REPORT ON DATA COLLECTION BY PENSION SUPERVISORS

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DATA COLLECTION BY PENSION SUPERVISORS

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ABSTRACT

This report looks at data collection practices employed by pension supervisors based on a survey of 41 IOPS member jurisdictions, with key updates observed since the previous IOPS Working Paper No 14, "Efficient Information Collection".

Key themes investigated in this report include prerequisites, information sources, data needs, data collection/analysis and IT systems to support information collection. This report also reviews recent issues related to data gathering arising from the transition to risk-based supervision and ESG oversight.

Focusing on these topics, this report aims to provide learnings, better practices and insights that may serve as a good reference for pension supervisors seeking to enhance their data collection processes. Among its many findings, it highlights that the seamless data collection, particularly for RBS and ESG oversight, builds on the synergy of data availability/accessibility, diversified information sources, quality data requests as well as ample supporting tools such as IT systems. The report also finds that IT facilities and data technologies will grow in importance in data collection, with the increasing demands for the use of big data and advanced data validation/analytics skills in pension supervision.

Keywords: data collection, pension supervision, private pensions

JEL codes: J-32, G-28, D-82, D-83

[*] International Organisation of Pension Supervisors (IOPS).

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Report on Data Collection by Pension Supervisors

Executive summary

This report presents the results of the IOPS survey conducted to gather information and practices about the data collection of the IOPS Members. The survey was designed to capture the prerequisites and detailed data collection practices taking place at each stage of data collection. **The key topics investigated** in this report include:

1. Prerequisites;
2. Information sources and data needs;
3. Data collection and analysis;
4. IT systems; and
5. Recent issues regarding risk-based supervision and ESG oversight.

Focusing on these topics, the report provides key findings and insights with respect to data collection, which was drawn out from responses of 41 IOPS Members, i.e., half of the membership.

1. (Prerequisites) The report looks into the prerequisites for effective data collection, particularly whether such requirements are adequately met. The survey finds that, **while the legal framework and industry capabilities are well in place in most jurisdictions, supervisory resources and IT systems need further enhancement.** This result may come as no surprise especially given that supervisory resources need to be commensurate with the rapid enhancement of data technology. To bridge such a resource gap, supervisors usually consider capacity-building programs, outsourcing, hiring professionals and collaborating with fellow supervisors.

2. (Information sources and data needs) Alike prerequisites, information sources play a vital role in determining the effectiveness of data collection. In particular, the survey observed that pension entities serve as a vital source for data collection. **Pension supervisors strive to use non-pension entities, such as external third parties and peer regulators, as a source of information. These efforts are envisaged to gain further momentum** given supervisors' recognition that well-diversified data sources can contribute to ensuring high-quality data by lowering the burdens on data submitters as well as allowing cross-validation with data obtained from other sources.

3. (Data collection and analysis) The report also sought ways to ensure the efficiency of data requests. **Data requests are generally influenced by various components notably data design, reporting format and the level of burdens on data providers.** Indeed, the survey found that supervisors make sure these components are adequately set out in such a way as to maximise the efficiency of data requests. Specifically, **data granularity may need to be determined** to the extent that data users are able to create new information by rolling up existing data without requiring additional data. The principle of **proportionality**, which exempts reporting duties of small entities, can be also taken into account as a means of lowering the burden on data submitters.

The report describes common approaches to data validation and finds that **supervisors make efforts to identify ways of validating qualitative data.** Supervisors consider several ways, including adjusting data formats so that automatic validation rules can be applied. However, based on responses received, it is envisaged that such alternative **approaches will be gradually superseded by advanced validation techniques**, such as natural language processing (NLP), that are being employed experimentally in some jurisdictions.

This report also investigated what components are needed to ensure effective data analytics. It was found that data analytics build on not only adequate data analysis techniques but also on the seamless use of data collected. Indeed, many supervisors underlined that **proper data analytics is not merely guaranteed by the capability to undertake analysis, but rather it is determined by the synergies of quality data entry, improved data accessibility, IT system support and experienced supervisors.**

This hints that supervisors may need sufficient data, supporting tools and resources, along with data analytics techniques, to maximise the uptake of data analytics.

4. (IT systems) As agreed by many responding supervisors, IT systems are the most useful tool to support data collection, and in essence, these systems are involved in all phases of data collection, including data reporting, warehousing, validation and analytics. Supervisors particularly stressed **the need for improved validation and analytics features in their IT systems**, which may reflect the reality that the current capabilities of IT systems do not fully support advanced data validation/analytics processes. In addition, the survey noted that **supervisors also consider the wider use of applications supporting data analytics**, notably data visualisation (e.g., Power BI and Tableau) and automatic reporting tools.

5. (Recent issues) Lastly, the report reviewed the issues around data collection arising from the transition to risk-based supervision (RBS) and ESG oversight. Such a shift may entail additional costs in relation to data collection, especially when the new framework is in its infancy stage. The data collection issues relating to ESG supervision may fall under such a case, buttressed by the fact that most responding jurisdictions encounter associated challenges largely due to a lack of legal framework, limited quality ESG data and taxonomy. However, **the challenges around RBS data gathering may stem from a lack of adequate data collection processes and/or systems and technology, not the transition itself.** This conjecture is particularly supported by the survey result that the transition to the RBS in many jurisdictions has not made any fundamental changes to their data collection processes.

Introduction

Pension supervision is evolving into data-driven supervision where the decision-making processes are based on information gathered. This trend appears to have been reinforced by supervisory experience that the appropriate use of data helps to conduct evidence-based supervision and allocate resources in a more efficient manner. Additionally, advances in data technologies that help supervisors derive key information from data have been accelerating such a trend. Against this backdrop, supervisors' interests are directed towards building effective data collection processes to expand the use of data in pension supervision. Consequently, the theme of data collection has been recognised by many IOPS Members as one of the priorities for further development, leading to the inclusion of the IOPS 2021-2022 Programme of Work.

The data collection involves a variety of processes including their collection, storage, validation and analysis, in which a sophisticated approach and adequate resources are required to ensure the effectiveness of such processes. The required approaches and data needs can vary widely following the supervisory objectives, regulatory regimes and industry environments. Further, due to time and resource constraints supervisors may need to prioritise which approaches and information to take. Thus, supervisors should clearly understand such requirements and circumstances. This is why an effective data collection process remains a challenge for some supervisors.

The purpose of this report is therefore to provide detailed approaches needed for building effective data collection processes. The report explores various data collection processes taken by IOPS jurisdictions and focuses on drawing out better practices and lessons learnt that can serve as references for other supervisors. In addition, the report aims to identify and address issues related to data collection, particularly those arising from the transition to risk-based supervision and ESG oversight.

Method, scope and data

A questionnaire sent to the IOPS Members in December 2021 was the key source for the preparation of this report. Forty-one IOPS Members[1], which is over 50% of the IOPS Governing Members, have provided detailed practices, experiences and lessons learnt with regard to the data collection and analysis. Their feedback served as crucial information for the preparation of this report.

Along with the questionnaire, this report has benefited from desk research, interviews and the collection of other financial sector examples relating to data collection. Particularly, the IOPS 2011 Working Paper No 14, *Efficient Data collection* was used as a very helpful source as well as a benchmark in reviewing and updating data collection information and practices of pension supervisors. This report also leveraged off some of the materials already provided for another related project and IOPS Workshops, notably the RBS learnings project and the ESG workshop held in May 2021.

In this way, the report focuses on discovering effective approaches for data collection and identifying the new supervisory demands for data-driven oversight, including new data needs and data technological advances. Key themes covered include: 1) prerequisites, 2) information sources, 3) data needs, 4) data collection and analysis processes, 5) IT systems, and 6) data collection issues related to the transition to RBS and ESG oversight.

1. Prerequisites

Prerequisites for effective data collection may include various factors, such as legal framework, supervisory resources, industry capabilities and technology/systems. To identify such prerequisites, Members were asked about 1) what components can be viewed as essential requirements to set up an

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[1] Albania, Australia, Austria, Belgium, Brazil, Bulgaria, Canada (CAPSA), Chile, Colombia, Costa Rica, Croatia, Czech Republic, Egypt, Georgia (ISSSG), Georgia (National Bank of Georgia), Hong Kong (China), Hungary, India, Ireland, Israel, Kenya, Lesotho, Liechtenstein, Lithuania, Macao (China), Maldives, Mexico, Morocco, Netherlands, Nigeria, North Macedonia, Peru, Poland, Portugal, Romania, Serbia, South Africa, Spain, Suriname, Türkiye and United Kingdom.

efficient information collecting process and 2) whether such components are put in place in their jurisdictions.

A vast majority of respondents agreed that most of the prerequisites listed in the questionnaire are vital for effective data collection[2]. In contrast, there are mixed views as to whether each prerequisite is properly met in their jurisdictions. (Figure 1). Whilst legal/regulatory framework and industry capabilities are in place in most jurisdictions, supervisory resources and systems to support data collection appear to have to be further strengthened in more than 1/5of responding jurisdictions (22.5% and 28.2% of the respondents, respectively):

- **Legal/regulatory framework:** most jurisdictions (37) reported that prerequisites in the form of legal/regulatory frameworks are in place, including legal measures to prohibit avoiding data submission or reporting wrongful information (39 jurisdictions, Figure 1).

- **Supervisors' resources:** a number of jurisdictions (31) stated that further improvement is needed despite their positive evaluation of their current resources. This particularly relates to supervisors' aims to expand the use of advanced data analysis techniques and IT systems.

- **Systems/Technology**: almost one-third of jurisdictions (13) mentioned that appropriate systems/technologies to support data collection are not in place in their jurisdictions. Some of these occur due to the lack of adequate IT systems (13), yet most of them are cases (27) where jurisdictions look to adopt advanced IT technologies to enable a high uptake of stored data.

Figure 1
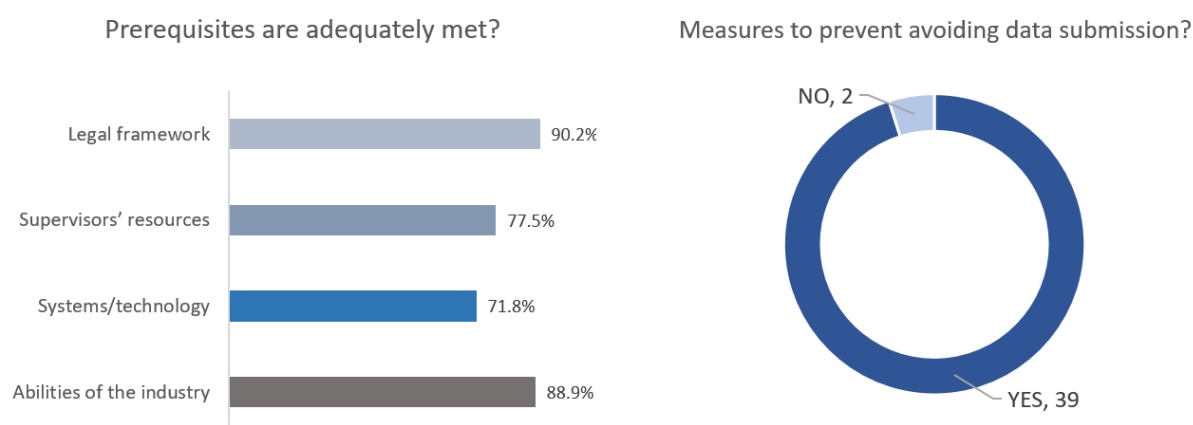
1) Multiple responses were possible in this question.

Source: IOPS survey conducted in December 2021.

Additionally, the survey investigated experiences on how to overcome challenges relating to a lack of supervisory resources or capabilities. A number of good practices were shared through the responses, which generally include: 1) capacity-building programmes, 2) outsourcing, 3) establishing procedures for hiring highly skilled professionals and 4) cooperation and information exchange between peer supervisors/relevant entities. The details of these practices are outlined below:

- **Capacity building** programmes serve as a means to reinforce supervisory resources in several jurisdictions. Peru stated that training courses for data processing using computer software,

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[2] Prerequisites: legal/regulatory framework (100% respondents indicated this as a prerequisite), supervisors' resources (97.6%), appropriate systems/technology (95.1%), abilities of the industry (87.8%), co-operation with other peer supervisors (68.3%) and country's infrastructure (70.7%).

such as programming languages and dashboard design software, has contributed to supervisors' ability to carry out information analysis on their own.

