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Summary report 2014–2016

Managing social security data

Technical Commission on Information and Communication Technology
International Social Security Association (ISSA)
Geneva

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Introduction

The use of information and communication technologies (ICT) in social security organizations is a global trend worldwide. The application of ICT has been enabling the implementation of increasingly comprehensive social security systems throughout the world. Through the integration of individual programmes as well as the implementation of advanced service delivery mechanisms, innovations in ICT are extending the scope and impact of social policies and, at the same time, simplifying and enhancing the quality of the services.

A number of innovative experiences carried out by social security institutions show that ICT is also transforming social security administration in:

- providing user-centric services that better satisfy heightened client expectations and empowering users by enabling self-services available at all times and everywhere;
- implementing large-scale social programmes coordinating several institutions including cross-border ones; and
- strengthening the social protection of the population by fostering an effective application of social protection laws.

A key conclusion of these experiences is that, as an indispensable enabler in the administration of social security systems, ICT often spells the difference between services and processes that can or cannot be done.

In this context, the increasingly important role of data for social security administration should be highlighted. Data play a crucial role, as most current operations and management decisions are based on data about enrolled persons, their working activities, their contributions and the received benefits. Accurate and reliable data are therefore the basis for effective social security systems. Moreover, the implementation of coordinated social programmes involving several institutions requires sharing and exchanging reliable data.

As a consequence, data management has become a key discipline for social security institutions, involving not only technological aspects but also business-related ones, especially data governance and data quality. Developments in this area consist of the implementation of master data and decision support systems in social security institutions across the world.

Moreover, advanced data processing and data analysis technologies are enabling the extraction useful information from Big Data. Innovations based on Big Data processing, so-called data driven innovation (DDI), could help to address emerging social challenges such as the health and social protection of vulnerable populations. Nevertheless, these initiatives require the development of institutional capacities to collect and analyse information as well as to enforce data protection regulations.

The ISSA Technical Commission on Information and Communication Technology has addressed these issues during the triennium 2014–2016, producing two new chapters of the *ISSA Guidelines on Information and Communication Technology* focusing on: (i) Master Data Management in Social Security; and (ii) the ICT-based Implementation of International Agreements, both of which are strongly based on electronic data exchange.

This report summarizes the results of the work of the International Social Security Association (ISSA) Technical Commission on ICT during the 2014–2016 triennium. It covers the two new chapters of the ISSA Guidelines on ICT. Preliminary results and forward-looking topics were discussed during the 14th International Conference on ICT in Social Security, held in Astana in September 2015. The report concludes with a brief overview of the relevant topics to be addressed in the next triennium.

1. Master data management

Social security operations and strategic decisions are based on the mission-critical availability of data related to the individuals and stakeholders involved in social programmes managed by institutions. As a consequence, the reliability of these operations and adjudications depends largely on the reliability of the data used.

Among the large volumes of data managed by social security institutions there is a key subset that is common to social programmes, and its quality and management have a strong impact on the overall activities of social security institutions. We call this information “master data” (Dreibelbis, 2008); it has been described as

> “the authoritative, most accurate data available about key business entities, used to establish the context for transactional data. Master data values are considered golden” (Mosley, 2010).

The master data in social security institutions consists of the subset of all the managed data that is required to carry out the social programmes.

Master data are also known as “corporate information systems” or “single registries”. They are especially relevant because they provide a formalized and single institutional framework of the most relevant concepts used in the institution: employees, beneficiaries, families, contributors, employees’ work history, and so on. Social security institutions require reliable information systems capable of supporting all master data and master data management operations. It is important that such information systems manage the quality of the data as regards completeness and accuracy to the greatest extent possible.

High-quality reliable data are a prerequisite for many processes in social security, for example calculating contributions, assessing claims and making payments. Consequently, almost all technology-enabled improvements in social security require elements of master data. For example, the introduction of Internet-based self-service for citizens requires that accurate data be passed to and from the applications to facilitate a claim. Or the implementation of case

management requires accurate citizen data for caseworkers to do their job effectively. Inaccurate or out-of-date data can lead to errors in claims and payments and are often the source of fraud.

In summary, almost any activity with one of the following characteristics triggers the need to consider implementing master data:

- the requirement for accurate and up-to-date data;
- the requirement to share data with others; or
- any business improvement initiative which requires data on the core business entities.

