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Using industry surveys to better understand the space economy

Drawing on established international guidelines and experiences in the space community, this chapter outlines good practices for conducting surveys of the space economy and presents a model questionnaire to spur international comparability.

Introduction

Collecting information on the space economy via surveys is a valuable tool for public policymakers and private decision makers to understand space activities and their broader effects.

This chapter is the result of extensive research into the principles and best practices of industry surveys. The information provided is grounded in international standards such as the *Frascati* and *Oslo Manuals* (OECD, 2015^[1]; OECD/Eurostat, 2018^[2]) with specific lessons learnt from the space community. This work has also benefited from OECD Space Forum members' insights and expert inputs from different administrations, industry associations, academia and the private sector. Special insights from the Canadian Space Agency (CSA) and the German Space Agency (DLR) have contributed to a practical guidance tool for future developers of space industry surveys. These insights are referenced throughout the text and summarised in Annex 4.B (Fischer et al., 2021^[3]).

Conducting a survey, and in particular initiating a new survey, can be challenging. Time and resources are required to design a robust survey; identify, contact and reach out to respondents; answer questions from stakeholders concerning the survey design itself; maintain the data collection process; and pre-process and validate results. The burden on respondents should not be underestimated, and the survey should be designed in order to minimise the time and effort required to answer it (OECD, 2015^[1]). It is therefore important to prepare surveys with care and to:

- identify potential synergies with existing national/industry surveys or specific events requiring data (e.g. regular Ministerial meetings of the European Space Agency)
- use national/international statistical classifications to ensure comparability across industries and countries where possible
- make it a repeated exercise over a regular period (e.g. annually or biennially). Organisations with limited resources may choose to reduce the survey frequency even further (e.g. once every four or five years) to limit the burden both on the government organisation and reporting units. The main trade-offs of having a low survey frequency are the recurring lack of up-to-date statistics on which to base policy decisions and the added effort to reconnect with respondents.

The following sections review some of the key points and principles for conducting a survey, providing best practices and lessons learnt. Selected categories that might be included in a model questionnaire are also outlined, as well as practical step-by-step approaches and recommendations for future surveys. A model questionnaire is also proposed in Annex 4.A to spur further international comparability.

A brief review of existing space industry surveys

The OECD has reviewed more than twenty questionnaires used to conduct regular surveys of the space economy or specific segments of it. All these surveys are referenced in this *Handbook*. Such surveys are essential to providing an indication on the size and health of the space economy (or of specific segments) at the national level and can provide the more granular information needed to support decision-makers in both the public and private sectors. The statistics they provide can also be key to assessing broader socio-economic impacts using different techniques like input-output analysis (see more on measuring impacts of space activities in Chapter 5).

In addition to these regular surveys, there are many more one-off studies exploring the economic effects of space activities, including for specific missions or segments of the space sector, that are based on ad-hoc questionnaires and expert opinion (Deloitte, 2019^[4]; Dialogic, 2021^[5]; Australian Space Agency, 2021^[6]). Many of these studies are led by consulting firms on behalf of public administrations and provide a snapshot of the national space economy within a particular period. Some of these ad-hoc studies also

review the broader effects of space activities on society. Finally, commercial market assessments provide additional information on the developments in diverse space markets (e.g. studies from Bryce Space and Technology, Euroconsult, Northern Sky Research, PwC, etc.).

Regular national and regional surveys are the focus of the following sections. Relatively few countries and organisations conduct annual or biennial measurements of their space economy. Table 4.1 gives an overview of selected surveys and reveals the approaches taken by different organisations.

Table 4.1. Selected space sector surveys

Survey name (responsible organisation)	Type of survey organisation	Coverage and target population	Sample size and response rate	Targeted economic activities	Survey status	Number of questions	Frequency
La filière aéronautique et spatiale (INSEE France)	National statistical agency	National, regional, firms	+1 500 (medium response rate, but narrow scope with good industry representativeness)	Aeronautics and space	Mandatory	25-30 questions (9 pages)	Annual since 2019 (regional since 1982)
US space industrial base and supply chain survey (US Department of Commerce)	Government agency / National statistical agency	National, administrations, firms, higher education, non-profit	+3 700 (high response rate)	Space manufacturing	Mandatory	+40 questions depending on the actor (46 pages)	Every 5-7 years). Last conducted 2011-13, new survey in 2022
State of the Canadian space sector (Canadian Space Agency)	Government agency	National, firms, higher education, non-profit	+200 (high response rate)	Upstream and downstream activities	Voluntary	15-20 questions	Annual (since 1996)
Economic ripple effects of ESA membership (Norwegian Space Agency)	Government agency	National, firms	+20 (high response rate)	Space goods and services	Voluntary	1-5 questions	Annual (since 1992)
Space industry survey (Swedish National Space Agency)	Government agency	National, firms	+ 50 respondents (medium response rate)	Upstream and downstream activities	Voluntary	5-10 questions	Annual
Size and health of the UK space industry (UK Space Agency)	Government agency	National, firms, higher education, non-profit	+1 000 and growing (rather small response rate, but desk research and very large scope)	Upstream and downstream activities	Voluntary	15-20 questions	Biennial (since 2010) to become annual in 2022
Space industry survey (Korea Aerospace Research Institute)	Industry association	National, firms, higher education, non-profit	+400 (high response rate)	Upstream and downstream activities	Mandatory	15-20 questions	Annual (since 2005)
Facts and figures (Eurospace, Europe)	Industry association	Europe, firms	+400 (medium response rate depending on the year, but narrow scope with excellent industry representativeness)	Space manufacturing	Voluntary	+20 questions (employment, sales and corporate information)	Annual (since 1991, major update in 2009)

Survey name (responsible organisation)	Type of survey organisation	Coverage and target population	Sample size and response rate	Targeted economic activities	Survey status	Number of questions	Frequency
State of the satellite industry (Satellite Industry Association)	Industry association	United States, global	Varies. Based on ad-hoc survey, interviews of selected firms and desk research	Upstream and downstream activities	Voluntary	n.a.	Annual
State and Health of the European EO Services Industry (European Association of Remote Sensing Companies)	Industry association	Europe, firms	+700 (medium response rate but narrow scope with good industry representativeness)	Earth observation	Voluntary	n.a.	Biennial (since 2013)
Space industry survey (Society of Japanese Aerospace Companies)	Industry association	Japan, firms	+90 (high response rate)	Mainly space manufacturing	Voluntary	10-15 questions	Annual

Note: n.a.= Not available.