- **Outsourcing** plays a key role in bridging the resource gaps, particularly when IT resources or advanced data processing capabilities need to be further strengthened. In practice, outsourcing is commonly adopted by several jurisdictions to implement a variety of purposes. These include the development of IT tools/software, technical assistance for data reporting (e.g., XBRL reporting), IT system audits, advanced data analytics skills and so on. The United Kingdom, for instance, stated that third party data engineering sources were used to assist in the development and automation of data pipelines. Costa Rica indicated that they outsourced R programming to compute actuarial balances/portfolio values using in-house actuarial models.

- **Hiring external professionals** is often considered a way to address resource scarcity issues in data collection. Supervisors appear to favour professionals with supervisory experiences with an IT background or data analytics knowledge given that data collection/processing is typically done using IT tools/software.

- **Collaboration with other entities** such as peer regulators or international organisations also appears to help pension supervisors expand their information gathering and processing capabilities. Colombia noted that collaboration with international organisations has made it possible for them to extend their technical knowledge and skills in pension supervision. Several jurisdictions, including Brazil, Costa Rica, Ireland and Peru are seeking collaboration with fellow authorities to fill resource gaps and increase the efficiency of data collection and analysis. In addition, Albania reported that cooperation with foreign experts has helped them exchange different experiences, thereby adopting better practices for integrating EU Directives into their own regulations.

2. Information Sources

Data collection depends on the efficient use of information sources. It is therefore crucial to understand how data sources could be optimised. The survey focused on identifying types of information sources and associated issues, as well as good practices by respondents to overcome such difficulties.

The survey confirmed that the major source of information that supervisors rely on is pension entities. For nearly 90% of respondents (37) pension entities are used as the primary source of information gathering. Supervisors face no particular restrictions on obtaining the necessary information from them. Along with pension entities, external third parties (68.3%) and peer supervisors (61.0%) turn out to be extensively used in gathering information in various jurisdictions. In general, third-party institutions typically include securities exchange, custodians, credit rating agencies, pension funds associations, industry consultants and financial software tools such as Bloomberg. Peer regulators for which pension supervisors seek information are other sector financial authorities, ministries and public sector entities.

Pension supervisors are empowered to request information from supervised pension entities. 95% of the respondents (39) are able to take appropriate steps, such as imposing penalties, to prevent supervised entities from avoiding data submission or reporting misinformation. Conversely, information gathering from fellow supervisors and external third parties is typically through mutual agreements between these entities.

Importantly, the use of information from non-pension entities not only reduces the reporting burden on pension entities but also allows supervisors to fully leverage the data gathered. As such, **several pension supervisors have been increasing the data gathering from external third parties or peer regulators, and, in our view, this trend is expected to gain further momentum.** Australia has noted that they obtain additional data insights from third party industry consultants. Consultants collect a range of data that APRA does not collect – often more qualitative and obtained by surveying entities rather than a formal data collection. As a result, they can provide additional data insights. Additionally, Peru stated that information from other government entities enables the authority to validate its databases.

Challenges related to information sources have also been raised in several jurisdictions, most of which appear to relate to the use of external third parties and peer supervisors. However, no good instances of overcoming the difficulties listed below were provided by any of the respondents:

- **External third parties**: One supervisor indicated that the use of information from external third parties may result in agency costs issues. For instance, reporting of the financial distress of pension funds is rarely made when the reporting responsibility rests with a third-party entity. Another problem raised is compatibility issues with third-party data inputs as such data is not always easily linked to each other.

- **Peer supervisors**: one jurisdiction reported that differences in the pension systems under the supervision and national laws may limit the adequate information collection from peer supervisors. In practice, supervisors may gather information within the scope of their supervision, and sharing of this information can be also restricted by national laws, including privacy laws. These differences thus may hamper the benefits of information sharing between supervisors. In addition, another jurisdiction noted difficulties in ensuring the quality of data obtained from fellow supervisors as well as in linking the data.

3. Information Needs

The next significant phase of the data collection process is to determine data request's scope and contents. The information obtained guides supervisors to employ their supervisory resources in an effective and timely manner. However, the required data typically tend to significantly differ given the purposes and activities of supervision (e.g., prudential supervision vs consumer protection), as well as regulatory regimes (e.g., rule-based vs risk-based approach). Moreover, the fact that all the information cannot be collected by pension supervisors due to time and resource constraints, makes supervisors prioritise what information needs to be obtained to achieve their supervisory aims. In this sense, it may be difficult for supervisors to precisely understand how data should be arranged and what data elements need to be collected.

The questionnaire therefore aimed to learn about data scopes and needs from Members' experiences. To this end, the questionnaire adopted the data classification that had been used in the previous IOPS Working Paper No. 14 – Efficient Information Collection (March 2011). These categories classified by key supervisory purposes help understand/determine what data items are needed to achieve each supervisory purpose. The data categories set in the questionnaire reflecting the needs of Members are as follows:

- Licensing or registration;

- Prudential supervision (fund/trust information, governance, financial information, investment and risk management including systemic risk analysis); and

- Consumer protection.

3.1 Licensing or Registration

Information requirements for licensing/registration generally pertain to data items that allow supervisors to verify whether pension entities meet the regulatory standards for entry into the market. **These items shared by respondents do not significantly differ from the existing information identified in the previous working paper.** The information collected and the amount of data vary from jurisdiction to jurisdiction based on their market entry criteria. Nevertheless, the information typically includes 1) key stakeholders, 2) business plans, 3) funding policy and 4) resources and capabilities (see Table 1).

Licensing/registration information may serve as a good base for other oversight purposes as it contains various general information relating to other supervisory activities. However, the information tends to

be qualitative and may become stale after registration. It also usually includes unconfirmed information such as risk management plans/draft contracts with outsourced service providers. As such, supervisors may need to differentiate between the information needs for licensing and other purposes. They may also need to update the information for licensing regularly if they intend to use them for other purposes.

Table 1 – Licensing/registration information

Category	Information needs
Stakeholders	• Information on plan sponsors/administrators (if different from plan sponsor), actuaries, independent auditors and custodians
Business plans / Funding policy	• Entity's business plan (e.g., articles of association) • Funding policy (e.g., documents setting out the funding policy including financial statement and initial actuarial valuation reports) • Management plans (e.g., draft contract with fund manager, fund management agreement) • Investment plans (e.g., investment strategy/principles, asset manager selection mechanisms) • Risk management plans (e.g., information on risk-control mechanisms) • Remuneration policies • Reporting and auditing mechanisms • Outsourcing/delegation plans (e.g., draft delegation contracts)
Governance	• Governance structure (e.g., information on the governing body – members of the governing body) • Information on ownership structure • Ownership of the entities (e.g., significant owners, directors, ultimate controller, CEO, manager)
Resources/Capacity	• Capital (e.g., documents providing a pension entity meets regulatory the capital requirements) • Organisational and technical capacity (e.g., IT systems and IT deployment plans) • Adequacy of other resources

Source: IOPS survey conducted in December 2021.

3.2 Prudential Supervision

As an umbrella concept encompassing various supervisory activities, prudential supervision can be classified into various categories in accordance with the purpose of supervision. The questionnaire grouped prudential supervision into five main categories. The rationale was to exploit the classifications used in the previous working paper and to avoid duplication between data categories. The categories are: 1) fund/trust information, 2) governance, 3) financial information, 4) investment and 5) risk management (including systematic risk analysis). The categories were defined primarily based on supervisory objectives that do not vary with the supervisory regimes (rule-based vs risk-based approaches) or type of activities (on-site vs off-site analysis). Put differently, data items belonging to each category can be utilised irrespective of the supervisory regime and type of activity as long as they aim to achieve the oversight objectives defined in the category.

Fund/Trust Information

The first data category classified in the theme of prudential supervision relates to grasping the nature of pension entities. Supervisors need to precisely understand the properties of pension funds in order to establish adequate regulatory standards and allocate their resources where supervision is needed. To this end, pension supervisors collect multiple data items. The data items typically include basic information about funds/trusts, member information, service providers and indicators revealing the status of funds/trusts.

Table 2 – Fund/trust information

Category	Information needs
Basic information	• Name/address of fund • Type of fund (e.g., DB/DC, closed/open) • Licensing/registration information (e.g., date of licensing/registration, licensing number)
Member information	• Age/gender distribution of members • Number of active/contributing/deferred members and beneficiaries • Changes in the number of members
Service providers	• Plan sponsor and administrator details • Actuaries information • Investment managers' information
Status of funds/trusts	• Financial information (e.g., value of assets/liabilities, expense ratios) • Operational information (e.g., disclosure procedures, merger/liquidation process, and redress mechanisms) • Contribution information (e.g., contribution rates, total amount of contributions)

Source: IOPS survey conducted in December 2021.

Governance

Governance can be defined as a system covering structure and process for decision making, accountability and control at the top of pension entities. Well-established governance is indispensable in ensuring risk control and safeguarding the interest of pension members[3]. As such, supervisors look for various data items to assess whether the pension entities have adequate governance in place. These items typically contain the role and mandate of governing board, decision-making procedures and internal compliance policies/audits.

Further, governance is one of the three key pillars of sustainability investing and disclosure. One of the major trends in the pension industry, which aims to integrate ESG components into pension supervision, may call for greater accountability and transparency, resulting in new demands such as further disclosure of governance-related matters. Thus, supervisors may need to gather additional data items or adjust existing information to respond to these changes.

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[3] https://www.oecd.org/finance/private-pensions/41013956.pdf – Pension Fund Governance: Challenges and Potential Solutions, OECD Working Papers on Insurance and Private Pensions No. 18, OECD, June 2008.

Table 3 – Governance information

Category	Information needs
Governing board	- Structure and mandate of governing board - Board election, chair appointment and evaluation process - Members of governing board - Board duties, responsibilities and qualifications - Annual general meeting rules and procedures - Sub-committee's formulations and responsibilities
Decision making procedures	- Risk management procedures (e.g., internal compliance programs) - Appointment process/evaluation/dismissal process of service providers and outsourced functions such as actuaries, custodian, investment manager, etc.
Internal compliance policy and audit	- Code of business conduct (code of ethics) - Conflict of interest policy - Member communication policy - Information and communication procedure policy (ICT policy) - Procurement policy - Trustee remuneration policy

Source: IOPS survey conducted in December 2021.

Financial Information

Financial information is used as a key benchmark to value the soundness of pension entities and to generate financial indicators, risk metrics and even disclosure materials for pension members. Accordingly, pension supervisors collect a wide array of financial data items. These range from snapshots revealing the financial positions of pension entities (e.g., the value of assets/liabilities, net asset value and amount of asset under management) to cash inflow and outflow having potential impacts on financial status (e.g., income/expenses, benefits and transfers amount). It also appears that a variety of information sources are available in most jurisdictions for gathering financial data, such as periodic/auditor reports and actuarial reports.

Table 4 – Financial information

Category	Information needs
Financial status	- Value of assets (e.g., total asset, net asset value and asset under management) - Value of liabilities (e.g., total liability, reserves and contingent liabilities) - Defined benefit liabilities (including benefit structures, age, gender and entitlements of members, and other components of actuarial calculations)
Income and expenses	- Income from contributions received (including pension schemes, employer contributors and individual payments) - Investment income (e.g., investment return) - Any other income (e.g., deficit recovery/repair contributions)

	• Expenses (e.g., total annual expenses, management fees, administration costs and service provider expenses)
Benefits paid and transfers	• Benefits paid (including lump-sum/partial payments and scheduled payments) • Transfer values
Other	Any other information that can be obtained from one of the following: - Actuarial reports; - Fund auditor's reports; - Periodic financial reports (quarterly, semi-annual, annual financial reports); and - Valuation reports by type of funds.

Source: IOPS survey conducted in December 2021.

