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Digital transformations can change the structure of interactions between public institutions, civil society organizations, and other stakeholders. These transformations aim to enhance service quality, efficiency, and effectiveness by improving processes and implementing digital and non-digital channels to provide access to the benefits of digitalized services and information. The end goal is a truly digital ecosystem that substantially increases people's wellbeing in society, while at the same time stimulating innovation and making information more available. This paper describes the experience of Paraguay's Ministry of Labor, Employment and Social Security in improving its processes, services, and systems as part of a digital transformation guided by a modular enterprise architecture.

JEL Classification: H10, L96, M15, J29
Key words: institutional capacity, public services, labor market intermediation, public policies

CONTENTS

ACRONYMS AND ABBREVIATIONS

API — Application programming interface.

IDB — Inter-American Development Bank

BPM — Business process management

CRM — Customer relationship management

DGE — Dirección General de Empleo (General Directorate of Employment)

DSSO — Dirección de salud y seguridad ocupacional (Occupational Health and Safety Directorate)

ECM — Enterprise content management (Gestión de contenido)

AI — Artificial Intelligence

IPS — Instituto de previsión social (Social Security Institute)

MTESS — Ministerio de Trabajo, Empleo y Seguridad Social (Ministry of Labor, Employment, and Social Security)

PCR — Project completion report

PAIL — Programa de apoyo a la inserción laboral (Job Placement Support Program)

ALMP — Active labor market policies

SII — Servicio de Intercambio de Información (Information Exchange Service)

SIL — Servicio de intermediación laboral (Labor Market Intermediation Service)

SINAFOCAL — Sistema Nacional de Formación y Capacitación Laboral (National Workforce Training and Education System)

SNPP — Servicio Nacional de Promoción Profesional (National Professional Development Service)

SMS — Short Message Services

SPE — Servicio Público de Empleo (Public Employment Service)

RAT — Registro del adolescente trabajador (Adolescent Workers Registry)

REOP — Registro Obrero Patronal (Employer-Employee Registry)

RUC — Registro único del contribuyente (Taxpayer Registry)

RUT — Registro Único del Trabajador (Unified Workers Registry)

CHAPTER 1
Digital transformation at Paraguay's MTESS

We are drowning in a sea of paper. The tide of paper documents in our government offices rises with each passing day, and this paper represents services that are slower and harder for citizens to access.

Digital transformations can change the structure of interactions between public institutions, civil society organizations, and other stakeholders. These transformations aim to enhance service quality, efficiency, and effectiveness by improving processes and implementing digital and non-digital channels. Non-digital channels are crucial for vulnerable populations that lack internet access or digital skills or have a disability and therefore cannot reap the benefits of digitalized services and information unless they are offered alternative access through an intermediary.[1] Achieving digital transformation involves creating a truly digital ecosystem that can substantially increase societal wellbeing, while at the same time stimulating innovation and making information more available.

Paraguay's Ministry of Labor, Employment, and Social Security (MTESS) has embarked on a transformation to improve processes, create databases that interoperate with those of other entities, and include service channels for different populations. This saves users time and steps by giving them a new way to access information and providing more efficient processes, as well as technological tools to support them and speed up the process. Since 2015, the MTESS has revolutionized the way its offices and units provide services to citizens through technological solutions that optimize efficiency, quality, access, and data flows, both within the institution and in its interactions with other entities. Meanwhile, the flood of paper has receded as it is replaced by databases and information systems.

The ministry has made great strides on its digitalization plan, achieving short-term results, with a focus on ongoing and periodic improvement. One success story is the labor market intermediation system. The first version of the system was launched in less than six months and reduced the time it took to register and serve job searchers. The system was then connected to other internal systems and other government agencies, which eliminated the need for paper entirely and greatly simplified the registration process.[2] Now, nearly 90% of all MTESS services are digital. The COVID-19 pandemic helped accelerate this process, since

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[1] Many people who use social services lack digital skills, whether because they were never taught them, never had access to those systems, or they are older. Digitization is commonly considered a process that broadens access to various services, but it can also leave out some groups. In a classic example of this dynamic, in 2022 older customers in Spain demanded that banks keep physical branches open to ensure their access to financial services, since it is difficult for them to use digital channels. Digital transformation should not be understood as replacing non-digital channels with digital ones. We should rather envision it as an effort to ensure that the benefits of better systems and more solid information and processes reach all users. The appendix of the study "Canales de un servicio de empleo," by Urquidi et al. (2021) contains an example of how digital and non-digital channels can coexist when providing social services.

it forced the MTESS to assist workers and employers online.