There are three main categories of surveys collecting data on space activities at national levels. The first group includes surveys developed by national statistical agencies and administrations to produce official structural business statistics (e.g. the French National Institute of Statistics and Economic Studies (INSEE) surveys, US Department of Commerce survey of the space industrial base) (US Department of Commerce, 2015^[7]; INSEE, 2021^[8]). The benefits of surveys conducted by statistical authorities include extensive sectoral coverage and comparability with other areas of the economy. Targeted organisations are often legally obliged to respond and must provide information that can be crosschecked with other administrative sources (e.g. tax data). A drawback is that the resulting statistics are usually aggregated due to confidentiality issues and other reasons for withholding specific information. Space activities are often therefore embedded in larger sectors like aerospace, information and communication technologies and defence. This leads to a lack of granularity (Box 4.1). Timeliness can also be an issue – the data might refer to performance two or three years behind the current year. Still, broad national industry surveys conducted by statistical authorities with well-targeted questions, often developed in cooperation with space agencies and/or industry associations, can be highly coherent with other official statistics.

A second category of surveys are conducted by space agencies, either in-house (e.g. Canadian Space Agency, Norwegian Space Centre, German Aerospace Centre, United Arab Emirates Space Agency) or subcontracted to consultants (e.g. Korea Aerospace Research Institute, United Kingdom Space Agency, The Netherlands Space Office, the Federal Belgian Science Policy (BELSPO)'s Space Research and Applications department) (Korean Ministry of Science and ICT, 2021^[7]; London Economics, 2019^[8]; CSA, 2020^[9]; know.space, 2021^[10]). One advantage to conducting surveys in-house is the opportunity to develop internal industry expertise and use distinctive administrative resources for designing and following up with survey respondents (e.g. listing business enterprises receiving grants or contracts). Furthermore, government space agencies may be better qualified than external actors to identify and delineate the target survey population, leading to more accurate results. However, this approach calls for the mobilisation of significant internal resources and time, with several people involved for the duration for the survey (Fischer et al., 2021^[3]). Outsourcing the survey is therefore another option, when such resources cannot be devoted in-house. Many consulting firms and research organisations are now providing ancillary services to space administrations in this manner. Outsourcing helps find the right expertise and limits the strain on existing staff or the need for dedicated internal resources. However, there are many challenges associated with outsourcing. Due to procurement rules, the consulting firm might change from one study to the next, and

the surveyed organisations are unlikely to share data and business strategies with a company that they do not know or trust. Other drawbacks include a lack of control over the data collection process, possible statistical quality matters, and potential confidentiality issues on contracts and other sensitive statistics. It still represents the only available option for some space agencies.

Box 4.1. An illustration of official surveys: INSEE surveys of aeronautics and space industries

The French National Institute of Statistics and Economic Studies (INSEE) has conducted regional surveys of the aeronautics and space industries since the mid-1980s at the regional level (since 1982 in Midi-Pyrénées and since 2000 in Aquitaine). The original regional surveys have led to a broader series of national surveys since 2019. The 2020 survey covers the whole of France (excluding French Guiana) (INSEE, 2021^[6]). In parallel, the Interregional Directorate of INSEE Antilles-Guyane is carrying out a survey on the impact of space activities on the French Guyanese economy in partnership with the Guiana Space Center.

The next round of analysis aims to delimit better the perimeter of aeronautics and space activities in France and measure the contribution of each to the national economy. It will provide data on the aerospace industry (function, range, customers), its outlook (evolution of the activity, recruitment), human resources and innovation. Using the French classification of products (NAF based on CPF rev. 2.1), the space industry is defined by the units of the aerospace sector (3030Z, 5122Z), by the "partial" sectors units (2051Z, 2562B, 2651A, 3316Z), and "potential" areas units (40 classes of activity NAF).

By definition, INSEE surveys provide relatively aggregated statistics. But, as seen in Chapter 2, policy demand for detailed statistics on the French space economy is increasing. The French space agency CNES has recently begun a partnership with the INSEE to explore a new statistical approach for measuring the space economy using satellite accounts to the core national accounting system.

The third and final category of surveys are conducted by industry associations (e.g. Eurospace, European Association of Remote Sensing Companies (EARSC), Society of Japanese Aerospace Companies) – based on regular questionnaires sent to their membership and beyond (EARSC, 2019^[13]; Eurospace, 2021^[14]; Society of Japanese Aerospace Companies, 2021^[15]). Some organisations outsource their industry data collection and analysis (e.g. Satellite Industry Association with Bryce Space and Technology, LLC) (Satellite Industry Association, 2021^[16]). Such proprietary surveys of business enterprises provide up-to-date annual industry data. The timeliness is useful, as official statistics tend to take longer to be collected and curated. In some cases, limitations may arise in the scope of the survey, which may be focused on one segment of the space economy. Issues related to data openness normally mean that detailed results are reserved for industry association members.

The surveys reviewed in this chapter vary considerably in scope, respondent types and the number and subject of the questions asked.

- The number of organisations responding to the surveys outlined in Table 4.1 range from less than 50 to several thousand. The type of organisations surveyed also differ from those focused solely on business enterprises to those that also target public and non-profit research organisations and higher education institutions.
- The target population of space industry surveys may also change over time (know.space, 2021^[10]). Whereas space manufacturing and other upstream activities used to be a major focus of industry associations (Table 4.2), many organisations now try to extend the scope to downstream activities and applications. This also affects the type and number of respondents.

- The number of questions included in questionnaires varies from just a couple of questions to more than a hundred. Mandatory surveys (e.g. US Department of Commerce) tend to be much longer than those that are voluntary.

Some lessons learnt from these and other surveys will provide the principles and best practices described in the next sections.

Table 4.2. Selected space industry associations

Country/Region	Industry associations	Annual statistics	Website
Australia	Space Industry Association of Australia (SIAA) Australian Association of Aviation and Aerospace Industries (AAAAI)	No	www.spaceindustry.com.au/ , www.aviationaerospace.org.au
Brazil	Associação das Indústrias Aeroespaciais do Brasil (AIAB)	Yes	www.aiab.org.br
Canada	Aerospace Industries Association of Canada (AIAC)	Yes	http://aiac.ca/
Europe	AeroSpace and Defence Industries Association (ASD)	Yes	www.asd-europe.org/
	Eurospace conducts surveys of the space industry and provides results to ASD	Yes	www.eurospace.org
	European Association of Remote Sensing Companies	Yes	http://earsco.org/
France	Groupement des Industries Françaises Aéronautiques et Spatiales (GIFAS)	Yes	www.gifas.asso.fr/
Germany	German Aerospace Industries Association (BDLI)	Yes	www.bdli.de
India	Society of Indian Aerospace Technologies and Industries (SIATI)	No	www.siati.org
Italy	Associazione delle Industrie per l'Aerospazio i Sistemi e la Difesa (AIAD)	Yes	www.aiad.it
Japan	Japanese Aerospace Industries Association (SJAC)	Yes	www.sjac.or.jp
Spain	Spanish association of defence, security, aeronautics and space technology companies (TEDAE) with a dedicated space section	Yes	www.tedae.org
United Kingdom	United Kingdom Aerospace, Defence and Security Group	Yes	www.adsgroup.org.uk/
United States	Aerospace Industries Association (AIA)	Yes	www.aia-aerospace.org/
	Satellite Industry Association (SIA)	Yes	www.sia.org/

