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Utilization of Information Technologies in Off-Site Supervision of Private Pension Systems

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ABSTRACT

Utilization of Information Technologies in Off-Site Supervision of Private Pension Systems

The increasing importance and complexity of private pension systems is in turn raising the importance of supervising these systems effectively. This paper examines ways in which IT can be used by pension supervisors to improve the effectiveness and efficiency of their operations. After presenting an overview of what types of data are collected by various IOPS members, how they are collected and to what use they are put, the paper aims to offer initial suggestions for international good practice in this field for discussion and how other IOPS members can integrate IT into their supervisory activities. A case study of how IT is integrated into the supervisory system in Turkey is included as an annex.

Keywords: Information Technology, early warning systems, on-site supervision, off-site supervision, risk monitoring, data collection.

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1. Executive Summary

As private pension systems become more complex, larger in scale and a more important component in retirement incomes, so the bar for the quality of pension supervision is also rising. One way pension supervisors across the world are striving to react to such new challenges is through the use of Information Technology. This project looks at how automated systems of data collection and analysis can be used to improve the efficiency and effectiveness of pension supervision worldwide.

The report finds that IT is being increasingly used and improved by pension supervisors across different types of pension system and supervisory approach – whether 'proactive' or 'reactive' and whether using risk-based supervision or not. Data is being collected to establish the compliance of supervised entities with regulation and to identify risks in a timely manner, as well as to provide enhanced statistics and information on pension entities and the industry as whole. The types of data collected were found to vary greatly, as was the frequency of collection (e.g. in some countries portfolio valuations are published only annually, in others daily) and the use to which the data was put (from simply publishing statistics to triggering early warning systems which require reaction from pension funds). Different technical solutions for gathering, storing and protecting data were also noted.

However, all the supervisory authorities which took part in the project recorded benefits from utilizing IT in their supervisory systems. These benefits ranged from efficiency and effectiveness gains on the part of the supervisory authority (allowing resources to be more targeted and the authority to act more promptly when problems were detected) to improved understanding and knowledge of the pension system as a whole on the part of pension funds and members through the release of industry data and statistics.

Consequently, the project has allowed a number of conclusions and lessons to be drawn as to how IT can be applied by pension authorities to make their supervisory systems more efficient and effective. Some key initial lessons learnt include the following:

- IT systems should be used at least for data collection and reporting functions, but should also be encouraged to detect problems, to move to a 'risk-based' supervisory approach and to use supervisory resources more efficiently;
- As much comparative data as possible should be derived from monitoring systems and this information should be disseminated widely;
- The quality of the data collected can be improved by explaining clearly to pension entities the importance and usefulness of the data collected and the purpose of the data collection process;
- Systems and checks should be in place to ensure the reliability and accuracy of the data collected and effective backup and recovery systems are essential;
- Though initial implementation costs will normally be recuperated through lower on-going supervision requirements, care should be taken not to overburden pension entities with technological requirements.

2. Introduction

This paper is a discussion of possible IT solutions to off-site pension supervision. After presenting an overview of what types of data are collected by various IOPS members, how they are collected and to what use they are put, the paper aims to offer initial suggestions for international good practice in this field for discussion and how other IOPS members can integrate IT into their supervisory activities, making them more efficient and effective.

Why is the use of IT important in pension supervision?

The increasing importance and complexity of private pension systems is in turn raising the importance of supervising these systems effectively, with high profile problems within pension systems in IOPS member countries in recent years increasing the focus and attention on pension supervisors. This paper examines ways in which IT can be used by pension supervisors to overcome their numerous challenges. Parallel to the developments in the IT technologies globally, such systems have become an indispensable element of supervision in financial markets in general. Due to the crucial role of the private pension systems within the financial markets, the utilization of such technologies in the supervision of pensions is of vital importance. For one thing, they present a considerable opportunity to reduce the supervision costs of the supervisory authorities, while boosting the efficiency and effectiveness of the supervisory systems. Timely intervention against probable problems, the cost of monitoring and supervision, ensuring compliance with regulations, the safekeeping of fund assets, avoiding fund mismanagement and the generation of statistics are among the issues discussed regarding the supervision of private pensions – and all of these functions can be assisted by the use of IT.

Therefore, the aim of this project is to investigate and analyze efficient and effective methods for the utilization of IT technologies in the off-site supervision of private pension systems. Furthermore, the project's final goal is to identify "lessons learnt" which have the capacity to guide the members of IOPS in their endeavors to utilize IT technologies in the supervision of their private pension systems.

The information presented covers fourteen countries' - namely Australia, Bulgaria, Czech Republic, Germany, Ireland, Israel, Korea, Mexico, Netherlands, Portugal, Spain, Thailand, Turkey and UK – and is drawn from replies to a questionnaire previously discussed and sent to all of the IOPS members. The questionnaire was prepared to collect information on the role and functioning of information technologies in off-site supervision, the advantages and disadvantages of utilizing information technologies etc. By assessing the information provided, a comparative analysis of the extent and scope of information technologies' utilization in off-site supervision of private pensions including pension funds and pension plans for member countries of the IOPS is available for use. As well as trying to initially identify good practice for the utilization of IT for discussion, this project aims to identify and thus show IOPS member countries the extent and scope of IT utilization in off-site supervision. We all know that every countries' private pension system, as their culture are unique, require a thorough analysis before any IT related project based on other countries' experience can be implemented.

While this project focuses on the utilization of IT technologies in the off-site supervision of DC type private pension plans, some of the findings relating to the usage of IT would be useful for supervisors of DB plans.

The report begins in Section 3 with a short comparative review of private pension systems of the fourteen countries which have provided data via the questionnaire. Section 4 tries to identify the scope and extent of off-site supervision in general by seeking answers to questions such as what is the goal of data collection, which risks are monitored through off-site supervision and what supervisory functions are attributed to off-site supervision? In Section 5 the type of data collected, the mediums used in data collection, the reliability of data collection and the amount of data received in terms of registries are determined across the fourteen private pension systems. Section 6 deals with the data processing methods used for reporting, generation of statistics and conducting analytical studies. Section 7 questions the existence and operation of an early warning system in these private pension systems. Sections 5,6 and 7 implicitly shows the degree of utilization of information technologies while in Section 7 the information technology requirements for both pension companies and pension funds are investigated. Section 8 tries to summarize pros and cons and lessons drawn from each country's experience in utilizing information technologies. The report concludes with a case study example of the IT system utilized by the Turkish pension supervisory authorities which is included in Annex 1.

3. Comparative review of countries' private pension and supervisory systems

The evaluation of the information collected by the questionnaire would be more difficult without knowing the key features of the individual pension systems of each country – such as the size, complexity and structural differences. Table 1 lists the number of pension plans[1] and pension funds[2] for each of the fourteen countries to whom we are grateful for supporting this project by replying to the questionnaire. As seen in Table 1 the countries pension supervisory systems have different characteristics in terms of the number of plans and pension funds. For example, in countries such as Australia, Bulgaria, Mexico and Germany[3] the pension system is mainly focused on pension funds only, whilst in other countries - namely Czech Republic, Ireland, Israel, Korea, Netherlands, Portugal, Spain, Thailand, Turkey and UK - pension plans have been used in addition to pension funds.

In addition the table names the supervisory authorities for each country's pension system. In countries where the pension supervisory system is focused on pension funds such as Australia, Bulgaria, Germany and Mexico, as expected, there is a single supervising authority. In countries such as Ireland, Israel, Korea, Netherlands, Portugal,

1. According to the OECD taxonomy, a pension plan is a legally binding contract having an explicit retirement objective (or – in order to satisfy tax-related conditions or contract provisions – the benefits cannot be paid at all or without a significant penalty unless the beneficiary is older than a legally defined retirement age). This contact may be part of a broader employment contract, it may be set forth in the plan rules or documents, or it may be required by law. In addition to having an explicit retirement objective, pension plans may offer additional benefits, such as disability, sickness, and survivors' benefits.