One key to the success of the MTESS' digital transformation was the use of a sustainable, phase-based, modular enterprise architecture[3] that was designed to avoid reliance on specific providers. This design helped the MTESS reuse existing components, add new modules and features, and generate reliable data on its services to citizens. This type of architecture also allows the MTESS to track interactions with users to improve its services to them. A given person might apply for a job, take a training, and be a salaried employee in to social security records and on company employee forms. That same person could even be a future employer, or they might have requested support from the ministry in a wrongful dismissal case or for employee rights violation. Meanwhile, companies provide information about their employees, seek new workers (by posting job openings), and request support for staff trainings. Through all these processes, employers provide valuable labor market information that can inform public policy if it is organized and accessible.

By using an enterprise architecture, the MTESS can identify projects and decide on the governance and long-term design of systems and processes and how they will be adopted by Ministry teams, all in an orderly, visible, and scalable way.

The first step for the MTESS was understanding the problem. One of the first issues identified was manual processes and paper records, which were cumbersome for Ministry officials and slowed down services for users. It was difficult to access information that had already been filed, so the MTESS often had to ask users for information that it already had but that was usually at another unit of the ministry. Under this system paper documents proliferated, and storing them caused logistical and administrative problems and meant that users often had to travel to the central office in Asunción to complete their business with the MTESS. The MTESS had no follow-up system, so people would crowd around service desks for updates on their processes, making more work for staff and causing longer wait times for users. When staff did need to find information that had been filed away, they had to manually search boxes for the documents, a time-consuming method. For example, staff at the job placement service would have to bring boxes of documents to the labor market intermediation service desk to match job seekers or candidates to available job posts. Meanwhile, employers would have to search paper résumés for candidates, and the service was not an appealing option because it was so inefficient. Storing data on paper limited research and data analysis for policymaking, and although companies periodically submitted their payroll information, it was not systematized, so was difficult to use. The MTESS had extensive administrative information, but it was also on paper and its uses were limited.

As part of the enterprise architecture, the digital transformation project identified two systems that could produce rapid progress toward the Ministry's objectives: (i) the Unified Worker Registry (RUT), which would centralize information on MTESS service users, and (ii)

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[2] This system is interlinked with the identification system to reduce data entry errors. Through integration with the Unified Workers Registry (RUT), the labor market intermediation system incorporates information that is already entered in other MTESS systems, which shortens processes and ensures the consistency of the information.

[3] An enterprise architecture produces a detailed map of proposed processes and systems. This in turn provides a strategic vision and allows an entity to roll out systems in phases and modules. By organizing all components, it makes processes and services more effective. Urquidi et al. (2021). This type of architecture is considered key to successful digital transformation (Iansiti and Nadella, 2022).

the labor market intermediation system, which would enhance services for job searchers, who had trouble finding quality job postings, and companies, which struggled to find candidates.

The architecture also made it possible to connect systems with different modules and systems at other ministries and government agencies to improve the MTESS' own processes.[4] For example, it can use this interconnection to confirm the identity of job seekers without having to request a copy of their identity document. Instead, it can retrieve the data directly from the entity in charge of Paraguay's identification information using an interoperable system. This method reduces the time it takes to enter data and prevents possible data entry errors. This step in the digital transformation was a resounding success, and it continues to gain ground by enabling a flexible, swift, interconnected, and scalable operation.

The MTESS decided to launch a digital transformation process as a vital step towards addressing the problem of inefficient, paper-based services. Constantly having to search for folders—which in some cases were not even at the MTESS office and had to be requested from the archives—delayed processes and lengthened procedures for citizens.

The ministry also had to deal with the complexity of processing information in three different data storerooms: one for labor, one for employment, and another for social security. Since the ministry lacked a unified database, companies and citizens would have to repeatedly supply the same information, generating even more documents and exacerbating storage constraints. This information was of no use for analyses either, and in many cases it could not be cross-referenced among the MTESS' different units. This meant that, for example, a company being investigated or even penalized for regulatory violations could apply for training or job placement at a different MTESS service desk. Creating unified records that draw from these three sources was therefore paramount. Meanwhile, verifications that required consulting other institutions like social security (Instituto de Previsión Social) could take days, delaying procedures, processes, and even the ministry's own oversight actions. It would therefore be highly valuable for the new unified records to be interoperable with those of other entities.

