National Open Access Policy Malta

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Executive Summary

- Presently, the Maltese Research and Innovation (R&I) system is characterised by a rather conservative publication culture and a lack of structured data sharing. Improving the circulation of knowledge through the introduction of a national policy addressing the 'openness' of the Maltese scientific system will improve scientific research, as well as accelerate innovation and the engagement of society. This will elicit clear advantages for Malta as an outward looking island-based EU Member State. It will, however, take time and a significant effort to align all relevant actors and collectively move forward towards 'openness'.

- Therefore, in 2017 Malta submitted a request to the European Commission's Policy Support Facility within the auspices of Horizon 2020 for support in developing its first national Open Access policy. The appointed group of experts commenced the specific support exercise in 2019 and prepared a tailored framework with a set of recommendations for a Maltese policy on Open Access. In April 2020, the final PSF report[1] with these recommendations was launched.

- The PSF report entailed a robust framework for Malta to develop its first national Open Access policy, however the policy needed to reflect Malta's current realities, to ensure acceptance and eventual effective implementation. To that end, during the initial policy development stage, The Malta Council for Science and Technology coordinated the setting up and work proceedings of a dedicated working group (the National Open Science Technical Working Group), which was made up of expert representatives of key stakeholders active in the field of Open Science. The Working Group members exchanged knowledge, views and provided technical opinions and advice on translating the PSF recommendations into practical, actionable items for Malta ensuring that the development of this policy was carried out in a way that is appropriate for the local Maltese context and its framework conditions.

- Following several Working Group participatory meetings, MCST developed this National Open Access Policy which aims to provide a clear direction for Malta to create a scientific system where 'openness' is the default. This policy builds on the provisions of the PSF report of April 2020, and provides a future-proof, actionable roadmap enabling Malta to align itself with European level developments relating to Open Science. The roadmap within this policy focusses on Open Access to scientific publications, Open/FAIR Research Data under the principle of "as open as possible, as closed as necessary", and related actions on awareness raising, skills, training and support, and research and researcher assessment. The policy aims to provide actions which comprehensively lead to a state of immediate Open Access.

- The transformation of Malta's scientific system towards 'openness' by default, must be undertaken in a way that is appropriate for the local Maltese context. In addition, to identifying awareness, commitment and funding as key success factors, this policy recommends a "phase-in"

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[1] https://rio.jrc.ec.europa.eu/sites/default/files/report/SS Malta_Final Report.pdf

approach for the implementation of the actions presented within, which is a step-by-step approach seeing the transitioning from an existing state onto a new one, in stages.

- The policy defines concrete phases for each subject area, with actions at each phase developing experience, skills, competences, and establish infrastructure, which become permanent, and built-upon in successive phases. The fact that phases of each subject area build on previous ones and that the relations between the phases have been carefully designed, facilitates the process towards achieving the projected goals. This approach renders this policy as operational as possible and strikes a balance between an over-ambitious policy, which would not find the support of local stakeholders, and an unambitious and uncontroversial policy which would not significantly improve the state of Open Access in Malta.

- The policy envisages that by the end of 2025 Malta transitions to a state of immediate Open Access in terms of publications by strengthening both Gold and Green Open Access approaches, together with significant progress in upgrading existing and developing new policies, infrastructure, and synergies necessary for FAIR research data management.

- Moreover, the policy encourages and provides guidance for relevant, local stakeholders to adjust their respective institutional research assessment and evaluation practices in a way that by the end of 2025, these adequately reward and incentivize Open Access practices. Furthermore, the policy calls for, a systematic upgrade of existing Open Access training activities and the development of well-coordinated support mechanisms fostering upskilling and increase in competences across all relevant Maltese institutions by the end of 2025.

- This policy also calls for a strong governance structure, that will ensure a well-coordinated effort, based on inclusiveness, trust and commitment which ultimately ensures the long-term success of the policy.

Definitions

Open Access to scientific publications

This can be defined as the practice of providing online access to peer-reviewed, scholarly research papers and scientific/academic information for reading, distribution, and productive re-use, not impeded by any financial, organizational, legal, or technical barriers, but with an obligation to attribute the work to the author. The two main Open Access approaches are, Green Open Access and Gold Open Access.

Green Open Access (self-archiving)

The published article, or the final peer-reviewed manuscript that has been accepted for publication is made freely and openly accessible by the author, or a representative, by depositing (archiving), in an online repository, before, at the same time as, or after publication. Some publishers request that open access be granted only after an embargo period has elapsed. An embargo period is a period (can range from 6 to 24 months), that may be set by publishers in the copyright transfer agreement, during which time, the accessibility of an article archived in a digital repository is restricted.

Open Access Repository

An Open Access repository, or open archive, is a digital platform that stores research and scholarly outputs, and provides free, immediate, and permanent access to these research outcomes for anyone to use (including users outside the institutional community), download and distribute. To enhance and facilitate Open Access, such repositories must be interoperable in line with the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH)[2]. Search engines harvest the content of open access repositories, constructing a database of worldwide, free of charge available research.

Gold Open Access (Open Access publishing)

The publishing of a peer-revied article in a journal which renders articles openly available on the publisher's platform without an embargo period. This Open Access approach shifts the publication costs away from the readers and onto the authors/research performing institute/entity funding the research, through one-off payments termed as Article Processing Charges.

Hybrid Open Access

This mode of Open Access refers to the practice of publishing in a subscription-based journal, in which some articles are made openly available against payment of Article Processing Charges from the author, while other articles/content remain closed access and accessible solely to those paying subscriptions.

Conventional non-Open Access Journals

Conventional (non-open access) journals require readers to pay to access journal content through access tolls such as subscriptions, site licenses or pay-per-view charges. Consequently, only those who have purchased a subscription to the journal/have purchased an article will be granted access.

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[2] http://www.openarchives.org/OAI/openarchivesprotocol.html

Moreover, copyrights for the published content are usually transferred from the author to the publisher.

Open Access Journals

Open-Access journals do not require readers to pay to access the journal's contents. The scientific community and the public have free online access to such journals' content. Normally, authors publishing in such journals are able to retain copyright of their respective articles and Creative Commons licenses are often used granting certain rights to the publisher.

Journal Impact Factor

The Journal Impact Factor is a measure of the frequency with which the average article in a given journal has been cited in a particular year. The Impact Factor is used to measure the importance or rank of a journal within its field by calculating the times its articles are cited. The calculation is based on a two-year period and involves dividing the number of times articles were cited by the number of articles that are citable. Journals with higher impact factor values are often deemed to be more important, or carry more intrinsic prestige in their respective fields, than those with lower values.

H-index

The h-index is an author-level metric used to evaluate the cumulative impact and performance (productivity and citation impact of respective publications) of a scientist, researcher, or scholar. Thus, the h-index is based on both the quantity and quality of research outputs by comparing publications to citations and thus provides an estimate of the importance, significance, and broad impact of a scientist/researcher/scholar's cumulative research contributions. Moreover, the h-index corrects for the disproportionate weight of highly cited publications or publications that have not yet been cited.

Research Data

Research Data refers to resources which the researcher collects, observes, generates, produces, or uses throughout the research process. It underpins and is needed to validate the research, and it is meritorious in research if it is published.

FAIR Data

FAIR Data and Open Research Data, although similar and somewhat overlapping concepts, are different. Open Data is available for everyone to reuse but may not be consistent in the way the data is accessed, may lack in machine readability, and may be harder to be interpreted. On the other hand, FAIR Data presents a well curated digital manifestation of the data, persistent and consistent in the way it is accessed, but may be (partially) closed, or may be free for particular types of use/reuse only, under the principle of "as open as possible, as closed as necessary". Rendering research data FAIR, improves the **F**indability, **A**ccessibility, **I**nteroperability, and **R**eusability of datasets. The FAIR data principle emphasizes the capacity of computational systems to find, access, interoperate, and reuse data with no or minimal human intervention because of the increase in volume, complexity, and generation frequency of research data.

Data Management Plan

A Data Management Plan is a formal plan outlining how a researcher/s will collect, organize, analyze, preserve, and share their data, both during and after completing a research project. It thus helps researchers establish good data management practices, plan, and track the creation of research data

and ensures adherence to funder requirements. A Data Management Plan is usually completed early in/prior to commencement of a research project

Metadata

Metadata is data providing information about a dataset/s rendering research data findable, trackable and (re)usable and thus facilitate retrieval of the data when deposited in a data repository. Metadata usually include information such as contact information, geographic locations, details about units of measure, abbreviations or codes used in the dataset, instrument and protocol information, survey tool details, provenance, and version information. Moreover, it can be found in different formats ranging from free text to standardized, structured, machine-readable, extensible content.

'Openness' principle

This is an overarching concept or philosophy that is characterized by an emphasis on transparency and collaboration, more specifically referring to the accessibility of knowledge, technology and other resources, the transparency of action, the permeability of organizational structures, and the inclusiveness of participation. The principle of 'openness' in research refers to the freedom of access to underlying data, the processes and to the final outputs of research, by all those interested.

'Widening' principle/participation

The 'Widening' principle/participation (including those actions under Horizon Europe), contribute to building research and innovation capacity for countries lagging behind. This will give an opportunity for such countries to strengthen their potential for successful participation in transnational research and innovation processes, promote networking and access to excellence. Moreover, effective implementation of relevant actions, will enable countries to upgrade and strengthen their research and innovation systems, and thus allowing the EU to holistically advance, in line with the policy objectives of the European Research Area.

Open-source software

Open-source software is computer software that is released under a license in which the copyright holder grants users the rights to inspect, use, study, change, enhance and distribute the software and its source code to anyone and for any purpose. Open-source software may be developed in a collaborative public manner.

Open Collaboration

Open collaboration is collaboration that is; egalitarian (everyone can join with no barriers to participation), meritocratic (decisions and status are merit-based rather than imposed), and self-organizing (processes adapt to individuals rather than individuals adapt to pre-defined processes).

Open peer-review

Open peer review is a scholarly review mechanism that is supposed to address various perceived shortcomings of the traditional scholarly peer review process, in particular its lack of transparency, lack of incentives, and wastefulness. Open peer review represents various possible modifications of the traditional scholarly peer review process. The three most common modifications to which the term is applied are; open identities (authors and reviewers are aware of each other's identity), open reports (review reports are published alongside the relevant article), and open participation (the wider community, and not only the assigned reviewers, are able to contribute to the review process).

Open Notebooks

Open notebooks represent the practice of making all key outcomes of a research project, publicly available online as it is recorded. This practice involves placing the personal/laboratory notebook of the researcher online together with all raw and processed data, and any associated material, as originally generated. The practice of open notebooks is not the norm in academia, however, is considered as part of a general trend towards more open approaches in research practice and publishing.

Open Educational Resources

These are freely accessible, openly licensed text, media, and other digital assets that are useful for teaching, learning, and assessing as well as for research purposes.

Open Monographs

An open/Open Access monograph is a scholarly monograph which is made freely available with a Creative Commons license.

Citizen Science

Citizen science is an umbrella term, covering the part of Open Science in which citizens can participate in the scientific research process in different possible ways including as observers, funders, identifying images or analyzing data, or providing data themselves. This allows for the scientific process to be available for all citizens and enables stakeholders' engagement and public participation.

List of Acronyms

APC – Article Processing Charge

API - Application Program Interface

CAP – Common Access Point

CC – Creative Commons

DMP – Data Management Plan

DOAJ – Directory of Open Access Journals

DORA - Declaration On Research Assessment

EC – European Commission

EOSC – European Open Science Cloud

ERC – European Research Council

ESCAPE - The European Science Cluster of Astronomy & Particle Physics ESFRI (European Strategy Forum on Research Infrastructures)

EU – European Union

FAIR - **F**indable, **A**ccessible, **I**nteroperable, **R**e-usable

IF – Impact Factor

IPR – Intellectual Property Rights

MCAST - The Malta College of Arts, Science & Technology

MCST – The Malta Council for Science and Technology

MFEA – Ministry for Foreign and European Affairs

MFED – Ministry for Education

MITA - Malta Information Technology Agency

MS – Member States (of the EU)

MT – Malta

NGO – Non-Governmental Organization

NPO – Non-Profit Organization

OA – Open Access

OD – Open Data

ORD – Open Research Data

OS – Open Science

OS-CAM – Open Science Career Assessment Matrix

PaNOSC - Photon and Neutron Open Science Cloud

PSF – Policy Support Facility

R&D – Research and Development

R&I – Research and Innovation

RDM – Research Data Management

RFO – Research Funding Organization

RPO – Research Performing Organization

SSHOC - Social Sciences and Humanities Open Cloud

UM – The University of Malta

WG – Working Group

1. Introduction

1.1 Background

Open Science represents a new approach to the scientific process which captures a systemic change to the way science and research have been carried out for the last fifty years. This approach is based on new ways of disseminating and diffusing knowledge, through cooperative work and collaborative tools, facilitated with ameliorated use of digital technologies. Open Science is key to the transition from standard practices of publishing research outputs, towards a research system which embraces active sharing, and the utilization of all available knowledge and publicly funded research outputs, at an early stage in the research process, with minimal or no restrictions at all.