2. According to the OECD taxonomy, a pension fund is a pool of assets forming an independent legal entity that is bought with the contributions to a pension plan for the exclusive purpose of financing pension plan benefits. The plan/fund members have a legal or beneficial right or some other contractual claim against the assets of the pension fund. Pension funds take the form of either a special purpose entity with legal personality (such as a trust, foundation, or corporate entity) or a legal personality managed by a dedicated provider (pension fund management company) or other financial institution on behalf of the plan/fund member.

3. It should be noted that BaFin supervises Pensionskassen and Pensionsfonds which provide their pension plans to BaFin. Therefore, the supervision of these entities includes the examination of the pension plans. However, BaFin do not collect the number of pension plans that the Pensionskassen and Pensionsfonds offer.

Spain and Thailand both pension plans and pension funds are supervised by a single authority. On the other hand, there are two distinct supervisory authorities for pension plans and pension funds in Czech Republic and Turkey.

The type of information required by supervisors will depend on the nature of the plans/funds which they are supervising. In addition, the number of plans/funds, as well as the number of institutions involved in pension supervision, will also affect the amount of data which can be collected by the main pension supervisory authority, how this data is handled and what is done with the data.

Table 1: Summary information about the countries' private pension systems

	Number of Pension Plans	Supervisory Authority	Number of Pension Funds	Supervisory Authority
Members supervising numerous plans/ funds				
Australia	-	Australian Prudential Regulation Authority	7689[4]	*as with plans*
Germany[5]	-	Bundesanstalt für Finanzdienstleistungsaufsicht	160+24[6]	*as with plans*
Ireland	93,000	The Pensions Board		*as with plans*
Netherlands	920	De Nederlandsche Bank	829	*as with plans*
Portugal	466	Instituto de Seguros de Portugal	221	*as with plans*
Spain	3216	Dirección General de Seguros y Fondos de Pensiones	1255	*as with plans*
Thailand	6700	Securities and Exchange Commission	555	*as with plans*
Turkey	962	Undersecretariat of Treasury	96	Capital Markets Board
UK	84,000[7]	The Pension Regulator	280	*as with plans*[8]
Members supervising limited number of plans/ funds				
Bulgaria	-	Financial Supervision Commission	24	*as with plans*
Czech Republic	11	Office of the State Supervision in Insurance and Pension Fund	11	Czech Securities Commission
Israel	41	Israel Insurance Commission	41	*as with plans*
Korea	44	Financial Supervisory Service	41	*as with plans*
Mexico[9]	1	CONSAR	16	*as with plans*

Source: Replies to IOPS Questionnaire (data received 2005)

4. 6665 of these funds have 4 or fewer members, while there are 319,805 other small (4 or fewer members) self managed funds which are not prudentially regulated (as of 30 June 2006).
5. Pensionskassen and Pensionsfonds are not allowed to provide DC plans.
6. For Germany only Pensionskassen and Pensionsfonds are covered by this survey. As of 31.12.2005 there are 160 Pensionskassen and 24 Pensionfonds.
7. Approximate number for DB and DC schemes
8. The Financial Services Authority in the UK also has responsibility for 'third pillar', personal pension plans.
9. Pension system is mandatory.

The first insight which can be drawn from this report is that because of high setup costs, the use of IT in off-site supervision might seem feasible only for supervisory authorities overseeing a concentrated pension system with a few pension entities. However, given innovations in IT and the reduction of high setup costs for moderately new technologies, utilizing IT has also been shown to be possible and useful in countries with pension systems consisting of hundreds if not thousands of pension entities. Indeed it could be argued that the use of IT will be of equal or more importance in these cases in the very near future.

4. Objectives of off-site supervision

4.1. Goals of data collection and risks monitored within the scope of off-site supervision

In this section the role of the off-site supervision for each country is assessed by investigating the goal of data collection in general and the risks monitored within the scope of off-site supervision. Based on the replies to the questionnaire, it is clearly understood that the following are among the goals of data collection for most of the countries:

- financial reporting,
- generation of statistics,
- identifying problematic areas,
- providing guidance for on-site supervision,
- better and more efficient supervision,
- targeting resources where the risks are,
- establishing level of risk to Pension Protection Fund,
- financial stability of each pension fund,
- actuarial analysis,
- actual vs. expected claims for disability and survivor benefits.

While the supervisory authorities' and supervised entities' capacity plays a critical role in collecting data, the collected data help supervisory authorities monitor basic risks such as:

- operational risk,
- market risk,
- credit risk,
- funding risk,
- valuation risk and mortality (longevity) risk to a certain extent,
- governance, compliance to regulations and business practices,
- employer covenant,
- adoption and execution of sound investment policies.

In short, data collection is mainly done for to establish the compliance of supervised entities (i.e. pension companies and pension funds) with regulations and identifying risks in a timely manner.

Table 2: Supervisory functions attributed to the off-site supervision

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
1. Statistical Collection														
Reporting purposes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Generation of statistics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2. Detection of Problems														
Detection of problems for further inspection on-site	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		✓
Monitoring of transactions[10]	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓
3. Monitoring Operational Performance														
Safekeeping of fund assets	✓	✓	✓	✓	✓	✓	✓ 11		✓	✓	✓			✓
Monitoring Financials	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓		✓
Controlling the calculation of technical provisions				✓		✓	✓					✓		✓
Monitoring the funding of technical provisions				✓		✓	✓			✓		✓		✓
Controlling the fit and properness of the pension fund staff (e.g. board of directors, etc.).			✓	✓	✓				✓	✓		✓		
Other			✓ 12	✓ 13	✓ 14		✓ 15		✓ 16	✓ 17		✓ 18		

Source: Replies to IOPS Questionnaire

10. E.g. opening accounts, switching to another pension company, changing fund portfolio allocation, etc.
11. On an ad hoc basis
12. Height and replacement of state contributions on due time
13. Monitoring the developments of the book and market values of assets
14. Compliance with the investment regime and asset valuation
15. Pension fund contracts that are submitted to prior approval
16. Compliance with the investment regime and asset valuation
17. Checking on the changes to employer covenant; winding up schemes
18. Pension plan provisions - to verify that plan members are reasonably protected, and the pension plan does not exceed its allowable mandate

4.2. Supervisory functions attributed to the off-site supervision

Identifying the supervisory functions attributed to off-site supervision is the first step to assess the scope and extent of off-site supervision for each supervisory authority. Some of these supervisory functions as shown in Table 2 are:

- monitoring of transactions,
- safekeeping of fund assets,
- reporting purposes,
- generation of statistics,
- detection of problems for further on-site inspection,
- monitoring financials,
- controlling the calculation of technical provisions,
- monitoring the funding of technical provisions,
- controlling the fit and properness of the pension fund staff (e.g. board of directors, etc.).

We are assuming that for countries where a certain function is not attributed to off-site supervision, either this function is performed through on-site supervision or is not performed due to specific features of the private pension system.

Off-site supervision can be seen to serve three broad functions (with only the German supervisory authority BaFin covering all functions):

1. Functions concerning reporting and generating statistics about the private pension system as a whole are covered through off-site supervision for all countries. In fact Thailand's off-site supervision system is totally devoted to only these two functions.