Principles for a successful space industry survey

Key principles and guidelines for conducting surveys on economic activity linked to research and innovation are well documented (OECD, 2015^[1]; OECD/Eurostat, 2018^[2]). The following sections provide some basic principles as they may apply to surveys in the space economy. For broader considerations on R&D and innovation, the *Frascati* and *Oslo Manuals* provide a wealth of information on approaches to measuring R&D and innovation. These manuals enable the production of internationally comparable survey results and should be considered key reference documents.

The information provided below has been intentionally kept general in order to be useful to different types of organisations interested in developing surveys. However, it also provides brief pointers and lessons learnt from the comparative study of existing questionnaires. This may give ideas to new surveyors and long-standing developers of surveys alike.

When putting together a survey, there are several standard elements to consider: The scope and objectives of the survey, the target population, the data collection modes to be used, the questions asked, validation of the results and the need to complement the survey with other data.

Scope and objectives: Designing the survey

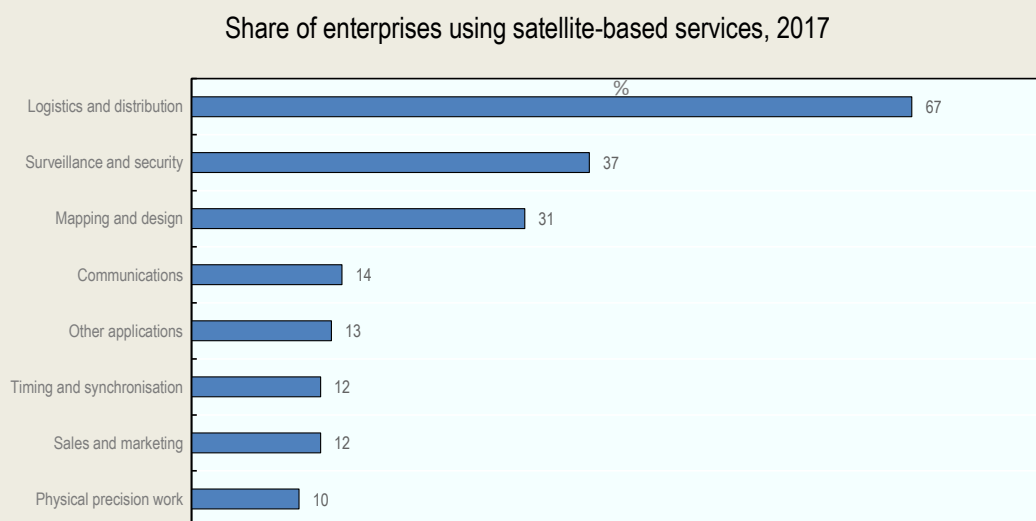
The first step when preparing a survey of the space economy is to clearly identify the objectives and delimit the scope of the exercise. It is important that the survey scope is aligned with initial strategic objectives, making it possible to then report back on policy priorities.

In most cases, surveys aim to provide information on the state of the space economy or segments of it (manufacturing, academic capabilities, etc.), by identifying key actors, their demographics, outputs and outcomes such as revenues or innovations (Eurosace, 2021^[14]). Increasingly, an additional objective is to conduct further economic impact analysis based on the statistics gathered (employment and revenues), such as input-output analysis for example (Korean Ministry of Science and ICT, 2021^[9]; Canadian Space Agency, 2020^[10]) (more details on techniques in Chapter 5). Another objective might be to survey the *users* of space products and services. Denmark Statistics, for example, has added space-related questions to two nation-wide annual surveys: “ICT use in enterprises” and the “Agricultural and horticultural survey” (Box 4.2).

Box 4.2. Tracking users of space applications via official statistics in Denmark

Since 2016, Statistics Denmark has included questions on the use of space technologies and satellite data in the broader economy in two national economic surveys. This makes it possible to track the use of space technologies and satellite data at a much larger scale than what is commonly possible from space-related surveys. The OECD Space Forum supported the development of the initial questions. The first survey targets Danish business enterprises in all sectors and asks about their ICT uses. It includes questions on the use of global navigation satellite systems and other satellite services. The survey found that in 2018 some 16% of Danish enterprises used satellite-based services (Figure 4.1).

Figure 4.1. Main applications of satellite-based services in Danish enterprises



Note: The results are based on data from 3 954 enterprises out of a total population of 16 465 enterprises.

Source: Danish Ministry of Higher Education and Science (2018^[15]), *Opfølgning på den danske rumstrategi* [Follow-up report to the Danish space strategy], <http://www.ufm.dk/brugrummet>.

This original approach using broad national industry surveys with short and targeted questions may identify unexpected user groups. In 2018, 77% of “large” Danish enterprises (250+ employees) in all surveyed

sectors had used satellite-based services. In individual areas of the economy, 32% of enterprises in the construction sector, 18% in trade and transport and 10% in ICT had used satellite-based services (Danish Ministry of Higher Education and Science, 2018^[15]).

Once the objectives of the survey are well defined (e.g. status of the national space economy, status of the space manufacturing sector, etc.), a consultation with key stakeholders should take place. Stakeholders may be organisations conducting space activities from any sector. This enables potential respondents to the survey to contribute to its design with the aim of reducing the survey burden once it is live. A period of testing and refining questions will be required.

The next step is to allocate resources. As mentioned earlier, whether small or large, conducted in-house or contracted out, surveys represent an investment both financially and in terms of human resources (Fischer et al., 2021^[3]). A timeline with defined milestones also needs to be developed, particularly if potential collaboration and possible overlaps with other surveys have been identified.

To conduct successful surveys, one important principle is to ensure that the survey design is robust to the pressures associated with changing circumstances in the space economy. This implies careful thought regarding both the questions asked and how they may be adapted in the future. Both the Canadian Space Agency survey, and most recently the UK Space Agency survey, have extended or changed their methodologies in such a way as not to disrupt their long time series. Approaches that enable statistics to be presented in time series form are preferable to ad-hoc surveys. A good example is the Eurospace survey which has been conducted for more than 20 years (Box 4.3).