Figure 1 illustrates, the extension of the 'openness' principle across the entire research cycle. It allows end users of research outputs to come up with new ideas and establish broader stakeholder networks. Such transformation in the modus operandi of doing research and organising science, has the potential to enhance the quality, impact, and benefits of science. It also accelerates the advancement of knowledge by making it more reliable, efficient, and accurate, better understood and accepted by society, and ultimately increasingly responsive to societal challenges.

However, Open Science should not be only considered as a way of opening the research process. Rather, it should be understood instrumentally as a driver for entrepreneurship, research integrity and inclusiveness, enabling growth and innovation through optimal reuse of scientific results by all stakeholders at all levels of society. As a result, Open Science practices would ultimately contribute toward a more competitive Europe and therefore should be embedded in the core of research and innovation strategies.
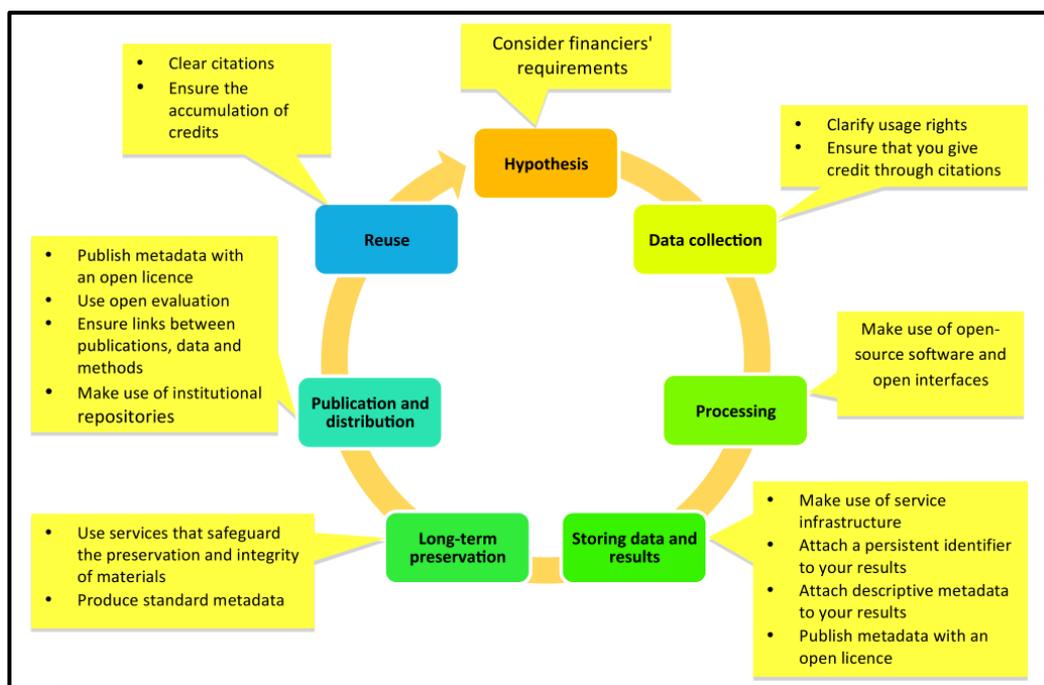
Figure 1: Extending the principle of 'Openness' to the entire research cycle (Retrieved from *https://www.fosteropenscience.eu/content/what-open-science-introduction* as last seen on 28/04/2021).

Open Science is a comprehensive term encompassing various elements, all of which spearhead the enhanced openness of all forms of research outputs, resources, methods, or tools, at any stage of the research cycle. Most of the focus is usually placed on Open Access to publications and Open Research Data. Nonetheless, Open-Source Software, Open Collaborations, Open Peer Review, Open Notebooks, Open Educational Resources, Open Monographs and Citizen Science, all of which fall under the umbrella of Open Science.
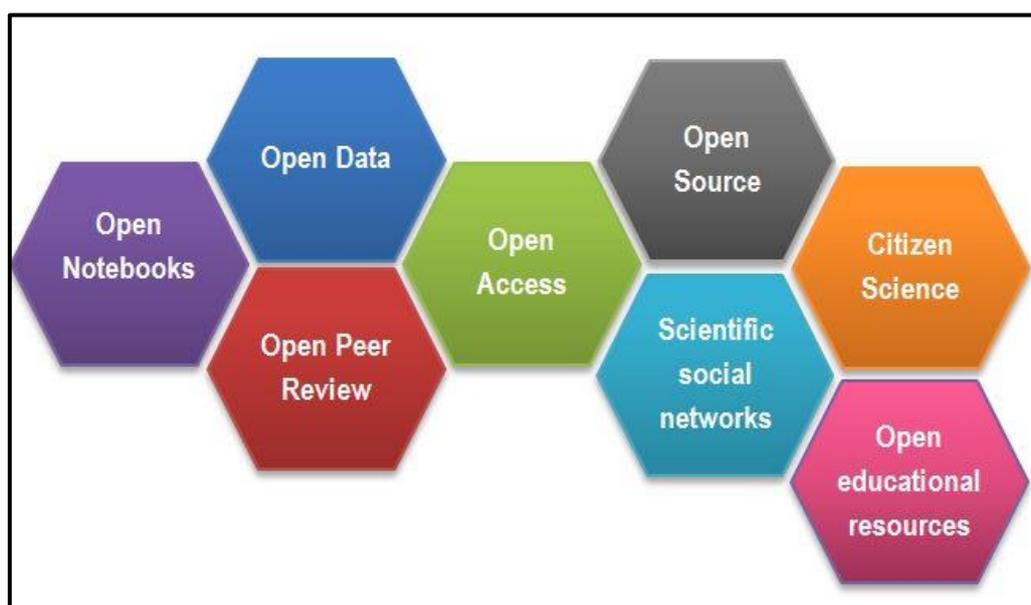
Figure 2: Key Elements of Open Science retrieved from *https://www.fosteropenscience.eu/content/what-open-science-introduction* as last seen on 28/04/2021.

1.2 What Open Access is not

To ensure acceptance and to glean the full benefits of Open Access, it is imperative that Open Access is not misconstrued as plagiarism, predatory publishing or in any way a hinderance to Intellectual Property Protection. In terms of scientific quality, publications in Open Access (both Green and Gold approaches), are expected to go through the same level of scientific scrutiny and a robust peer-review process, such as the case with publications in subscription-based journals. The presence or absence of peer-review practices will also assist researchers and academics in choosing high-quality, reputable journals, and eliminate the use of journals termed as 'predatory'. The latter is an exploitative publishing business model imposing publication fees to authors, without checking the legitimacy of the articles, and without the editorial and publishing services provided by legitimate journals whether Open Access or otherwise. Moreover, the main authors of publications in Open Access, must always be given the proper credit owed, preventing cases of plagiarism.

The relationship between Intellectual Property and Open Science must also be clearly defined and interpreted correctly. Open Access does not affect or hinder in any way the decision to exploit research results commercially, including through patenting. It is up to the researchers to decide whether to publish directly in Open Access or seek protection. If researchers opt for commercialisation, then no publication, Open Access or otherwise, is made, before a patent is applied for.
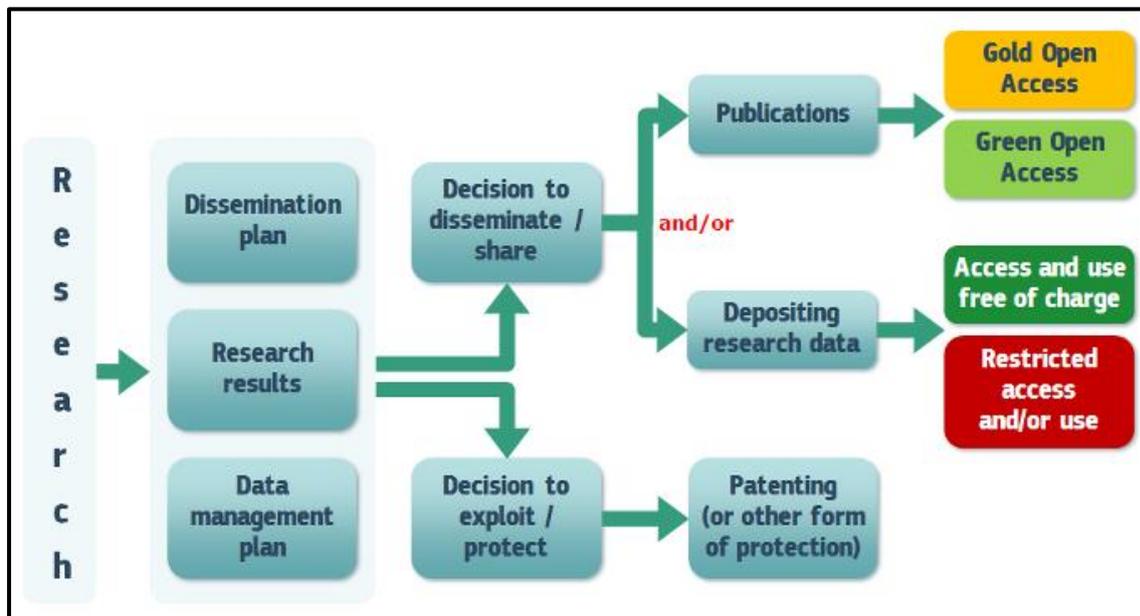
Figure 3: Open Access to scientific publications and Research Data in the wider context of dissemination, exploitation and protection retrieved from *https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/open-access_en.htm* as last seen on 28/04/2021.

1.3 European level and EU Member States' developments

Right from the inception of the various modalities of Open Science, notably Open Access to publications and Open/FAIR research data, EU Member States and other European countries have supported the concept of 'openness' and are continuously seeking to facilitate and maximize access and re-use of research outputs. Moreover, there is a push, at European level, for Open Science policies to cover all aspects of the research cycle, and for sharing of knowledge and data as early as possible in the research process. There is also broad acknowledgement amongst key European actors, that adequate and proper incentives and rewards are important towards achieving this goal.

In 2003, a landmark meeting organized by the Max Planck Society and the European Cultural Heritage Online project, brought together leading international research, scientific, and cultural institutions with the purpose of developing a web-based research environment which uses the Open Access paradigm as a mechanism for having scientific knowledge and cultural heritage accessible worldwide. This meeting resulted in the Open Access movement achieving one of its milestones, with the issuing and signing of the "Berlin Declaration on Open Access to Scientific Knowledge[3]". The Berlin Declaration builds on the widely accepted Budapest Open Access Initiative[4], which calls for research

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[3] http://www.berlin9.org/about/declaration/

[4] https://www.budapestopenaccessinitiative.org/

outputs to be made widely available online by the respective authors without payment expectations, and to limit restrictions for use and re-use of results, by way of accelerating the pace of further research.

The Berlin Declaration is an international statement on Open Access and access to knowledge, which outlines concrete steps to further promote the Internet, as a medium for the dissemination of knowledge. It defines requirements of an Open Access contribution, which include that the author or rights holder grants users, free and irrevocable access to a publication, together with a license to copy, use, distribute, transmit and display the work publicly, and to make and distribute derivative works, in any digital medium, subject to proper attribution of authorship. Moreover, it states that a complete version of the work and all supplemental material are deposited in at least one online repository which uses suitable technical standards. The repository must also be supported and maintained by an academic institution, scholarly society, government agency, or other well-established organization seeking to enable Open Access, unrestricted distribution, inter-operability, and long-term archiving. In addition to publishing research outputs using these principles, the Declaration also encourages researchers to advocate in favor of Open Access and contribute towards the development of assessment tools and measures which relate to Open Access practices. The wide support for the Berlin Declaration is illustrated by the signatories, which amount to 690 (until 23/06/2021)[5].

Projects funded within the auspices of Horizon 2020 Framework Programme, included specific deliverables, primarily open access to peer-reviewed publications, and encouraged access to, and reuse of research data. With regards to publications, Horizon 2020 beneficiaries were mandated to deposit the published version, or the final peer-reviewed manuscript in a repository of their choosing. In addition, beneficiaries needed to also ensure that the chosen repository grants accessibility to the deposited documents within 6 months of publication, or 12 months in case of research in the areas of Social Sciences and Humanities.