For citizens, having to carry out business on paper often meant they had to travel to obtain documents or certifications. They also had to make payments at service desks with long lines or at correspondent banks outside of the ministry, again forcing them to go from place to place and spend time that they might not have. In addition to being inefficient, the process posed corruption risks, since information was not reconciled quickly, as well as the risk of errors in processes and payments.

By designing this architecture, the MTESS has made progress on several fronts. To transform the manual, paper-based processes that kept it from being able to produce reports and follow up on cases, the MTESS decided to design an architecture to improve

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[4] The MTESS is connected to the Information Exchange System (SII) of the Ministry of Information and Communication Technologies (MITIC), https://www.mitic.gov.py/viceministerios/tecnologias-de-la-informacion-y-comunicacion/servicios/sistema-de-intercambio-de-informacion. This gives it access to other ministries' systems, which are periodically added to the SII, continually expanding its access to online information and services.

and systematize these processes. In parallel, it created data bases and, eventually, data marts[5] that provided the information that each area needed for analyses. One step it took was to use technology to optimize the registry of companies and employees (called the Employer-Employee Registry, or REOP) and make it a comprehensive, online solution. The REOP centralized all related processes in an integrated system that feeds into a single database to ensure that the records from those processes are consistent, high-quality, unique, and complete. The REOP includes requests from companies for labor compliance certificates; electronic updates to employee information; and records of dismissals, vacations, and other legally required labor records, and it can also be used to generate and manage all aspects of inspections and fines and manage multi-channel payments and payment methods through the financial system, online, and in real time.

Another example from the General Directorate of Employment (DGE) involved incorporating an artificial intelligence engine into the ParaEmpleo portal, which is part of the labor market intermediation. This engine optimizes the process of matching job seekers with available jobs. The initiative took shape after it became clear that the process of labor market intermediation system[6] draws on multiple variables. As of the writing of this paper, the MTESS is optimizing the tool to provide more customized service without using an external artificial intelligence solution, so the portal is temporarily under maintenance. However, the ministry's architecture design enabled all other systems, databases, and infrastructure to remain operational during the redesign of the labor intermediation system. The architecture's modularity and integrations allow other modules to continue to function, and these features also prevent reliance on specific providers. The same principle applies when replacing systems or implementing additional ones, avoiding data losses and preventing problems or inconveniences for system users at other units.

By the end of 2022, the digital transformation had reduced face-to-face paperwork processes for companies or individuals by about 90%[7]. Units that have begun the transformation request less paper documents, and the process has created databases for analysis. It has also facilitated interoperability[8] with other government services through web services, which simplifies procedures for users and guarantees the quality of information. For example, integration with the citizen identification system allows the ministry to validate a person's identity and prevents errors in the person's name that could lead to duplicated records or other problems. Integration with the tax authority allows the ministry to validate company and employer data. Finally, integration with the Social Security Institute (IPS) allows the MTESS to confirm whether job placements resulted in formal employment. Together, this information means that users do not have to provide their details more than once, and it allows the ministry to analyze the results of its policies.

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[5] A data mart is a version of a data warehouse where users can work with the data without touching the database. It allows operational units to view operational data for analysis and business intelligence. Each data mart is for a specific data need, providing access to information relevant to a particular type of analysis or operational unit. One data mart can be used by more than one area if they need similar data.

[6] For more information about the advantages in the uses of AI in employment services see Urquidi and Ortega (2020)

[7] In addition, the ministry now follows up on these procedures virtually.

[8] To understand the benefits of interoperability, which is the ability of technology, information and communication systems to exchange data and share information in order to efficiently deliver social services, see Pombo et al. (2019).

CHAPTER 2
The Job Placement Support Program

From 2002 to 2012, Paraguay's economy grew at a faster rate than that of most countries in Latin America and the Caribbean, which led to a decline in its urban unemployment rate. However, underemployment grew during the same period, and informal employment remained above 80%. Young people and women were the most affected by these trends.