2. Most of the other authorities also use off-site supervision for detecting problems (which will be further investigated by on-site supervision) and for other monitoring purposes. Functions directly relating to the pension members are also listed under the heading of monitoring of transactions - such as opening accounts, switching to another pension company, changing fund portfolio allocation, any expenses deducted from individual accounts etc. It is interesting that these functions are carried out not only by the supervisory authorities which oversee only a few plans or funds (such as Bulgaria, the Czech Republic, Ireland, Israel, Korea and Mexico) but also by those covering many hundreds or even thousands of pension entities. In countries such as Australia, Portugal and UK pension transactions are not monitored offsite, rather problems are detected offsite for further onsite inspection. In contrast, in countries such as Ireland and Korea an opposite supervisory approach is taken – i.e. although transactions are monitored offsite, this does not serve for further inspection onsite. Considering that there are millions of members in private pension schemes, these transactions present a huge burden on the supervision capacity. However the off-site supervision of these transactions increases the supervised entities' conformity to regulations and enhances the system's reliability in the eye of members.

3. The final functions relate to the fund's operation and performance, such as safekeeping of fund assets, monitoring financials, calculation and monitoring of technical

provisions, the properness of fund staff etc. These also constitute a major burden for private pension systems which have a large number of funds. Yet even in countries where there are a large number of funds - such as Australia, Germany, Netherlands, Portugal, Spain, Turkey and UK - these functions are performed as a part of off-site supervision.

The evidence from the countries surveyed suggests that data should be collected at least for statistical and reporting purposes, as well as monitoring and detecting additional problems for on-site investigations. Although the first two functions are broadly covered by almost all the countries, functions related to monitoring of operations are limited according to feasibility.

5. Types of data collected and produced

5.1. Types of data collected

In order to perform the above mentioned supervisory functions supervisory authorities need data about pension members, pension plans, pension funds and the administrative staff responsible for the operations of the supervised entity. Such data as shown in Tables 3-1, 3-2 and 3-3 is grouped into three parts:

- contract information
- pension plan
- pension fund

Contract information

Here the supervisory authorities were asked to identify what types of data they collect from the pension companies and/or pension funds. As seen from the tables below, replies are in parallel with the structure of the countries' private pension systems. Care should therefore be taken when evaluating the information provided in the tables below, taking into account the private pension system structure of the country examined. For example, as seen in Table 3-1 in Germany, Israel, Netherlands, Thailand and UK contract information details are not collected. In Australia, Ireland and Spain plan member information, account activity and fund preference and weights (Australia only) are collected annually and quarterly (Ireland only), whilst such data contract details are collected weekly in Mexico (excluding fund preference and weights), monthly in Czech Republic (including member risk profile), monthly, quarterly and annually in Bulgaria (excluding fund preference and weights) and Korea (excluding account activity), and whenever there is an amendment (i.e. a new member, a new transaction in account etc.), in Turkey and Bulgaria (account activity only). In Portugal only plan member information is collected annually.

Table 3-1: Types of data collected - Contract information[19]

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey[20]	UK	Korea	Israel	Ireland	Spain
Plan member information	A	M, Q, A	M		W		A		D		M, Q, A		A	A
Contract details		M, Q, A	M		W		O		D		M, Q		Q	O
Account activity	A	D, M, Q, A	M		W				D				Q, A	A
Fund preference and weights	A		M						D		M, Q, A			
Member risk profile			M						D					
Other													Q, A[21]	

Source: Replies to IOPS Questionnaire

Pension Plan Information

In Table 3-2 Bulgaria has no pension plans, whilst in Ireland and UK data is not collected, and in Mexico, where there is single plan, only commission details are collected weekly. In Thailand, where there are 6700 plans, information about fund committees is collected at the time of registration and amendment, and in the Netherlands, where there are 920 plans, the technical parameters of plans are collected annually. In Australia some commission details are collected quarterly and investment choices are collected annually. The Czech Republic collects the technical parameters of the plan, joining and leaving conditions and some additional data, whilst Germany collects the technical parameters of plan, investment choices, leaving conditions and some additional data. In Portugal commission details and joining and leaving conditions (excluding technical parameters of plans which are collected annually) are collected and all of the previously mentioned data are collected at the time of registration of the plans and when there are further changes in Israel, Spain and Turkey whereas these are collected monthly in Korea.

19. D: Daily, W: Weekly, M: Monthly, Q: Quarterly, SA: Semi-annually, A: Annually, O: Whenever there are changes

20. Turkish monitoring system requires pension companies send the corresponding data daily in case of any change occurring in pension accounts.

21. Transfers in and out

Table 3-2: Types of data collected - Pension plan

	Australia	Bulgaria	Czech Republic[22]	Germany[23]	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
Technical parameters of plan			O	O		A	A		O			O		A
Commission Details	Q,A				W		O		O		Q	A		O
Investment Choices	A			O					O		M,Q,A	O		O
Joining Conditions			O				O		O		M,Q	O		O
Leaving Conditions			O	O			O		O		M,Q	O		O
Other	O		O	O				O						

Source: Replies to IOPS Questionnaire

Pension Fund Information

For pension funds data collection occurs more frequently compared to contract information and other pension plan data as there are more transactions related to fund's operations performed everyday. Other than Ireland, Portugal, Thailand and UK all countries collect information about fund transactions: Australia and Spain annually, Bulgaria, Mexico and Turkey daily, Czech Republic, Israel and Korea monthly and Germany and Netherlands quarterly. Portfolio valuation and financial statistics are collected by every country except Ireland at various frequencies ranging from daily to annually. Fund share value data is collected in Bulgaria, Mexico and Turkey daily, in Israel monthly and in Germany and Netherlands quarterly.

From the type of data collected across different countries we can easily see that countries assigning more functions to offsite supervision have the ability to collect a wide range of data. In this sense data collection is dependent on the scope of offsite supervision. The frequency of data collection however relies on the extent of IT usage by the pension entities and the supervising authority since collecting frequent data promptly requires the use of automated systems. Without implying the type and amount of data to be collected, supervising authorities can easily be advised to improve their data collection performance by employing IT.

22. Frequency not specified

23. At the time of introduction of the plan and when the parameters of the plan change, commission details are reported with the business plan presented to BaFin at the outset

Table 3-3: Types of data collected - Pension fund

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
Financial statistics	Q, A	D, M, Q, A	SA	A	M	A	Q	M	D	A	Q	M		A
Portfolio valuation	Q, A	D	M	Q, A	D	Q, A	Q	M	D	A	M, Q	M		A
Pension payments, number of members	Q, A	D, M, Q, A	Q	A	W	A	A	M	D	A	M, Q	M	Q, A	A
Fund transactions	A	D	M	Q, A	D	Q			D		M, Q	M		A
Fund share value	A	D		Q, A	D	Q, A			D			M		
Own funds		D	M	A	D		A				Q	M		
Specific reports for control		D, M, Q, A	M	Q, A	Q		O [24]							A
Technical provisions			SA	A			A			A		A		A
Transactions of fund staff			Q	A										
Other		M, Q, A [25]	O [26]	A [27]	D [28]			Q [29]						

Source: Replies to IOPS Questionnaire

24. When problems exist or are expected

25. Pension fund reserves

26. The list of pension fund's shareholders – Annually, Information about participants in supplementary pension insurance - Monthly

27. Detailed information about the items of the balance sheet and profit and loss calculation

28. Investment regime

29. Number of members

5.2. Descriptive and analytical statistics

In this section the analytical capabilities of the monitoring systems used by the supervisory authorities are assessed by the type of descriptive and analytical statistics produced by their monitoring systems. It should be stressed that the periodicity of these statistics is independent from the monitoring systems' capability and depends on the periodicity of the data collected to a large extent.

The Australian monitoring system can make calculations for descriptive statistics such as annual age segmentation, standard deviation and mean of contribution, revenue and benefit payments across periods and entities and average assets per member quarterly. In addition to that analytical statistics such as number of entities with lower/higher average assets and ROA lower/higher than average and expense ratios higher than a certain level might also be produced. In Bulgaria the monitoring system is used to produce descriptive statistics such as the pension fund unit value daily and any analytical statistics can be produced on demand. In the Czech Republic the monitoring system allows age, gender, average asset and contribution histogram of members, breakdown of portfolios of pension funds to be produced.