Looking beyond Horizon 2020 and towards the new EU Framework Programme, Horizon Europe (2021-2027), Open Access practices will continue to have a prominent presence in EU policies and will be embedded in selected work programs. In Horizon Europe, research data will be open by default with the caveat that the principle of 'as open as possible, as closed as necessary', is adhered to, by establishing a clear balance between openness and the protection of scientific information, commercialization and Intellectual Property Rights, privacy concerns and security. Emphasis will be placed on the proliferation of findable, accessible, interoperable, and re-usable (FAIR) data. The EC has launched an initiative under the auspices of the HE framework programme, titled 'Open Research Europe'[6]. This is a publishing platform aimed at fostering the integration of Horizon funded research outputs into a single European data space. Moreover, the platform facilitates beneficiaries' compliance with the terms of their funding and offers researchers a publishing venue to rapidly share their scientific research outputs. Moreover, the use of certified repositories and other EU E-infrastructures such as the European Open Science Cloud (EOSC) will be required for the deposition of research data in some Horizon Europe work programs.

EU Member States have a key role in the endeavour to move towards a more open research process. With significant advancements in digital technologies, Open Access is increasingly featuring in

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[5] https://openaccess.mpg.de/319790/Signatories
[6] https://open-research-europe.ec.europa.eu/about/

Member States' R&I policies. European researchers can avail themselves from enhanced support to create an open, collaborative research environment, also based on reciprocity.

In September 2018, an international consortium of research funding and research performing organizations, with the support of the European Commission and the European Research Council, announced the launch of cOAlition S[7], an initiative with the aim to make full and immediate Open Access to research publications a reality. The principle of the main consortium's initiative, Plan S, is that from 2021, all scholarly publications emanating from research funded by public grants must be published in compliant Open Access Journals, on Open Access Platforms, or made immediately available through Open Access Repositories without embargo. cOAlition S funders include national research funders, European and international organizations, and charitable foundations, which have agreed to implement Plan S, in cooperation with the European Commission and the ERC to accelerate the transition to full Open Access.

Building on the European Commission Recommendations on Access to and Preservation of Scientific Information (2012, revised 2018)[8], and the Council Conclusion on the transition towards an Open Science system (2016)[9], several EU Member States contributed to the establishment of the Open Science Policy Platform providing recommendations to the EC on best practices relating to the continued development and practical implementation of the Open Science Policy. In doing so, EU Member States moved a step closer towards aligning with the European Vision on Open Science.

1.4 Benefits of Open Access for Malta

1.4.1 Maltese scientific system and research community Level Benefits

The introduction of new policies on Open Access, facilitating and endorsing public access to research outputs, was a contributing element of the steady increase in awareness on OA and in the number of researchers opening-up their respective research outputs (more details in Section 2). Many of such policies are often driven by ethical, utilitarian arguments, arguing the right of taxpayers to access literature emanating from publicly funded research. As valid as such arguments may be, it is as important to address and find achievable solutions to eliminate barriers to changing researchers' behaviour and perceptions of OA, notably that OA practices could present a risk to career development and advancement. In view of this, more work is needed to promote the benefits of the 'openness' principle with regards to research outputs, to eliminate such concerns.

The OA resources for R&D in Malta particularly those attributed to basic research are relatively scarce. Consequently, by practicing OA, researchers increase the reproducibility of research outcomes. This will prevent unnecessary duplication and thus greatly contribute towards making best use of limited resources.

Maltese researchers, entrepreneurs, and other public and private actors, require access to scientific results and the ability to form collaborative partnerships, to generate new scientific knowledge,

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[7] https://www.coalition-s.org/

[8] https://digital-strategy.ec.europa.eu/en/library/recommendation-access-and-preservation-scientific-information

[9] https://data.consilium.europa.eu/doc/document/ST-9526-2016-INIT/en/pdf

ensure the industrial uptake when applicable, and ultimately the development of innovative products and services. Consequently, the scientific system would greatly benefit from fewer barriers to knowledge transfer, OA to scientific research, and mobility of researchers and brain circulation. In addition to speeding up the research process and the promotion of re-use of research outcomes, increased accessibility of results, renders the assessment of research more transparent and combats scientific fraud through increased reproducibility.

Opening-up research outputs can be also instrumental for more industry-academia collaborations, increasing the uptake and re-use of scientific information by different Maltese private sector enterprises. With the assistance of additional support measures, such collaborations increase the probability of effective re-use and exploitation of scientific knowledge leading to the development and commercialization of new innovative solutions, products and services specifically targeting users' needs.

An open research process, enables a wider use of research outputs, data, methods, and infrastructures, increasing the effectiveness and mobility of research-based knowledge. This in turn promotes advancements in the societal knowledge base by facilitating equal access to evidence-based knowledge and fosters an increase in equality within the research community and society at large. To maximize the benefits gleaned from research, it needs to positively impact and be accepted and endorsed by society at large. Increasing the transparency of the scientific system and the availability of research results for societal use, is an important step towards achieving this.

1.4.2 Researcher Level Benefits

Beyond the benefits gleaned by the Maltese scientific system and research community, there is evidence that research outputs published in Open Access are associated with high citation rates and in certain instances have a bigger impact in the short-term when compared to publications in subscription-based journals[10]. Even though in the long-term, the impact has been found to be similar between these modes of publication, still studies show a slightly larger impact for publications in OA. Moreover, the OA citation advantage can be conferred regardless of whether researchers choose to publish in OA Journals (Gold Open Access approach), or self-archive in OA repositories (Green Open Access approach), and whether OA publishing practices are initiated by the researchers or mandated by an institution or funder.

When publishing in subscription-based journals researchers must forfeit ownership of their respective research products by granting copyrights or exclusive reuse rights to the publishers of such journals. To the contrary when publishing in OA journals, researchers retain nearly all rights to their manuscripts and materials. However, the Gold Open Access approach is not the only way with which researchers can retain control of their work when publishing. There are ways to openly share work while still publishing in non-Open Access journals seen as prestigious in their respective field. Researchers may decide to practice OA via the Green approach, deposit their research outputs in an open repository, while simultaneously publish in any journal of their choosing under Creative Commons licenses[11]. In

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[10] https://journals.library.ualberta.ca/istl/index.php/istl/article/view/2512

[11] https://creativecommons.org/licenses/

doing so, authors retain copyright, and simply grant specific (non-exclusive) rights to publishers, and thus, will have the right to immediately open-up their manuscripts through OA repositories.

Therefore, with the use of these licenses, researchers can eliminate embargo periods imposed by certain publishers and yield a state of immediate Open Access whereby the re-use of existing research results can be done at an earlier stage. As a result, OA has the potential of accelerating the process with which researchers built on existing knowledge. This shows that research outputs available in OA are cited and exert an impact earlier than non-OA publications.

Enhancing reproducibility, pursuant to research outputs made available in OA, will ameliorate the quality of research conducted in Malta, and inevitably increases the number of citations for researchers. Furthermore, Maltese researchers will also have the opportunity to access European and International resources which are made available in OA.

Research collaborations by way of participating in new projects, are pivotal towards enhancing the knowledge base. However, identifying and cooperating with appropriate collaborators is also significant. OA practices increases researchers' visibility of their respective work by research communities and can therefore serve as a key enabler for researchers to connect with one another. Apart from spearheading collaborations, it also facilitates rapid access to novel data and software resources and create new opportunities to interact with and contribute to ongoing projects. Open collaborations and large-scale collaborative research, contribute to the 'widening' principle allowing for the distribution of work and expertise among many researchers, thus proving to be essential for certain projects' success. Equally important, open collaborations not only result in new functionalities from which the broader scientific community benefits, but also regularly provide researchers with enhanced community recognition, and lead to new employment opportunities.
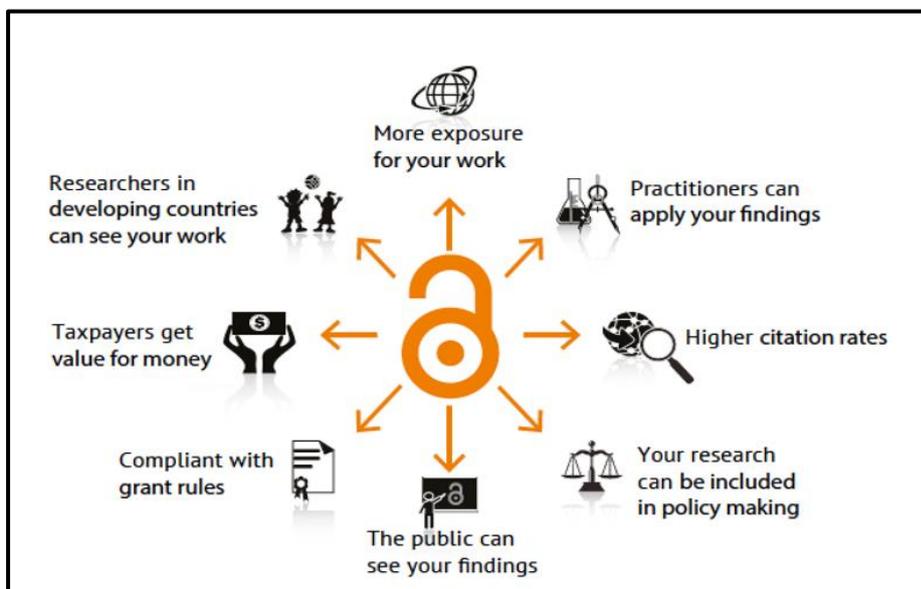
Figure 4: Benefits of Open Access. Edited from *https://www.mysciencework.com/omniscience/open-science-open-access-far-apart* (as last seen on 02/07/2021).

2 Current Situation in Malta

2.1 Open Access Publications in Malta

Figure 5 illustrates that over the years, the total number of Open Access publications in Malta has been on the increase, with a slight decrease being registered in 2018 and 2019. This overall increase in the number of publications made available in OA, could be an indication of increased awareness of OA and willingness to share research outputs. Such positive signals augur well for the future acceptance and uptake of a national Open Access policy for Malta.
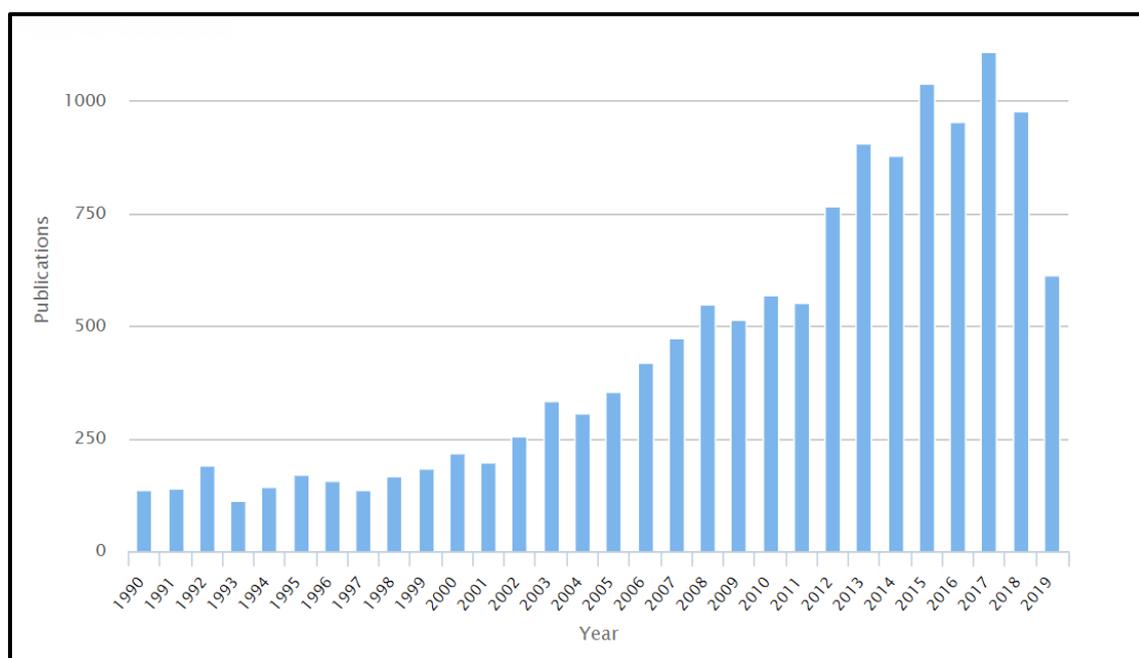
Figure 5: Open Access publications in Malta over time retrieved from *https://www.openaire.eu/os-malta* as last seen on 06/05/2021.