Investments

Fund investment information serves as an indicator by which supervisors can predict the profitability and stability of pension performance. This eventually helps supervisors to take appropriate actions to mitigate risks to regulated bodies and safeguard the interests of pensioners. Most investment-related items thus have relevance to measuring investment performances and risks, which are also utilised to establish investment policies and performance/risk benchmarks. Details include: 1) investment principles/strategies, 2) investment details including investment performance and costs/fees, 3) investment risks and 4) investment-related internal processes (e.g., monitoring/oversight process on asset managers). These data are generally obtained directly from investment firms, yet supervisors also employ additional information sources, such as investment performance reports and materials provided to (potential) pension members.

Meanwhile, investments by pension funds tend to move beyond traditional investments that primarily trade stocks and fixed income. In fact, for some jurisdictions and pension funds alternative investment, notably investing in real estate and infrastructure, has been flowing into this area[4]. In addition, sustainability investments that many pension funds have adopted or intend to take can be a potential game-changer in the field of pension investment. In light of these changes, supervisors may need to consider how to reconcile investment data items.

Table 5 – Investments information

Category	Information needs
Investment principles/strategies	• Investment principles/guidelines (including documents providing that pension entities meet investment guidelines) • Portfolio management (asset allocation/trading) strategies • Portfolio information (e.g., investments held, derivative positions and financial indicators such as duration) • Trading information (e.g., transaction records/details including assets, date of transaction, prices and volume of securities trading) • Information on sustainability investing (ESG investment)

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[4] http://www.iopsweb.org/WP_29_Supervision-Pension-Investment-Management.pdf – Supervision of Pension Investment Management Including Non-traditional Investment, IOPS Working Paper No. 29, September 2017, http://www.iopsweb.org/WP_36_Supervision_Infrastructure_Investments_by_Pension_Funds.pdf – Supervision of infrastructure investments by pension funds, IOPS Working Paper No. 36, April 2021.

Investment details	• Investment performance (e.g., realised/estimate returns, risk-adjusted returns) • Investment costs and fees (e.g., investment expenses charged by types of assets/strategies/managers such as asset management fees) • Information on asset managers
Investment risks and internal process	• Investment risks (e.g., risk appetite, investment limits) • Measures to monitor and oversee performance asset managers • Evaluation process of investment risk management
Other	Any other information that can be obtained from one of the following: - Investment committee minutes; - Investment performance reports; and - Description of funds made available to members.

Source: IOPS survey conducted in December 2021.

Risk Management

Risk management generally refers to the entire set of processes for identifying and mitigating the risks associated with pension activities[5]. Data items for risk management naturally include those related to risk identification, assessment, treatment and testing/monitoring. The respondents have shared various items ranging from risk management policies to risk indicators/methodologies. To collect these items, supervisors tend to employ various information sources such as reports of risk analysis, risk monitoring results, stress testing outcomes and risk committee minutes.

In essence, the data items for risk management are inclined to be commensurate with the changes in market conditions as well as the evolution of risk management techniques. Given the increased market fluctuations and uncertainty, these shared data items may need to evolve over time reflecting emerging risks such as pandemic and geopolitical risks.

Table 6 – Risk management information

Category	Information needs
Risk management system	• Risk management policy/framework • Risk definition (e.g., interest rate risk, liquidity risk) • Risk identification process • Risk assessment methodologies/process • Risk treatment strategies (including procedures taken to mitigate risks or reduce the impacts of risks) • Risk monitoring and reporting process
Risk variables/indicators	• Information on regulatory capital • Variables used in gauging risks (e.g., regulatory capital, interest rates) • Risk indicators used (e.g., solvency/liquidity ratio, value at risk (VaR), expected shortfall)

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[5] http://www.iopsweb.org/principlesguidelines/46864307.pdf – OECD/ IOPS Good Practices for Pension Funds' Risk Management Systems, January 2011.

	• Actuarial assumptions used in risks management (e.g., life/mortality tables, life expectations) • Scenarios for stress testing
Other	Any other information that can be obtained from one of the following: - Internal risk management rules/regulations; - Results of risk reviews, risk monitoring and stress testing; - Risk appetite statement (RAS); - Reports of risk analysis (e.g., reports on capital requirement, liquidity reports, risk indicators reports, own-risk assessment reports); and - Risk committee minutes

Source: IOPS survey conducted in December 2021.

Risk management is conducted by pension supervisors at two levels in many jurisdictions: micro and macro levels. The latter normally focuses on identifying and analysing risks on a sector or thematic basis such as systemic risks analysis and macro-stress testing. Information items for macro analysis thus generally have to do with identifying the interconnectedness of macro/financial variables and measuring the impacts of shocks from market volatility or the breakdown of pension entities. Many respondents shared the data items for systemic risks analysis through the questionnaire, and they include:

Table 7 – Information for systemic risk analysis

Category	Information needs
Systemic Risk Analysis	• Macro-economic variables (e.g., interest rates) and economic outlook • Monetary policy expectations and outlook • Financial market performances and trends (e.g., valuations, volatility) • Prudential information of pension entities (e.g., solvency ratio, liquidity ratio) • Corporate financial information relating to fund sponsors/employers • Information on the financial stability of guarantors (entities providing guaranteed products) • Foreign investments and the impacts of FX volatility on overseas investments • Decisions made by members (e.g., switching administrators/pension funds) • Information on emerging risks

Source: IOPS survey conducted in December 2021.

3.3 Consumer Protection

Information demands for consumer protection comprise two major pillars: information for members/beneficiaries and consumer protection measures. In practice, pension supervisors collect various data to provide consumers with information. This can include fund selection (e.g., fund prospectus, fees/costs levels, pension projection calculator) and benefits/entitlements of pensioners/beneficiaries. Supervisors also gather data to set internal policies (e.g., public disclosure, consumer privacy) and measures to safeguard consumers.[6] The respondents provided the following data items and sources to achieve the aforementioned purposes:

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[6] http://www.iopsweb.org/WP_27_Role-Supervision-Consumer-Protection.pdf - The role of Supervision related to consumer protection in private pension systems, IOPS Working Paper No. 27, December 2016.

Table 8 – Information for consumer protection

Category	Information needs
Information for fund selection	• Investment information (e.g., past performance, investment style, portfolio managers) • Fee level/structure (e.g., amount of costs/fees, general fee structures) • Indicators of pension fund soundness (e.g., solvency ratio) • Retirement benefits (e.g., net asset value standing to member's accounts) • Consumer complaints (e.g., number/reasons of complaints received) • Service quality (e.g., interruption in service) • Credibility (e.g., administrative penalties imposed on pension entities)
Consumer protection measures	• Consumer complaints/queries handling process (e.g., timeframe for responding to complaints) • Consumer risk management process (e.g., risk metrics for consumer compliance risks) • Consumer data protection (e.g., standard procedure for the processing of personal data) • Consumer due-diligence protocols (CDD)/consumer profiling
Services	• Data for pension projection/calculation (e.g., projection methodologies, underlying assumptions – interest rates, actuarial variables) • Information disclosure (e.g., disclosure standards/mechanisms) • Financial education
Other	Any other information that can be obtained from one of the following: - Complaints by members or other interested parties; - Pension fund prospectus; - Periodic reports of pension entities; and - Complaint reports

Source: IOPS survey conducted in December 2021.

## 4. Data Collection and Analytics Process

The data collection process can be divided into several steps (subprocesses). The first one is to clearly *define the range of data and data elements* needed for effective pension supervision, covered in the previous section. The second is to *obtain these data* using available information sources in an effective way. The third is to *utilise the obtained data* to the fullest with efficient validation/analysis techniques, thereby achieving the purpose of pension supervision. As effective data collection ultimately lies in the successful implementation of each phase as well as the synergies between them, the questionnaire aimed to identify best practices and areas for improvement at each stage. Hence, this section will focus on the remaining areas that are not previously covered, such as data gathering, validation and analytics process.

The data collection and analysis process is also a broad concept that encompasses various themes such as data requests, reporting, management and analytics. The survey touched on these diverse topics relating to the collection process to identify areas of greater interest to the IOPS Members and stages where more supervisors' resources and efforts need to be placed.

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http://www.iopsweb.org/IOPS-Good-Practices-Consumer-Protection.pdf - Good Practices on the Role of Pension Supervisory Authorities in Consumer Protection Related to Private Pensions, IOPS, February 2018.

IT systems were selected by a majority of jurisdictions (29) as an area, amongst many others, for further improvement to establish effective data collection processes. Improvements in information processing/analysis (23) and data validation (18) along with IT systems were also highlighted by a number of jurisdictions. In addition, the quality of requests (18) and clear instructions/effective communication with data providers (18) were stressed as one of the priorities in need of further improvement. The specific details of each category will be discussed in the order of the data collection/analysis phases.

Figure 2
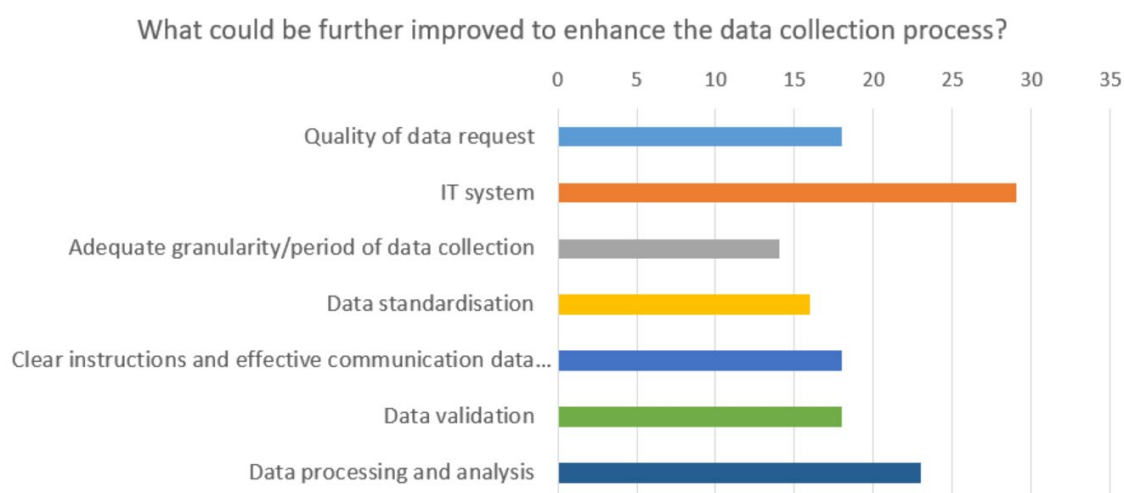
What could be further improved to enhance the data collection process?

1) Multiple responses were possible in this question.
Source: IOPS survey conducted in December 2021.

4.1 Data Requests

Quality information can only be obtained through appropriate data requests. Accordingly, such requests were highlighted by respondents as one of the essential requirements for building an effective data collection and analysis process. In fact, responses to the survey show that **although most jurisdictions have adequate data request processes in place, many authorities (18) believe that further steps towards enhanced data requests are still needed.** In this respect, the survey focused on drawing out good instances on making appropriate data requests.

Pension supervisors employ a variety of means to ensure data requests are of high quality. The key focus areas of the survey results include proper data structures, data format, review of data requests, clear guidelines and reducing the burden on data users/submitters.

Data Structures

As data requests are typically designed building on existing data structures, such well-designed data structures eventually lead to a quality data request. Among many desirable attributes of data structures, **proper data granularity** has been stressed by two jurisdictions (Peru and Lithuania). In the opinion of these authorities, the data that is not granular enough could fail to provide sufficient details, which results in generating unnecessary data requests. Well-grained data allows the ability to roll-up data, which enables the creation of necessary information without additional requests.

Data Format

A data format refers to a reporting format used for the electronic transmission, which generally determines the level of accuracy, accessibility and convenience of data reporting. Supervisors adopt and employ a particular format in view of the pros and cons of each format.