The German monitoring system produces descriptive statistics - for example the mean funding level of all pension funds, developments in the assets of pension funds over time and the mean interest. It also identifies the number of underfunded pension funds, the number of pension funds operating cross border and solvency requirements. In Mexico descriptive statistics such as investment returns, statistics about members and fees and analytical statistics such as switching members between funds, portfolio compositions and returns can be produced.

The Dutch system also allows similar statistics which are also published in bulletins. In Portugal the monitoring system may be used for producing statistics about contributions, benefit payments, commissions and returns on investments, member age histogram, members by plan types, funding ratios and identifying plan sponsors not paying contributions in accordance with actuarial valuations. The Thai monitoring system produces statistics - for example concerning the provident fund portfolio, cash inflow and outflow and fund size. The Turkish monitoring system can daily produce mean and standard deviation of contributions, member age histograms, members by cities and regions, members paying contributions higher than a certain amount, members with more than one pension contract etc.

The Irish monitoring system allows calculation of quarterly take up statistics, annual statistics on contributors' properties such as economic status and both quarterly and annually assets and transfers statistics. In Israel, the system on a monthly and annual basis gives average yields and yield variances among pension funds, changes in assets of and contributions to pension funds, and changes plan membership. The Korean system releases monthly statistics for the employer-sponsored pension plan contracts, the number of participants, contracts and the size of pension fund assets, and for the pension funds (reserves) the amount of deposits, insurance products, stocks and bonds. In UK the monitoring system allows for the calculation of descriptive statistics such as funding levels by type and size of schemes, membership types and for taking samples for surveys and analytical statistics such as under-funded schemes, late or non-payment of employers' contributions and risk scoring based on employer credit ratings on monthly, quarterly or annual basis.

IOPS, in line with 'Principles of Private Pension Supervision'[30], recommends deriving as much comparative data as possible from the monitoring system and disseminating this information widely. For example, the Dutch bulletins and the Turkish progress reports could be seen as a good example of producing descriptive statistics about the pension system and publicizing this information.

5.3 Early warning system

Early warning systems analyze data collected to flag potential problems before they arise. Australia, Czech Republic, Ireland, Israel, Thailand and Turkey do not have such early warning systems at the moment. Other countries, although not named exactly as an "early warning system", have sub-systems used for similar functions. For example, in Bulgaria, the early warning system checks the data received from the pension companies and the custodian bank using filters for investment limits and other legislative prohibitions and then identifies the discrepancies between the two sets of data. In case of non compliance sanctions such as imposing enforced administrative measures, fines and penalty payments are applied.

In Germany an overall early warning system is under preparation. However, BaFin already uses two supervisory tools which can be regarded as a kind of early warning system: 1) Stress testing and internal stress tests on a quarterly basis (for Pensionskassen), 2) Forecasting (Pensionkassen and Pensionsfonds). The stress test is supposed to verify if an insurance company is able to meet its liabilities under the insurance contracts at all times and cover the required regulatory capital with appropriate assets despite a prolonged crisis on the capital markets, and without having to resort to taking counter measures. For this purpose BaFin studies the effects the following scenarios would have on the next balance sheet date:

- Loss in fair market value of bonds of 10 per cent
- Loss in fair market value of shares of 35 per cent
- Loss in fair market value of bonds of 5 and shares of 20 per cent
- Loss of fair market value of shares of 20 per cent and real estate of 8 per cent

The stress test scenarios likewise take into consideration risks associated with credit ratings in case of fixed-interest securities and loans with reductions between 0 and 30 per cent. Depending on the result of these scenarios the insurance company is subject to certain notification obligations towards BaFin. In addition, insurance companies have to carry out internal stress tests at least once every three months. Depending on the result, certain notification obligations have to be met. Pension funds furthermore have to furnish realistic forecasts on the dates BaFin fixes (in general at least for the key date 30 June). The aim is to forecast the surplus on the next balance sheet day. The forecasting also considers hidden reserves and losses and comprises also an inquiry on the size of the bonus paid out for the next year.

30. IOPS Principle 9.3 *Pension supervisory authorities should provide and publish clear and accurate information for the pension industry and the general public on a timely regular basis – such as the financial situation of the pension fund industry and observations on major developments in the pension sector. Disclosure will generally be on an aggregate basis, but could also be on individual pension funds, in which case the rules of confidentiality may be particularly relevant.*

In Mexico every pension fund submits a daily transaction report at the closing of the trading day. From this data, a summary is prepared, which provides guidance on possible violations of the investment regime. The report is also used as an early indicator of investment strategies implemented by the funds. The following working day, a full transaction, accounting and valuation report is submitted by each pension fund. A surveillance system performs an 80-rules check that supervises each fund's compliance with accounting and investment regime regulation. The same system issues warnings when a certain level, amount or number is close to a specific limit. Finally, regarding market risk, a comparison between a fund's Montecarlo Value at Risk (mVaR) trend and its Historical Value at Risk (hVaR) trend provides an early warning of violating the regulatory imposed limit on the latter (the mVaR trend reacting more rapidly to changes in volatility than hVaR´s). Also, the number of scenarios that exceeds the hVaR limit beyond the confidence interval (set at 95%@1 day) is used as a warning measure of the likelihood of a specific fund of violating its risk limit.

In the Netherlands the early warning system is positioned as a last step in data quality management and, for the majority of funds, triggers issues to be dealt with during supervision. It is also used to set the order in which supervised entities are supervised.

In Portugal, based on the data collected, the supervisory authority (ISP) identifies the pension funds with low funding ratios and managing entities with low solvency margins. It also determines the investment policy adopted by each pension fund to finance their liabilities, commissions received, new individual adherents and contributions level distribution.

In UK the system called PRISM is used to run regular queries against scheme and employer data and produces an early warning list for Pension Protection Fund. The Spanish system performs ratio analysis on investment limits, commission, minimum capital, etc. The Korean system benefits from the already established early warning system for the financial sector and seeks financial soundness for pension trustees without pointing the private pension plans at present.

Key variables for stress testing

In the Bulgarian system approximately 70 filters are used as key variables. The information system collects data from the pension companies, custodian banks, Bulgarian stock exchange and central depositary. Each filter checks different conditions, makes comparisons, calculates results and finally sends the results of these checks (via E-mail) to the respective supervising expert.

The German system uses the following key variables:

For stress testing:

- Technical reserves and discount rate
- Own funds
- Value of asset classes
- Amount of assets with different credit ratings groups
- Interest rates for the different asset classes
- Solvency capital requirements

For forecasting:

- Variables of the profit and loss calculation
- Own funds
- Hidden reserves and losses in assets
- Bonuses declaration for the next year

The Mexican supervisory authority claim that the scarce amount of data (particularly investment regime violations that signal excessive risk) is currently insufficient to measure the reliability of the specific warning measures used, and hence the system as a whole.

The Dutch claim that as their system is based on 'business rules' with yearly revisions, key variables can be added and dropped upon request. Currently there are 20 rules for quarterly data and 51 rules for annual data.

In Portugal the key variables are identified as the ones used for the calculation of funding ratios, solvency cover and asset allocation.

In line with the IOPS 'Principles of Private Pension Supervision'[31], supervisory authorities should adopt a 'risk-based' approach to pension supervision – seeking to offset problems proactively before they arise rather than reacting after the event. International good practice shows that information technologies constitute a very important part of early warning systems by enabling a wide range and amount of data collection, huge processing power and prompt action. Any risk-based approach should rely on an early warning system and thus IT in various ways.