1.1. Goals and benefits of adopting master data in social security

Generally speaking, the benefits of implementing master data are largely related to avoiding the risks associated with disparate and multiple versions of data concerning the same things – risks around inefficiency, inaccurate or inconsistent treatment of citizens and their entitlements, inaccurate or inconsistent treatment of employers and the perceptions (by citizens, employers and politicians) of the effectiveness of the agency. In addition, master data provide the means to develop new social programmes (re)using reliable information about employees, employers, beneficiaries, etc.

More concretely, implementing master data in social security may lead to benefits in both ICT and business areas. This section presents a summary of such potential benefits based on the recent ISSA report on master data management by Brailey and Gibbon (2016).

Table 1 presents key business improvements that may be achieved in different areas by adopting master data.

Table 1. *Business benefits of implementing master data*

Benefit area	Key business improvement
Increased efficiency in business operations by having a "single version of the truth"	Lower staff effort Less wasted staff time Fostering self-services and e-services.
Reduced error Preventing: • erroneous calculation of contributions due or calculation of benefits to be paid • inability to reach contributors and beneficiaries due to errors in the contact data	Improved accuracy of collections and payments Less staff effort in resolving problems
A 360-degree view of the customer (customer-centric view) A holistic view of beneficiaries and contributors covering family links and household-related information	More accurate targeting social policies and programmes Personalized and/or targeted customer services Improved customer service including the ability to launch new social programmes Lower effort/costs for customers Support of customer-centric case management
An accurate view across the ecosystem of social programmes and service delivery. In particular, several branches or agencies may be involved in meeting a citizen's holistic needs or entitlements	Facilitated implementation of coordinated social programmes (national and international) Better end-to-end service delivery
Elimination of fragmented information systems	More consistent treatment of cases Less staff effort in resolving problems Reduction in data inconsistencies and increased data quality.
Reduced opportunity for fraud and error Prevention, for example, of individuals being able to make multiple claims for benefits on the basis of multiple or ambiguous identities	Lower programme losses Reduced operational costs on fraud management
Improved operations through leveraging data for business insights. In particular, building the basis for applying analytics on the overall data resources of the institution	Enabling personalized services Enabling usage of analytical techniques for forecasting and social risk management Developing "evidence-based" and "outcome'" planning, again using analytical tools to derive insights from the data Modernization of business operations, e.g. risk-based processing Improved management processes Improved capability to evaluate success and failure

Source: Brailey and Gibbon (2016).

In turn, implementing master data systems can bring efficiency gains to technology operations in a number of ways, as shown in Table 2.

Table 2. *Benefits of MDM for the ICT area*

Benefit area	Key ICT improvement
Benefits in ICT operations costs	Reduced data management costs by preventing multiple datasets being managed
	Greater ICT efficiency through elimination of redundant data
	Easier to maintain overall consistency when system updates are carried out
	Improved security controls and data protection enforcement
Benefits in ICT development	Reduced costs for the integration of systems
	Reduced time to introduce new applications
	Better support for a SOA-based and multi-platform approach

Source: Brailey and Gibbon (2016).

1.1.1. Quantifying the financial benefits of master data

Determining financial benefits from master data in the context of social security agencies is not easy. Nevertheless, Brailey and Gibbon (2016) present three types of experience and evidence that can be useful in further developing such analysis:

1. **Internal business operating costs.** A case analysis study on the approaches to implement "Smarter Social Services", particularly on the expected benefits of each one, concluded that implementing an "improved access to information" and a "single view of the client" would enable cost reductions of 8.9 and 9.7 per cent respectively of the total operating costs (Reiners et al., 2012).

2. **Reducing error and fraud.** It has been determined that master data are a fundamental tool for reducing fraud and error. However, addressing these issues requires an additional range of tools and techniques, and not all social security programmes are equally susceptible to fraud and error. Nevertheless, an average of 8 per cent of total costs can be estimated. Even a small improvement may involve huge amounts of money, given the enormous sums involved. For example, data consolidation and cleansing in the master data project of the Mexican Social Security Institute (*Instituto Mexicano del Seguro Social* – IMSS) enabled the identification of over 80 million undue benefit cases, most of them corresponding to duplicated and overlapped benefits and others not complying with eligibility rules.

3. **Cost reduction to employers.** Figures relating to the Belgian Crossroads Bank for Social Security (BCSS, 2014) also indicate another potential benefit from master data: the electronic services between employers and social security actors. So, whilst the benefits described represent a combination of the master data and the impact of the automated new services, the case provides useful insights. In this case, the saving to employers as evaluated by external auditors from the Belgian Planning Bureau amounts to some EUR 1.7 billion per year. Compliance with rules on social security contributions, and completing and

submitting reports and records are often identified as a substantial burden on employers, so any improvements are likely to be very much welcomed.