The causes of these problems included low employment service coverage, insufficient institutional capacity at the employment service to solve labor market problems, and a mismatch between available job training and employer needs. The country therefore sought support from the Inter-American Development Bank (IDB) in the form of the Job Placement Support Program (Programa de Apoyo a la Inserción Laboral – PAIL) and a $5 million investment loan Nº2660/OC-PR that was signed on March 16, 2012.[9]

PAIL provided comprehensive support through better access to jobs and training. It was built on two key pillars: (i) providing more detailed information on vacancies, job seekers, and linkages between labor supply and demand to improve the pace and conditions of hiring, as well as matching supply and demand for skills; and (ii) enhancing workers' basic and technical skills. This would not have been possible without strengthening the General Directorate of Employment (DGE) and cooperating with the National Workforce Training and Education System (SINAFOCAL) and the National Professional Development Service (SNPP) as part of the DGE's centralized service desk. Creating the centralized service desk enabled the project to add a system for generating and monitoring data and for managing the program that made it easier for job seekers and companies to register on the job exchange. It also made it possible to monitor program data on beneficiaries and companies, as well as stipend payments and other aspects. The data from this system were added to the MTESS database.

Thus, PAIL achieved several advances. First, it showcased the effectiveness and relevance of active labor market policies (ALMP)[10] for supporting groups at a unique disadvantage when seeking employment, such as young people. Second, the project led to increased job searcher and company registrations with the Labor Market Intermediation Service (SIL). Third, PAIL served its users more efficiently and effectively, reducing wait times. Lastly, it conducted an assessment of the skills that are in demand in the productive sector so young people can develop them using new modes of training.

● Background on Paraguay's MTESS and Public Employment Service (SPE)

In 2014, the MTESS identified the information management challenges described above, as well as the problems of relying on paper documents in its services. Among the most serious difficulties was the time it took to enter and update company payrolls. Another problem was a lack of transparency in

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[9] For results for PAIL alone, see the project completion report (PCR). The project also included a $5,082,165 contribution from the Paraguayan government.

[10] PAIL also took into account existing evidence on labor market programs and their effectiveness. See for example Dar, A. and Tzannatos, Z. (1999).

union approval processes, which resulted in more pressure from unions on the MTESS. A third major challenge was officials granting special privileges in certain cases or altering payments. This situation was exacerbated and normalized by a fines system that provided little transparency and lacked records.

The Job Placement Support Program (PAIL) aimed to strengthen Paraguay's Public Employment Service (SPE), run by the General Directorate of Employment (DGE). It was designed to expand the services' poor geographic coverage and replace the highly specific job placement tests that were very time consuming for applicants and job counselors. It also sought to raise confidence in the service among the private sector, which registered few job openings with the service,[11] and modernize the service's inefficient and ineffective manual processes.

The ministry's paper-based processes also directly undermined the quality of the DGE's service,[12] which relied on two forms: one that job seekers filled out before their employment counseling interviews, and one that career counselors filled out during the interview. These forms were stored in folders and then consulted one by one in physical format as job openings arose. Job counselors also filled out daily report forms and spent time classifying CVs and resumes and filing them in folders and boxes, as shown in the image below. These internal administration processes took up a significant portion of the staff's time, reducing their availability to serve applicants and work with employers to enter information on new vacancies. As explained above, this paper-based information could not be used for data analyses. It also offered no way to learn employer needs in terms of skills and/or job profiles.

Job seeker résumés on file at the DGE, 2015

Photo: Gloria Ortega

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[11] In 2011, the DGE registered 500 job seekers and 80 job openings per year. Once the first technological solutions were implemented in 2016, these figures increased to 15,203 and 6,347 respectively.

[12] Consultancy for designing a high-level architecture. SERINCO SRL (2015).

PAIL's analyses aimed to fix the poor performance of the DGE's service as a result of the few job openings registered, which were only 80 in 2011. Employers and staff explained that when companies would come to the employment service with job openings, job-matching staff would search the folders for potential candidates and, based on the limited information in résumés, find potential matches between candidate skills and occupations in the applicant profiles. They would then call candidates to confirm their availability to apply for the job (often they had already obtained employment through other means) and match available candidates with the employer, putting the parties in contact with each other. This procedure had multiple disadvantages, including:

- difficulty locating job seekers;

- the impossibility of knowing their job status in real time (they may have already gotten a job);

- limited capacity for rapid response due to the heavy workload of DGE staff;

- the requirement for job seekers to physically travel to the DGE office in Asunción when they wanted to submit a resume and register, which also meant that they did not report whether they had already found a job or update their information; and

- the need for physical storage space.