6. Technical Issues

6.1. Data collection methods

The mediums used to collect data range from the very well known electronic media such as CD, zip discs and floppy discs etc. to Virtual Private Networks (VPN) where an enhanced additional level of security is sustained. Table 4 shows the types of medium used by the countries for data collection. While five of the fourteen countries - Australia, Germany, Mexico, Netherlands and Turkey - use some form of electronic media and Germany allows pension funds to send their data in paper format. The Czech Republic appears to use email as the single medium, whilst in the other three countries – namely Bulgaria, Portugal and Thailand- the use of FTP and HTTP dominates.

As seen from Table 4 nearly all of the countries other than Czech Republic, Ireland, Israel and Spain are beginning to rely on FTP and HTTP which are more appropriate for faster and larger data collection. The security of data which is of great importance for companies is being maximized via utilization of HTTPS and VPN while transferring these data.

31. IOPS Principle 5.2 *Pension supervisory authorities should be pro-active, seeking to avoid significant problems before they occur and intervening, in a proportionate way, at as early a stage as possible and searching for those supervisory instruments which add most value to the desired supervisory result.*

Table 4: Medium of data collection

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
Electronic media (CD, floppy discs, etc.)	✓			✓	✓	✓			✓	✓		✓	✓	✓
Email	✓	✓	✓							✓	✓	✓	✓	
FTP[32]		✓							✓	✓				
HTTP[33]	✓			✓			✓	✓		✓	✓			
HTTPS[34]		✓[35]												
VPN[36]					✓				✓					
Other				✓[37]						✓[38]				✓[39]

Source: Replies to IOPS Questionnaire

6.2. Reliability of data

Various methods are used for assuring the reliability of data in different countries. For example, in Australia and Spain mandatory checks are performed to ensure that all required data is submitted. Further checks in between periods and on particular items enhance data reliability. In Bulgaria the data is received via HTTPS with digital signature. In the Czech Republic data is confirmed by the statutory body. In Germany a cross check mechanism is applied within the forms provided and any mistakes are fed back to pension funds. In Mexico consistency of information provided is validated via cross checks and ex-post verification at on-site visits. In the Netherlands the reliability is assured by the rules set in data entry systems and an additional manual check is performed on a set of key variables. In Portugal various adequate checks including cross checking with the

32. **File Transfer Protocol:** A client-server protocol which allows a user on one computer to transfer files to and from another computer over a TCP/IP network. Also the client program the user executes to transfer files.

33. **Hypertext Transfer Protocol:** The client-server TCP/IP protocol used on the World-Wide Web for the exchange of HTML documents. It conventionally uses port 80.

34. Using an **https:** URL indicates that HTTP is to be used, but with a different default port and an additional encryption/authentication layer between HTTP and TCP.

35. HTTPS with digital signature

36. **Virtual Private Network:** The use of encryption in the lower protocol layers to provide a secure connection through an otherwise insecure network, typically the Internet.

37. Pension funds are also allowed to provide relevant data in paper format using special forms and diagrams. Especially small undertakings prefer paper format.

38. GSI (Government Secure Intranet)

39. XML system, telematic procedure

internal database are implemented. In Thailand this reliability check had been done manually but now this process is being developed to be done electronically. In Turkey the XML formatted data file that is automatically produced from company's database via a computer code is checked by certain rules about the format and values of the data. The UK requires a signed declaration by trustees or person acting on their behalf that data is correct. In addition to this, there are validation and sense checks on the website. Similarly, the Irish system requires that data is signed off by two of the directors of the company. In Israel, annual financial reports are analyzed thoroughly. The Korean authority without indicating how, claims a reliability rate of 80 to 90 percent.

The reliability of data collected is of great importance to the supervisory authorities as the analysis made based on this data lead to decisions affecting pensioners, pension entities and the pension system as a whole. Thus international good practice suggests improving the data collection process via utilizing IT as this minimizes the errors from human interaction. However, it should not be forgotten that the IT systems might be intentionally managed to distort the data collected. This should also be kept in mind while using the benefits of IT when collecting data from pension entities.

6.3. Amount of data received and the retention period

In this section countries were asked to give an estimate about the amount of data they collect and the retention period of these data. In Australia the number of fields (data items) is approximately 1000 and the retention period is said to be not specified as yet. In Bulgaria, without giving an estimate for the amount of the data collected, it was reported that all data are currently retained in databases. In the Czech Republic an estimate is not given, but it was reported that the data concerning each individual account is obliged by law to be retained for a period of ten years by pension funds. In Germany an estimate of 2000 pieces of data per pension fund are given and the data is reported to be kept for an unlimited period. In Mexico 40-45 million registries per month are collected. 35 million of these are kept at a database that is renewed every month and 10 million of these are incremental data which is added to a database of 1 billion registries and kept historically. In Netherlands 75 fields quarterly and 1016 fields annually are kept indefinitely. In Portugal it is said that over 2.5 million registries are collected annually and the data is kept for 10 years. In Thailand without giving an estimate for the amount of the data collected it is said that the data are received from 20 pension management companies which are responsible for 6,700 employers. In Turkey data collection began with the inception of the private pension system in October 2003, with data being collected cumulatively from the pension companies using XML formatted files which assure reliability and integrity of data to a large extent. This data amounts to over 200 GB of text data with over 1000 fields. Currently it is planned to keep the data indefinitely on the databases. The British system has 459 fields for approximately 84,000 scheme returns and keeps the data indefinitely. In Israel nearly 300 fields of data are received in an electronic database and are also kept indefinitely. The Irish authority also keeps the data collected on 30 fields indefinitely. Korea states without giving an estimate for the amount of the data that quarterly reports collected are retained permanently.

Thanks to the improvements in database technology, all countries could keep their pension data composing of over millions of registries indefinitely. None of the countries should encounter any problem in keeping their data indefinitely provided that they are able to collect these data electronically and have recovery systems.

6.4. Data processing methods

As data sitting in databases is hard to interpret, retrieving information from such raw data is of great importance to the supervising authority when taking decisions, making policies and identifying problems. When retrieving information from the data in databases, queries are used. Here the aim of this part of the questionnaire was to identify the methods by which the supervising authorities use the data and make queries when certain information is required. Therefore four different situations as seen in Table 6 were depicted based on the place where the database is stored and whether static and/or dynamic queries can be made. Other than Ireland and Korea all countries' supervisory authorities are capable of making off-line static queries on stored database. Only seven countries: Bulgaria, Germany, Israel, Mexico, Netherlands, Turkey and UK are able to perform off-line dynamic queries on stored databases. The countries that are capable of doing on-line static queries on remote databases using a specific program are Bulgaria, Germany, Korea, Portugal and Turkey. Finally Australia, Bulgaria, Germany, Korea, Portugal and Turkey are countries which can make on-line dynamic queries on remote databases using a specific program.

Table 5: Data processing methods used

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
Off-line static queries on stored database[40]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓
Off-line dynamic queries on stored database[41]		✓		✓	✓	✓			✓	✓		✓		
On-line static queries on remote database using a specific program[42]		✓		✓			✓		✓		✓			
On-line dynamic queries on remote database using a specific program[43]	✓	✓		✓			✓		✓		✓			
Other													✓[44]	

Source: Replies to IOPS Questionnaire

40. e.g. previously designed templates
41. e.g. templates designed when querying
42. e.g. an html based applications using previously designed templates
43. e.g. a java based application using templates designed at the time of query
44. Database application designed specifically for Irish data with a corresponding reporting tool from wide previously designed templates

International good practice suggests at a minimum conducting off-line static queries on stored database, but supervisory authorities should try to implement dynamic queries as well since information which are not included in previously designed static queries might be of use at the time of query. Queries on remote databases on the other hand serve for flexibility and make databases available to various people.

