as ICT, social sciences and engineering. Both have a clear economic objective and the potential for a strong economic impact.

e. Resource-efficient buildings

The construction sector in Malta accounts for 4% of GVA and 5.4% in terms of employment (2012 data) however these figures have been decreasing over the past years. There is scope for exploring innovative solutions in the sector which address water scarcity and energy (dependence on fossil fuels, take up of renewable energy sources, etc.), both of which remain two of Malta's major economic challenges. Innovation in resource efficient buildings would transform the sector by increasing value-added, increasing green jobs and growth while at the same time addressing a societal challenge which is in itself a business opportunity. This specialisation area will focus on solutions for improved resource efficiency in new and existing buildings through, inter alia, demonstration projects and optimisation.



The importance of innovation in this area stems from legal obligations which Malta has in this field, coupled with the fact that solutions developed abroad may not be easily transposed locally due to climatic variances and differences in building materials, among others. This specialisation area should involve extensive collaboration among architectural design, engineering, materials science and energy technology among others.

f. High value-added manufacturing with a focus on processes and design

While its share of GVA as a percentage of total GVA has decreased over time, the GVA in real terms of the manufacturing sector has increased over the past years. This sector remains the predominant sector for research and innovation investment. Statistics for 2010 indicate that manufacturing activity encompassed 65.4% of all innovation expenditure and 62.2% of intramural R&D expenditure. This indicates clearly that, in spite of shifts towards the services sector, the manufacturing sector is still strong and should therefore be sustained through a greater focus on innovation niches within this sector. To this end, two focus areas for innovation are process innovation (through optimisation of resource use, energy efficiency, automation etc.) and innovation in product design (product development, prototyping, etc.)

g. Aquaculture

Malta's aquaculture industry has developed to its present status over a period of around twenty years. R&D is carried out both within the public and the private sector. Malta has developed a good degree of know-how in this sector and has participated in a number of EU-funded R&D projects. There is a good degree of collaboration between the public and private sector, however there is scope for exploring further consolidation of existing strengths by focussing on areas of common interest among different players. Infrastructural investments in the area include plans for a local hatchery. Maltese aquaculture can therefore capitalise on these strengths and differentiate itself as a leading innovator in aquaculture.

8.3 Actions and action lines

The thematic specialisation areas identified encompass a greatly heterogeneous mix of sectors. Each thematic area is unique in terms of level of maturity, position along the value chain, number of players, public-private sector interrelations, funding streams and opportunities for innovation. This diversity will need to be taken into consideration in tailoring actions and initiatives which provide the right environment for closer collaboration with each theme and at the intersection between the different themes. The actions to achieve the goal of 'smart, flexible specialisation' will therefore need to be tailored to each thematic area or groups of thematic areas, but will:

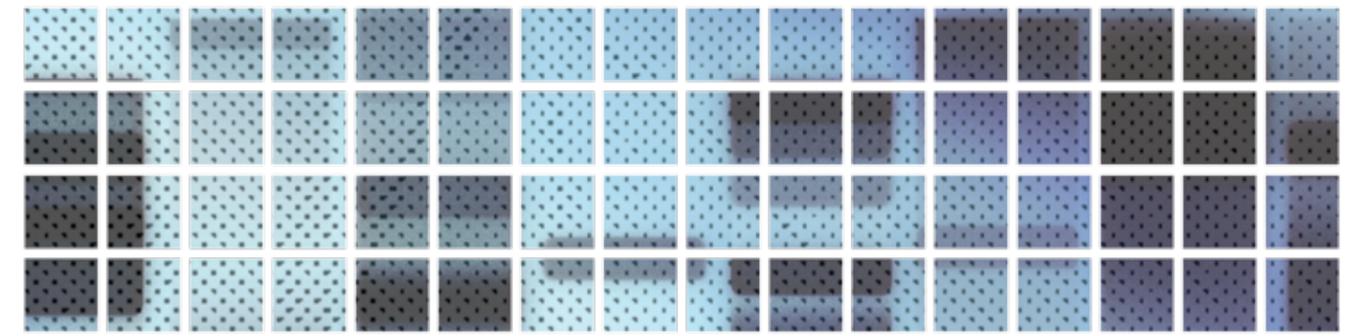
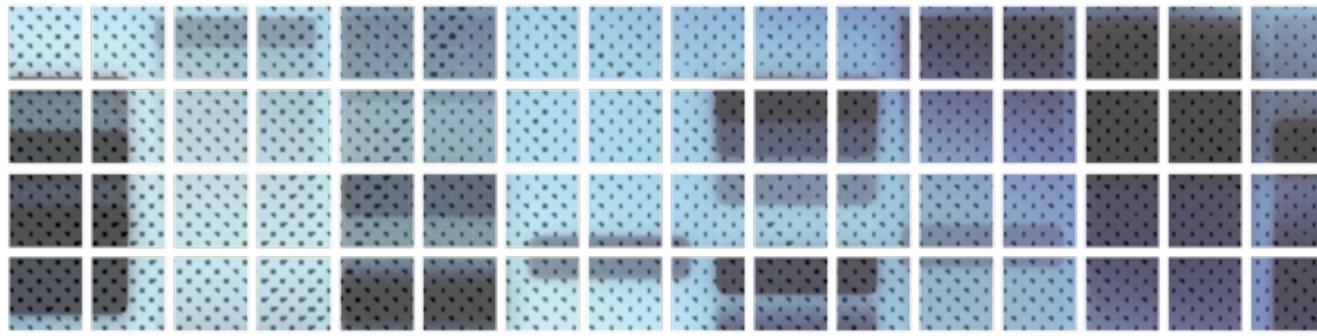
- Involve in-depth policy research in each area, involving an analysis (inter alia) of legislation, standards, and issues of public perception and other factors which influence innovation potential.
- Involve the utilisation of both national and EU funds (such as ESF, ERDF, the European Agricultural Fund for Rural Development – EAFRD, and the European Maritime and Fisheries Fund - EMFF) and EU public-public or public-private initiatives (e.g. Joint Technology Initiatives, Joint Programming Initiatives, etc.) to set up or strengthen nodes of activity to improve their innovation capabilities.
- Pursue specific innovation opportunities based on economic and business potential, expected benefits to society or a combination of both. To this end, thematic areas will have innovation, business needs and objectives at their forefront, with support from the public and academic sector as required. Through this set up, specific niches for innovation opportunities will need to be identified for each thematic specialisation area.
- Prioritise human capacity building, as described under goals 1 and 2 of this Strategy, in the identified thematic specialisations.
- Leverage Malta's strength in multi-disciplinarity by promoting cross-fertilisation of ideas, expertise and projects among different thematic areas and involving both STEM and SSH (Social Sciences and Humanities) expertise, with the ultimate goal being the identification and commercialisation of new solutions, products, processes and services. Innovation opportunities at the interface between two or more areas, as well as innovation opportunities emerging through the enabling role of ICT, will be of paramount importance.

- Support linkages to international partners via various European and international networks to promote transfer of knowledge derived from research undertaken abroad and its application for innovative solutions in the identified thematic area.

8.4 R&I opportunities in Rural Development

Malta's very small size, extremely high population density, considerable built-up landscape and the limited (and increasingly threatened) natural habitats highlight the importance of careful management of the rural areas as a national resource. Agriculture is important in shaping the rural landscape, but, as an economic activity, it is hindered by complex structural issues such as the small size of fields, high labour costs and the opportunity cost of agricultural land.

Promoting value-added and innovation in agriculture and rural development can help off-set the impact of these constraints. Malta's Rural Development Programme 2014-2020 provides an in-depth description of activities envisaged to this end.



9 - Reviewing and updating this Strategy

The rapid pace of technological, social and economic change is such as to render any strategy outdated in a short period of time. 'Strategy' must therefore be about 'the process' as much as about 'the document', especially when the strategy concerns innovation - the very essence of change and novelty. The reviewing and updating of this Strategy will involve three components:

1. Setting targets and measuring progress through indicators;
2. Communication management, co-design and coordination; and
3. Knowledge-based policy design.

9.1 Setting targets and measuring progress through indicators

Regular monitoring of a number of parameters which are meant to reflect progress in the Strategy's implementation at a macro level will be undertaken. These indicators aim to provide a balanced assessment of both the inputs and the outputs of the research and innovation system. Ambitious but achievable targets are set for each indicator.