Challenges related to data format have been mentioned by some European jurisdictions having another mandate to report to the European Insurance and Occupational Pensions Authority (EIOPA). One supervisor stated that the data format requested by EIOPA ("eXtensible Business Reporting Language", XBRL[7]) is not used in their jurisdiction. Consequently, some pension funds are struggling to generate and submit reports in that format. Another respondent pointed out that the discrepancies between the EIOPA's data taxonomy (based on XBRL) and the jurisdiction's classification incur additional costs.

Practices such as providing IT tools or guidance/manuals for XBRL reporting could overcome such challenges, ensuring regional comparability and collaboration in data collection.

Data Request Review

The review of data requests is typically used to ensure requests' quality. 27 respondents (67.5%) have a standardised process for reviewing and updating the data requesting process (Figure 3). These reviews include a variety of methods, such as eliminating unnecessary reports, creating a standard form to avoid duplication of ad-hoc data requests, and adjusting reporting templates and intervals.

In addition, 33 jurisdictions (82.5%) evaluate the adequacy of the data requests before sending out the information requests (Figure 3). Industry consultation (29) is the most frequently used by the respondents, followed by an internal review of deadlines/volume of data requested (18), and engagement with industry bodies (11). Below are some examples of good practices regarding data request reviews shared by the respondents:

- **Data request manuals**: Costa Rica issued information manuals and guidelines that help supervisors establish the frequency and standards for data requests/reporting as well as the data validation process.

- **Consultation process**: Hungary holds public consultations with pension market participants and stakeholders when reviewing changes in data collection requests. In addition, Romania conducts pilot testing with a small group of reporting entities to ensure greater data validity.

- **Verification of the purpose of requests**: Colombia has structural and business validations in place to make sure that the information entered through its system is consistent with the information required for its supervisory duties.

Figure 3
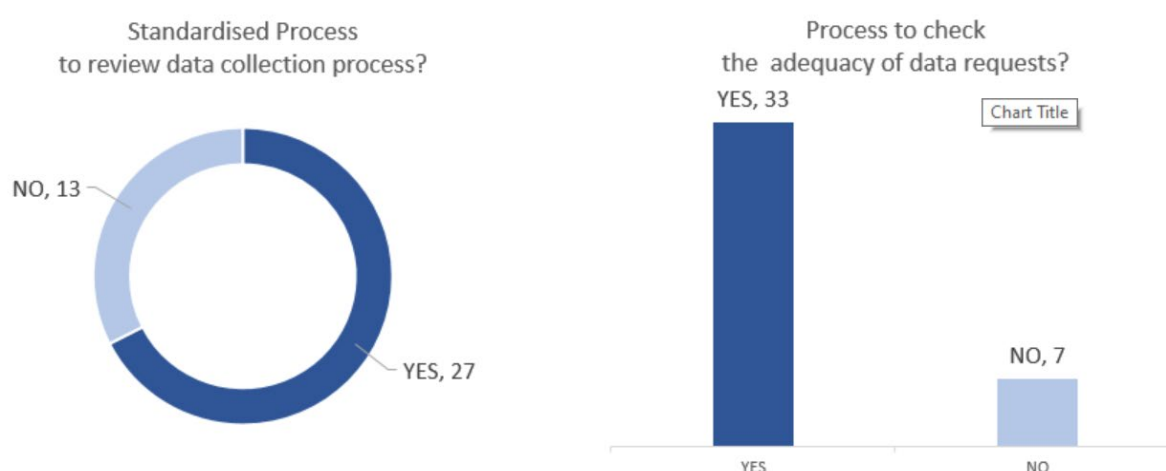
Source: IOPS survey conducted in December 2021.

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[7] https://www.eiopa.europa.eu/tools-and-data/supervisory-reporting-dpm-and-xbrl_en

Clear Instructions and Communications

It is pivotal to provide explicit instructions to supervised entities on how to create/submit data when requesting information. Ambiguous data requests make it far more difficult for data users to obtain 'first-time accurate' information, which entails, in turn, ineffective additional tasks for both data consumers and originators.

The majority of respondents (37) believe that their regulated entities are well aware of the purposes and scopes of data requested. Yet, many pension supervisors (18)[8] still underscored the need for clear guidance and effective communication for better data collection. The following practices shared by Members may provide insightful responses to the challenges posed above:

- **Instruction manuals/guides:** Nearly 85% of respondents (35) including Canada (CAPSA), Chile[9], Peru, Spain and the Netherlands, published instruction manuals/guides that provide clearly delineated explanations on how to generate data and how to file data reports via IT systems. In addition, online FAQs are used in Australia in relation to new data collections.

- **Communication tools**: About 55% of respondents (23) use the communication tools to support supervised entities. For example, the Netherlands effectively makes use of such tools to support the data submission of small-sized entities that cannot invest in advanced data reporting systems. Türkiye operates a similar "PMC communication platform" as a means of open communication policy with the regulated.

- **Virtual Assistance:** Chat functions in IT systems facilitate effective communication on data filing between supervisors and pension entities in Morocco.

- **Training programmes:** Egypt offers training for data reporting agencies, helping data submitters recognise problems with data updates as well as effective communication with pension corporations.

- **Standardised reporting**: Mexico stated that standardised layouts for the collection of information, along with clarity of requests, bring significant benefits to providing clear criteria for creating and submitting information. Costa Rica introduced data reporting standards that make it easier to organise reports, generate metrics and access the same information, irrespective of the size or manager of a pension fund.

Burden on Data Users/Submitters

Data requests should minimise the burden on data users and data originators. Accordingly, supervisors strive to maximise the efficiency of information gathering while minimising unnecessary work by data submitters. Many respondents provided their experiences and perspectives on how to ease the burden on information users/generators.

Diversifying information sources is one of the commonly used methods by multiple supervisors. The extensive use of available information sources allows supervisors to avoid placing too much burden on specific entities, notably pension funds. Nearly 35% of respondents are currently taking steps to diversify their information-gathering channels, which they stated is effective in cutting down on the burden on pension entities.

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[8] 16 out of 18 respondents (89%) believe that clear guidance/effective communication is still needed although the supervised entities in their jurisdictions are well aware of the instructions of data requests.

[9] Chile has a rulebook that provides guidance and information on generating investment data, which is available at: https://www.spensiones.cl/portal/compendio/596/w3-propertyvalue-2559.html (in Spanish).

- **Other sources:** Brazil obtains investment data directly from the Securities and Exchange Commission instead of pension funds. This not only releases pension funds from the obligation of filing data but also allows regulators to collect data in a faster and more reliable manner. In a similar way, Türkiye also noted that they were able to cut nearly 85% of the data volume collected from pension entities by gathering transaction data of pension entities from Takasbank.
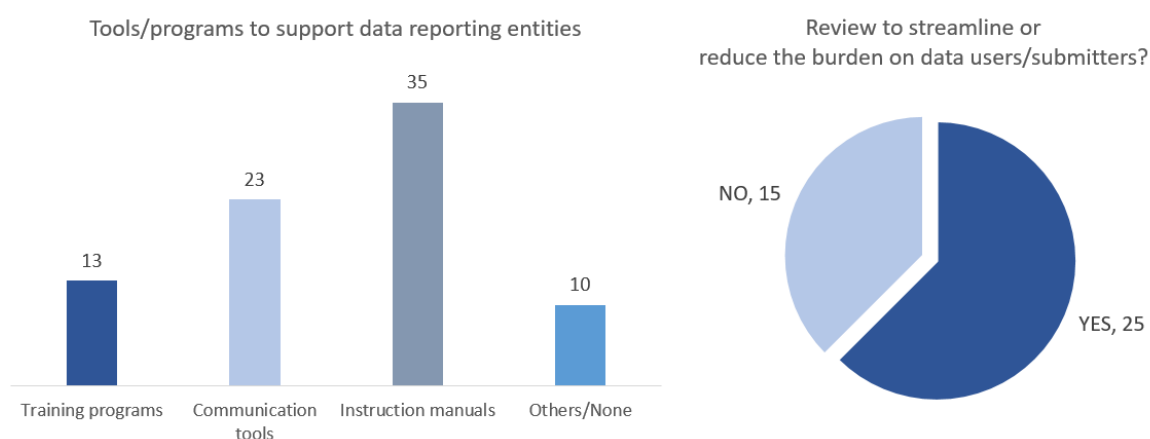
Additionally, the survey results provided an interesting fact concerning data requests. The survey investigated what makes supervisors request new information rather than leveraging the existing data. Responding to this question, 60.5% of respondents cited missing key information from the existing datasets as the primary cause, followed by a lack of data compatibility and comparability. This result implies that **adequate database design can help reduce duplicated/similar data requests.** Supervisors thus need to take into account various factors such as data elements having key information, data relationships and data granularity:

- **Data elements:** Supervisors need to clearly understand and decide on data items to be stored in light of their data analysis models and data systems. Missing key information and frequent changes in the database can result in additional data requests, eventually leading to an increased burden on data submitters.

- **Data relationships**: Data compatibility, comparability and interconnectivity should be considered in the early stage of data design in order to avoid additional burden on data submitters. A lack of comparability/compatibility between existing and new data often leads to extra data requests. Further, when data are interconnected, changes in data elements can affect other data, which may result in data users requiring the existing data due to the impact of changes.

- **Data granularity**: Proper segmentation of data structures that enables data users to aggregate/generate the necessary information using existing data. This greatly contributes to reducing duplicated data requests.

Lastly, the respondents also shared their experiences on the ways to scale up the efficiency of data requests. Two-thirds (25) conduct reviews to streamline and reduce the burden related to data requests, including on their staff. Some good examples were shared by Members, which include:

- **Proportionality:** The principle of proportionality applies in 11 jurisdictions (27.5%). Jurisdictions typically differentiate data reporting based on the type of pension plan and the size of its assets to reduce the data submission burden for low-risk pension institutions. Belgium, for example, exempts the filing of monthly reports for pension funds with assets under management (AUM) of less than €1 billion.

- **Consolidated approach:** Chile defines data requests with the participation of different areas/departments of the supervisory authority to ensure that the requests are in line with supervisory purposes. However, the identification of strategic data requirements is not determined by such a consolidated approach.

- **Cooperation with peer regulators:** Turkish supervisor cooperates with other peer authorities to avoid submissions of the same data by pension entities to multiple authorities.

Figure 4

Tools/programs to support data reporting entities

Review to streamline or
reduce the burden on data users/submitters?

1) Multiple responses were possible in this question.
Source: IOPS survey conducted in December 2021.

Box 1 – Proportionality in information reporting

Belgium has different reporting rules given the size of pension funds. Monthly reporting on pension assets only applies to pension funds having assets under management (AUM) of over €1 billion. In addition, quarterly reporting is mandatory for those with over €100 million AUM.

Croatia imposes distinct information reporting obligations depending on the type of pension fund, particularly whether it is a mandatory fund or a voluntary one. While mandatory funds are required to file quarterly financial reports, voluntary pension funds can submit semi-annual reports. For the current exposure reports, all mandatory pension funds are subject to mandatory reporting, yet voluntary funds with an AUM of less than HRK 50 million are waived from the reporting duty. In addition, voluntary pension funds are exempt from reporting duties on liquidity status and coverage of liability, which must be reported at least twice a year by mandatory pension funds.

Ireland requires additional reporting duties for DB schemes to ensure that such schemes build up and maintain sufficient funds to pay members their entitlements, as required under the Pensions Act 1990.[10] The extra reporting encompasses actuarial data returns, actuarial funding certificates and funding standard reserve certificates, all of which need to be certified by actuaries.

Hungary imposes reduced reporting obligations on pension funds which are in the process of winding up. For instance, the voluntary funds in liquidation can report less amount of information than other funds in operation.

EIOPA has set different requirements for the reporting of the look-through approach for large pension funds, such as those having over €1 billion AUM, following the EIOPA's regular information requests on occupational pension funds.

Source: IOPS survey conducted in December 2021.

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[10] Further information about supervision of solvency of occupational DB pension funds in Ireland is available at: http://www.iopsweb.org/WP-35-IOPS-Supervision-of-solvency-of-DB-pension-funds.pdf – Supervision of solvency of occupational DB pension funds in the current financial environment, IOPS Working Paper No.35, December 2021.