6.5. Disaster recovery

As shown in Table 6 below, other than the Czech Republic and Korea all countries have relational database management systems. Countries excluding the Czech Republic, Ireland and Spain have data warehouses for storing data and security and recovery systems for protecting them against any disaster scenarios.

The Australian monitoring system includes an Oracle data warehouse and operational database, a Java application at the institution site, Oracle workflow and designer, Oracle Discoverer and Microstrategy for reporting and business intelligence. In addition, a separate remote warm Disaster Recovery Planning (DRP) site is maintained.

The Bulgarian monitoring system consists of two physically separated modules which are logically connected, provided handy interface for transferring, keeping and analysis of data. They are an outside module (open for authorized users) and an inside module - giving a possibility for review and analysis of data to internal users.

The Thai recovery system allows the database to be recovered in only three hours. Daily backup of the database is also done within three hours. Meanwhile the Israeli and Turkish supervisory authority operate a relational database where data from pension companies are input. All companies' data are secured separately and stored in a data warehouse. British system does not keep company data separately.

Table 6: Current information technology infrastructure

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
Relational Database Management System and/or Data Warehouse	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Security/Recovery Infrastructure	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		
- Security of separate company data for commercial purposes		✓			✓				✓			✓		
- Availability of disaster recovery system	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		

Source: Replies to IOPS Questionnaire

International good practice relating to IT infrastructure suggests that relational databases and effective disaster recovery systems should be in place since data safety is of great importance.

7. Information technology requirements for pension entities

This section addresses a parallel issue of what IT systems should be required from pension entities themselves in order to comply with supervisory requirements.

7.1. Information technologies requirements

In this section the supervisory authorities were asked to identify the areas of supervision where the supervised entities, meaning pension companies and pension funds, are required to employ information technologies of any kind without naming brands or specific technologies. These areas for clarity were grouped into three:

- Supervision of pension plan sponsors' and pension fund management companies' operations on a periodical basis
- Financial supervision of pension funds
- Operational supervision of pension funds.

Table 7-1: Areas where information technologies are required to be employed by pension entities

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
Operational compliance		✓			✓		✓				✓		✓	
- Standards on individual accounts					✓		✓				✓			✓
- Standards on investing contributions		✓			✓		✓				✓			✓
- Standards on commissions		✓			✓		✓				✓			✓
- Other							✓[45]							
Consolidation of transactions[46]		✓			✓				✓					
Safekeeping of pension plan members information		✓			✓		✓		✓					
- Historical information for querying electronically		✓			✓		✓		✓					
- Real time availability of data		✓												✓
Informing public and plan members		✓					✓		✓		✓			
Generation of statistics		✓			✓		✓	✓	✓	✓[47]	✓		✓	✓

Source: Replies to IOPS Questionnaire

45. All balance sheet variables

46. i.e. guaranteeing accuracy of transactions

47. Supervised entities are required to complete Scheme Return on line. Scheme return data produced in collaboration with Pensions Protection Fund are analysed for use by pensions sector.

Supervision of pension plan sponsors' and pension fund management companies' operations

As shown in Table 7-1 Australia, Czech Republic, Germany, Israel and Netherlands do not impose any such requirements on using information technologies for supervision of pension plan sponsors' and pension fund management companies' operations. On the other hand, other than Ireland, Thailand and UK that require the usage of IT for generation of statistics, Bulgaria, Korea, Mexico, Portugal, Spain and Turkey enforce the usage of IT in almost all the areas listed in Table 8-1.

Financial supervision of pension funds

For financial supervision of pension funds, Australia, Czech Republic, Germany, Ireland, Israel, Netherlands and UK do not enforce usage of IT as shown in Table 7-2. While Thailand requires the usage of IT for transactions and portfolio changes and statistics for diffusion of information, other countries - Bulgaria, Korea, Mexico, Portugal, Spain and Turkey - enforce the usage of IT in relatively more areas.

Table 7-2: Areas where information technologies are required to be employed - Financial supervision of pension funds

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
Limits of investment		✓			✓		✓				✓			✓
Transactions and portfolio changes		✓			✓		✓	✓	✓		✓			
Market prices and portfolio valuation		✓			✓		✓		✓		✓			✓
Market transactions as financial reference for supervision		✓			✓				✓					✓
Related people list to control conflicts of interest		✓												
Fund staff transaction information for controlling conflict of interest														
Statistics for diffusion of information					✓		✓	✓	✓					✓

Source: Replies to IOPS Questionnaire

Operational supervision of pension funds

As seen from Table 7-3 while Australia, Germany, Israel, Netherlands, Thailand and UK do not enforce the usage of IT, other countries require the pension funds to use IT for areas such as keeping the list of affiliated members, and pensioned members and pension payments.

Table 7-3: Areas where information technologies are required to be employed - Operational supervision of pension funds

	Australia	Bulgaria	Czech Republic	Germany	Mexico	Netherlands	Portugal	Thailand	Turkey	UK	Korea	Israel	Ireland	Spain
List of affiliated members		✓	✓		✓		✓		✓				✓	✓
List of pensioned members		✓	✓		✓		✓		✓				✓	✓
Supervision of pension payments		✓			✓		✓		✓		✓			✓

Source: Replies to IOPS Questionnaire

Utilizing IT in offsite supervision of private pension systems also requires the pension entities to adopt information technologies in their structure. Thus, in areas where the supervising authority sees utilizing IT is vital pension entities have to be enforced to employ information technologies to a certain extent to assure that data collection is conducted as required by the supervising authority. Pension funds should be encouraged to use IT to collect as much useful data as possible on their members. However, care should be taken not to over burden pension entities with technological requirements (in particular smaller funds should not be forced into installing a special IT system) – as the potential higher costs involved may be born by pension fund members.

8. Summary and Conclusions

8.1. Summary

Although this project started with the relatively ambitious goal of identifying good practices in utilization of IT in off-site supervision of private pension systems (especially DC style systems), to achieve this goal a further study with a deeper analysis of a wider range of countries' private pension systems is needed. However, this should not underestimate the findings of this report, which has summarized to what extent IT is utilized in off-site supervision of the 14 participating IOPS members' private pension systems.

As discussed, functions attributed to off-site supervision range from reporting and the generation of statistics in Thailand, to the monitoring of transactions, safekeeping of fund

assets, reporting, generation of statistics, detection of problems for off-site supervision, monitoring of financials etc. in Germany (where only DB type pensions are allowed).

Depending on the structure of the countries' the pension system, data about members, plans and funds are collected over various periods. Whilst Bulgaria, Mexico and Turkey collect most of their data daily, other countries generally collect data quarterly and annually generally. The frequency of data collection is a critical factor in design and capacity of IT systems used and stands as one of the main reasons for relying more heavily on IT systems. The other critical factor again for utilizing IT is the amount of data received and retained. With over millions of contracts, countries' IT utilization will increase accordingly as this leads to considerable cost savings.

Besides enabling the supervisory authorities react promptly to problems, IT systems used in off-site supervision also enhance the supervisory authorities' analytical ability by providing them various data processing methods. Data stored in databases are queried in various ways ranging from off-line static queries on stored databases to online dynamic queries on remote databases. This means calculating various statistics and making analysis with a few clicks.

Some countries have IT systems acting in a fashion similar to "early warning systems". The utilization of IT in broader terms enables countries to detect problems in offsite supervision and thus leads to a more effective and focused on-site supervision.

Responses to the questionnaire examining information technology requirements in areas such as supervision of pension plan sponsors' and pension fund management companies' operations, financial supervision of pension funds, operational supervision of pension funds reveal that not all countries impose obligations in their regulation for usage of IT by the pension entities and service providers supervised.