Box 4.3. Example of a robust space industry survey: The Eurospace survey

Eurospace is a space industry association that has been collecting data on European space manufacturing for more than 20 years (Eurospace, 2021^[12]). The data collection is supported by business enterprises operating in Europe but is not limited to Eurospace membership. Respondents answer a questionnaire providing detailed information on their sales and employment relevant to space system design, development and manufacturing. For enterprises not directly responding, proxy data are elaborated using information provided in previous years (when available) and/or information available from public sources such as the European Space Directory, media sources and company websites.

The survey relies on well-established processes. It has by definition a focus on space manufacturing, but it also covers other space economy activities. To avoid double-counting, Eurospace calculates consolidated sales at the European level, while also taking into account intermediate sales throughout the space manufacturing value-chain where possible. The survey methods (including changes in methodology) are publicly available and the resulting long time-series make the survey a robust and respected instrument to track developments in the European space manufacturing space sector. The results have also proven to be a useful baseline for other broader surveys.

Target population

Organisations to be surveyed, or “reporting units”, need to be carefully selected, since respondents are the most valuable resource in the survey process (OECD, 2015^[1]).

Unless a census is conducted of a specific sub-set of organisations operating in the space economy, a representative sample of respondents must be selected from the target population. The characteristics of the reporting units and the response rate realised will decide the representativeness of the survey sample and therefore the robustness of the results. In order to improve the quality of its results, the Eurospace

industry association, for example, seeks responses from business enterprises that represent some 80% of revenues in European space manufacturing annually (Eurosace, 2021^[12]).

Several OECD seminars and workshops have reflected on national practices in surveying subsets of the population of organisations operating in the space economy – from those groups of organisations operating in very broad areas of the space economy to those with very narrow characteristics. The target population should be based on the surveys' objectives. For example:

- **Surveying beneficiaries of public space funding:** In 2021, BELSPO initiated its second space survey (the first one took place in 2016) with the objective of monitoring the status of the space economy in Belgium. BELSPO targeted a specific subset of space organisations and directed the survey only to actors that received public funding (including ESA and Horizon 2020 grants). Such organisations were asked to report and quantify their upstream, downstream and space-related activities (based on *Handbook* and *OECD Frascati Manual* definitions). The sample included public and private entities that were already beneficiaries of public funding. The survey collected information on 160 actors (125 companies and 35 semi-public organisations or universities) identified by their tax identification number to enable checks for consistency with the data available in the National Statistical Office's microdata archives (Teirlinck, 2021^[16]).
- **Surveying actors involved in space research:** Also in 2021, the Netherlands Space Office conducted several analyses of the Dutch space economy either directly or via contractors. One report commissioned by the Dutch Ministry of Education, Culture and Science, provided a qualitative and quantitative picture of the activities of groups specifically involved in space research in the Netherlands (Dialogic, 2021^[4]). Targeting some 56 research institutes and universities, the survey contributed to mapping the capacities and positioning of Dutch research in European and international space programmes.
- **Surveying actors in earth observation and data analytics:** In this same vein of conducting targeted surveys, the French space agency initiated an internal industry survey in 2019 directed at French business enterprises involved specifically in earth observation and data analytics. Building on CNES grantees and on recent hackathon participants to build a survey population, the survey provided a new picture of the organisations involved in French earth observation activities with a particular focus on identifying start-ups.

The construction of a list of organisations that may form the target population for a typical space economy survey is therefore highly dependent on the scope and objectives of the survey. A typical way forward for deciding the target population may involve one or more of the following steps:

- List companies, public research institutions and universities which are known to participate in space programmes (identified via contracts, grants).
- Enlarge the search to other space-related organisations (via industry and professional associations' memberships, public and private business incubators, official business registers).
- Filter out irrelevant actors through desk research and a possible preliminary screening (i.e. contacting some companies directly to check if their activities fall within the scope of the survey or not). As an example, many actors in downstream space activities are registered as data-processing companies (ISIC two-digit code 63: Information service activities and four-digit code 6311: Data processing, hosting and related activities). Based on existing business registries, contact with such companies can help filter them for relevance or reveal other relevant actors for the survey. In the latest UK Space Agency survey, some 1 218 organisations were identified as being engaged in some space-related activities in the UK in the 2018/19 fiscal year (running from 6 April to 5 April the following year) (know.space, 2021^[11]). These organisations were all individually assessed by a review of their website or through annual reports.
- Identify start-ups via hackathons, competitions and prizes organised by space agencies (e.g. Space Apps, Copernicus Masters). The EARSC finds that initiatives such as these have simplified

the process of identifying new actors involved in earth observation and data analytics (EARSC, 2019^[13]).

- Finally, check commercial online databases (e.g. Crunchbase, ZoomInfo, Owler) to identify start-ups and investor companies using relevant industry categories (e.g. space travel) and keyword searches.

Modes of data collection

When conducting a survey, data collection can be carried out by various modes, including electronic collection, a paper questionnaire or by telephone (OECD, 2015^[11]).

Increasingly, questionnaires make use of the internet. A well-designed online questionnaire can be easier for a respondent to interact with than a simple paper questionnaire and the results may be more readily processed into a format suitable for analysis.

Box 4.4. How to boost surveys' response rates?

In order to ensure that the results of surveys are meaningful, survey response rates should be as high as possible. Some best practices for engaging with respondents from space agencies and those derived from the *Frascati* and *Oslo Manuals* (OECD, 2015^[11]; OECD/Eurostat, 2018^[2]) are provided below:

- ensure good question and questionnaire design including, where necessary, explanatory notes, hypothetical examples and documentation that may be informative for the respondent
- pre-contact respondents to confirm contact information and industrial activity
- clearly communicate the purpose and use of the survey data to generate trust
- use the respondent's name when in contact with them and personalise the wording of reminder emails. Both the Canadian Space Agency and the UK Space Agency include messages from their President/Director-General when contacting respondents.

4.1.1. Drafting the questions

Drafting and testing the questions is a crucial element of the survey process. A model questionnaire is discussed in the next sections, with questions proposed in Annex 4.A, but two general principles borne from recent country experiences can inform the drafting process:

Drafting questions without reinventing the wheel: The German Space Agency launched the first German space survey in September 2020. It targeted around 1 200 space-related companies as well as space research organisations that were identified via desk research and database searches. The structure of the survey closely aligns with the one conducted by the Canadian Space Agency and references the *Handbook* definitions. The questions collect information regarding the positioning of organisations in the value chain; their revenues (national and international, public and private); the level and characteristics of their workforce; their R&D dynamics; and the funding received under the German National Programme for Space and Innovation (Fischer and Grunewald, 2021^[17]).