4.2 Data Validation

Data validation refers to the whole set of processes to evaluate the fitness for use of data before they are used in the analytics process. Validation plays a key role in securing the quality of data, leading to greater usability of data collected and the integrity of data-driven decisions made. With the greater demands for dealing with massive data, validation is growing in importance among pension supervisors.

In general, the validation process deals with *the detection and removal/replacement of invalid data* as well as *data cleansing* to ensure data quality. To this end, data users examine whether incoming data meet the predefined validation rules or criteria. Such validation tests tend to vary given resources, techniques and the attributes of data. For instance, validation for *quantitative* data involves an automated process performed by an IT system with built-in validation rules, whereas those for *qualitative* data are primarily conducted manually by data analysts mainly due to the heterogeneous nature of qualitative information. The following are common validation practices shared by the respondents:

- **Data validation group:** half of the respondents (21) have groups/individuals dedicated to data collection and validation. All of these authorities evaluated that this has contributed to the improvement of data quality.

- **External validation**: nearly 60% of the respondents (23), as part of their validation process, require reporting entities to have external verification. Australia, for instance, requires that all data submitted should be the product of systems, procedures, and internal controls that have been reviewed and tested by an external auditor at a minimum on an annual basis. In Ireland, defined benefit schemes need to be reviewed for accuracy by dedicated portfolio managers.

- **Multi-layer approach** (see Box 2 below): Several respondents, including Portugal and Lithuania, have adopted a multi-step validation approach. This is to validate incoming data through several stages having different validation aims, which intends to maximise the effectiveness of the validation process. Generally, the first step involves examining *the basic validation rules*, such as data type, range, format or the presence of outliers, and checking for possible errors. The next step focuses on *the contents of the data*, particularly whether the data is well-generated according to the data requests and purposes. The latter is prone to be done by data analysts/teams responsible for the data.

- **Automatic validation**: Thirty (85.3%) of respondents using IT systems use an automatic validation process. The IT system inspects whether incoming data meet the pre-defined validation rules –data type, format, range and outliers are examined by the IT system. A variety of validation techniques from simple calculation/comparison to AI-based rules are employed. Currently, this approach normally applies to quantitative data where validation rules can be relatively easily set. Yet, it is envisaged that these techniques will be expanded to non-quantitative data verifications with the advancement of data technologies such as machine learning. Further details on the validation techniques run on IT systems will be discussed in section 5.

- **Cross-reference validation**: Cross-checking is one of the common validation techniques used in five jurisdictions. The validation rules compare incoming data with a trusted database (e.g., validated previous reports, data obtained from third parties such as custodians and peer regulators), ensuring the integrity and accuracy of data entered.

- **Validation manuals:** Costa Rica employs a handbook for pension entities that provides information on data validation.

Box 2 – Multi-layer validation

Spain performs multi-step verification by the IT system that classifies incoming data into two groups: a blocked and non-blocked group. Whilst data falling into the blocked group cannot be submitted through the system, those classified as the non-blocked group may be filed if a reasonable explanation is provided, following which the data will be evaluated by data analysts.

Lithuania's two-step automatic validation rules comprise two stages: the first is for warning purposes and the second is for blocking purposes. The first aims to draw the attention of the data analysts to further investigate the submitted information. The second is to ensure that data cannot be entered unless the information is appropriately changed.

Portugal's multi-tiered approach to validation can generally also be divided into two parts. The first step is to verify the correctness of the incoming data by using a set of validation rules. In the second stage, the data quality is further examined by the group/team responsible for data accuracy.

Hungary conducts validation in two stages. The first is to examine data quality through predefined rules in IT systems. The second is a short individual expert review covering both quantitative and qualitative data. The review for quantitative data contains plausibility checks.

Source: IOPS survey conducted in December 2021.

In addition, the survey identified some challenges pertaining to data validation. **Nearly half of respondents (17) stated they struggle to validate data quality and accuracy**, particularly due to the lack of adequate validation procedures for qualitative data. In practice, the nature of qualitative data to which validation rules hardly apply, tends to impel data users to inspect the data quality manually.

Figure 5
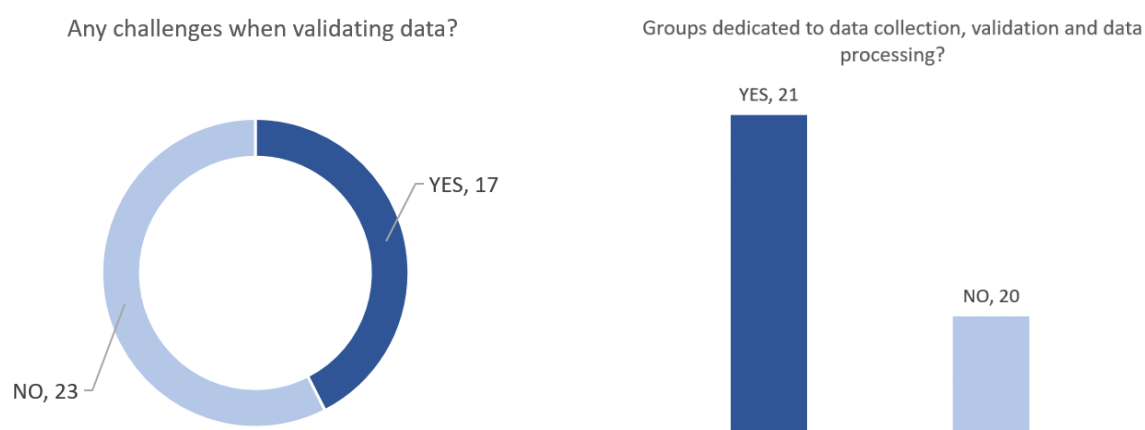
Source: IOPS survey conducted in December 2021.

The following practices on qualitative data validation provided by the survey participants may serve as good references for addressing the challenges above, as well as enhancing validation techniques. The validation features in IT systems are discussed in section 5.3 "Validation Tools" further below.

- **Predefined formats:** the Netherlands' reporting formats/forms allow for more efficient validation by using fixed fields with a small scope or limiting answers (e.g. custom lists) to predefined options instead of large free-form text fields.

- **Automated rules**: Peru transforms data formats to the extent that automated validation rules can be applied for qualitative data validation: one instance is a code-based (e.g., single-choice)

format which allows data generators to select the predefined options. In this format, the system screens incoming data in such a way that it returns an error unless the data contains predefined possible values.

- **Third-party data:** cross-reference checking with data from third-party sources such as custodians or securities exchanges is widely used for qualitative data validation. Serbia, Spain, Georgia, Maldives and Mexico extensively utilise third-party data to examine the fitness of qualitative data.

- **Validation materials/tools**: South Africa uses supporting materials and tools for qualitative data validation, including checklists with validation rules, audit trails including transaction records in accounting books, and validation templates

4.3 Data Analytics

Well-developed analytic skills enable pension supervisors to widen possibilities for data-driven decision making and to reap more benefits from utilising data collected. In particular, in our view, the demand for improved data analytics is expected to continue to grow, coupled with the paradigm shift in which the wider use of innovative technologies is ubiquitous in the field of pension supervision. Given the fact that **a third of respondents (15) are experiencing challenges in data analysis**, the need for advanced data analytics is well justified.

The survey reaffirmed that adequate data analysis calls for numerous prerequisites such as quality data input, greater data accessibility, state-of-the-art data analysis techniques, IT support, and experienced supervisors. Members pointed out the following areas to secure proper data analysis:

- **Adequate data:** one supervisor noted that the lack of data often results in an inability to support the analysis capabilities that are otherwise relatively well developed. Also, incomplete data standardisation is an impediment to effective data analysis or makes it more expensive to analyse data properly. One jurisdiction stressed the significance of establishing a more consolidated and single source of truth database from which more efficient and enhanced data analytics can be conducted.

- **Data accessibility**: one jurisdiction emphasised that increased access to databases enables data users to generate effectively necessary information and tailored reports they need for further analysis.

- **Analysis techniques:** three jurisdictions pointed to the inefficiency of data analysis skills as the major obstacle. In view of another supervisor, advanced analysis techniques such as artificial intelligence-based scenarios and stochastic analysis are needed for better data processing.

- **IT system capacity**: two jurisdictions indicated the lack of IT system capacity, such as not being linked with pension institutions or difficulty to process big data, to be the biggest obstacle to effective data analysis.

- **Ability of supervisors**: two supervisors pointed out that the lack of supervisors' capacity can be one of the obstacles to efficient data analytics. This issue can occur particularly when using advanced techniques such as R programming or Business Intelligence tools that require supervisors' adjustment in information formats and skills in managing information.

The Members also shared their practices and aims to develop in the area of data analytics. Since these practices are generally more involved with the functions of IT systems, we discuss them in detail in section 5.4 "Data Analysis Techniques" below.

5. IT Systems

The growing use of data[11] in pension supervision has been driving the need for IT systems supporting data collection and processing. The survey results confirm this trend. Nearly 90% of respondents (36) mentioned they use IT systems[12] to collect and process information gathered in their pension supervisory authority. Many of them stated that they plan to further develop their IT systems for better information processing.

The main features underpinning an IT system include electronic reporting, data warehousing, data validation and data analysis. The survey results tell us that, **whilst data reporting and warehousing functions are properly up and running in most jurisdictions, data analysis (including statistical tools) and validation processes need further development and enhancement**. In fact, all the IT systems currently in use by the respondents have data reporting and storage features, but 15% of reported systems have no validation capabilities and 25% do not support data analysis/statistical tools.

Figure 6
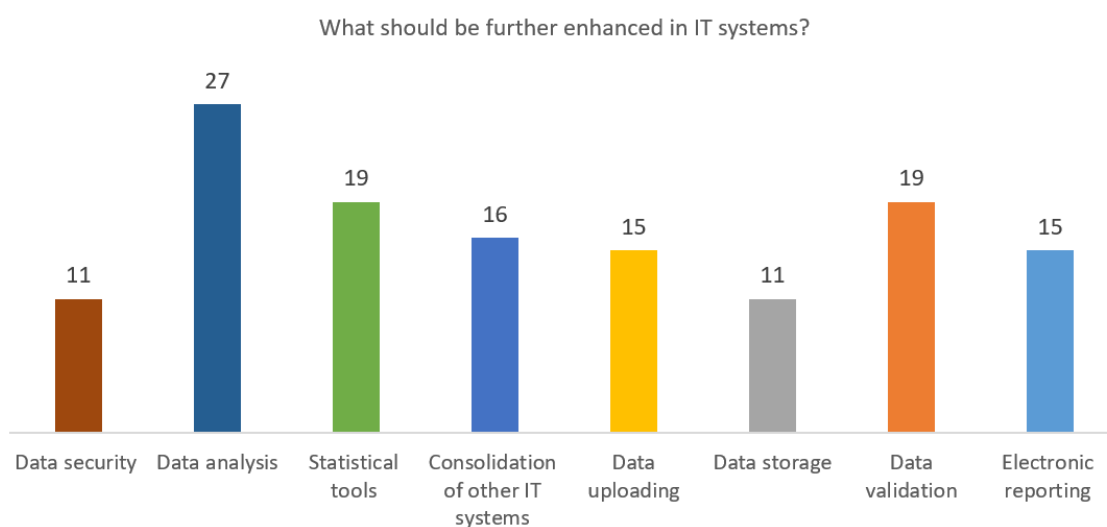
What should be further enhanced in IT systems?

1) Multiple responses were possible in this question.
Source: IOPS survey conducted in December 2021.

5.1. Electronic Reporting

Electronic reporting appears to be well-functioning in most of the IT systems used by pension supervisors. Approximately 31 respondents (86.1%) who are using IT systems collect about 75-100% of their information using this function, and four (11.8%) garner 50-75% of the information electronically.[13]

Despite the widespread use of and positive reviews of electronic reporting, 41.7% of jurisdictions (15) will seek further updates to their digital/online reporting capabilities. Additionally, it appears that these updates need to come with a discussion of **how to extend online reporting** for the ad-hoc and qualitative data, as well as **how to facilitate digital reporting** using advanced technologies.