1.2. Implementing master data

1.2.1. Overview

The successful implementation of master data requires a common set of disciplines and activities. As with all business change, at the outset it is critical to define the business objectives of the project together with the business justification (the business case). This will drive the definition of the data to be designated as master data.

Because a move to master data will always involve working with existing data, an important early component of any master data project is data cleansing. Insufficient attention to data cleansing at the beginning can undermine the value of the project or even lead to failed projects. Furthermore, the solution design must ensure that the quality and consistency of data are maintained throughout operations.

The main implementation tasks involve:

- master data governance and master data management;
- design and implementation;
- data quality; and
- master data system operations.

More specifically, the governance of the master data involves addressing the following key topics:

- defining the business case;
- defining the master data;
- determining who can access the data;
- defining when and how they can use the data; and
- defining who is responsible for what data.

1.2.2. A programme, not a project approach

According to Brailey and Gibbon (2016), the adoption of master data in social security institutions should be viewed as a journey, not as a single implementation project. Experience suggests that selecting well-defined tactical projects with limited scope that support the overall vision of the organization, and implementing them in a phased approach over time, is most likely to deliver success. Of course, a long-term phased approach places even greater importance on the role of governance.

1.2.3. Architectural considerations

The architectural considerations concern the balance between having a centralized master data system vs. a distributed one. More concretely, there are three general architectural models: repository, registry and hybrid.

The **repository model (also sometimes called Enterprise or Centralized or Transactional)** is where the master data for an enterprise is stored in a single database. The applications that use the master data are all modified to use the master data in this central hub, instead of data stored in their own application database, making the master data hub the single system of entry and record. This approach eliminates issues with keeping multiple versions of the data and is suited to centralized and transaction-oriented scenarios. However, while in the context of a single institution the repository model represents a viable architecture, in multi-organizational contexts it may infringe data protection regulations.

The alternative approach, called the **registry model (also called federated),** is where each source system remains in control of its data and remains the system of entry for that data; there is no central data hub. The hub only records where data is held, which systems are allowed access to which data, and "polices" access to data across systems. This approach has its complexities as well, particularly for synchronizing updated data and supporting high-performance transactions, but is often more acceptable to business leaders who can maintain ownership of their own data.

Whilst there are two main fundamental approaches, in practice there are in practice also **hybrid models**, which combine elements of both to better match actual data processing requirements and to have an appropriate architecture for the organizational context.

In addition, two specific scenarios may be relevant for social security institutions:

- Scenario 1: Existing multiple databases for benefits schemes and/or contribution collection.
- Scenario 2: Inter-institutional master data – Existing multiple databases for benefits schemes and/or contribution collection.

1.3. ISSA Guidelines on master data for social security

The ISSA Guidelines on master data for social security address the aspects described above. They are organized as shown in Table 3.

Table 3. *General structure of the ISSA Guidelines on master data implementation*

Section	Main aspects addressed by the Guidelines
Master data governance and management	Establishing institutional programmes on master data Defining strategies, scope, plans, and roles
Data quality	Establishing an institutional framework for data quality involving ICT and business (social security) areas
	Applying preventive measures to filter "bad quality"
	Applying corrective measures to detect errors to improve quality
Design and implementation issues	Defining the concrete architecture for the institution's master data based on the architectural styles
	Carrying out the implementation phases, from requirements analysis to development and software integration
	Implementing the interoperability mechanisms to connect with other systems
	Managing evolution and changes
	Enforcing security and privacy in master data
ICT operations	Defining a service-level agreement (SLA) and carrying out operations

8 It is important to point out that the ISSA Guidelines on master data for social security refer to other ICT guidelines on the general technical aspects. In addition, this section can be seen as a further development of the individual Guideline 17, "Developing a master data model and system".

2. ICT-based implementation of international agreements

International social security agreements constitute a key legal instrument enabling the protection of the social rights of migrant workers by ensuring that periods of employment are taken into account for granting benefits in the signatory countries. International agreements also aim at preventing the "double contribution" of temporary workers in a host country, enabling cost savings without reducing social protection. While most international social security agreements are bilateral – being concluded by two countries – there are some multilateral agreements allowing several countries to coordinate parts of their social security schemes.

Nowadays, international social security agreements make possible the portability of benefits for millions of insured people, and generate the export of billions of dollars in cash benefits around the world among signatory countries. This involves significant cross-border data exchange and back-office information processing.