Recognising that different information may be gathered from different target populations: Korea has conducted an annual survey on the status of the Korean space industry since 2005. The survey includes almost 500 business enterprises, R&D institutions and universities that participate in space-related activities and reflect the Korean space sector's supply chain from upstream (e.g. manufacturers of satellite, launcher and ground stations) to downstream (e.g. satellite communication and direct-to-home TV service providers). Based on a 15-year time-series, the survey recently revealed that the number of organisations operating in the country's space economy has grown considerably in the past decade.

According to the 2020 survey, 40% of actors were established after 2005, and 70% started space-related business or research after 2005. To gather information specific to each sector, the Korea Aerospace Industries Association sends out three different versions of its annual space industry survey to business firms, research institutes and higher education institutions (Korean Ministry of Science and ICT, 2021^[9]). Sending an “inclusive” questionnaire to organisations from different sectors, with dedicated questions is also another cost-effective approach.

Validating the results and complementing with other data sources

Concerns over the quality of survey data are recurrent in studies of the space economy. It is therefore useful to document the different steps taken and make the methodology utilised publicly available. This may help analysts validate the results and ensure data quality. Such a methodological note should summarise:

- How the list of organisations making up the target population was constructed (which actors and why?), maintained (new actors included?) and assessed for representativeness (which indicators were chosen?).
- Indicators such as the response rate should be included.
- How double-counting issues were addressed. Were revenues consolidated or not? This question may occur particularly when considering revenues of large space prime contractors and their subcontractors. To avoid double-counting for instance, Eurospace calculates consolidated sales at the European level, while trying to determine intermediate sales throughout the space manufacturing value-chain where possible.
- In the case of a repeated survey, evident discrepancies should be indicated (change in the scope from past surveys? More actors were included?) with an explanation of the differences between results over the years.

Using data sources that are complementary to the survey data may also provide a wealth of information that could contribute to corroborating the results. For example:

- Annual reports, business registries and commercial databases can be useful administrative sources. Tax data, when available, can be useful in cases where expenditure on research and development are eligible for tax credits and allow a cross-check with survey results. As an example, the CSA is working with Statistics Canada to identify overlaps between the CSA’s space industry database and official statistical records, which could significantly facilitate quality control or potentially replace certain questions in the survey.
- Other estimates derived from desk research and interviews may be useful. For example, the indirect estimation of R&D expenditures based on modelled estimates. These more subjective estimates need to be substantiated as much as possible.

Towards a model questionnaire

This part of the chapter proposes generic categories and selected questions that may be included in a simplified questionnaire. It builds on both standard practices and lessons learnt from conducting surveys of space activities. The proposed model questionnaire can be found in Annex 4.A.

The model questionnaire aims to encourage better cross-country coherence and improved data availability for space economy analysts. This model is not prescriptive and there will always be differences across countries that will necessitate adjustments. However, its structure is inspired by existing questionnaires and is intended to provide a concrete illustration to practitioners. Definitions of many of the terms used are

provided in Chapters 2 and 3. The model questionnaire is split into several sections, each one focused on a particular area of interest. The six suggested sections are:

1. General instructions and definitions
2. Respondent information
3. Revenues
4. Workforce and skills
5. Research, development and innovation
6. Effects of participation in government space programmes.

General instructions and definitions, and the sections on revenues and workforce and skills are included in most long-standing space industry surveys (Table 4.3). The questionnaires often address the business enterprise sector as well as government, higher education institutes and public research organisations.

Table 4.3. Sections and questions in selected space industry surveys

Survey name	Revenues	Workforce and skills	R&D and innovation	Effects of participation in space programmes
La filière aéronautique et spatiale dans le Grand Sud-Ouest ¹ (INSEE France)	Space-related revenues	<ul style="list-style-type: none"> • Space-related workforce (FTEs) 	Not applicable	Not applicable
State of the Canadian space sector (Canadian Space Agency)	Space-related revenues by: <ul style="list-style-type: none"> • sectors • Value chain • Geographic distribution • Customer type 	<ul style="list-style-type: none"> • Space-related workforce (FTEs) • Geographic distribution • Occupations • Gender 	<ul style="list-style-type: none"> • Internal and external R&D expenditure • R&D workforce • Inventions • Patent applications 	Revenues generated from products originally supported by public funding
Space industry survey (Swedish National Space Agency)	<ul style="list-style-type: none"> • Revenues • Geographic distribution • Customer type 	<ul style="list-style-type: none"> • Space-related workforce (headcounts) • Educational attainment • Gender 	Not applicable	Not applicable
Size and health of the UK space industry (UK Space Agency)	Income by: <ul style="list-style-type: none"> • Sectors • Value chains • Geographic distribution • Customer type 	<ul style="list-style-type: none"> • Space-related workforce (headcounts) • Geographic distribution • Educational attainment 	<ul style="list-style-type: none"> • External and internal R&D expenditure 	Not applicable
Space industry survey (Korea Aerospace Research Institute)	Space-related revenues by: <ul style="list-style-type: none"> • Sectors • Geographic distribution • Customer type 	<ul style="list-style-type: none"> • Space-related workforce (headcounts) • Geographic distribution • Occupations • Educational attainment • Gender • Age • Years of experience 	<ul style="list-style-type: none"> • Internal and external R&D expenditure 	Not applicable

Survey name	Revenues	Workforce and skills	R&D and innovation	Effects of participation in space programmes
Facts and figures (Eurosace ,Europe)	Revenues by: <ul style="list-style-type: none"> Geographic distribution Customer type 	<ul style="list-style-type: none"> Space-related workforce (FTEs) Educational attainment Age Gender 	Not applicable	Not applicable
State and Health of the European EO Services Industry (EARSC, Europe)	Space-related revenues by: <ul style="list-style-type: none"> Sectors Value chain Geographic distribution Customer type 	<ul style="list-style-type: none"> Space-related workforce Educational attainment Gender 	Not applicable	Not applicable
Space industry annual survey (Society of Japanese Aerospace Companies)	Revenues by: <ul style="list-style-type: none"> Sectors Geographic distribution Customer type 	<ul style="list-style-type: none"> Space-related workforce (headcounts) Occupations 	<ul style="list-style-type: none"> R&D expenditure Patent applications 	Not applicable
State of the satellite industry (Satellite Industry Association (SIA), United States)	Revenues	<ul style="list-style-type: none"> Space-related workforce (headcounts) 	Not applicable	Not applicable

1. These surveys are not specifically targeting space sector enterprises but include some space-related questions.

Section 1: General instructions and definitions

From its beginning the survey should provide clear instructions and practical information for respondents (OECD/Eurostat, 2018^[2]). Some basic definitions may be included as well as explanatory notes either in an annex or, in the case of web-based questionnaires, as floating fields. To be user-friendly, it is also useful to mention how long it will take to respond and how many questions are included (even if not all of them may be applicable). Some surveys may be quite short while others may be very long and the respondent may wish to know this in advance.