No.	Indicator	Latest available figure	Trend	2020 target
1	Gross R&D expenditure expressed as a percentage of GDP.	0.72% (2011 figure)	Largely stable between 2004 and 2009. Increasing since 2010.	2.0%
2	The number of doctorate holders as a percentage of the active population.	0.47% (2012 figure)	Largely stable between 2006 and 2009. Increasing since 2010.	0.60%
3	The number of researchers (expressed in full-time equivalents, FTE).	755 (2011 figure)	Largely stable between 2004 and 2010. Increased in 2011.	900
4	Innovation expenditure as a percentage of GDP.	1.46% (2010 figure)	Largely stable.	2.5%
5	Employment in knowledge-intensive activities as a percentage of total employment.	40.8% (2011 figure)	Steadily increasing.	55%
6	Enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation) as a percentage of total enterprises.	36.0% (2010 figure)	Limited data available, making it difficult to identify trends. An initial target is set on the basis of available data and may be reviewed when more data is available.	50%
7	Enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation) in the Core NACE Codes as a percentage of total enterprises.	41.5% (2010 figure)	Limited data available, making it difficult to identify trends. An initial target is set on the basis of available data and may be reviewed when more data is available.	60%

The above are an initial set of measurement tools selected among available indicators. It is however recognised that these indicators do not capture aspects of the wider innovation system within which the actions recommended in this Strategy will be implemented. New indicators will therefore be developed over time to capture this aspect more effectively in the future.

9.2 Communication management, co-design and coordination

Targets and indicators can provide an important overview of trends and developments. However these require careful interpretation through adequate contextualisation, especially in a small country context. To this end, it is planned for the consultative process undertaken in the preparation of this Strategy to become a regular feature of R&I strategy development and updating, thus embedding the necessary flexibility to respond to emerging challenges and opportunities.

Instability in specialisation profiles is associated with the size of the country. The smaller the economy, the more variation there is in specialisation profiles. Unless one knows the economy and the data very closely it isn't possible to distinguish changes due to actual developments from the changes driven by data. Therefore the retention of open communication channels with stakeholders provides a means of continued supplementation of statistical data with 'the story behind the numbers' to enable the Strategy to reflect and respond to real situations and opportunities. Identified stakeholders in this regard are government ministries, public sector entities, social partners, representative bodies, academia and the business sector. These stakeholders need to be kept informed of developments in implementing the R&I Strategy, while the Malta Council for Science and Technology (MCST) - as the entity entrusted with preparing the Strategy and overseeing its implementation - requires the input of these stakeholders to ensure that the Strategy remains pertinent in guiding the right investment in the right areas.

To this end, a core steering group will be set up as a forum for co-design and coordination in the development and implementation of new measures as well as the evaluation of measures implemented. Its members will keep each other informed of developments relating to the implementation of the National R&I Strategy, share information and avoid overlaps. This steering group shall meet at least twice per year or more if necessary. The Malta Council for Science and Technology will chair this group and provide its secretariat. The following entities will be represented on the steering group:

- Ministry of Finance
- Ministry for Education and Employment
- Ministry for Economy, Investment and Small Business
- National Commission for Further and Higher Education
- Malta Enterprise
- University of Malta
- Malta College of Arts, Science and Technology

Additional participants may be invited on an ad hoc basis and depending on the agenda.

9.3 Knowledge-based policy design

Policy support tools which ensure the ongoing improved design of policies and take into account the highly dynamic and competitive environment within which R&I operates should contribute to informing the review and updating of this Strategy. These should include, among others, mapping exercises, benchmarking studies, improved design and gathering of R&I indicators, greater emphasis on audit, evaluation and impact assessment studies, peer review, sector-specific skills requirements for R&D and innovation, increased use of anticipatory intelligence, foresight and horizon scanning to identify emerging opportunities and threats.