Malta is an innovative country with a twenty-first century approach to digitisation. However, when compared to practices in other EU Member States, Malta is not yet up to speed when it comes to practicing Open Access (Figure 6). One plausible reason feeding into this, could be related to the relative lack of policies addressing OA at national and institutional level, and open repositories in which researchers can archive research outputs in OA.
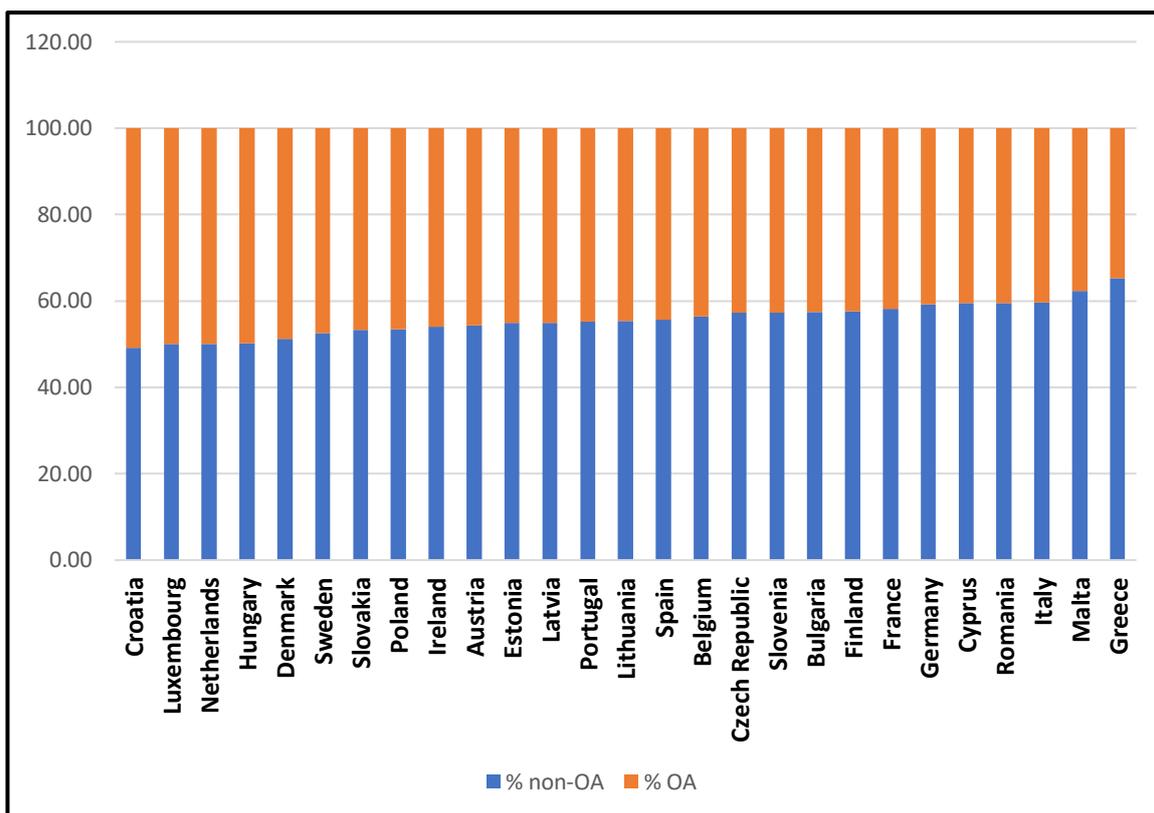
Figure 6: Percentage of Open Access Publications in total publications, by EU Members State retrieved from *https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/open-science/open-science-monitor/trends-open-access-publications_en#open-access-to-publications* as last seen on 06/05/2021.

Presently in Malta, only 1 institution has developed and implemented a dedicated institutional Open Access policy, and there are no concrete policies for, or around, ORD and/or FAIR Data yet. With regards to infrastructure, 3 institutions have established an institutional Open Access repository with 1 of these being dedicated to scholarly outputs. There are also 82 Malta-based Open Access Journals, all of which are available online.

2.2 Institutional Level Open Access policies and infrastructure

In 2014, the University of Malta Library developed and implemented the first Maltese institutional repository (OAR@UM). It is an online platform in which UM academics, researchers and support staff can deposit research content, which are preserved and disseminated via OA and can be accessed through the internet without authentication. All content deposited on OAR@UM can be retrieved and is easily harvested by indexing services and search engines such as Google and Google Scholar and this repository has also been registered with reputable Open Archive Initiative service providers including OpenAIRE, COnnecting Repositories, and Bielefeld Academic Search Engine (BASE). The research material uploaded on OAR@UM include, monographs, peer-reviewed journal articles, electronic theses and dissertations, conference proceedings and audio-visual materials. National intellectual and cultural heritage outputs are also accepted on OAR@UM and disseminated in OA. Moreover, for content uploaded on OAR@UM in restricted access, a 'Request a Copy' button on the repository's

platform allows non-UM users to request an electronic copy of the documents directly from the author.

In 2017, the UM implemented its Open Access policy[12] which recommended and encouraged academics and researchers to adopt the Green Open Access approach and upload their research papers onto OAR@UM in Open Access. In June 2021, this policy has been upgraded, and UM academics and researchers are now obliged to deposit a copy of their research papers on OAR@UM. Moreover, the UM's institutional Open Access policy supports Gold OA publishing when funds for 'Article Processing Charges' are available. While authors are free to publish in journals of their own choosing, the OAR@UM gives researchers an OA option for peer-reviewed publications.

An online repository was also implemented by the National Archives of Malta consisting of the collective memory of the Maltese national, through the preservation and accessibility of public records. Public records are defined in the same archives law (Cap. 477 of the Laws of Malta) as records (not publications) produced or received by public entities and departments. A substantial amount of the public records stored in this online are open to the public and can be accessed either through the National Archives respective[13] website or through the Archives Portal Europe[14].

The Malta Libraries has also implemented an online institutional repository serving as an online public access catalogue. This online catalogue consists of documents created and published annually by government ministries and entities. Documents preserved in Malta Libraries' online repository include, annual reports, business reports, audit reports, business and strategic plans, policy documents, commission reports, together with reports created by NGOs, NPOs and other non-governmental associations that have valid content value. Moreover, Malta Libraries recently uploaded an online incunabulum[15]. This initiative enhanced the availability of several documents, which are now easily accessible to the public in Open Access.

2.3 Institutional Level Open/FAIR Data policies and infrastructure

Several stakeholders are showing a keen interest in the area and are currently investing resources for the eventual upgrade of current policies and infrastructure, or the development of new ones, to cater for the opening-up of research data.

2.4 Maltese Open Access Journals

Several national research performing organizations have introduced their own Open Access journals. The UM currently has 81 full-text Maltese journals available in OA on the OAR@UM repository[16], with 2 of these journals being indexed in the Directory of Open Access Journals (DOAJ). The DOAJ is a community-curated online directory that indexes and provides access to high quality, OA, peer-reviewed journals.

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[12] https://www.um.edu.mt/library/oar/handle/123456789/20022

[13] nationalarchives.gov.mt

[14] archivesportaleurope.eu

[15] https://www.maltalibraries.gov.mt/iguana/www.main.cls?surl=search&p=*#recordId=1.30755&srchDb=1

[16] Open Access: Maltese journals - Library - L-Università ta' Malta (um.edu.mt)

The Malta College of Arts, Science and Technology (MCAST) publishes the 'MCAST Journal of Applied Research & Practice' which serves as a platform for showcasing vocational and applied research that is carried out either by researchers and professionals working within MCAST, or with its collaborative partners. This journal is also available online and thus accessible in OA to the public[17].

The Malta Chamber of Scientists has implemented an online journal entitled 'Xjenza' which is a peer-reviewed, Open Access, international journal. It encompasses research articles, original research reports, reviews, short communications, and scientific commentaries in various fields including mathematics, statistics, geology, engineering, computer science, social sciences, natural and earth sciences, technological sciences, linguistics, industrial, nanotechnology, biology, chemistry, physics, zoology, medical studies, electronics, and all other applied and theoretical aspect of science. Apart from providing access to research being performed nationally and internationally by Maltese scholars 'Xjenza' aims to provide a launching platform into scientific publishing for a wide scope of potential authors, including students and young researchers, in a peer-reviewed environment. Two issues are produced every year which can accessed through the 'Xjenza' website[18].

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[17] https://journal.mcast.edu.mt/resources/html/cms/MAINPAGE
[18] https://www.xjenza.org/

3 Methodology

3.1. Malta's request to the European Commission's Policy Support Facility

Towards the end of 2017, Malta submitted a request to the European Commission's Policy Support Facility (PSF) within the auspices of Horizon 2020 for support in developing its first national Open Access policy.

The European Commission appointed a group of experts and the PSF specific support exercise commenced in July 2019. The aim of the PSF exercise was to provide contextualized external advice and operational recommendations on defining the vision, goals, and scope of a national Open Access policy in Malta, together with the provision of clarifications on the requirements for its implementation.

The appointed expert group for this Specific Support on the Development of a national Open Access policy in Malta prepared a set of tailored recommendations based on:

(a) The background report prepared by Technopolis Consulting Group - This report[19] provided the experts engaged in this specific support exercise with relevant background information and outlines the current state-of-play of OA in Malta.

(b) PSF Expert Group first country visit (October 2019) - During the PSF Experts' first country visit, interviews were set up with key, national stakeholders in the Maltese R&I and scientific publication system. The interviews with the list of stakeholders as illustrated in Annex I during the bilateral visits of the PSF Experts were based on a semi-structured questionnaire.

(c) Two workshops held during the PSF Expert Group's second country visit (December 2019) - The PSF Expert Group's second visit to Malta entailed two workshops. The stakeholders which were visited and interviewed during the first country visit were invited to participate in these workshops.

High-level representatives from key stakeholder participated during the first workshop during which the experts presented draft recommended actions for the development of an Open Access policy in Malta, which was followed by a "pre-mortem" exercise. This exercise, as outlined in Annex II, required the stakeholders to imagine a situation one year after the adoption of the Maltese Open Access Policy with the recommendations as presented by the PSF experts, and identify potential reasons and explanations for an unsuccessful policy.

The consolidated outcomes of the first workshop fed into the proceedings of the second workshop during which expert representatives from the key stakeholders provided advice on the PSF Experts' recommendations and proposed policy framework, and on the implementation process of the recommended actions.

In April 2020, the final PSF Report[20] entitled "Open Access: an opportunity for Malta", was launched.

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[19] https://rio.jrc.ec.europa.eu/library/specific-support-malta-background-report
[20] https://rio.jrc.ec.europa.eu/sites/default/files/report/SS Malta_Final Report.pdf

3.2 The setting up of the National Open Science Technical Working Group

The PSF report provided Malta with a robust framework for developing its first national Open Access policy. Nonetheless, as the report itself recommends, the policy's development needed to be carried out in a way that is appropriate for the local Maltese context and its framework conditions, to ensure acceptance and eventual effective implementation.

To that end, during the initial policy development stage, a dedicated working group (the National Open Science Technical Working Group) was set up, made up of expert representatives of key stakeholders relevant for the development of the Maltese Open Access Policy as illustrated in Annex III. MCST coordinated the setting up and the work of this working group.

The group served as the principal avenue for communication management, coordination and knowledge and information exchange required for the co-design of Malta's National Open Access Policy. The coordinated approach adopted through this working group and the creation of wider networking were key to ground the policy into Malta's current realities through individual and collective expertise and experience.

Several working group participatory meetings were set up, during which the group members exchanged their views and provided technical opinions and advice on translating the PSF recommendations into practical, actionable items, contextualized in a small, peripheral country context such as Malta.

In addition to enabling the embedding of the PSF Experts' recommended actions within the factual context of Malta, the National Open Science Technical Working Group also reviewed draft texts of the policy prior to the launch of a public consultation exercise.

4   Objectives of a National Open Access Policy for Malta

4.1 Policy Goals and Visions

The Maltese R&I system is characterised by a rather conservative publication culture and a lack of structured data sharing. Improving the circulation of knowledge through the introduction of a national policy addressing the 'openness' of the Maltese scientific system will improve scientific research, as well as accelerate innovation and the engagement of society. This will elicit clear advantages for Malta as an outward looking island-based EU Member State. It will, however, take time and a significant effort to align all relevant actors and collectively move forward towards openness.

The National Open Access Policy presents a roadmap focusing on different subject areas, namely: Open Access to scientific publications, ORD/FAIR Data under the principle of "as open as possible, as closed as necessary", and related actions on awareness raising, skills, training and support, and research and researcher assessment. The policy aims to provide actions which comprehensively lead to a state of immediate Open Access.

The vision of this national policy is to create a local scientific system where 'openness' of research outputs and scientific knowledge is the default. The mission of this policy is to provide a future-proof, actionable roadmap for Malta to achieve this vision while also enabling it to align itself with European level developments. This policy builds on the findings of the PSF report of April 2020, while contextualizing the PSF report in the Maltese context and local framework conditions.