As an example, the US Department of Commerce’s mandatory survey indicated that the “[p]ublic reporting burden for this collection of information is estimated to average 14 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information” (US Department of Commerce, 2013^[18]).

Section 2: Respondent information

This section includes information concerning the respondent (organisation and point of contact). As mentioned by all survey developers, it is important to make sure that a point of contact is well-identified and can be contacted if there are issues with responses (e.g. missing information).

Section 3: Revenues

Space sector revenues (often used interchangeably with “sales” and “turnover”) refer to the income received from the sale of space goods and services. Revenue is one of the main measures used to track the health and development of the space economy.

Different breakdowns of income need to be captured: Sales versus grants, domestic versus international sales (exports), and public sector revenue versus private sector revenue. Revenues also ideally need to be reported by key activities (e.g. manufacturing, satellite operations) and when possible, by sector of

application (e.g. satellite communications, earth observation). Some countries may wish to highlight specific sectors (e.g. meteorology). If broadcasting is of interest, it should be kept as a separate sector of application because of its sheer size (see Chapter 2 for definition of activities). Based on existing examples (e.g. Canada, Germany, United Kingdom, Korea), the model questionnaire in Annex 4.A suggests some questions to facilitate comparisons across countries.

Business enterprises may be involved in major institutional contracts with many of their own suppliers receiving shares of these larger contracts along the value chain. This affects how revenues are accounted for in different enterprises. At the survey level, this may require appropriate consolidation for accurate measurements that avoid inflating the final figures on revenues as demonstrated by the Eurospace methodologies to avoid double-counting (Eurospace, 2021^[12]). When surveying different departments in a given business enterprise, special attention should be given to avoid double-counting revenues by mistake.

Section 4: Workforce and skills

This section collects information on the total number of people working in the organisation and those involved in space-related activities. As seen in Chapter 3, there are many ways to measure employment with different metrics useful in different contexts. Questionnaires to support the collection of work and labour market data should be aligned with the latest international standards (International Labour Organisation, 2021^[21]). The workforce of certain organisations and facilities (e.g. NASA and ESA centres) may include external contributors (external contractors) that are fully integrated into the organisation's activities without formally being employed by them. The *Frascati Manual* recommends that these external personnel be identified and counted as part of the workforce.

Some of the key metrics to collect include:

- Total workforce and space-related workforce: It is important to indicate the unit of measurement e.g. the number of people employed (headcounts) or full-time equivalents (FTEs). FTE is the ratio of working hours actually spent on an activity during a specific reference period (usually a calendar year) divided by the total number of hours conventionally worked in the same period. If the same person performs two or more tasks, an indication of the weighting of each task in their overall responsibilities would be required. Any potential external personnel/contractor (fully integrated into activities, but not employed by the organisation) should also be counted.
- Space-related workforce, by space activity, when possible, i.e. involved in space exploration, telecommunications, etc. (see model questionnaire in Annex 4.A).
- Type of occupation: Options in this question need to be well defined, ideally using existing national and/or international classifications. As seen in Chapter 3, the *Oslo Manual* encourages the collection of data on occupational status based on the International Labour Organisation Standard Classification of Occupations (ISCO-08) (ILO, 2016^[20]). This includes occupations such as “science and engineering professionals”, “information and communications technology professionals”, and “science and engineering technicians”.
- Educational attainment (e.g. secondary school, post-secondary non-tertiary (vocational school) or different levels of tertiary education): International frameworks include the UNESCO Fields of Education and Training (ISCED-F 2013).
- Age and gender of employees: These aspects are useful for tracking specific policy objectives such as gender equality or demographic trends in the space economy.

Section 5: Research and development / Innovation

The OECD provides guidance for collecting data and developing statistics on research and development (R&D) and innovation in the internationally agreed *Frascati Manual* on R&D and the *Oslo Manual* on Innovation (OECD, 2015^[1]; OECD/Eurostat, 2018^[2]).

Three types of questions should generally appear in this section:

- R&D-related expenditure: A distinction between internally and externally funded R&D could be included depending on the details required.
- R&D workforce: The number of workers engaged in R&D activities preferably in FTEs.
- Innovation: Asking respondents to provide proxy information such as the number of patents awarded.

Section 6: Effects of participation in space programmes

In recent surveys conducted by the Canadian Space Agency, a new section on “return on investment” has been included (Canadian Space Agency, 2020_[10]). This section aims to gain a better understanding of the effects of government funded space projects (e.g. increased collaboration, reputational effects, and additional revenues). The nature of the effects will differ depending on the type of organisation that received funding (business enterprises, public research organisation and universities). Several questions can be asked regarding:

- additional revenues (e.g. not the grants/contracts themselves, but estimates of additional revenues generated as a result of programme participation)
- increased visibility and reputation
- improved internal knowledge, skills and capabilities
- partnerships and collaborations with other actors (public/private)
- scientific and innovation outputs (scientific papers, patent applications, innovations).

Concluding the survey: At the end of the questionnaire, it is useful to allow additional comments from respondents. This provides respondents with the opportunity to freely input information they consider to be important to the subject of the survey but missed in the questionnaire.

Key take-aways on space economy surveys

By summarising existing best practices, this chapter has provided some of the key considerations involved in conducting a space economy survey. The following key conclusions on surveys complement remarks made in Chapter 2 (definitions and concepts) and Chapter 3 (actors):

Use standard and well-established practices: This chapter relays the practices and data collection efforts of a selected government organisations and industry associations carrying out space industry surveys, most of which are using standard and well-established practices. While it may be beyond the means of smaller space organisations to carry out large-scale surveys, all economies with a space programme are encouraged to conduct surveys using standard methodologies and then share high-level public results (e.g. aggregated data, space industry demographics). This can provide valuable information and contribute to identifying trends in the broader space economy for the benefit of all.

Partner with other knowledgeable organisation: Partnerships with government agencies, such as national statistical offices and with industry associations, can provide methodological support, added credibility and, in some cases, secure extra funding (particularly when conducting large-scale economic surveys). Collaboration often ensures a more solid and standardised methodological approach and greater outreach and visibility.

There is a strong need for greater international co-operation and co-ordination to improve comparability: Agencies conducting industry surveys highlight the burden of work involved, even when only supervising consultants’ work. Greater international co-ordination for developing joint definitions and methodologies is therefore necessary to reduce the burdens associated with survey design. The OECD Space Forum will continue to facilitate exchanges on best practices across a growing number of institutions worldwide.