- **Ad-hoc and qualitative data**: The majority of respondents cited the ad-hoc character of data requests (28) and of qualitative data (25) as the fundamental reason hindering the data collection

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[11] In 33 jurisdictions (82.5%) the amount of data collected has increased over the last 5 years.
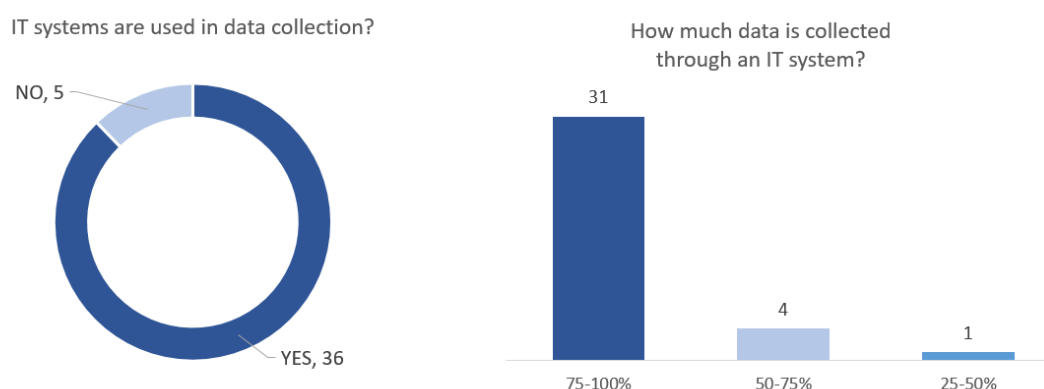
[12] The number of IT systems used differ from jurisdiction to jurisdiction ranging from 1 to 40 with the average of 2 systems.

[13] One respondent stated that they collect 25-50% of information through their IT system.

via an IT system. This implies that further enhancement can be contemplated to expand digital reporting for such formats of data.

- **Use of SupTech[14] tools:** adopting advanced technologies can be considered to streamline the reporting process and facilitate online reporting. Bank of Lithuania, for example, has developed an IT interface that enables efficient data transfer with reporting bodies using application programming interface (API) modules and has gone on to pilot specific data exchanges[15].

Figure 7

IT systems are used in data collection?

NO, 5

YES, 36

How much data is collected through an IT system?

31

4

1

75-100%   50-75%   25-50%

Source: IOPS survey conducted in December 2021.

5.2. Data Warehousing

Data warehousing is another well-equipped feature in the IT systems used by pension supervisors. Indeed, the authorities using IT systems for data collection (36) answered they have storage functions in place in their systems. Further, most respondents indicated **the data storage as an area in which no enhancement is required** –however, still 30.6% of jurisdictions (11) believe further enhancement for data storage is necessary. The survey signals some areas that may deserve further research by IOPS and/or exchange of experiences between IOPS Members:

- **Storage Location**: Twenty-six jurisdictions (72.2%) use an internal server primarily due to security reasons. However, the rest of the respondents, i.e. slightly above 1/4, believe that an external server helps them achieve greater usability and safeguard higher security at a relatively lower cost. As the transition to cloud servers is expected to accelerate, it might be worthwhile to further investigate within the project if the cloud should be used by pension supervisors, particularly in terms of security issues[16]. This concern seems to be reinforced by legislation that prohibits storing data on external servers. (12 responses; multiple responses were possible).

- **Data Integration**: Uploading or aggregating incompatible format data such as non-electronic ones and those imported from other IT systems represents one of the key issues identified by

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[14] SupTech refers to any applications of FinTech used by regulatory, supervisory and oversight authorities (The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions, FSB, October 2020).

[15] Further information is available at: https://www.lb.lt/en/news/bank-of-lithuania-shares-unique-experience-in-data-management.

[16] 96.2% of respondents (25) said that one of the major obstacles to migrating towards cloud-based systems is security considerations including privacy.

survey participants. A further review of how to effectively combine data from multiple sources into single data storage ("ETL process[17]") is also needed.

- **Consolidation**: A centralised database where information is collected, stored and maintained in one location but can be accessed from many points is expected to be adopted by several jurisdictions. For example, Lithuania intends to adopt the centralised database at a national level, and one jurisdiction in Canada is establishing a single database from which more efficient and enhanced data analytics can be conducted. Considerations to materialise centralised data warehousing can be one of the significant topics regarding the use of data storage by pension supervisors.

- **Cyber Security**: Security protocols to safeguard stored data from cyber threats were highlighted by 11 respondents (30.6%). Given that sensitive personal and financial information are kept in data stores, cyber countermeasures can be one of the key topics to be addressed in terms of data warehousing. Importantly, the security measures, in nature, must be developed to dynamically respond to ever evolving cyberattacks. Indeed, Croatia emphasized that security measures/functions should be regularly audited, tested and upgraded to counter cyber threats. Mexico also noted that security protocols are under review to ensure information privacy.

Figure 8
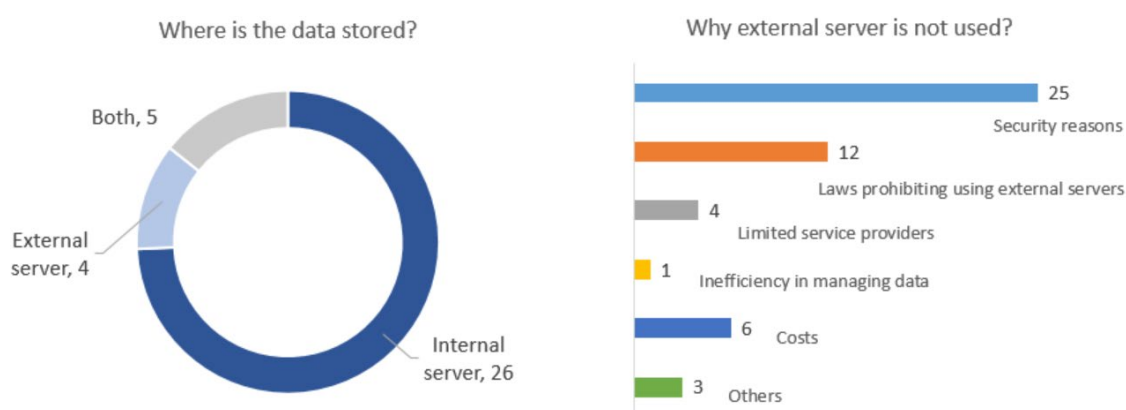
1) Multiple responses were possible in this question.
Source: IOPS survey conducted in December 2021.

5.3. Validation Tools

Data validation is an area that many jurisdictions (19) recognised as requiring further improvement. This is particularly the case for authorities that have no validation capabilities in their IT systems (5 jurisdictions[18]). In particular, the survey results hint that **particular attention should be paid to validation skills for qualitative data and to advanced technologies** (e.g., AI-based machine learning validation tools). In fact, only 13 respondents (31.7%) have adopted IT systems for non-quantitative data verification and only one (the Netherlands) reported that the machine learning skills are utilised for verifying data quality. Members have shared some good practices on data validation including:

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[17] ETL, which stands for "extract, transform and load", is a data integration process that combines data from multiple data sources into a single, consistent data store that is loaded into a data warehouse or other target system. Further information is available at: https://www.ibm.com/cloud/learn/etl.

[18] That is five out of 36 jurisdictions that use IT systems for data collection and analysis.

- **Validation Reports:** Costa Rica and Serbia employ validation reports that are provided by the IT system. The validation reports typically list the errors detected, the time of data input and data submitters.

- **AI-based Tools:** AI-based validation techniques can substitute for "spot checks" or "spreadsheet-based formulas", which are unsuitable for working with large data sets[19]. The Netherlands uses machine learning-based data examination tools when verifying the quality of data entered**.** Text mining tools for examining the accuracy or accountability of text-type data are also under consideration in the Netherlands.

- **Business Intelligence (BI) Tools [20]:** The Czech Republic uses business intelligence (BI) platforms for data validation.

Figure 9
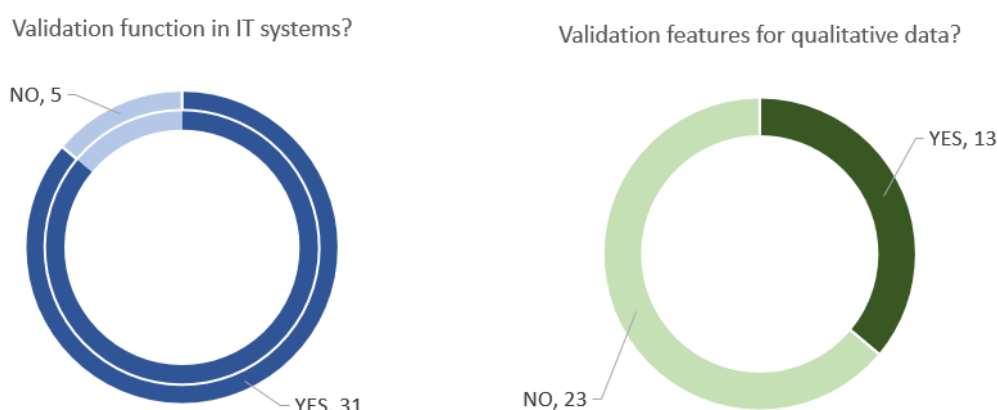
Source: IOPS survey conducted in December 2021.

5.4. Data Analysis Techniques

A significant number of jurisdictions noted that **data analytics capabilities, that use data processing technology and machine learning techniques, are most in need of upgrades.** In consequence, so are statistical tools that provide statistical results in a form of tables and charts. As detailed earlier, the finding of this survey appears to be closely associated with the supervisors' aim to scale up the advanced analytical capabilities. Although there are only a few jurisdictions that put such technologies in use, 16 jurisdictions stated that they are willing to pursue cutting-edge analysis techniques.[21]

Members also offered their views regarding advanced tools and features they intend to adopt for better data analytics. It may make more sense to interpret many of the following examples as proposing some guidance to supervisors rather than actual operational examples, given the limited use of advanced technologies in most jurisdictions as for today. Nevertheless, these examples can provide insightful implications for adopting and advancing data analysis applications.

- **Machine Learning**: In the Netherlands, text-mining tools[22] are used to analyse non-financial data such as audit reports. The United Kingdom also applies basic-level machine learning

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[19] https://www.bis.org/fsi/publ/insights9.pdf - FSI Insights on policy implementation No 9, Innovative technology in financial supervision (Suptech) – the experience of early users, July 2018.

[20] https://en.wikipedia.org/wiki/Business_intelligence_software

[21] This result shows that the field of data analysis with advanced technologies (e.g., artificial intelligence or machine learning) could be an area for future IOPS workshops and/or exchanging experiences of Members.

[22] https://en.wikipedia.org/wiki/Text_mining

techniques for data clustering and prediction. In addition, natural language processing (NLP[23]) is expected to be further used in the UK and Spain. Spain has started several projects that use NLP for the summary and classification of information recovery. Similarly, Belgium intends to use web-scraping[24] and semantic search to better utilise the data collected.

- **Business Intelligence (BI)**: Peru noted that BI platforms are used to facilitate data analysis such as data mining and machine learning needed in behavioural prediction or clustering methods. Suriname also considers adopting BI tools for better information processing.

- **Automated Reporting**: Belgium has adopted a risk model that provides automatically derived results from reporting. Hong Kong (China) also mentioned that their automatic generation of periodic reports is one of the features that need development.

- **Others**: South Africa stressed the need for monitoring capabilities to detect risks or problems. In addition, Spain noted the need for analytical tools for qualitative data, which would reduce data entry and analysis tasks as well as generate comparable information.

Box 3 – Challenges to adopting advanced IT systems

The survey looked at the key factors impeding the adoption of advanced IT systems in Member jurisdictions. 39 respondents (95.1%) shared their views on the issue.

The cost of adapting and changing existing IT systems was selected by a majority of the survey respondents (21, 52.5%). In general, the system upgrades imply that all the existing IT systems must be in sync with the new systems and that the industry also needs to have sufficient resources in place to be able to use the upgraded version. One Canadian jurisdiction mentioned that the cost of these upgrades should justify the benefits of adopting a new advanced system.