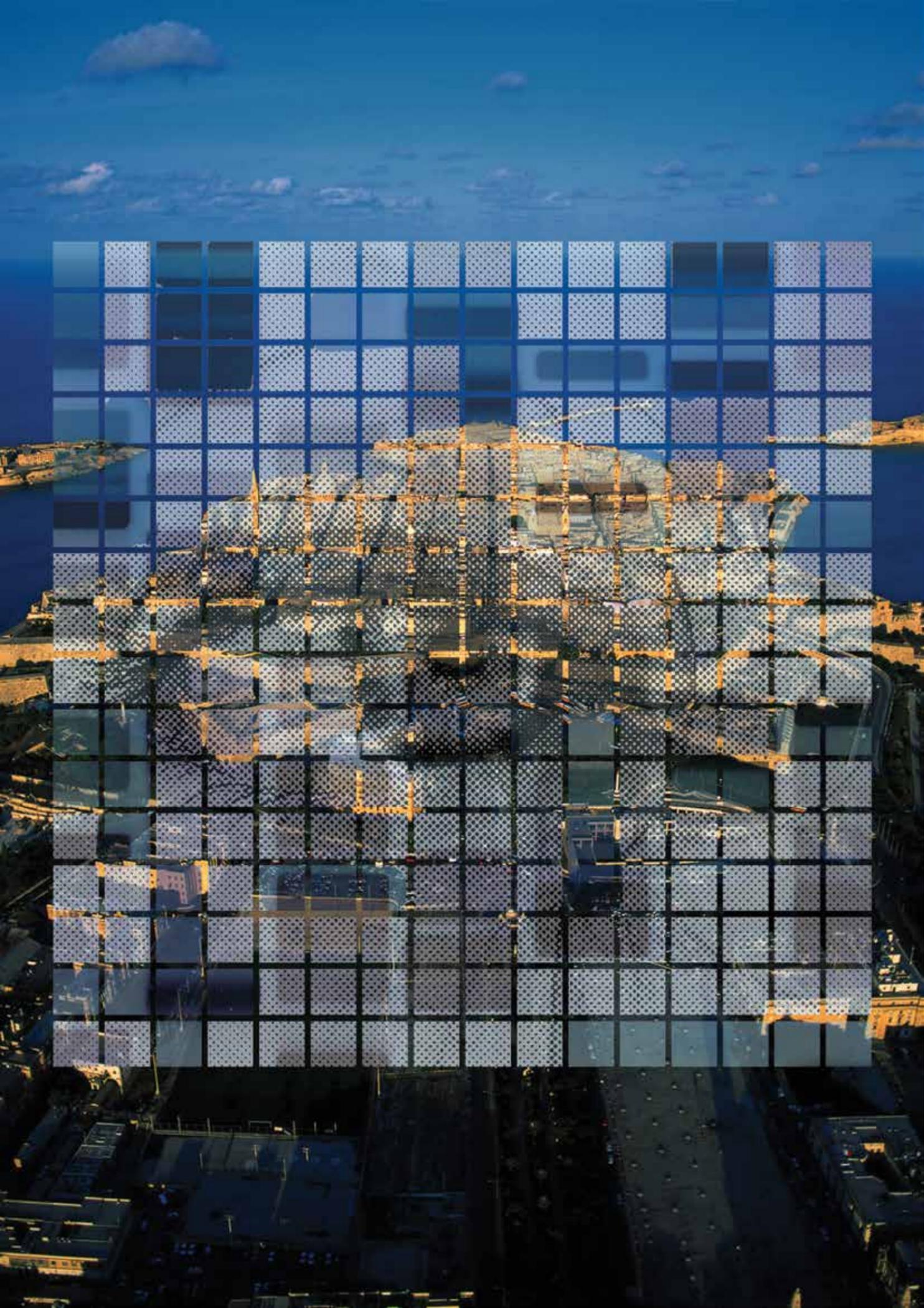
9.4 Implementation, review and update

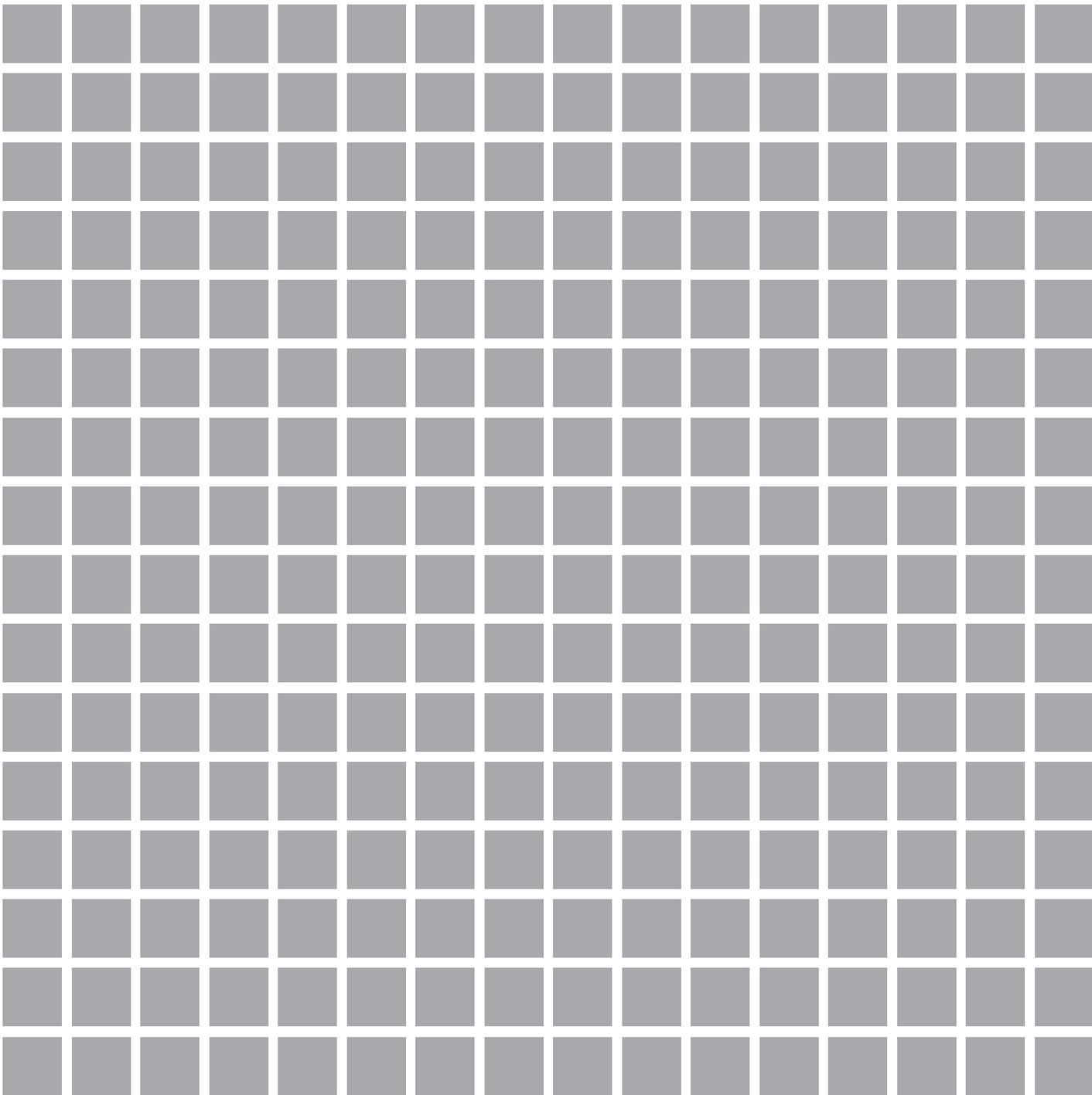
This Strategy aims to balance the need for stability with the need for ensuring that the document remains relevant over time. The need for stability is addressed through the separation of the strategic and the tactical aspects - a separate, rolling, short-term R&I Action Plan to implement the action lines identified by this Strategy will steer the implementation of this Strategy.

The need to ensure continued relevance will be met through periodic reviews and possible updates of the document based on the outcomes of the core steering group as well as regular focus group meetings. Indeed, focus group meetings with the private sector and social partners will be held on a biennial basis (in 2015, 2017 and 2019). The aim of the focus groups will be to provide a forum for the private sector and social partners to:

- a. Provide their feedback on the implementation of the Strategy; and
- b. Provide input regarding thematic priorities (re-confirmation, introduction of new themes or sub-themes, phasing out of themes, etc.)

In line with feedback received during the preparation of the present Strategy, government representatives will be involved in these focus groups in order to provide a forum for an open exchange of information between the public and private sector. The Malta Council for Science and Technology will coordinate the organisation of these focus groups. The strategy document may be revised and updated on the basis of the outcomes of the focus groups; and any updates will also take into consideration the inputs of the core steering group.





The Malta Council for
Science & Technology

Villa Bigli,
Kalkara KKR 1320,
Malta

www.mcst.gov.mt



MINISTRY FOR EDUCATION AND EMPLOYMENT
GREAT SIEGE ROAD, FLORIANA, MALTA