With regards to the implementation of the actions presented, the adoption of a "phase-in" approach is recommended. A phased implementation approach is a method of transitioning from an existing state to a new one in stages. The policy defines concrete phases for each subject area, with actions at each phase developing experience, skills, competences, and establish infrastructure, which become permanent, and built-upon in successive phases. As a result, the phases of each subject area build on previous ones, facilitating the process towards achieving the projected goals. This is also coupled with the fact that each phase and the relations between the phases have been carefully designed to make the end goal achievable. This approach renders the policy as operational as possible and strikes a balance between an over-ambitious policy, which would not find the support of local stakeholders, and an unambitious policy, which would be uncontroversial but would not significantly improve the state of Open Access and Open Data in Malta. In line with Malta's context, a step-by-step approach is essential for the policy to gain acceptance.

By the end of 2025, it is envisaged that Malta transitions to immediate OA in terms of publications, together with the significant progress in upgrading existing and developing new infrastructure and synergies necessary for FAIR research data management. Moreover, the policy encourages relevant stakeholders, and provides guidance so that by the end of 2025, institutional research assessment and evaluation practices are adjusted in a way that adequately reward and incentivize OA practices. Furthermore, the policy calls for a systematic upgrade of existing OA training activities and the development of well-coordinated support mechanisms fostering upskilling and increase in competences across all relevant Maltese institutions by the end of 2025.

The policy calls for a strong governance structure as described in Section 7, that will ensure a well-coordinated effort based on inclusiveness, trust and commitment which ultimately ensures the long-term success of this policy.

4.2 Critical Success Factors

Certain enabling framework conditions, notably, awareness, commitment, and funding, are cross-cutting requirements for the success of the policy.

4.2.1 Awareness

Awareness raising of both the potential benefits and challenges of Open Access among all relevant stakeholders (academia, citizens, politicians, industry) in Malta is pivotal to foster understanding, support, and the underlying commitment to a national Open Access policy. It is important to present the arguments supporting this policy and to create customised narratives for the different stakeholders, which should be communicated not only at specific Open Access events but also at general events attended by the scientific community, the business community, and the public. This requires actions including a wide awareness raising campaign across the country. All communication and dissemination activities must be undertaken in a structured and coordinated manner. To ensure this, an overarching organization is to be given the strategic and operational responsibility for awareness raising in Malta.

4.2.2 Commitment

For Malta to benefit from this National Open Access Policy, it is imperative to ascertain the involvement of all key stakeholders as described in the Section 7. Regular and on-going dialogue, between the relevant stakeholder groups must be ensured, whilst considering both the communalities and the intrinsic differences that exist between them. This dialogue should be driven by a logical and systematic strategy and operationalised through narratives clearly outlining and succinctly emphasizing the benefits the policy can provide to each stakeholder group. Thus far, MCST coordinated the conversations with all relevant actors as to maximise the level of commitment, ultimately developing an over-all inclusive policy.

This dialogue needs to go beyond the development of this policy to continuously identify actors that are currently not among the key stakeholders, those who are currently not aware of Open Access issues, and those that have not yet conveyed interest. Although incentivising them to become involved is a demanding task, such bottom-up support could ultimately contribute towards enhancing the success of the policy.

4.2.3 Funding

This policy recognizes the need for a stable funding structure at the implementation stage of this policy. The economic model drawn up by the PSF panel of experts estimating OA and ORD funding in Malta (PSF Report Annex I), can act as a basis and feed into the development of an economic model for OA funding in Malta. As with the translation of the PSF recommendations into practical, actionable items for Malta, such an economic model needs to be tailored to the local, Maltese context and Malta's framework conditions to ascertain its sustainability and effectiveness.

4.3 Timelines

This first National Open Access Policy reflects the national context and setting in 2021, and its implementation will commence in the beginning of 2022 and span over the course of the next few years. The launch of the policy in 2021 will be accompanied by a broad awareness-raising campaign.

The implementation of this policy will be monitored over time through different indicators as outlined in Section 8, as well as the governance structure referred to in Section 7, and lessons learnt, and experience gained will feed into the upgrading of the policy document at the end of 2025.

5 Key Policy Areas

5.1 Open Access to Scientific Publications

5.1.1 Introduction

Green Open Access (self-archiving), and the Gold Open Access (publishing in Open Access Journals), are the predominant publishing methods practiced by Maltese researchers by way of opening-up their scientific research outputs.

Both these publishing approaches are equally essential for the OA ecosystem, each with its own specific advantages and disadvantages. This policy addresses both approaches and presents a phased approach towards strengthening both Green and Gold OA in Malta. The policy actions presented in this Chapter complement the existing publishing practices already being undertaken by local researchers, but at the same time build on current practices, upgrade existing and establish new infrastructure to improve the current situation of OA practices in Malta, with the aim of enabling immediate OA by 2025. Such actions would therefore foster a 'future proof' policy and the measures outlined in this Chapter should serve as tools to implement it as such.

5.1.2 Institutional Open Access Policies

The only institutional Open Access policy in place, is that of the University of Malta as outlined in Section 2. This indicates that the majority of key stakeholders performing or funding research, including those with an operational institutional repository, lack an Open Access policy governing OA publishing and self-archiving within their respective institution.

Whereas the establishment of necessary infrastructure is essential, institutional policies play a complementary role in providing an overarching framework for an institution's OA practices. The implementation of an institutional Open Access policy can drive the correct application of OA practices, support researchers in the dissemination process and spearhead compliance and acceptance of the 'openness' principle.

To that end, this policy commends those national stakeholders that employ researchers, or are in the process of engaging in such employment, those funding research, and those which disseminate documents and other material in OA through a repository or otherwise, to develop and implement an institutional Open Access policy to further streamline and promote OA practices in Malta.

5.1.3 UPSCALING GREEN OPEN ACCESS

5.1.3.1 Phase 1 – Voluntary deposition

In this phase, depositing and providing Open Access to research outputs in accordance with the embargo periods stipulated by the respective publishers should be encouraged but will remain voluntary for Maltese researchers.

a) Setting up of Institutional Repositories

As illustrated in Section 2, to date, there are three operational institutional Open Access repositories in Malta. However, many Maltese organizations conducting, or funding research are still lacking an institutional repository in which respective researchers or beneficiaries can self-archive research outputs. In view of this, and due to the fact, that some research performing organizations foresee a future increase in their respective research activities the need of more institutional repositories is inevitable.

The setting up of institutional Open Access repositories will enable stakeholders to archive, preserve and disseminate their respective scientific outputs. This enhances the sharing of knowledge generated by researchers and provides an opportunity for the use and re-use of an institution's research outputs for further research activities. Through indexing and tracking of scientific outputs, individual researchers can benefit from the setting up of such repositories by obtaining a permanent link for all their respective research outputs.

This policy strongly encourages Maltese institutions (RPOs and RFOs), which currently lack an institutional repository but engage in research activities or are aiming at reinvigorating their research system, to develop their institutional repository. To ensure best use of limited resources and to prevent duplication of work, this policy strongly encourages entities embarking on this task to seek advice from and collaborate with local stakeholders having relevant knowledge and experience on the subject matter. This local networking, together with establishing communication channels with reputable Open Archive Initiatives will facilitate the process and will ensure the development of high-quality institutional repositories. Moreover, a budget should be made available to those institutions willing to develop an institutional repository, to assist setting up such an Open Access repository.

b) Establishing a Common Access Point

Beyond 2025, to further enhance the mobility of knowledge emanating from research activities undertaken in Malta, the establishment of Common Access Point (CAP) will be considered to possibly serve as a link and common entry point between existing institutional Open Access repositories. The establishment, management, and ownership of the CAP shall be discussed and decided at 'Executive Committee' level as per the proposed 'Governance Structure' for policy implementation (further details in *Section 7.4.2*). MCST could be responsible for its dissemination and marketing.

5.1.3.2 Phase 2 - Transition towards mandatory deposition

Once the necessary Phase 1 infrastructure is in place and operational, institutions managing such infrastructure should establish and provide dedicated support to researchers within their institution and develop an easy deposition process with sufficient resources and easy-to-use tools.

These are key factors which can greatly assist both research performing and research funding organizations to amend respective Open Access policies and gradually shift self-archiving of scientific research outputs from a voluntary practice to a mandatory one. For such a transition to be successful, researchers and funding beneficiaries must be fully aware of the benefits gleaned from the Green Open Access approach and consider self-archiving of respective research outputs as a personal achievement and contribution to the research community rather than an obligation.

Whereas this policy strongly encourages research funders to introduce OA deliverables within project applications, a degree of flexibility as to when OA requisites are imposed will be necessary for some scientific research outputs, including but not limited to, those with Government security and/or sensitive information issues. Due to the sensitive nature of such research activities, a case-by-case approach may be adopted when mandating self-archiving.

This phase's policy vision is for self-archiving of copies of published articles and other scientific research outputs emanating from research funded by national programmes and funding schemes to become mandatory, when possible, whilst at the same time allowing researchers to publish in any journal of their choosing. The deposited items will then become either openly accessible, or otherwise accessible through a 'request a copy' option in line with embargo periods set by Journal Publishers.

5.1.3.3 Phase 3 - Towards a state of immediate Open Access

Traditionally, as part of the process of submitting an article to a journal, authors are required to transfer their copyright to the journal publisher. This infers that authors forfeit the rights to their research outputs and grant ownership to the journal publisher. However, at European level there is increasing awareness and promotion of the concept of 'Copyright Retention', (such as the work of cOAlition S), with the aim of fostering a gradual shift towards granting specific licenses to publishers instead of copyrights.

This last phase of upgrading the Green Open Access route in Malta consists of the phasing-in of publication processes with zero embargo periods, fostering a state of immediate Open Access. RPOs should seek to set up Creative Commons licenses at institutional level such that authors can retain copyright and ownership of their research articles and grant adequate licenses to publishers. In addition to yielding a state of immediate OA, enhancing knowledge transfer and the over-all quality of research in Malta, this would also align Malta with key policy initiatives and instruments at EU level such as plan S and Horizon Europe.

5.1.4 Upscaling Gold Open Access

The Gold Open Access publishing approach is a means of making research articles immediately and freely accessible without barriers such as embargo periods and subscription costs. Open Access Journals offering this type of publishing service do not charge subscription of access fees bust most charge publication fees known as "Article Processing Charges". APCs are usually covered by the authors themselves, the institution with which the author is affiliated, or the research funder.

The average APC fee is that of €1,400 per published article, with some thematic, high impact factor journals from major publishers charging fees around €2,000 per article. This effectively limits Open Access circulation among the less affluent authors, academics, students, and institutions.

In Malta, there are currently no specific measures or actions in support of the Gold Open Access route of publishing. This policy presents two initiatives with the aim of supporting researchers and authors opting to practice Open Access Publishing (Gold Open Access), and Maltese Open Access Journals.

5.1.4.1 Institutional budget for Gold Open Access

This policy recommends the allocation by central government of a funding pot at institutional level dedicated towards funding APCs required to publish articles in Open Access Journals. Such funds would encourage researchers to practice Gold Open Access and enable the development of sustainable and reliable structures within individual stakeholders, for the funding of OA publications. MCST is to retain oversight of the process and outcomes of such funding initiatives by establishing salient monitoring indicators (more details in Section 8).

To ensure an equitable and sustainable fund, this policy advises those RPOs adopting such an institutional budget, to govern the pertinent funding with the use of clear and stringent criteria, namely:

- a ceiling for maximum cost per publication

- a ceiling on the maximum number of publications per individual researcher

- Non-eligibility of publication in Hybrid Open Access Journals

In case an institutional pilot fund is set up, this policy recommends that the institution monitors the pilot outcomes throughout its course and to carry out an evaluation process at the end of the pilot period. In addition to analyzing the cost-to-benefit ratio of the pilot fund, the data collected through regular monitoring, would enable an evidence-based decision regarding the continuation of the fund beyond the piloting period and the eventual setting up of a permanent Gold Open Access Fund.

5.1.4.2 Support Maltese Open Access Journals

The Directory of Open Access Journals (DOAJ) is a community-curated online directory that indexes and provides access to high quality, Open Access, peer-reviewed journals. DOAJ strives to achieve an equitable global transition to Open Access by raising the reputation and visibility of Open Access journals from any country or discipline. Several institutions including UM, MCAST and Malta Chamber of Scientists have established their own institution Open Access journals, with UM currently having 81 Open Access journals, MCAST having 1 journal and the Malta Chamber of Scientists having 1 journal. However, only a small fraction of these journals is registered in the Directory of Open Access Journals (DOAJ). In view of this, this policy underlines the need to strengthen the quality of Maltese Open Access Journals through registration in the DOAJ.