The overall development of a social security agreement involves two streams of activities. First, carrying out preliminary discussions and negotiations, preparing the agreement text, signing and ratifying the agreement, and defining when the agreement will start to be applicable (so-called entry into force). Second, it requires setting up the administrative procedures to respond to requests related to the agreement as well as defining the roles and responsibilities for these

tasks. The latter are usually established in the so-called administrative arrangements attached to the social security agreement.

The implementation of international agreements requires reliable mechanisms for data exchange among the institutions involved. This includes, among other matters, defining the data to be exchanged, the authentication mechanism (e.g. electronic signature), the protocol for request–response exchanges specifying maximum delays, as well as implementing the ICT-based systems to support these operations. Moreover, it also involves carrying out the daily operation of the agreement, through automated processes to the greatest extent possible, which mainly consists of receiving and sending information and notifications of changes as well as processing benefits claims. As the operational tasks involve cross-border data exchange and information processing, intensive usage of ICT is necessary to achieve effectiveness and reliability in the application of the agreement.

In spite of the increasing application of ICT in social security, the ICT-based implementation of international agreements remains challenging. The lack of standards on data and processes is the main reason. In addition, the complexity of developing inter-institutional and cross-border systems constitute a barrier for implementing ICT-based systems supporting international agreements. While several recommendations, frameworks and guides have been developed to address the policy- and legal-related activities leading to the entry into force of the agreement (Hirose et al., 2011; ILO, 2006), there are no similar materials addressing the operational implementation aspects.

A new section of the ISSA Guidelines on ICT has been developed to address the implementation of the operational aspects of international agreements by using information and communication technologies, focusing on data exchange processes and related functions.

2.1. Main scenarios

As mentioned before, international social security agreements may be bilateral or multilateral. In addition, they may involve one or more institutions in the same country.

These features lead to four scenarios (see Table 4) which are relevant for implementation purposes and particularly for defining the system architecture and the interoperability mechanisms.

Table 4. *Main implementation scenarios for international agreements and interoperability considerations*

	Bilateral	**Multilateral**
Only one national institution participating in the agreement	The interaction involves two institutions	The interaction involves several institutions from different countries
	The interaction may be implemented as point-to-point connections between the only national institution and the other liaison agency(s)	Implementing the interaction requires a full International architecture (including common services and a "trusted third organization") connecting the single national institution and the other liaison agency(s)
Several national institutions participating in the agreement	The interaction involves several institutions from two countries	The interaction involves several institutions from different countries
	Implementing the interaction requires a national architecture connecting the institutions using point-to-point mechanisms or using an integration middleware	Implementing the interaction requires a full international architecture (including common services and a "trusted third organization") connecting the national liaison agencies
	International point-to-point connections between the national liaison agencies(s) and the others	Full national architecture connecting the national institutions

2.2. ISSA Guidelines on supporting the ICT-based implementation of international social security agreements

Similarly to the master data implementation, a new section of ISSA Guidelines on ICT was developed in order to support institutions on the operational implementation of international social security agreements. These guidelines focus on key implementation aspects:

- the overall architecture for the system, covering the international, national and institutional levels for the different scenarios presented;
- the interoperability mechanisms to be used to interconnect the different parts of the system as well as to solve term mismatches;
- the reliability, security and authentication of exchanges, which enable formally valid transactions complying with the data protection clauses to be carried out, and provide the means to follow up the operations; and
- the standardization of processes and information models for the data exchanged.

The structure of the ISSA Guidelines supporting the ICT-based implementation of international social security agreements is presented in Table 5.

Table 5. *General structure of the ISSA Guidelines on supporting the ICT-based implementation of international social security agreements*

Section	Main aspects addressed by the Guidelines
Governance and management	Establishing a governance structure and roles at international and institutional levels
	Defining a strategy and an implementation plan
	Establishing principles to manage main operations and resources: request-based data exchanges and notifications, information models, digital certificates and electronic signatures, traceability mechanisms, software tools, etc.
Architectures	Defining the architectures at the three levels: international, national, and institutional
Interoperability	Implementing the technical interoperability mechanisms for the systems connection at each level
	Defining semantic interoperability approaches to improve the accuracy of the matching of concepts and persons' identities
Security and authentication	Implementing authentication mechanisms based on digital certificates
	Implementing a secured data exchange and enforcing data protection
Operational processes and information models	Defining and implementing processes and information models for request-based data exchange and for notifications
ICT operations	Establishing service-level agreements (SLAs) and putting into practice the ICT operations at the different levels

The ultimate goal of the ISSA Guidelines is to support the implementation of standardized solutions which may support multiple international agreements instead of implementing a specific data exchange system for each agreement. Similar to the section on master data implementation, these Guidelines refer to those already existing on the technical aspects (e.g. interoperability, security, etc.).