Annex 4.A. Model survey for measuring the space economy

As discussed in this chapter, all surveys need to be based on specific objectives that are context specific. Despite this, a model survey with some generic sections and questions is proposed here in order to encourage the use of particular generic questions. The questions should be adapted to local context with more or less detail added as required. The questions are largely inspired by existing questionnaires and the lessons learnt shared during OECD Space Forum meetings (Fischer et al., 2021^[3]). To facilitate follow-up analysis, the proposed questions presented here should be arranged in matrix format using spreadsheet programmes (e.g. MS Excel and alternatives) and ideally use online solutions.

Respondent information

Contact Information for the survey

Name:

Division/Department:

Email:

Phone:

Organisation name:

Address:

Postcode:

(If applicable, a unique identifier such as a tax reference number may also be requested)

Please specify your organisation type:

- Micro enterprise (<9 employees)
- Small enterprise (10-49 employees)
- Medium enterprise (50-250 employees)
- Large enterprise (>250 employees)
- Higher education institution
- Other research / non-commercial organisation (please specify): ...

Is your organisation privately owned or publicly traded?

- Privately owned
- Publicly traded
- Publicly owned
- Not applicable

Is your organisation foreign-owned? If yes, what percentage (from 0% to 100%)?

Is your operating profit consolidated in the earnings of a parent company? Yes/No

If so, please give the name of your parent company: ...

Revenues

Please indicate for which fiscal year you are reporting (note; the start of the fiscal year may be different from country to country, often with a start in January or April):

- 2020-2021
- 2021-2022

What is your organisation's total revenue? ... (national currency)

What is the share of space-related revenues in your organisation's total revenue? ... %

Please estimate a breakdown of space-related income by type:

- Domestic sales: ... %
- International sales (exports)
- Grants: ...%
- Other (please specify): %

Please give a breakdown of your space-related revenues (domestic and international) by customer type:

- Business enterprises: ... %
- Government administrations (list all the names of the main possible customers, e.g. space agency, defence department...): ... %
- Higher education institutes (list all the names of the main possible customers, e.g. university X or Y): ...%

If you are exporting products and services, please estimate the breakdown by customer location (total should be 100%)

- North America (USA, Canada, Mexico): ...%
- Europe ...% (European Union ...% -- Non-European Union (Norway, Switzerland): ...%
- Central and South America (including Caribbean): ...%
- Middle East: ...%
- Africa: ...%
- Asia and Oceania: ...%

Please select which space activity your organisation is engaged in:

- Science
- Space exploration (including space stations, rovers and probes)
- Space transportation (including launch)
- Satellite communications (excluding broadcasting)
- Satellite broadcasting
- Positioning, navigation, timing
- Earth observation (excluding meteorology)
- Meteorology
- Other (generic technologies or components, please specify): ...

For each space activity you are engaged in, please provide a breakdown of your total space-related revenues by your main products and services (total should add up to 100%). The table could be repeated for each space activity, i.e. space exploration, telecommunications, etc. (see Chapter 2 for definitions).

Share of space-related revenue (%)	Main areas of products and services
	Research, engineering and other services
	Space manufacturing
	Space launch and transportation
	Operations of space and/or ground systems
	Supply of devices and products supporting the consumer markets
	Supply of services supporting the consumer markets

Please indicate if these space-related revenues are fully consolidated (i.e. including intermediate products and services from third parties). Do you track the share of these intermediate products and services in your consolidated revenues?

Workforce and skills

Workforce

Please indicate the number of employees, in [country], working in your organisation in full time equivalent hours, also including externally hired staff. (Full-time equivalent (FTE) is the ratio of working hours actually spent on an activity during a specific reference period (usually a calendar year) divided by the total number of hours conventionally worked in the same period.)

Please estimate the share of employees involved in space-related activities? ...%

Please indicate the total number of people employed in your organisation by job function and indicate the share of employees in space-related activities and the share that are female.

Functions	Total number of employees	% of female employees	% of employees involved in space-related activities
Management			
Engineers and scientists			
Technicians			
Marketing and sales			
Administration			
Students/interns			

Over the last year, has your organisation experienced challenges recruiting qualified workers to the extent that positions remained vacant? Yes/No

Please select the occupations for which your company has experienced challenges recruiting qualified workers to the extent that positions remained vacant (e.g. management, engineers and scientists, technicians, marketing and sales, administration, students/Interns).

Skills

Please estimate the percentage breakdown of employees by the highest qualification obtained in the most recent year available (total 100%)

- PhD or above: ...%
- Master's degree: ...%
- Bachelor's degree: ...%
- Vocational qualification: ...%
- Other qualification ...%

Research, development and innovation

Research and development

Could you provide your organisation's total expenditure on R&D? ...

Could you estimate the share of your organisation's total expenditure on R&D for space activities? ...%

How many people are employed in R&D activities and working the equivalent of full-time hours? ...

What is the share of people involved in space-related R&D and working the equivalent of full-time hours? ...%

Inventions

Please indicate the number of space-related inventions you have produced this year (protected or not): ...

Please indicate the share of space-related patents you have registered this year: ...

If applicable, please indicate the number of space-related technology licenses you have received this year:

...

Innovation

Innovation in space products/services: A product innovation is a new or improved good or service that differs significantly from the firm's previous goods or services and which has been implemented on the market. It includes significant changes to the design of a product, or digital products or services. It excludes the simple re-sale of new goods and changes of a solely aesthetic nature.

Please indicate if you have introduced any new or improved space products this year? Yes/No

Please indicate if you have introduced any new or improved space services this year? Yes/No

Innovation in business processes: A business process innovation is a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use in the firm.

Please indicate if you have introduced any of the following types of new or improved processes that differ significantly from your previous processes this year:

- Methods for producing space products or providing services (including methods for developing products or services)? Yes/No
- Logistics, delivery or distribution methods? Yes/No
- Methods for information processing or communication? Yes/No
- Methods for accounting or other administrative operations? Yes/No
- Business practices for organising procedures or external relations? Yes/No
- Methods of organising work responsibility, decision making or human resource management? Yes/No
- Marketing methods for promotion, packaging, pricing, product placement or after sales services? Yes/No

Effects of participation in space programmes

Has your organisation received grants from a governmental institution in the past? Yes/No

Please describe: ...

Has the project generated reputation effects (new contracts, new clients, etc.)? Yes/No

Please provide details: ...

Have you attempted to generate revenues from the product, application or service developed for the project, beyond the value of the original project (i.e. commercialisation)? Yes/No

Are you planning to use a product, application or service developed for the project to generate revenues from sales to customers that are not specified in the project contracts? Yes/No

If the product, application or service developed for the project was re-used in other space projects, please indicate the total revenue received over the last year: ...