8.2. The benefits reached through utilization of information technologies

The countries mostly declare common benefits reached through the utilization of IT. Among these were prompt action, cost and time savings, systematic and standard approach established, easy data availability etc. The enhanced and more effective interaction between the on and off-site supervisions is also emphasized by many.

In addition to the difficulty in the quantification of cost savings, the utilization of information technologies in off-site supervision has lead to increased data quality and reliability, time savings, prompt actions etc. across all countries. Other than in the Czech Republic, Ireland, Israel and Thailand, all countries more or less stressed the usual benefits of information technologies. For example, in the Australian case cost savings have not been quantified but significant increases in data collection quality, timeliness and efficiency of collection have been reached and information is made readily available to supervisory staff for analysis. In Bulgaria the IT system is said to have allowed more effective processing of information, the creation of a database including historical information which is more suitable for analysis, and the creation of an early warning system.

Germany pointed the benefits of IT as follows:

- Actual and past information are immediately available. You do not lose time while searching them in your filing department.
- More detailed information about special items can be requested.

- Descriptive statistics can be used in order to receive information about the whole pension fund market.
- IT facilitates the introduction of automatic "cross-checking".

Korea claims that IT reduces the time spent and costs for supervision and increases the efficiency of supervisory efforts. Mexico stresses the advantages such as processing speed, security, standardization and frequent supervision, while the Netherlands reaches more uniformity in supervising among staff members and ability to prioritize the work load through IT. In Portugal IT has enabled data availability for ready action of supervision and easier management. Spain emphasizes the improvement in quality of information. The Turkish system, which relies heavily on IT, enables the supervision of the pension system by a staff of less people, makes prompt action possible and increases the peoples' trust in private pensions via enhanced transparency. The UK points to informed decision making and thus possible regulatory action through better information, optimized use of resources in key areas via analysis of the data, and the responsibility taken by customers for updating their data when allowed to do so online.

Enhanced Interaction between on-site and off-site supervision

The enhanced and more effective interaction between the on and off-site supervisions was also emphasized by many participants in the survey as one of the main benefits of utilizing IT technologies in pension supervision. For example, in the Australian supervisory authority, APRA, off-site analysis of data is performed by the same team that undertakes the on-site supervision. Information and analysis arising from the off-site supervision is used to focus the on-site supervision, in particular to determine areas for further investigation. One of the areas covered during on-site supervision is making an assessment on the processes in place for the preparation of returns provided to APRA. This may involve sample testing the actual underlying data for accuracy, examining the process for completing returns, or discussions with internal or external audit on their review of the accuracy of returns provided to APRA. Also during on-site supervision APRA undertakes an assessment of the IT systems used by institutions (usually including use of internal specialist IT staff).

In Bulgaria the Social Insurance Supervision Division performs controls in two ways: off-site and on-site control. The off-site control is based on information submitted daily, reporting problems in the Pension Insurance Company / Pension Fund activity, and setting the fields for further inspection. On-site control completes full or partial examinations in connection with these problems. The off-site control then checks that they have been solved in a suitable timeframe.

The Czech supervisory authority examines and crosschecks data as it is provided in reports and statements submitted by pension funds with the data gathered in the information and controlling system SDPF II. All this information is used to assess the stability of individual pension funds and provide incentives for the initiation of on-site inspection in some cases.

Since there are many things that can only be supervised during on-site inspections – such as the compliance with legal requirements regarding the safekeeping of assets or the treatment of members and beneficiaries of pension funds - it is still very important for the German supervisory authority to have on-site inspections on a regular basis. During on-site inspections the supervisor focuses on those issues which cannot be supervised off-

site. If used together, the supervisor is said to have the possibility to get a realistic "picture" of the pension funds.

In Mexico off-site supervision allows for continuous surveillance that in turn provides direction to on-site supervision. In the Dutch supervisory system the supervisor, during on-site supervision, has the opportunity to focus on issues detected during off site supervision. And during off site supervision one has the opportunity to monitor the progress of issues discussed during on site supervision.

In Portugal off-site supervision results are used to determine the areas where on-site supervision is needed and through on-site inspection it is possible to check the data collection reliability and quality. Similarly in Thailand, early warning signals from off-site supervision lead to on-site supervision where proper analysis should be conducted.

The Israeli system uses the data examined off-site to identify the issues to be explored on-site. Similarly, the UK's offsite supervision results identify areas where further investigation is needed and thus enable the best use of limited onsite supervision capacity. They also show the trends and allow breakdown of sectors in terms of risks and needs. The IT system is also used for educational needs of the trustees and others. Korea, pointing to another risk - namely distortion of the data provided by the pension entities - stresses the importance of onsite supervision when distortion is the case.

Future Developments

Given the benefits which the supervisory authorities have derived from using IT within their supervisory systems, further projects to improve the current IT system are on the way for most of the countries included in this report, in areas such as incorporation of risk management, early warning systems, data warehouses, financial supervision etc. For example, the Bulgarian authority is planning to move towards a risk-based approach to supervision (using a combination of financial and market ratios, trends and statistics), as well as introducing portfolio analysis into their system and modeling and forecasting abilities for individual pension entities and the market as a whole. The IT system will also be integrated with other sectors which the FSC supervises (such as insurance and investment). In Germany an overall early warning system is being prepared and a data warehouse is planned, whilst the Korean supervisor also envisages the formation of a technical database. Consar in Mexico is working to incorporate operation risk into their systems and the Dutch Central Bank is also moving to a more risk-based supervisory approach where IT will play a dominant role in supervising low to medium risk pension entities. Interesting projects in Turkey include introducing online education of private pension intermediaries and licensing for life insurance intermediaries. The authorities in Thailand are improving the quality and scope of the data collected, with UK improvements focused on document management systems and centralized data storage.

8.3. Lessons Learnt

The following initial 'lessons learnt', that have been derived from the analysis in the paper and from suggestions by IOPS members, are presented for discussion:

- IT systems should be utilized in pension supervision as, in addition to the difficulty in the quantification of cost savings, it leads to increased data quality and reliability, time savings, prompt actions, and generally increased efficiency and effectiveness. Innovations in IT and the reduction of high setup costs for

moderately new technologies now allow IT systems to be possible and useful in countries with pension systems ranging from only a few to many thousands of pension entities.

- The evidence from the countries surveyed suggests that data should be collected at least for statistical and reporting purposes, and monitoring and detecting additional problems for on-site investigations.
- Without implying the type and amount of data to be collected, supervising authorities can easily be advised to improve their data collection performance by employing IT (countries assigning more functions to offsite supervision have the ability to collect a wide range of data).
- IOPS, in line with 'Principles of Private Pension Supervision', recommends deriving as much comparative data as possible from the monitoring system and disseminating this information widely. For example, the Dutch bulletins and the Turkish progress reports could be seen as a good example of producing descriptive statistics about the pension system and publicizing this information.
- In line with the IOPS 'Principles of Private Pension Supervision', supervisory authorities should adopt a 'risk-based' approach to pension supervision – seeking to offset problems proactively before they arise rather than reacting after the event. International good practice shows that information technologies constitute a very important part of early warning systems by enabling a wide range and amount of data collection, huge processing power and prompt action. Any risk-based approach should rely on an early warning system and thus IT in various ways.
- Supervisory authorities should utilize FTP and HTTP which are more appropriate for faster and larger data collection. The security of data can be maximized via the utilization of HTTPS and VPN while transferring these data.
- As the reliability of data collected is of great importance to the supervisory authorities, international good practice suggests improving the data collection process via utilizing IT as this minimizes the errors from human interaction. However, it should not be forgotten that the IT systems might be intentionally managed to distort the data collected. This should also be kept in mind while using the benefits of IT when collecting data from pension entities.
- The quality of the data collected by the utilization of IT can be enhanced by improving supervised entities' understanding of the importance and usefulness of the data collection and by making sure there is a clear definition of every variable. It is also important to give feedback on joint information from the data collected. The goals sought in utilization of IT should be communicated effectively among parties such as supervisory authority's departments, pension companies, pension funds and also the pension members.
- The use of specific lay-outs should be used to make data handling easier. The use of data standards is critical as is metadata management. Data structure has to be flexible enough to allow necessary information to be extracted.
- System rules and checks should be in place to enable questioning or ensuring the accuracy of information received. A data quality officer could also be employed.