Closely related, the lack of budget and human resources was also cited as one of the major obstacles. Half of the survey respondents (20, 50.0%) selected the limited resources as a hurdle to adopting new IT systems. In particular, several opinions were provided that IT resources in the system development should be secured first to facilitate the introduction of advanced IT systems.
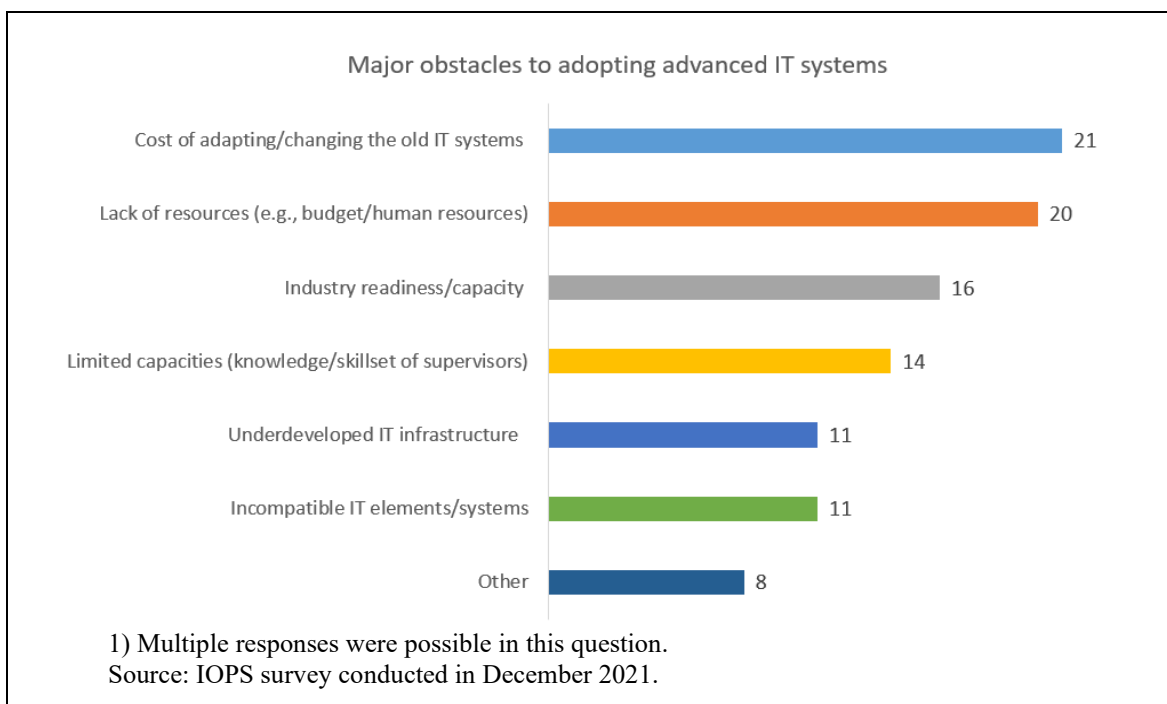
Another challenge is industry readiness and capacity. 40% of the respondents (16) mentioned that one of the major barriers to implementing advanced IT systems is caused by the lack of industry capability. These include the limited budgets of small pension funds, the inability of pension funds to deal with IT infrastructure and even the lack of support for new technologies by software vendors.

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[23] Natural language processing - Wikipedia

[24] https://en.wikipedia.org/wiki/Web_scraping

Major obstacles to adopting advanced IT systems

Cost of adapting/changing the old IT systems	21
Lack of resources (e.g., budget/human resources)	20
Industry readiness/capacity	16
Limited capacities (knowledge/skillset of supervisors)	14
Underdeveloped IT infrastructure	11
Incompatible IT elements/systems	11
Other	8

1) Multiple responses were possible in this question.
Source: IOPS survey conducted in December 2021.

Source: IOPS survey conducted in December 2021.

6. RBS & ESG

Transitioning to risk-based supervision (RBS) and supervision that integrates ESG factors, evokes many discussions about implementing the approaches in various jurisdictions. As part of such debates, the IOPS conducted the RBS survey in March 2021 and held the ESG workshop in May 2021. Both showed that the seamless use of data is one of the fundamental issues to be resolved for implementing such supervisory frameworks. The survey therefore focused on identifying which areas of data collection need to be further explored to support such initiatives.

6.1. Risk-based Supervision (RBS)[25]

Data collection issues appear to have been resolved for the majority of jurisdictions adopting an RBS approach. Twenty-one respondents (65.6%)[26] said they currently have no difficulties collecting and utilising data in their jurisdiction. 25 supervisors (64.1%) rated that they had sufficient data to implement the RBS approach. In addition, most jurisdictions indicated that the transition to the RBS approach does not entail significant changes in the information collected. [27]

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[25] 71% of data collection survey participants (29) also completed another RBS survey.

[26] 32 jurisdictions out of 41 survey participants are undertaking the RBS approach.

[27] "Supervisory authorities do not necessarily need to collect more information for risk-based supervision. Indeed, they may need to hold less detailed information about the activities of individual plans or funds or about minor compliance failures." – Efficient Data Collection, IOPS Working Paper No. 14, March 2011

Figure 10
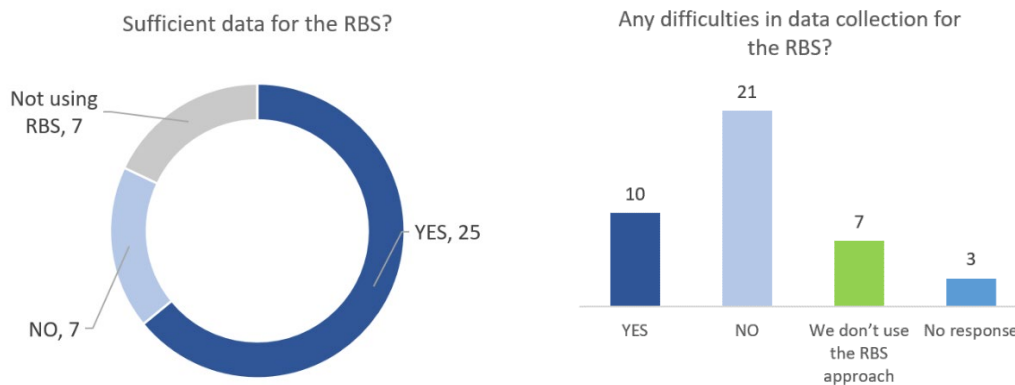
Source: IOPS survey conducted in December 2021.

However, one-third of jurisdictions (10) reported that the introduction of the RBS approach or a transition to RBS raises some challenges relating to data collection processes. Three[28] of these jurisdictions mentioned the challenges are associated with gathering information needed. Some jurisdictions, including those having no collection issues, have provided their views on potential difficulties that may arise in collecting RBS information. In general, **these issues appear not to be fundamentally different from those encountered in rule-based regimes.**
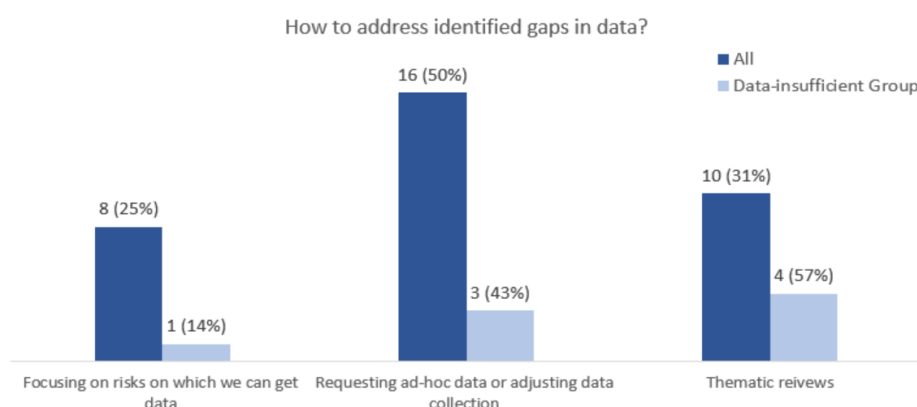
- **New Information:** Peru stated that the RBS approach draws upon new risk metrics; this often requires information that has never been collected.

- **Rise in Data Use:** one jurisdiction in Canada mentioned evolving risks to supervised entities lead to requirements for increased data collection and usage.

- **Accessibility to Data:** Some jurisdictions often face issues with accessibility to the information – some information can be gathered only through intermediary institutional investors, e.g. investment funds (such as UCITS). The limited availability of data may result in some supervisors focusing only on the risks for which they can collect data.

Approaches to address the identified gap in data when establishing, using or revising the RBS approach were provided by jurisdictions (32) applying the RBS. **Ad-hoc data requests or the adjustment of data collection requirements is the method most frequently used.** Thematic reviews (10) or concentrating on risks where data exists (8) are alternative methods adopted in many jurisdictions. In contrast, the approaches taken by data-insufficient authorities (7) – respondents who are experiencing the lack of data needed to undertake the RBS approach – produced slightly different outcomes. Thematic reviews (4) are most frequently employed in these jurisdictions, followed by ad-hoc data collections or adjusting data requirements (3).

One finding is particularly worth noting. **25% of respondents to this RBS question (8) stated that, in order to address data gaps, they adjusted their focus to the risks on which they could collect data. Seven of them have also noted that they do collect sufficient data on the risks they wish to focus.** However, one may further investigate how to address potential data gaps in such a way that data-driven supervision can focus on the areas of greatest need and not only on those areas where data is most easily accessible.

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[28] The remaining four jurisdictions stated no significant problems arose undertaking the RBS approach, despite insufficient data being collected.

Figure 11

How to address identified gaps in data?

■ All
■ Data-insufficient Group

16 (50%)

10 (31%)

8 (25%)

1 (14%)
3 (43%)
4 (57%)

Focusing on risks on which we can get data | Requesting ad-hoc data or adjusting data collection | Thematic reivews

1) Multiple responses were possible in this question.
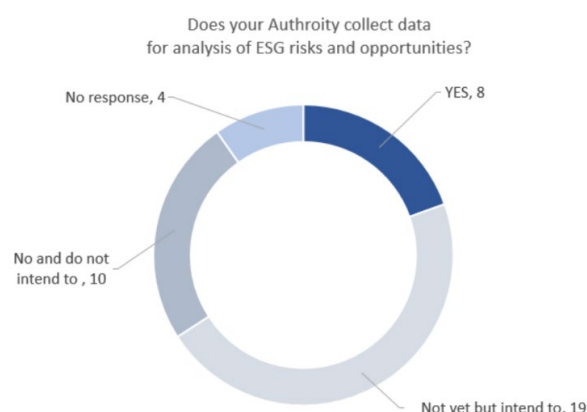Source: IOPS survey conducted in December 2021.

6.2. ESG considerations

Sustainable investing is in the early stage of development and so is the supervision that focuses on ESG integration. This naturally may entail higher and new costs for data collection. The survey aimed to examine the main obstacles to effective data collection for ESG supervision[29] and find ways to overcome such difficulties.

Due to the initial juncture of ESG investing, there are only eight jurisdictions[30] (19.5%) pioneering information collection to assess ESG risks and opportunities and to implement sustainability disclosure. However, 19 jurisdictions (46.3%) have expressed an intention to gather ESG information in order to integrate ESG components into their supervision. In particular, some authorities also indicated their willingness to collect climate-related financial information as part of efforts to combat climate change.

Indeed, it is envisaged that many supervisors may adopt the Task Force on Climate-related Financial Disclosures (TCFD)[31] or similar initiatives proposed by other bodies such as the European Commission, and thus increase reporting of climate information. Against this backdrop, the demands for ESG and climate change data will continue to rise by pension regulators as well as pension institutions.

Figure 12

Does your Authroity collect data
for analysis of ESG risks and opportunities?

No response, 4
YES, 8
No and do not intend to , 10
Not yet but intend to, 19

Source: IOPS survey conducted in December 2021.