These problems undermined the employment offices' results. For example, in 2010 the Asunción office only provided individual employment guidance to 562 people, of which 222 were referred to companies. That year, the office only registered 98 job openings at 79 companies. By 2015, these numbers had increased to 2,269 people served and 200 vacancies registered. In 2011, it took a job seeker an average of 90 minutes to register. By 2015, the average time had dropped to 30 minutes.

This in-depth assessment of the employment service also prompted the ministry to assess the other areas of the MTESS and identify potential solutions to the problems found.

Enterprise architecture as a tool for structuring digital service implementation plans

In response to the problems described above, in 2015 the MTESS laid out a digital transformation strategy that involved developing and implementing different technological solutions within an enterprise architecture.[13] One step in this process was to take stock of certain MTESS units and the challenges they faced. This provided a foundation for specific assessments of the different units' processes, as well as the information they generated and needed for the services they provided. This architecture aligned the institution's mission and vision—which is to lead the way in ensuring decent work and employment for the population—with the strategic processes and pillars that had to be in place to achieve that mission. The key to

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[13] The power of an enterprise architecture is discussed in Urquidi et al. (2021). The MTESS' enterprise architecture was designed through a consultancy made possible by IDB technical cooperation financing. SERINCO SRL (2015).

implementing digital services at the MTESS was using a sustainable, modular architecture that could be deployed in phases and was not dependent on specific providers. These services were designed for digital citizens and employers, but also for those with fewer technological skills,[14] who could receive assistance from job counselors and trained staff. Now when they go to MTESS offices, they receive more streamlined in-person services, without printed documents. For example, registration now takes 15 minutes instead of 90 as it did before the new systems were implemented.

In terms of data architecture, the idea was to build a structure that could help handle people's requests and manage procedures more effectively at all ministry offices. Citizen and employer databases are therefore now used across all modules, regardless of which vice-ministry they belong to. These databases are also available across all sub-entities of the ministry. They are interoperable with other databases and are used for multiple processes.[15]

Likewise, the project designed the Unified Worker Registry (RUT) with a comprehensive vision that incorporates all parties that interact in some way with the MTESS. The RUT interoperates with the employers registry and can be used to register applicants, employees, people receiving unemployment benefits, and anyone else involved in MTESS processes, regardless of their employment status.

For the various information systems, the PAIL defined an architecture that could be implemented in a modular, scalable, flexible, and sustainable way. The project developed and implemented several technological solutions for MTESS processes that were fully integrated with the RUT. An example is the "Identity" project for managing job-training services. This project gives people online access to their work history, as well as the training they received and other MTESS actions. This allows the Ministry to better track and analyze indicators, trends, impact reports, and active employment policies. For example, it can measure the effect of a job-training on participants' employability or entrepreneurial capacity and their salaries, career path, and growth. It can also show which trainings had the most impact and which skills are in highest demand.

Subsequently, the project added an automated call system for asking job seekers if they are still looking for a job and deciding whether to keep them active in the database. This tool selects files from the job-search system, extracts the contact information, and creates an automated survey.

Figure 1 displays the MTESS capacities identified as part of the enterprise architecture.

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[14] For a map of service channels in a public employment service, see the appendix of Urquidi et al. (2021).

[15] In 2022, the data architecture was adjusted to implement a model that includes data for processes, which is tied to people's names in internal systems; data for MTESS business intelligence, including data marts; and an output data that is anonymized, aggregated, and decoupled from people's names for use by researchers.

Figure 1. MTESS capacity diagram

Source: MTESS enterprise architecture

Another important step was identifying the technological or infrastructure architecture components needed to support the proposed solutions and ensure their scalability and sustainability, including server infrastructure and virtualization, load balancing, and protection systems.[16] The project decided to run the MTESS' solutions on the Paraguayan government's cloud services, implementing virtualized servers. It negotiated with the National Secretariat for Technology, which supplied a data center and cloud servers that meet the highest cybersecurity standards and ensure an effective and efficient internal control environment. This mode of operating sparked a digital revolution in the country, as the recently created ministry became one of the first government bodies to run all its programs and software in the cloud.