- Thanks to the improvements in database technology, all countries could keep their pension data composing of over millions of registries indefinitely. None of the countries should encounter any problem in keeping their data indefinitely provided that they are able to collect these data electronically and have recovery systems.
- International good practice suggests at a minimum conducting off-line static queries on stored database, but supervisory authorities should try to implement dynamic queries as well since information which are not included in previously designed static queries might be of use at the time of query. Queries on remote databases on the other hand serve for flexibility and make databases available to various people.
- International good practice relating to IT infrastructure foresees that relational databases and effective disaster recovery systems should be in place since data safety is of great importance.
- Utilizing IT in offsite supervision of private pension systems also requires the pension entities to adopt information technologies in their structure. Thus, in areas where the supervising authority sees utilizing IT is vital pension entities have to be enforced to employ information technologies to a certain extent to assure that data collection is conducted as required by the supervising authority. Pension funds should be encouraged to use IT to collect as much useful data as possible on their members. However, care should be taken not to over burden pension entities with technological requirements – as the potential higher costs involved may be born by pension fund members.

Annex I

Case Study: Turkey

Information technology forms an integral part of the pension supervisory system in Turkey – which is one of the most automated and advanced of all IOPS members. A daily electronic monitoring function is conducted by the Pension Monitoring Center, a legal entity established for performing the supervisory functions within the scope of authority delegated by the Turkish Treasury - which is the main pensions' regulatory and supervisory body. The authority of Pension Monitoring Center is set by pension legislation and the institutions own articles of association are subject to approval by the Minister of State in Charge of Economy.

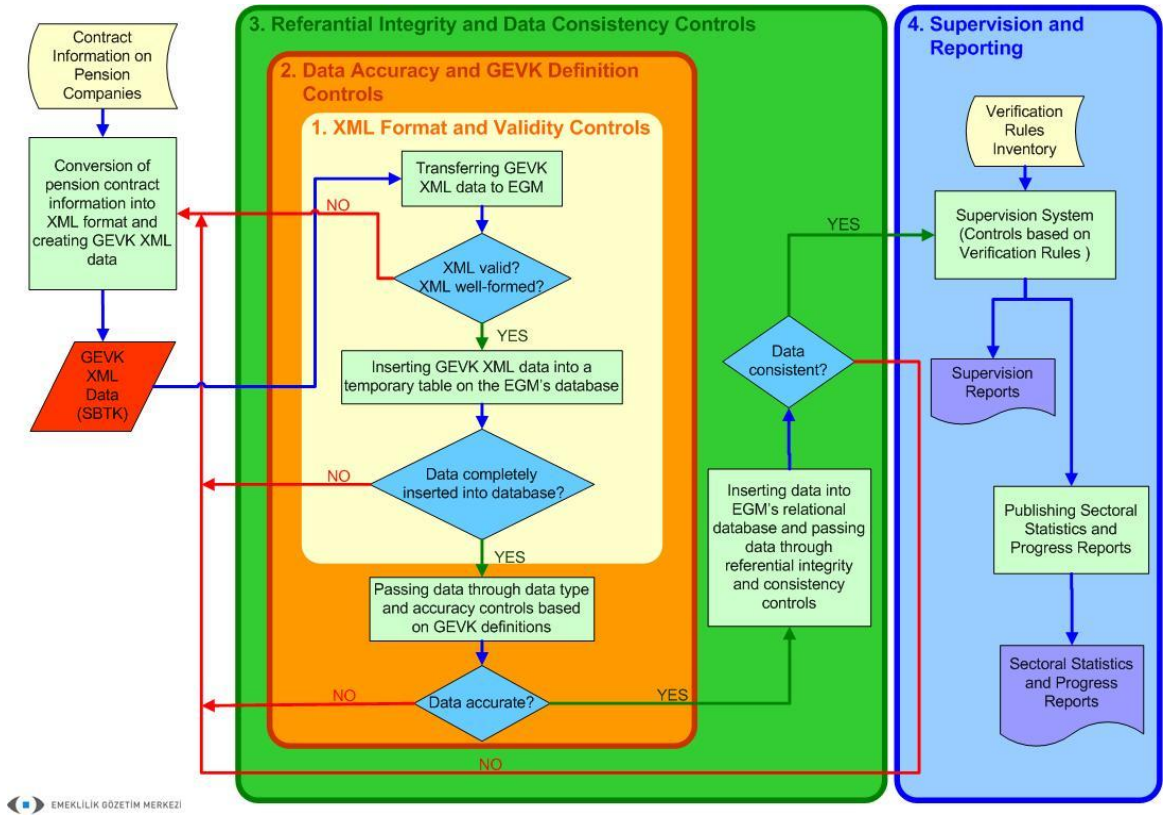
The IT monitoring system in Turkey is prescribed by regulation and uses an 'Enhanced Monitoring Activity Data Set (GEVK)'. Though the type of system which pension companies were obliged to install was set by regulation (and indeed pension companies were obliged to upgrade or renew their IT systems), the choice of actual provider was left open, with many potential providers competing in the market.

The system registers changes in the daily transactions of pension companies' information. Operational data is transferred to a data sub-set with a single file containing all transactions. The information is secure and controlled by comprehensive verification rules which are stored in the Verification Rules Inventory on the Pension Monitoring Center's database. The file is in XML format –i.e. Extensible Markup Language - which

is ideally designed to meet the challenges of large scale electronic data (being strong in simplicity, adaptation, linking, intelligence and maintenance).

At the close of daily transactions, pension companies control and verify their data within their own IT environment. After this inner verification processes, companies convert all the daily pension contract information into the XML format and construct their GEVK XML data. Pension companies transfer this XML data to the Pension Monitoring Center and finalize their closed transactions.

Once the Pension Monitoring Center is informed and has received the XML files, the file format is first controlled. If the file is not well formed or/and not valid it is sent back to the pension company. If the format is acceptable, the XML file is passed and stored in a temporary table in the database of the Pension Monitoring Center. If the data is completely inserted into database, a series of controls are then enacted (data type control / data null control / accuracy controls based on GEVK definitions). If data fails to pass these controls, error reports are produced and send to the companies via FTP protocol. If the data is accurate, it is inserted into a relational database and passed through referential integrity and consistency controls. If the data is inconsistent, error reports are produced and sent to the pension companies. Finally, if the data is consistent, it is passed through the Supervision System which includes controls based on Verification Rules to make sure that the transactions are in line with the pension regulation, the technical basis for pension plans and other general actuarial requirements. If the data fails to pass these verification controls supervision reports are produced. If the data is passed as consistent and verified through the control processes mentioned above, the sectoral statistics and progress reports are produced and published by the Pension Monitoring Center.



The Turkish supervisory authorities see benefits from their system accruing to all participants in the pension industry. For beneficiaries, enhanced security is provided by improved supervision, and they have an increased awareness and understanding of their pension and the industry as more statistics and data are published. The pension companies benefit though greater knowledge of the industry environment, via being able to follow participant and competitor behaviour. They are now able to obtain sector statistics for benchmarking purposes which allows them to determine marketing and sales strategies. Meanwhile, the supervisory authority now has monitoring tools to identify problems and direct the supervisory process which allow for the efficient allocation of resources and prompt action to remedy problems.