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[29] http://www.iopsweb.org/IOPS-Supervisory-guidelines-integration-ESG-factors.pdf - Supervisory guidelines on the integration of ESG factors in the investment and risk management of pension funds, IOPS, 2019

[30] Austria, Brazil, Bulgaria, Hong Kong (China), Kenya, Spain, Israel and the United Kingdom. Brazilian supervisor currently only collects information on how ESG criteria are considered as part of investment policies by pension funds.

[31] https://www.fsb-tcfd.org/

Box 4 – Information needs for ESG

The survey asked what information items need to be collected to incorporate ESG components into pension supervision. Given ESG oversight is still in its infancy, detailed data items have not yet been clearly set out in most jurisdictions. Instead, many respondents provided key cases where ESG data needs to be collected and, where possible, potential data items. Below is a summary table of the cases shared by Members:

Supervisory purposes	Key cases where ESG information is required from the pension funds/schemes
Identification of ESG components	- ESG criteria used - Metrics to measure ESG criteria (e.g., environment – carbon emissions and footprints, water use, use and diversity of energy sources and waste management)
ESG risks evaluation	- Identification of ESG risks and supporting data items - Metrics and targets used to assess ESG risks - ESG risk assessment methodologies - Effects of ESG risk assessment results on business strategy and risk management process
ESG investing	- Investment details (asset classes, their percentage) under ESG criteria - Metrics considered in investment decisions and monitoring - Pension entities' investment policy with regards to ESG - ESG investment opportunities and risks
Sustainability disclosure	- Indicators and targets used for sustainability disclosure including TCFD - ESG rating for issuers in the funds' portfolio
Governance	- Governance arrangements in place relating to the management of ESG risks - Reporting arrangements - Policies and procedure manuals to improve the governance schemes regarding ESG

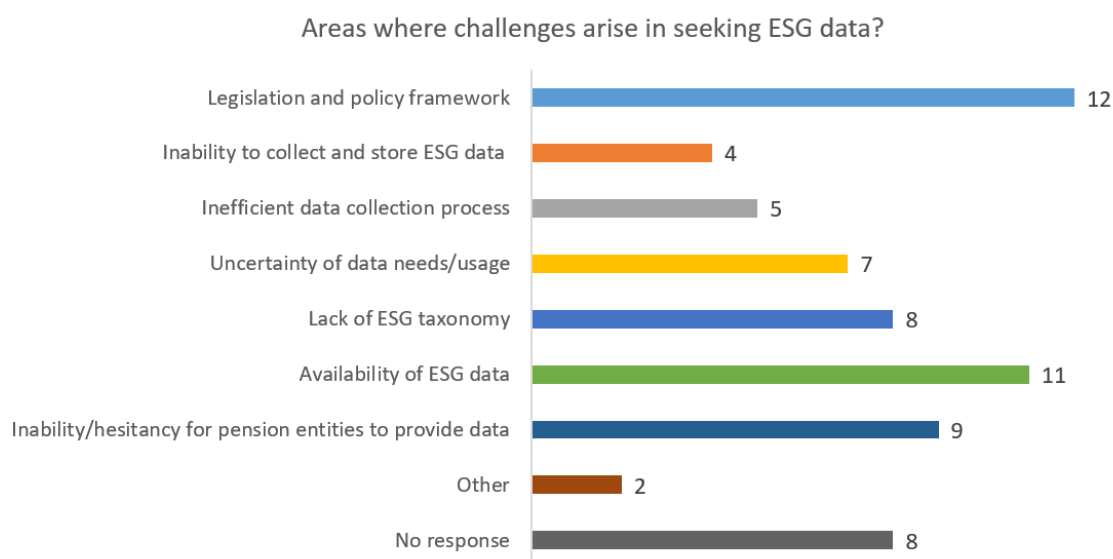Source: IOPS survey conducted in December 2021.

However, there are a number of problems that need to be addressed for the seamless use of ESG data by pension supervisors and pension entities. Challenges that arose when seeking ESG data appear to occur primarily due to lack of adequate regulation, limited data availability and uncertainty in ESG classification:

- **The lack of a legal/regulatory framework** for ESG supervision, among many others, has been recognised as one of the underlying reasons why pension supervisors struggle to collect ESG data (Figure 13). In fact, the absence of a legal/regulatory regime is cited as one of the major obstacles by 12 jurisdictions. In one jurisdiction, for instance, the enforcement of new requirements aimed at increasing the flow of ESG information across the investment chain is

underway. Some other supervisors also noted that they are awaiting the final regulatory technical standards on SFDR[32].

- **The limited availability of ESG data** is also indicated by various Members as one of the fundamental barriers (11). This appears to have to do with the incapacity or hesitancy of pension institutions and their investees to produce ESG information. In addition, it may be the case that there is no need for such firms to generate ESG data. One supervisor noted that it is understandable that pension funds are hesitant given the implications of disclosing sensitive data on liabilities and assets in practice. According to two other supervisors, many pension entities are not fully aware of the ESG components due to the early stage of ESG investment.

- **The incompletion of ESG Taxonomy** appears to be a significant issue for many supervisors looking to integrate ESG factors into their supervision. Some European jurisdictions raised potential difficulties in implementing ESG taxonomy and disclosure rules (SFDR). At the same time, several pension supervisors appear to be making ongoing efforts to adopt and implement ESG taxonomy. Colombia noted that they have adopted/published a green taxonomy[33], which defines a classification system for economic activities and assets that can make a significant contribution to meeting environmental objectives. Brazil noted that they are cooperating with peer regulators and relevant parties to discuss ESG taxonomy[34].

Figure 13

Areas where challenges arise in seeking ESG data?

1) Multiple responses were possible in this question.
Source: IOPS survey conducted in December 2021.

To address the issues above, some jurisdictions have **highlighted the need for persistent work to shape ESG supervisory frameworks, including ESG taxonomy and sustainable disclosure while**

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[32] Sustainable Finance Disclosure Regulation (Regulation 2019/2008), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32019R2088, see also related report by ESMA (2021) on draft Regulatory Technical Standards (sustainability disclosures), https://www.esma.europa.eu/sites/default/files/library/-jc_2021_50_-_final_report_on_taxonomy-related_product_disclosure_rts.pdf
[33] https://www.taxonomiaverde.gov.co/webcenter/portal/TaxonomaVerde
[34] The Brazilian supervisor participates in a working group, called the Laboratory of Financial Innovations (LAB) which consists of financial regulators as well as the private sector and academia. ESG taxonomy is one of the frequently discussed topics in the group.

improving the understanding of regulated bodies by providing appropriate guidance and training programs[35].

Conclusions

The purpose of this report was to provide the IOPS Members with meaningful insights and directions for improving data collection processes. Consequently, the survey has identified various areas relating to data collection where many pension supervisors are keen to improve, and many good practices/lessons learnt by the IOPS Members.

The data collection process may vary given supervisory purposes/regimes, the existing data collection environments and/or the structure and size of the pension industry. Given these differences, **fields of interest or areas of improvement in data collection can also vary from jurisdiction to jurisdiction**. In this respect, this paper has summarised the key takeaways of the survey results based on the major purposes/needs of supervisors, enabling supervisors holistically review the survey results and reflect the findings on their own needs.

The first notable objective shared by supervisors pertains to **increasing the efficiency of the data collection and analytics process.** Supervisors should seek to design their information requirements in a way that optimises the amount of information and avoids unnecessary costs such as duplicating information requirements. However, it can often be challenging for some supervisors for several reasons, such as limited resources or lack of experience in data collection. The following instances presented in this survey can serve as a good reference for supervisors seeking the efficient use of supervisory resources/regulated entities for data collection:

- **Prerequisites**: Problems related to insufficient supervisory resources for data collection can arise, particularly when adopting advanced techniques and new IT systems. To bridge resource gaps supervisors used the following: 1) capacity building programmes; 2) outsourcing; 3) hiring professionals; and 4) collaborations and information exchange between peer supervisors/relevant agencies.

- **Information sources**: Diversifying information sources can offer a variety of benefits such as reducing the burden on data providers and leveraging information as cross-reference checks as part of validation. Some supervisors who struggle with scaling data sources, therefore, should discuss and explore ways to ensure the quality and compatibility of data entered, and reduce the barriers to sharing information between different sources of information.

- **Data requests**: Supervisors should strive to design data requests to avoid incurring unnecessary costs. Proper database design, review of data requests, effective communication with data submitters, and efforts to reduce the burden on data providers may be necessary for some supervisors to improve the quality of data requests.

The second objective relates to **advancing supervisory data collection/processing skills**, especially in data validation, analytics and IT systems. The purpose appears to be closely associated with the higher demands on the use of information caused by the development of (big) data processing technology. Clearly, the shift to data-driven supervision will in turn require more data and processing skills in pension supervision, signalling that pension supervisors should enhance data collection processes to keep pace with these changes. Given this backdrop, the following experiences and plans shared by Members having these goals will help supervisors orient the development of data processing processes.

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[35] Hong Kong (China) issued the "Principles for adopting Sustainable Investing in the Investment and Risk management processes of MPF Funds" to MPF trustees in November 2021, and MPF trustees are requested to review whether their investment/risk management standards in order to meet the Principles. See the document: cir-20211126.pdf (mpfa.org.hk)

- **Data validation** for qualitative information may be the first consideration for supervisors looking to enhance their validation skills. To this end, supervisors may take into account several validation techniques such as using a predefined reporting format limiting responses or performing cross-reference checks using information from other sources. It may be also useful for supervisors to review/adopt validation practices ensuring data quality, such as the dedicated data validation group, external validation or multi-tier validation.

- **Adequate data analysis** is expected to rely more on advanced data analysis techniques such as data mining using AI or machine learning. In line with this trend, supervisors may wish to adopt these techniques in pension supervision. However, having advanced data analytics techniques does not always guarantee better data analysis. In fact, many respondents noted that **data analytics is the outcome of a synergy** of quality data input, greater data accessibility, IT system support and experienced supervisors – for instance, one jurisdiction stated that their advanced analytics techniques were often not feasible primarily due to insufficient data. Therefore, supervisors should strive to meet all these conditions in order to put advanced analytics techniques into use.

- **IT systems** generally involve numerous functions, including data reporting, storage, validation and analytics, which implies that supervisors should keep updating these features to the extent that these functions fully support data processing needs. Alongside this, supervisors may need to look for advanced tools and capabilities supporting data validation and analysis, including data visualisation (e.g., Power BI and Tableau), automated reporting/monitoring and machine learning analytics tools. Additionally, database design, accessibility levels and the use of cloud servers as data warehousing may be topics worth discussing for some supervisors.

Lastly, **the shift to a new supervisory approach** such as risk-based supervision or oversight integrating ESG components may entail adjustments to data needs or changes to existing data collection processes. The survey also confirmed that additional costs concerning data collection may arise in several jurisdictions in transition to a new regulatory framework/regulation. Due to a lack of sufficient experience with new supervisory frameworks, particularly ESG supervision, concrete solutions to address these issues have not been fully covered by this survey. However**, the survey results suggest areas for supervisors to pay further attention to and approaches to tackle these issues:**

- **Risk-based supervision** may affect the process/data needs of data collection in some jurisdictions. Problems occurring in implementing the RBS such as data gaps may be addressed through lessons learnt from other jurisdictions that have already experienced similar data shortages during the transition. Most importantly, these jurisdictions may need to focus more on improving their data collection processes. Given that the transition to the RBS has not fundamentally affected the data collection processes in many jurisdictions, **data-related issues such as data gaps may have stemmed from a lack of adequate data collection processes and/or systems and technology, rather than the transition itself.**

- **ESG data** has not been yet clearly defined in most jurisdictions due to its infancy, thus it may not be surprising that relevant data is not being fully collected by supervisors. Apparently, effective ESG data collection is not feasible without an efficient data collection process as well as robust ESG oversight. Therefore, **supervisors should focus on building their own solid ESG supervisory philosophy and framework** by collaborating with relevant entities (e.g., other pension supervisors and international organisations). These efforts will eventually lead supervisors to effectively define ESG data needs/classifications and garner necessary information from relevant entities.

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