If the product, application or service developed for the space project was adapted for use in areas of the economy not related space, please indicate the total revenue received over the last year: ...

Final section*Possible evolutions of your organisation:*

Compared to performance in the last three years, please estimate how your organisation is likely to perform over the next three years. Please comment on factors influencing your projections:

	Much lower	Lower	Same	Higher	Much higher	Not applicable
Revenue						
Export (if applicable)						
Employment						
R&D expenditure						
Overall investment						

Further contact

Would you accept to be contacted via email to take part in further engagement hosted by xxx (the surveyor) and for your information to be shared for this purpose? Yes/No

Should you wish to make any other comments concerning this survey, please feel free: ...

End of the Model Questionnaire

Annex 4.B. Launching and conducting a space industry survey: Lessons learnt from CSA-DLR co-operation

Canada and Germany are two active members of the OECD Space Forum that collaborated closely on space economy surveys in 2020 and 2021. They kindly agreed to share their experience in this *Handbook*, with a systematic approach and practical recommendations for actors wishing to develop their own survey (Fischer et al., 2021^[3]).

The Canadian Space Agency (CSA) has considerable experience in managing its national space industry survey and using the results to guide policymaking. The German Space Agency (DLR) used in 2020-21 very similar questions to those in the CSA survey. Enhancing international comparability of results is challenging, as survey design has to be considered, from how the target population is selected to the sampling methodology, through to the procedures followed to process the results. Still asking similar questions is a step in the right direction.

Based on exchanges in several OECD Space Forum meetings, and on the recent Canadian and German experiences, the lessons learnt from the experts in the CSA and the DLR are provided below and are referenced throughout Chapter 4 on industry surveys. The authors, Hendrik Fischer and Mara Grunewald from the DLR; and David Haight; Aaron Parsons; and James Jarvis-Thiébault from the CSA, are kindly thanked for their useful inputs.

Organisational requirements for launching a space industry survey

The resources, time, and effort required for the survey are determined by its scope. Members of the OECD Space Forum have suggested that a team of two-three people are needed at various times throughout the process, with at least one staff member dedicated to maintaining the survey and contact list for a sample size of 150-250 organisations.

Where to begin

It is recommended that before beginning the process of establishing a survey, consultation with national statistics agencies, other government departments, and the OECD Space Forum be conducted to learn of available public sources of information and to establish parameters for the survey.

- Additionally, national statistics repositories may contain information sought for the survey, alleviating the need to ask these questions and limiting response burden on survey participants.

Establishing a target audience, which may include industry, academia (universities, colleges, and technical institutes), associations, non-profit groups, research institutes, etc., will determine how broad or targeted the survey will be.

- It is recommended that space organisations begin the outreach to a target audience through existing relationships and known actors in the space community.

Survey methodology

The following guidelines are not exhaustive, but will provide vital information and processes to ensure a better outcome for the intended survey:

- Presumably, the survey to be administered will be voluntary and proponents should therefore be aware of limitations associated with voluntary surveys.
- The length of the survey and the response burden on participants should guide development.
- Language should be clear and simple, minimising misinterpretation and inaccuracy in survey responses.
- Information should not be collected unless it has an intended utility. Therefore, it is important to ensure that the questions being asked are relevant to the indicators you wish to measure.
- Determine the type of information you intend to collect. Given the focus on socio-economic measurements, it is assumed the majority of indicators are quantitative (revenues, employment, R&D spending etc.), but the value of qualitative data should not be dismissed, and consideration for qualitative impacts should be considered as well.
- Run a preliminary test of your questionnaire with one or two companies or organisations that are well known to you. This way, misunderstandings and imprecise formulations can be avoided in advance.
- It is recommended that a “feedback” section be added to each survey to allow participants to voice concerns, technical issues, clarifications, and suggest improvements to the survey. This type of information is valuable for improving measurements and the posing of questions.
- Lessons learnt through administration of space sector surveys over time have also suggested that a willingness to adjust the survey based on needs and input is useful, and that continual refinement over time is essential to maintain relevance and consistency.
- Prior to reaching out to organisations, it is important that a contact list be developed not only with the names and contact information of organisations, but with key points of contact that will actually respond to the survey. The contact list will require constant updates and maintenance to ensure its accuracy and utility.
- Categorisations for data collected can be further informed by this *OECD Handbook on Measuring the Space Economy*. The report contains further details on space value-chain classifications, as well as methods for utilising industrial classifications (see Chapters 2 and 3).

Logistical issues

Prior to discussing the survey on the phone with the organisation, an outreach strategy should be developed. The strategy should include a standardised introduction to the head of the organisation (president, CEO, etc.), description of the survey and its utility, as well as a request for the organisation to identify a key point of contact who will respond to the survey.

This process is important for communicating the importance of the survey and establishing a point of contact.

- In addition, building a positive relationship at the outset will help ensure a high response rate.

It is recommended to use a single email address for all email communication related to the survey. In this way the organisation has a standard method of contacting the survey administrator should there be any issues.

- When launching the survey, an initial invitation to the president/CEO (from the head of the entity administering the survey) alerts them that the survey has launched.

- Subsequently, an email containing an individualised hyperlink to the survey should be sent to the survey contact that will complete the survey on behalf of the organisation.
- Reminder emails should be distributed two weeks prior to the survey deadline to encourage participation.
- When the survey is complete, a thank you email with a link to the report should be distributed to survey participants.

To mitigate the risk of a low response rate, it is encouraged to call organisations two weeks prior to the survey deadline as a reminder with a particular focus on key organisations.

- Phone calls are the most efficient method of encouraging organisations to participate.
- Personalised emails are a useful supplementary method of encouraging participation.

To increase the informative value of the survey data even in the event of low response rates, focus particularly on the big players, who generate the lion's share of employees and sales. If the ten largest companies or research institutes do not provide accurate data, the informative value of the survey would be severely limited. To mitigate the risk of a low response rate, it is encouraged to call organisations two weeks prior to the survey deadline as a reminder with a particular focus on key organisations.

- Spend enough time in convincing the big players to participate and to identify the right contact person within their organisations.
- Additional reminders by phone calls are useful.

Data collection and storage

A system for distributing the survey in a confidential manner is recommended, such as an email invitation containing individualised hyperlinks to a secure survey web address.

- Data collected in this manner are more secure and easier to collate than administering forms through email.
- A centralised system for collecting the data makes it more easily retrievable for analysis once the survey has closed.

Conclusion

Conducting a survey and subsequent publication of space sector data (in aggregate) has significant utility as a domestic communication tool, and allows for international comparisons, trend assessments, and informs government decisions on policies and programming for the space sector.

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