Since 2015, the MTESS has been working to implement a digital transformation plan for digitizing all the services it provides, as well as ensuring their quality and accessibility. To carry out this transformation, it has defined the value chain, shown in Figure 2, which includes client needs and expectations, managing citizens and companies, and operationalizing the services.

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[16] The virtualization is the abstraction of of Information Technology resources that masks their physical nature and limits from users. Load balancing enhances a network's capacity by using available servers more efficiently. Server and equipment protection helps safeguard them from unwanted attacks. See: https://www.gartner.com/en/information-technology/glossary

Figure 2. Processes: MTESS value chain
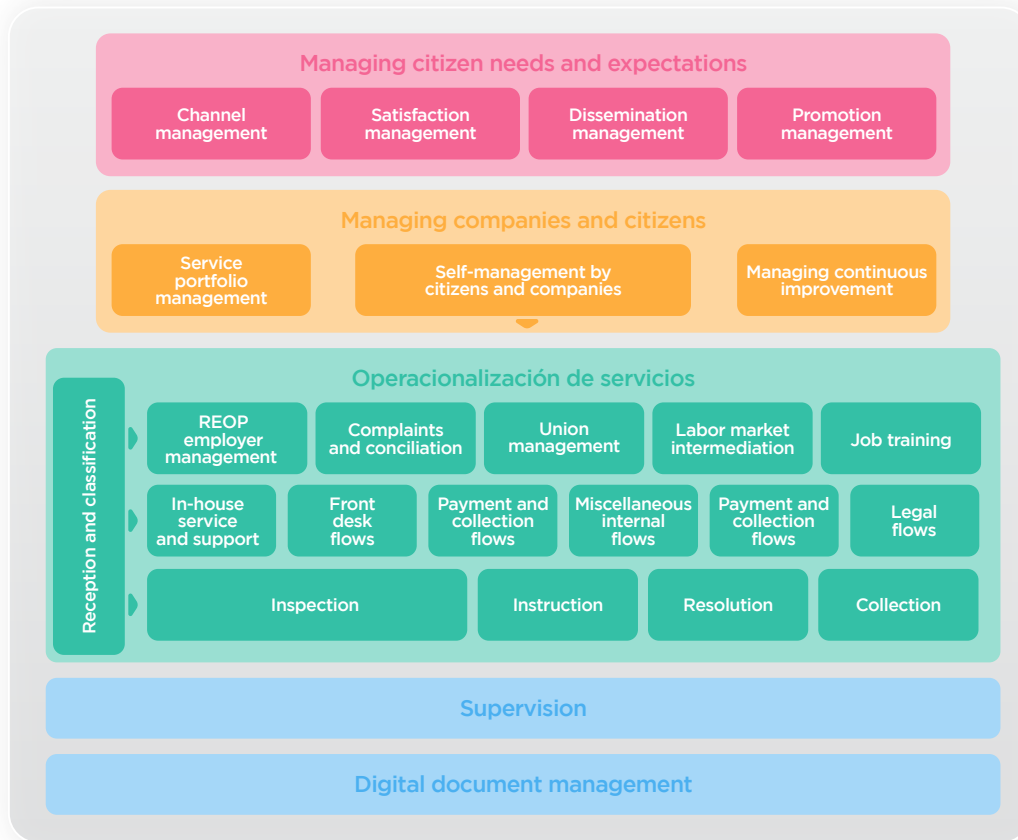
Source: MTESS enterprise architecture. REOP: Registro Obrero Patronal [Employer-Employee Registry].

The MTESS' digital transformation also allowed it to meet companies' requests for digital workers. For example, during the quarantine in 2020, the project provided online training and internships to certify 494 people in digital marketing or as community managers. This intervention helped meet companies' needs for workers to launch digital sales and customer service channels.

Challenges encountered and technologies implemented

The DGE's transformation to expand its services and coverage was guided by four strategic pillars (Figure 3): (i) national coverage and service channels,[17] (ii) comprehensive data management, (iii) data analysis to identify trends, generate reports, and predict labor market movements, and (iv) follow-up with beneficiaries.