3. Conclusions and future developments

The project carried out by the ISSA Technical Commission on ICT in the triennium 2014–2016 delivered two new chapters of ISSA Guidelines on ICT addressing highly relevant topics for social security institutions: master data and implementation of international agreements.

The new extended version of the ISSA Guidelines on ICT thus addresses the three main parts involved in a corporate application of ICT in social security: (i) ICT governance and management; (ii) key technologies; and (iii) social security components.

In addition to the Guidelines, other supporting material is being developed, notably a report on the benefits of implementing master data in social security (Brailey and Gibbon, 2016) and roadmaps for implementing the different scenarios described in this report by using the Guidelines.

Furthermore, the activities developed during the triennium, notably the International Conference on ICT in Social Security held in Astana in September 2015, the meeting of the Technical Commission held in Casablanca in March 2016 and the Forum of Technical Commissions, have enabled validation of the results as well as the identification of new topics to be developed in the future. Two of these topics are briefly presented in the following sub-sections.

3.1. Big Data and analytics

Looking forward, a new data-driven ICT revolution is taking place. There has been an exponential growth in worldwide data use, giving rise to "Big Data". Although the measurement of the real total data generated, collected and stored is still speculative, some sources suggest that more than 2.5 billion gigabytes of data are generated every single day, which is more than 167,000 times the information contained in all the books in the Library of Congress of the United States. By 2015, this had led to an estimated cumulative data storage of around 8 trillion gigabytes.

In particular, the implementation of innovative approaches leveraging on business data constitutes a highly interesting area for social security. The so-called data-driven innovation (DDI), refers to significant improvement of existing, or the development of new, products, processes and organizational methods based on the Big Data phenomenon. Advanced data processing and data analysis technologies are used for "customer profiling," and to extract other cross-analysed information from Big Data. Such DDI, combined with Internet and mobile-based developments, cannot only improve products, processes and organizational methods, but can also meet global social policy challenges, such as the health and social protection of vulnerable populations. In turn, advances in artificial intelligence could provide the background to increase the automation of social security e-services through regulatory enforcement mechanisms as well as to enhance customer support and case management through virtual assistants and natural language processing.

Some pioneering applications of Big Data and analytics are already ongoing in social security institutions. For instance, these techniques are being used in Italy, National Employment Accident Insurance Institute (*Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro* – INAIL), Spain (*Tesorería General de la Seguridad Social* – TGSS), France, National Family Allowances Fund (*Caisse nationale des allocations familiales* – CNAF), and Uruguay, Social Insurance Bank (*Banco de Previsión Social* – BPS) for detecting evasion and fraud in social security contributions. These institutions are applying predictive analysis using contribution collection as well as benefits-related databases in order to enlarge the information base for the analysis. These systems have enabled to improve compliance enforcement.

In addition, the National Health Insurance Service (NHI) of the Republic of Korea has implemented a Big Data project covering all the social security information of the entire population (50 million people) collected since 2001. This includes demographic data, contributions paid, benefits received and medical data. The Big Data includes data from several national databases and is used to support decision-making and to predict the incidence of diseases and other social risks. Notably, it supports the Health Risk Assessment (HRA) based on individual risk status (smoking, drinking, physical activity, obesity, BP, FBS, etc.) and the Alarm Service for communicable diseases. It also enables forecasting the risk of disease outbreaks or epidemics (such as influenza, eye disease, food poisoning, skin disease, etc.) and providing prior information of outbreaks for prevention of disease and promotion of health. The de-identification of personal information ensures compliance with data protection regulations.

Future activities in this area may include the development for the ISSA Guidelines on ICT of a chapter on analytics, as well as participating in the development of ISSA Guidelines addressing the issues of error, evasion and fraud.

3.2. Sectoral technical standards supporting data exchange

Developing sectoral technical standards for supporting data exchange has been highlighted as a major topic of interest of social security institutions in the various ISSA events addressing ICT-related topics. The goal is to enhance the efficiency of data exchange systems, not only for international agreements but also for national cross-institution exchanges.

Such developments will be addressed in the triennium 2017–2019 through a collaboration with the ICT industry in the context of the ISSA ICT Industry Forum. The goal is to foster the development of a transparent and constructive working relationship between the ICT sector and the ISSA, which could deliver more cost-effective outcomes for ISSA member institutions and also benefit the industry. In this context, a joint development of technical standards could reduce risks and generate economies of scale as well as facilitate partnerships in adopting innovative business models.

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