To register journals in the DOAJ, institutions need to meet the quality criteria imposed by the DOAJ as explained in the DOAJ website[21]. The quality criteria include basic journal information, quality and transparency of the Editorial Process, openness of the journal, content licensing and copyright issues. In addition to these criteria, DOAJ has developed a quality seal which outlines the best practices.

While this policy recommends that institutions should seek to register as many of their journals as possible in the DOAJ, this policy also acknowledges that the registration process can be a hefty one and difficult to successfully complete without support. In view of this, RPOs are encouraged to provide technical and financial support institutionally, to further enhance the quality of their respective Open Access Journals to comply with the criteria set by the DOAJ. Moreover, the stringent DOAJ quality criteria and the registration process, necessitate collaboration and knowledge exchange between local stakeholders which will increase the probability of success stories in this regard.

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[21] https://doaj.org/apply/guide/

5.2 Open Research Data and relevant Infrastructure

5.2.1 Introduction

Open Research Data, the FAIR Data concept, and Research Data Management, are relatively new topics to the research community, and not many countries in Europe or around the world have established and implemented relevant national strategies, policies, and infrastructures. Moreover, the sharing of research data is impeded by lack of adequate recognition since data citations are not yet a common practice, and by resistance from researchers who consider opening-up research data as a risk to jeopardize their individual publishing trajectory and impact.

At EU level, a strong signal in favor of Open Data was sent through Horizon 2020, its main research and innovation funding program, specifically through running a flexible pilot on Open Access to research entitled "Open Research Data (ORD) pilot". This pilot encouraged researchers to voluntarily open-up their respective research data by considering the need to balance openness with the protection of scientific information, commercialization, and intellectual property rights, privacy concerns, and security, and addresses data management and preservation. The pilot applied to research data underlying publications, but beneficiaries could also voluntarily make other datasets open. Participating projects were required to develop a data management plan, in which they specified what data will be open. This ORD pilot comprised all thematic areas of Horizon 2020 underlining the EC's ambition of "Open Research Data per default". Being a flexible pilot, beneficiaries could choose to 'opt-out' and not participate in the pilot at any stage of the project lifecycle. The ORD pilot aimed to improve and maximize access to, and re-use of research data generated by Horizon 2020 projects.

Building on the achievements and experience gained throughout the course of Horizon 2020, the EC aims to move a step closer towards fostering a European state in which research data is open by default, by moving beyond Open Access and promote Open Science within the ambit of the current framework programme (2021-2027), Horizon Europe. OS practices will be embedded in selected Horizon Europe work programs, depending on the scientific discipline.

In Horizon Europe, research data will be open by default under the principle "as open as possible, as closed as necessary." DMPs will become mandatory, even if research data is not open. The requirement for responsible data management will be separated from the requirement for providing open access to research data. More emphasis will be placed on supporting as much as possible the proliferation of data that is FAIR (findable, accessible, interoperable, and re-usable). Furthermore, the use of certified, reputable repositories and E-infrastructures including the EOSC will be required for research data in some Horizon Europe work programs.

5.2.2 FAIR Data

Despite the many advantages of opening-up research data, there seems to be less awareness of what the data science revolution will imply in terms implementing measures and associated costs. The European scientific system is characterized by shortcomings such as non-interoperable services and research data and limited cross-disciplinary access to research data. With the exponential increase in the size and complexity of research data, it is becoming more and more difficult for researchers to

curate, organize and store their own research data in a manner allowing it to be used by themselves or other researchers at a later stage.

In view of this, financial support towards the development of new research infrastructures is important, but this need to be coupled with technical support and adequate resources for data hosting and data stewardship. The provision of this technical support to researchers in curating and rendering research data FAIR, and the implementation of FAIR guidelines are essential for RPOs and institutions establishing data repositories. The adoption of FAIR data sharing, plays an essential role in the objectives of OS, to improve and accelerate R&I, and to increase the engagement of society.

FAIR data sharing is high on the agenda of the EC, and in support to the implementation of the FAIR data principles the EC established a FAIR Data expert group which was entrusted the task of developing tangible and actionable recommendations on this regard. The recommendations from this expert group address a broad range of changes in terms of policies, research culture and technical elements to turn FAIR into reality in Europe. Amendments in the data discovery, citation, and reuse processes; the establishment of data services to support FAIR; the implementation of interoperability frameworks which incorporate research community practices; the development of distributed, federated infrastructure unlocking the potential of analysis and data integration; upskilling in terms of data science and data stewardship; and incentives and funding for OS and FAIR, were amongst the recommended actions and measures proposed by the expert group.

The EC together with MS are in the process of setting up the EOSC which shall act as an umbrella initiative to implement key Open Science policies and provide seamless services in support of the idea of "commons". The key objective of EOSC is to present equal possibilities for European researchers to store, share, and re-use data across nations and scientific disciplines.

5.2.3 Open Research Data in Malta

While there is wide support across Maltese stakeholders to Open Access to scientific publications and is increasing in terms of acceptance and use, Open Research Data and FAIR Data is more recent and thus awareness and experience are consequently more limited. In addition, ORD and FAIR Data practices require a tailored approach for different disciplines making its implementation more challenging.

As with practices relating to OA to publications, the realization of ORD and FAIR Data, requires the development and implementation of policies, and the establishment of the necessary infrastructure and services. This is a process that requires careful design and allocation of resources.

None of the key Maltese stakeholders, producing and funding research, have established and implemented concrete policies for, or around, ORD and FAIR Data. The UM is currently in the process of collecting the necessary information, and is seeking to develop the skills, expertise and synergies needed for the eventual drafting of an institutional Open Data policy, together with the development of necessary infrastructure and new services enabling the curation, storage and sharing of research data.

As with policies on ORD and FAIR Data, none of the key Maltese stakeholders have established infrastructure and tools for researchers to store and share research data. However, the UM aspires to develop guidelines to exchange best practices relating to Research Data Management.

This policy addresses both OA to publications and OA to research data, with priority and focus given to the former. The rationale for this approach stems from the fact that progress on OA to publications is the relative 'low hanging fruit', that can help pave the way for more awareness on, and acceptance of, the principle of 'openness' and its eventual extension to research data. This policy recommends a phased approach for Open Research Data and FAIR Data practices in Malta, both in terms of policies, and the setting up of infrastructure, where each phase develops, tests, and establishes processes and procedures, which become permanent in following phases. This national policy incorporates a framework spearheading the creation of a solid base in Malta for a future, more fully fledged National Open Research Data Policy, but stops short of specifics beyond Phase 1, to allow for a review and update of the policy in line with experience and lessons learnt. The details of the contents of Phase 1 are further elaborated on hereunder.

a) Voluntary Open Research Data

This policy recommends that during Phase 1 a voluntary exploration of options is adopted in terms of ORD and FAIR Data practices for all publicly funded research. The key aim of this initial phase is to kick-start the process of upgrading Malta's current state-of-play in terms of Open/FAIR Data with relevant Maltese stakeholders gradually developing and implementing the necessary infrastructure, including targeted training activities, technical support, and legal aspects. The roll-out benefits of such developments will entail enhanced awareness amongst researchers and key players, capacity building in terms of ORD and FAIR Data practices, and development of new synergies in Malta, preventing duplication of efforts and fragmentation.

b) Data Management Plans

DMPs are pivotal to ensure good data management practices as these describe the decisions made by researchers relating to the methodologies and standards used in the collection, processing, curation, and preservation of research data generated throughout the life cycle of a project. Moreover, DMPs are crucial in the process of rendering research data FAIR (findable, accessible, interoperable, and re-usable). This policy strongly encourages RFOs to include as a deliverable, the submission of DMPs at the proposal developing stage of a national funded projects. This exercise will potentially promote awareness for issues around, data collection, processing, preservation, and dissemination, as well as a pre-emptive measure avoiding mishandling of research data generated at all stages of the project's life cycle. This policy also encourages the use of well-established, reputable DMP template services for the compilation of DMPs.

c) FAIR practices

This national policy strongly encourages the adoption of FAIR practices. Technical support to researchers in rendering their data sets FAIR is important during this phase. In order to ensure the provision of such support, this policy requests research funders and other relevant Maltese stakeholders to allow data stewardship costs to become eligible costs in national funded projects. It is recommended that researchers use well-recognised and accredited data repositories to store and share data. Researchers are encouraged to seek to deposit in data repositories with persistent identifiers. In terms of accessibility, researchers are encouraged to use data repositories with unrestricted APIs for better machine readability. The policy promotes and endorses the use of repositories which produce metadata coherent with OpenAIRE and DataCite Metadata Guidelines,

together with the use of discipline domain metadata by way of enhancing the interoperability of data sets. The reusability aspect of stored and shared data sets is essential for this data to be used in other research activities, fostering acceleration of research and innovation and generation of knowledge and prevent duplication of work and hence ineffective use of limited resources. In view of this, researchers practicing Open Data are encouraged to grant permission for text and data mining, exploitation, reproduction, and dissemination and to use simple open licenses such as Creative Commons.

d) Data sharing

This policy strongly encourages researchers to seek to share research data underpinning scientific publications, through a reputable data repository. However, this policy acknowledges the need for researchers to set a suitable embargo period upon deposition before opening the data. Furthermore, in addition to data underlying research publications, researchers are also encouraged to deposit other data generated along the project life cycle, such as raw data and associated metadata. This policy encourages research funders setting deliverables of national funded projects that, when possible, to include as a requirement for beneficiaries to report back the deposited data at project assessment time (interim and final).

e) Metadata

As a consequence of data complexity and data entropy, the life span of typical datasets may be short lasting, usually from generation to publication. This also applies for data, which is properly archived and preserved, which despite this, still tends to degrade in information content through time. The generation and registration of metadata of research datasets is essential for maintaining long-term historical records of datasets and to mitigate inconsistencies in documenting data and processing methods. Consequently, metadata have the potential of delaying data entropy and thus increase dataset longevity. Metadata enhances the findability of stored data and facilitates data sharing and long-term reuse by the originator, and by other researchers. This stems from the fact that metadata contain pertinent information on the data set contents, context, quality, structure, and accessibility, which is required to understand and effectively use the data. To further promote the FAIR concept, this policy strongly encourages researchers to immediately open metadata, and for this practice to be by default as much as possible.

f) Open Data Policies and relevant Infrastructure

To further support ORD and FAIR Data practices in Malta, this phase will provide an opportunity for key Maltese institutions to upgrade existing and develop and implement the necessary ORD policies and relevant infrastructure.

During this phase, this policy encourages:

i. RPOs to seek to form synergies and participate in relevant forums to gain the necessary capacity, skills and knowhow required on key issues such as DMP formation, curation of data into FAIR data, deposition in data repositories and research data sharing. MCST will seek to signpost such availabilities.

ii. RPOs to consider the possibility of setting up/upgrading of institutional repositories to allow researchers to store and share research data. In the interim, it is recommended that researchers

and national funding beneficiaries are advised, supported, and encouraged to use EU E-infrastructure, namely data repositories and services. In addition to increasing the possibilities of new research, faster development of innovative solutions, and the prevention of duplication and fragmentation, through storing and sharing research data, researchers would also gain relevant experience and the necessary know-how which will in-turn facilitate the eventual implementation of institutional ORD policies and infrastructures, should these be developed.

iii.   RPOs to seek to develop Open Data and FAIR institutional/departmental guidelines on ORD best practices. Such guidelines can act as a solid base for the development of future institutional policies on ORD and FAIR Data practices.

The OpenAIRE National Open Access Desk is well positioned to play a central role in advising researchers about the available tools and services for Open Data and could be instrumental in preparing a list of services and contacts available for use, as well as appropriate guidelines. Furthermore, such services could also be found through the EOSC Portal or the panEuropean ongoing data cluster projects such as Panosc (Photon and Neutron Open Science Cloud), EOSC-Life for life sciences, SSHOC (Social Sciences & Humanities Open Cloud), and ESCAPE for Astronomy.

5.2.4 Moving beyond Phase 1

As explained earlier, this policy recommends that the end of Phase 1 is followed by a point of reflection with an extensive analyses of Phase 1 developments and outcomes. With the experience gained and lessons learnt during Phase 1, Malta would have a better understanding of the strengths and what aspects require further improvements. In view of this, Malta would be in a better position to take evidence-based decisions on ensuing policy phases and establish a best way forward on ORD/FAIR Data policies and infrastructure appropriate for the local context.

6   Policy Enabling Factors

6.1 Research and Researcher Evaluation

Through Open Science, researchers and research administrators seek to improve the quality, reproducibility, and social impact of research. Researchers' engagement in OS can be spurred through encouragement and incentives from employers and research funders through assessment. The addition of OS practices as an indicator in research/researchers' evaluation matrices could act as a key factor ensuring that a lasting change towards OS materializes. This can only be achieved if a far more comprehensive assessment of researchers is introduced.

In fact, the EC is undertaking on-going consultations with relevant stakeholders to identify salient ways to further improve the European research assessment system with specific emphasis being placed on incentivizing OS practices. The EC intends to present a European initiative towards a reformed research assessment system which embraces a 'coalition of the willing' approach, following an agreement between European RPOs and RFOs. The initiative would define the ambitions, principles, and broad lines of action for a modernized research assessment system, with a roadmap and milestones for its implementation. It will also ensure that the appropriate national framework conditions will enable changes in research assessment.

Changing the evaluation of academic work is one of the necessary steps in the transformation of research systems that embrace OS. Adapting the rewards cycle in research to increasingly incentivize and recognize OS practices, will fuel the transition to a more inclusive and collaborative academic culture that also engages with society even when setting research agendas.

6.1.1 Recognising and Rewarding Researchers in the Context of Open Science

For most researchers and academics, securing funding is an important aspect of career development and ultimate success of their research programs. In recent years, research funders and research performing organizations have introduced awards and funding opportunities specifically targeting open research practices. While there is no guarantee that these funding mechanisms will be maintained, these clearly reflect the changing norms in the Scientific System and illustrate the increasing opportunities that Open Access offers in gaining recognition and resources.

Current evaluation methods practiced by employers of researchers in Malta are mainly based on the prestige of the journals in which researchers publish their research outputs. The journals' prestige is in turn based mainly on the Journal Impact Factor. This policy strongly encourages employers of researchers to not only base researcher assessment on the IF of the journals in which researchers publish but include OS practices as one of the criteria in their respective researcher performance evaluation processes and career development and progression.

The European Framework for Research Careers (EFRC) demarcates researchers into four categories, namely First Stage Researcher (R1), Recognised Researcher (R2), Established Researcher (R3) and Leading Researcher (R4). Researchers at all levels (R1-R4), should be incentivized and supported to

practice OS while keeping in mind the needs and responsibilities of each category. New evaluation criteria in institutional assessment processes must be fair and must offer guarantees of treating every applicant equally, irrespective of his/her career level. Whereas giving acknowledgement to past achievements/practices with rewards is important, steering future behaviors with incentives is also essential especially for early-stage researchers.

Those RFOs managing national funded projects, are encouraged to include OS practices in the evaluation criteria for funding proposals.

6.1.2 Research/Researcher Evaluation Tools

Most employers of researchers rely on a limited set of evaluation practices, mostly geared towards assessing research publications. In addition, quantitative publication metrics, notably the Journal IF and H-index, and qualitative peer review, are the commonest practices considered for evaluating researchers and their output. Other methods, such as those that adequately reflect the engagement of OS practices, are less widespread and less developed as part of individual-level incentive and reward structures. In fact, to date, there is no evidence for alternative assessment practices in Malta.

Evaluating a researcher cannot be summarized by a single figure since researchers' merits and achievements are a complex set of different variables. A better approach would be through the use of evaluation methods with multi-dimensional criteria, which have a higher probability of providing a more realistic proxy of the measurement of quality and thus would be more reliable and accurate, eliminating any discrimination.

There are several available tools that can be used to streamline and facilitate the implementation of such assessment methods. Two of the most used tools are The Open Science Career Assessment Matrix (OS-CAM), and Declaration on Research Assessment (DORA).

(a) The Open Science Career Assessment Matrix (OS-CAM)

OS-CAM provides a framework that can be used to develop evaluation systems that can be applied in various contexts at individual and group level, for the purpose of recruitment and promotion, in the evaluation of grant and fellowship applications and to develop institutional funding allocation models or incentives focused on building OS capacity. In addition, the OS-CAM can be used for this purpose, taking into consideration what is expected from a researcher and what is relevant for the specific post, grant, or career advancement. This tool incorporates broader aspects of being an excellent researcher, such as service and leadership, research impact and contribution to teaching, many of which are starting to be included in Research Performing Organisations' job descriptions and promotion criteria.

In view of this, OS-CAM possibly represents a practical move towards a more comprehensive approach to evaluating researchers, including through the lens of OS, and describes how these broader aspects can be considered within the context of recognising researcher's contributions to OS.

While the OS-CAM can be populated with numbers and weightings, this can only be part of the process. In any evaluation process, the wide diversity of researchers' experiences and capabilities are such that good decisions require qualitative judgement. This is ideally done through a panel of independent researchers who, respecting the principles of 'openness', transparency, and merit, are

entrusted with the task to assess the range of a researcher's achievements, whether it is for a new position, career advancement or for a funding grant.

(b) Declaration on Research Assessment (DORA)

DORA is another tool that recognises the need to improve the ways in which the outputs of scholarly research are evaluated. It presents a means of measuring research output quality by regulating the practice of using the IF of journals to assess individual researchers or research groups or even institutions. In a similar manner to OS-CAM, it presents an ideal opportunity for RFOs and RPOs to introduce a far more comprehensive assessment of researchers that will encourage and incentivise their participation in Open Science. To date, close to 13,000 institutions and individual researchers worldwide have signed the DORA.

6.1.3 Way forward for Malta

This policy acknowledges that changing researcher evaluation and assessment methods which have been engrained in the local culture for a long period of time is complex, and this complexity is the main, key barrier towards change. Notwithstanding this, the development of research/researcher assessment practices that adequately reflect OS practices, is an issue that is rapidly gaining in prominence in Europe and should therefore also be addressed in the Maltese context.

In line with the general approach of this policy, a phased approach is proposed, possibly with pilot actions, seeing employers of researchers introducing a more nuanced assessment of researchers, which takes OS practices into account. This policy encourages the undertaking of research/researcher evaluations making use of the available Evaluation Tools such as DORA and OS-CAM.

This policy acknowledges that adopting a new approach to evaluating research and researchers will take time and stresses that it needs to be well-planned, and its implementation continuously monitored and improved when necessary. The outcome of this change must be to improve the quality of research in a manner that safeguards research integrity and greater peer and public engagement in research. Most importantly, it must mainstream the practice of OS through incentivising researchers with recognition and rewards. This will require feasibility studies and pilot exercises to ensure that the approach achieves the desired outcome. This policy recognises that there cannot be a one-size-fits-all approach, given the difference between disciplines and institutional structures.

6.2 Awareness Raising

Beyond reinforcing Open Science with additional incentives and rewards and with the development of support infrastructure, it is imperative that key actors in the field strive to raise awareness of Open Science Practices which is pivotal to enhance uptake. Raising awareness of the value of the 'openness principle' on an individual, institutional, and societal level will prepare a fertile ground for learning and practicing appropriate skills. Awareness of OS policy initiatives, existing guidelines, as well as existing training opportunities forms an integral part of the awareness raising endeavor.

One key challenge of RPOs and RFOs is promoting the idea of uploading research outputs in Open Access to researchers and/or academics, some of which might be unaware of OA and its benefits, or their copyright obligations and restrictions. Indeed, RPOs and RFOs have important, but different complementary roles in raising awareness on the subject matter.

Besides a lack of awareness of OA practices, take up can also be hindered by researchers' reluctance to openly share research outputs, perhaps because of journal reputation considerations, or funding concerns[22]. To counteract this, strong communication channels need to be set up with the main players and customized narratives should also be provided, to ensure that concerns and reservations with disseminating research outputs through Green or Gold Open Access are adequately and effectively addressed.

6.2.1 Launching an awareness-raising campaign in Malta

This policy recommends that MCST in collaboration with other stakeholders, undertakes a broad awareness-raising campaign on Open Science, addressing Open Access to publications, Research Data Management, as well as Open/FAIR Research Data. This campaign should start with the launch of this policy and should aim to increase awareness on the benefits and challenges of OS practices amongst all relevant stakeholders in Malta, notably academia, citizens, politicians, and private entities.

Structured coordination of communication activities by relevant stakeholders is essential, and to ensure this, it is recommended that an overarching mechanism is established. This work should be followed up and complemented by relevant actions at institutional and sectorial levels.

6.2.2 Institutional Open Access Champions

It is recommended that research performing organizations nominate Open Access Champion/s at institutional level, to act as main contact point/s providing support and the necessary information and guidance to researchers, on issues relating to Open Science. Such institutional Open Access champions should be adequately skilled and experienced in the field, and themselves practice OA, to be well equipped to promote such practices and effectively contribute to a change in culture and mentality of researcher in Malta with regards to the 'openness' principle.

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[22] *https://www.weforum.org/agenda/2014/11/barriers-to-open-access-publishing/* (as last seen on 25/06/2021)

6.2.3 Institutional Open Science Departments

One main hinderance to OS practices is the misinformation and misconceptions, notably on the peer-review process in OA, copyrights, and rights retention, circulating among local researchers and academics and the private sector. To this end, this policy endorses and commends the continuation of activities currently being undertaken by some Maltese actors, with the aim of providing technical information and assistance to researchers, and to highlight the benefits of OS.

It is strongly recommended that in addition to electing an institutional Open Access champion, RPOs should also establish an institutional Open Science Department, serving inter alia as an outreach department, further assisting the marketing of the OS concept and to organize the workflow related to OA. In addition to providing technical support to researchers, another key task of such a department would be to engage in the organization of workshops, talks, information sessions and other outreach activities, showcasing the benefits of OS. Such activities, coupled with the participation and support of the institutional Open Access Champions, would help reach a wide audience, and will increasingly encourage researchers and academics to practice OA and thus, redress current hinderances to OS practices.

6.3 Skills, Training, and Support

When researchers are aware of Open Science, and are adequately trained, supported, and guided at all career stages to practice OS, the potential to fundamentally change the way research is performed and disseminated is enhanced.

In 2017, the European Commission's Steering Group on Human Resources and Mobility (SGHRM) Working Group on Education and Skills, conducted a survey with the aim of assessing the current situation on OS perspectives and good practices. The pertinent report[23] entitled "Providing researchers with the skills and competencies they need to practise Open Science", recommends a set of actions and measures aiming at fostering an environment where researchers across Europe and Member States acquire appropriate skills and competences necessary to practice OS.

The report underlines that the survey outcomes indicate that there is a general shortage of appropriate skills training and guidance for researchers in terms of OS practices. Researchers' and academics' feedback showed, that either training opportunities for Open Access to publications, Research Data Management, and Open/FAIR Data are not yet widely offered, or that they are not aware of those existing training opportunities, and of Open Science policies and practices. This showcases a clear and urgent need of more skills, training, and support activities on the topic, to begin, and also continue to engage, and fully practice OS. Nevertheless, the survey outcomes confirm that most researchers would like to participate in OS-related courses.

6.3.1 Defining necessary skills for Open Science

Open Science skills for researchers in a modern technological and data intensive research environment, are undergoing a rapid change, requiring integrated solutions from different actors. In view of this, national and institutional OS roadmaps will be needed to address the new challenges in a coherent way.

As illustrated in Table 1, in alignment with the EU Open Science Monitor[24], OS skills can be regrouped into four larger categories of skills that researchers and other members of the research and scientific community need to practice with varying degrees according to respective disciplines and professions.

23

https://www.researchgate.net/publication/319017220_Written_by_The_Working_Group_on_Education_and_Skills_under_Open_Science_Providing_researchers_with_the_skills_and_competencies_they_need_to_practise_Open_Science_Report_of_the_Working_Group_on_Educati

24 https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/open-science/open-science-monitor_en

Table 1: the four categories of necessary Open Science skills.

Category	Skills
1	Skills and expertise necessary for Open Access publishing, both Green and Gold approaches.
2	Skills and expertise in research data management; data production; data analysis, use, reuse; FAIR Data principle, respecting legal and other constraints.
3	Skills and expertise to act in and beyond one's own scholarly and disciplinary community.
4	Skills and expertise resulting from a general and broad concept of Citizen Science, where researchers interact with the general public to enhance the impact of science and research.

The skills highlighted in Table 1, are needed at different levels by the research system; researchers, technicians,and support and administrative staff, depending on the role that these various functions have in an OS research environment.

6.3.2 Situation in Malta

As regards the situation in Malta, the UM Library provides information and training on OA to scientific publications. More specifically an Open Science Department was established, which apart from running a website with information and guidelines on OS, organises a variety of Open Access-related activities, such as training workshops and courses. The UM Library provides voluntary training to researchers and academics with the aim of explaining how research outputs, notably peer-reviewed publications, can be uploaded on the UM's institutional repository "OAR@UM", and offer training sessions with academics addressing copyright and plagiarism issues. Moreover, as part of the annual Open Access Week, more in-depth training on both the Green and Gold Open Access approaches is provided by the UM Library. Publisher representatives are invited by the UM Library to provide academics and researchers with guidelines on best practices related to publishing methodologies, with Open Access publishing being the main focus of these discussions and talks.

Currently, there seem to be no specific training actions being undertaken by key Maltese stakeholders, targeting research data management and Open/FAIR Data. The UM Library is however in the process of collecting the necessary information and developing the required expertise and skills to enable the provision of such training.

6.3.3 Recommended way forward for Malta

Open Science is transformative to the research landscape, allowing research to be carried out with a high degree of transparency, collegiality, and research integrity. For OS to become a reality, researchers need appropriate discipline-dependent skills, training, and professional development at all stages of their research careers. The overarching goal of this policy is to ensure that OS skills become an integral and streamlined component of the standard education, training and career development paths of researchers and academics in Malta. Such a transformation can create unprecedented connections between researchers and the general public, allowing for a vibrant Citizen

Science movement, poised to have transformative effects on how research is executed. Moreover, a broad-spectrum of OS skills will have a major impact on research integrity, enabling researchers to avoid plagiarism, data manipulation, and data falsification, which further underlines the importance of developing such skills.

a) Establishment of institutional skills, competencies, and training centres for Open Science

With regards to training and support measures on Open Access to publications, this policy endorses and strongly encourages the continuity of those actions and activities being undertaken institutionally, and encourages other key Maltese actors, notably research performing entities, to introduce such technical assistance to their respective researchers and academics. Moreover, this policy recommends building on and further developing the training actions already being undertaken, to wholly cover the four skill categories outlined in Table 1.

To streamline such activities institutionally, this policy recommends key Maltese actors currently employing researchers, to "phase-in", the development of a skills, competencies, and training centre/department for Open Science practices. The sharing of lessons learnt, technical expertise and experience from those institutions having such a centre already in place, could be pivotal to prevent fragmentation and duplication of efforts. Coordination across relevant Maltese stakeholders is also encouraged, through this policy's governance structure.

Encouraged activities to be undertaken within such institutional training centers include:

a. Skills and training for researchers on practices related to Open Access to publications, research data management, Open/FAIR Data

b. Skills and training for the support personnel (technical, legal, ethical, and business aspects for all supporting staff)

c. Setting up of a coordinated Helpdesk which offers knowledge-based support on various Open Science issues pertinent to the institution.

b) Career Development with an Open Science perspective

It is critical for key Maltese stakeholders to ensure that researchers at all levels, have access to professional development and the appropriate skills to fully engage with OS. Moreover, learning and practicing OS skills should form a more integral part of professional training and career development for researchers. This professional development must be tailored for all four research stages (R1 to R4). Furthermore, R3 and R4 researchers need to take more leadership, and act as drivers towards a change in the local culture.

This policy acknowledges the need to be sensitive to independent learning styles and to OS possibilities and challenges of different disciplines and takes into account that different disciplinary scholarly communication practices have been established.

7   Implementation, Governance and Sustainability

The diversity in research practices and publication cultures within different disciplines poses multi-actor challenges and consequently calls for contextualized solutions in terms of Open Science. In view of this, the engagement of a variety of stakeholders is required with each having different roles and responsibilities to fulfil. The main identified stakeholders pertinent to the implementation, governance, and sustainability of this National Open Access Policy for Malta, are the Government of Malta, Research Performing Organizations and Research Funding Organizations.

7.1 National Government

National Governments have a variety of roles in spearheading Open Access and Open Science. In 2017, the Government of Malta joined other EU Member States governments in supporting OS by mandating the development of a National Open Access Policy. This aligned Malta with provisions of the 2016 Competitiveness Council Conclusions[25] on the transition towards an OS system. Member States' governments are either directly involved in OA negotiations, through funding or policies, or allocate funding towards national Open Science programmes and initiatives.

7.2 Research Performing Organizations

RPOs, such as higher educational institutions and other research institutions, also have a pivotal role to play, particularly in leading the transition towards a research and scientific system which increasingly embraces the 'openness' principle in terms of research outputs. Furthermore, through their respective OS policies these actors can set standards and provide guidance for best practices while at the same time respect the individual researchers' choices of publication and data management venues. Through incentives and evaluation systems which adequately reward OS practices, RPOs can help create research ecosystems in which researchers take publishing decisions in the interest of OA and OS.

7.3 Research Funding Organizations

Research funders also have an active role to play, particularly in setting conditions for national funded research grants and deliverables related to OA and OS for beneficiaries. Many research funders across the EU have adopted policies for OA publishing. Moreover, when applicable, some RFOs ask for the submission of DMPs as a requirement relating to scientific research data.

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[25] https://data.consilium.europa.eu/doc/document/ST-9526-2016-INIT/en/pdf

7.4 Proposed Governance Model for Malta's National Open Access Policy

The governance model for implementing the National Open Access Policy for Malta will require the active involvement of all key stakeholders and will be pivotal in safeguarding the policy's sustainability in the long-term. As was the case in other Member States, without clear political support, without supportive leadership from higher educational institutions, and without research funders pushing towards mandatory OA publishing conditions, successful implementation and a future proof national Open Access policy will be very difficult to achieve.

In addition to national funding, coordination between key stakeholders is an important driver for the successful implementation and sustainability of a national Open Access policy. An inclusive, well-balanced, and equitable coordination mechanism among relevant Maltese actors is key towards a successful Open Access policy which results in a swift transition towards a research community which embraces and practices OS. Coordination does not necessarily require the establishment a new entity, but rather, the key success factor being building bridges which sustain an open communication and coordination process on an ongoing basis.

7.4.1 Phase 1: National Open Science Technical Working Group

The PSF report provided a strong framework for Malta to develop its first National Open Access policy. As the report itself recommends, the report's recommendations need to be embedded in practice in the factual, context on the ground in Malta to ensure acceptance and eventual effective implementation.

The Malta Council for Science and Technology coordinated the setting up and the work of a national OS WG. This WG acted as the principal form for national communication management, coordination and knowledge exchange required for the co-design of the National Open Access Policy. This group ensured that the policy's development was carried out in a way that is appropriate for the local Maltese context and its framework conditions, through adequate contextualization in a small, peripheral country context such as Malta. The WG members (Annex III) thus helped ground this policy in Malta's current realities through their individual and collective expertise and experience, by providing technical opinions and advice on 'translating' the PSF report's recommendations into practical, actionable items for an Open Access policy for Malta.

The open communication channels with key stakeholders, through this WG was pivotal to ascertain the right balance between an overambitious policy, which would not find local stakeholder support, and an unambitious policy, which would not significantly improve the state of OS in Malta.

7.4.2 Phase 2: governance structure for policy implementation

Following the work of the National Open Science Technical Working Group towards the development of this policy, the implementation process necessitates a more sophisticated governance structure. To that end, the following governance structure is recommended:

(a) <u>Executive Committee</u> - This committee would have the responsibility of executing the policy's objectives and ensuring that the specific actions for each stakeholder are followed up. It is recommended that high level representatives from all key stakeholders, form part of this committee. Coordination at this executive level is particularly important for those national services provided in support of OS, addressed in previous chapters of this policy.

(b) <u>Thematic working groups</u> - In the process of executing this policy it is important for the Executive Committee to be supported by experts in working groups, the setting up of which would be based on the content of this national policy. This layer of thematic working groups should be responsible to provide the necessary, specific expertise and advice on roadmap actions and milestones.

8   Policy Monitoring

The global transition to Open Access has accelerated in the past few years. Many EU MS have developed and implemented or are in the process of developing national OA policies and/or strategies[26]. Moreover, some key, European research stakeholders, including but not limited to, RPOs and RFOs have also adopted institutional Open Access policies and established supporting measures for researchers including provision of funding and development of infrastructures and services to foster the transition to OA.

The launch of Malta's first National Open Access Policy, together with the development and upgrading of institutional OA repositories and policies, prove that Malta valorizes 'openness' in terms of circulation of knowledge, and endeavors in aligning itself with European-level developments in the field of OS. This transition, however, is complex and involves a variety of approaches and multifaceted strategies, and thus, the continuous and constant availability of data and information on the state of scholarly publishing at national and institutional level, is invaluable to help monitor this policy's implementation.

MCST will retain oversight of the level of implementation of this policy until the end of 2025, by conducting monitoring exercises in 2023 and 2025, to gather pertinent information through a set of different indicators. The identified indicators were selected with the scope of keeping a clear visual on the progress in terms of the transition of Malta's scientific system and research community to OA, and to monitor the outcomes of the investments made to support this transition. Moreover, the selected indicators (Table 2) will provide information on the sustainability of the actions recommended within this policy. All these will enable evidence-based evaluation and upgrading of Malta's OA policy.

This document presents Malta's first National Open Access Policy which reflects the national setting and context in 2020-2021, and its implementation will span the next few years. The policy will be reviewed in 2025, and the lessons learnt, experience gained, and information collected from the monitoring exercises may guide the revision and subsequent updating of the policy.

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[26] *https://www.openaire.eu/os-eu-countries*

2021 National Open Access Policy Dimension	Identified indicators
Key Policy Areas	**A1:** Number of publications in OA (Green and Gold), as a percentage of the total number of publications.
	A2: Number of institutional OS policies.
	A3: Number of Maltese OA Journals registered in DOAJ, as a % of the total Maltese OA journals.
	A4: Total expenditure covering costs of APCs.
	A5: Number of nationally funded programmes that include OA publishing (Green or Gold OA) as a required deliverable, as a % of all nationally funded programmes.
	A6: Number of nationally funded programmes that include the submission of DMPs at proposal development stage, as a required deliverable, as a % of all nationally funded programmes.
Enabling Policy Factors	**B1:** Number of training activities addressing OS.
	B2: Number of participants attending B1 training activities.

Annex I: Local stakeholders interviewed during PSF Experts' first country visit

The PSF expert group's first country visit took place from 2 October to 4 October 2019 and included interviews with the below list of stakeholders that are active in the Maltese R&I and scientific publication system. The interviews with these stakeholders were based on a semi-structured questionnaire, developed in advance.

- Tech MT

- Malta Enterprise

- MCST

- The Malta Chamber of Science

- UM

- Malta Data Protection Office

- National Library of Malta

- MEDE (Scholarships)

- MEAE (Funding)

- National Archives

Annex II: 'Pre-mortem' exercise undertaken during PSF Experts' second country visit

During our second visit to Malta the expert group undertook two workshops to which the stakeholders interviewed during the first country visit were invited. The first workshop was held with high-level representatives from key institutions in Malta. During this workshop, the experts presented draft recommendations and performed a 'pre-mortem' exercise[27].

The 'pre-mortem' technique can be considered as a risk analysis which is conducted in a way that elicits from participants, critical and outside the box thinking. The main objective of this technique is to lead to the identification and analyses of the potential problems of a given project prior the commencement of the actual project. The participating, local stakeholders in the second country visit's 'pre-mortem' exercise were asked to imagine a situation one year after the Maltese national policy on Open Access has been launched and assume that the policy failed to achieve its goals. During the exercise, the participants were asked to come up with possible reasons behind this negative outcome.

The 'pre-mortem' exercise is divided into three steps:

I.   Brainstorm

The first part of the exercise is to brainstorm all imaginable reasons for the failure. The aim is to come up with as many explanations as possible without considering the probability of occurrence and without thinking of solutions. The brainstorm input is prepared individually per participant.

II.   Categorisation

All the outputs of the brainstorming step are circulated/made available with all participants. In Step II, the brainstorming ideas are categorised into two groups; A) Issues about which something can be done to redress, B) Issues which cannot be influenced or do anything about. This exercise is normally performed as a plenary session.

III.   Solutions

The last step of this exercise is to come up with different solutions to the issues that are placed in category A of Step II.

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[27] https://hbr.org/2007/09/performing-a-project-premortem

Annex III: Members of the National Open Science Technical Working Group

The WG was composed of stakeholders relevant for the purpose of supporting the development of Malta's first OA policy. It worked at the level of seniority necessary to bring to the group both technical expertise and a wide understanding of an organization's perspective and requirements in different areas of OS. The member organizations of the WG are listed below.

- MCST (Chair and Secretariat of WG)
- Malta Chamber of Scientists
- UM
- Malta Libraries
- MFED
- Office of the Prime Minister (Funds and Programmes Division)
- National Archives of Malta
- MCAST
- Tech.MT
- MITA
- Office of the Information and Data Protection Commissioner

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4. https://www.springernature.com/gp/open-research/about/benefits
5. https://elifesciences.org/articles/16800#bib40
6. https://www.openaire.eu/open-science-europe-overview
7. https://www.openaire.eu/os-malta
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11. https://www.openaire.eu/open-science-europe-overview
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