In line with these pillars, the project proposed solutions within an architecture based on detailed planning of each of its components. It linked the MTESS' mission and vision with the processes required to carry out its mandate and the systems and applications needed to support those processes. The

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[17] See the appendix on service channels in Urquidi et al. (2021).

strategic pillars allowed PAIL to prioritize the most important areas of work and deploy a modular implementation to ensure the integrity of each technological system that has been added.

The project was able to better implement the centralized service desk by first defining the enterprise architecture for systems and processes. This step cast a strategic vision and provided an overarching design, and allowed systems to be rolled out in phases and modules. It also made it possible to organize services in a more effective and efficient way.

Figure 3. Strategic pillars of public employment services

National and Omnichannel Coverage
National coverage with interoperable or unified systems.
Multi-channel access for citizens and companies.
Multi-channel access for citizens and companies.
Zero lines, zero paperwork.

Comprehensive Data Management
Creating repositories and integrating with external databases for analytics.
Generating reliable, consistent, complete, and timely data.
Following the universal principles of data management and privacy.

Trends, reporting, and forecasting
Managing the results of employability programs.
Creating indicators that measure the performance of ministry teams.
Employability indicators by region, industry, and job opportunity.
Trend forecasting and predictive analysis.

Comprehensive follow-up for citizens
Unified registration system for workers and companies.
For citizens: recording multiple events such as job searches, job training, complaints, etc.
For companies: recording inspections, compliance, etc.
Segmenting and managing vulnerable citizens and those with barriers.

Source: MTESS enterprise architecture.

The solution to the MTESS' coverage difficulties was both physical and virtual. Although PAIL favored a virtual platform due to increased internet penetration,[18] it was decided that there also needed to be physical spaces and support channels so job seekers and employers with few digital skills could still access the SPE platform. To expand coverage, the MTESS also organized job fairs[19] and established seven physical offices.[20]

The PAIL project also built out the physical and technological infrastructure of the DGE, with support from the Inter-American Development Bank (IDB).[21] It provided different resources, ranging from furniture to "automated line management"[22] for in-person services, helping equip and expand more DGE offices in the country as a cornerstone of a solid and sustainable employment network. The results of strengthening the DGE are reflected in the enhanced job service, which registered 5,348 job openings in 2019. This number rose to 7,513 in 2020 and 11,277 in 2021. In terms of services for job seekers, the DGE served 14,292 people in 2019, which rose to 51,961 in 2020 and 69,350 in 2021. Of these job seekers, 30,197 and 65,077 were matched to a job opportunity in 2020 and 2021, respectively. Registration still takes only 15 minutes, one-sixth of the time required before the system was implemented (Figure 9)[23].

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[18] Especially prepaid internet. Sequera Buzarquis, (2017)

[19] A job fair is a physical or virtual space to which the MTESS invites companies seeking workers and job searchers so they can meet. A fair has the advantage of shortening recruitment, interviewing, and hiring times for both job seekers and employers. As of 2019, over 50,000 job seekers had registered with the ministry. Most registered at job fairs between 2016 and 2019.

[20] The departments with offices in operation are Alto Paraná, Itapúa, Guairá, and Cordillera, some of which may have more than one location.

[21] Through loan agreement 2660/OC-PR.

[22] Line management consists of a set of synchronized systems that monitor user flows and assign shifts at service desks.

[23] PCR for loan agreement 2660/OC-PR.

Two of the physical offices opened in 2019, and the last one in 2020. The offices are interlinked with the MTESS system and allow users to access online information at the national level. From 2018 to early 2020, a total of 12 offices were set up, with staff on the payroll of the Paraguayan government, a factor that makes the offices more sustainable.

The SPE and labor market intermediation became a priority for the MTESS. By implementing an ontology- and semantics-based artificial intelligence engine,[24] it was able to comprehensively improve job matching. This technology compares and contrasts a large number of variables, including skills, distance from home to work,[25] work schedules, and even company values. ParaEmpleo was valuable because it gave users these complex, variable-based relationships, which provided better and faster matching (Urquidi and Ortega, 2020) and allowed the MTESS to analyze the skills most in demand on the market.

The main design feature of the enterprise architecture is its modularity and scalability. PAIL originally planned to implement the architecture in 2015 and ultimately did so in 2017. However, it continued to scale up and improve this initial system over the course of the project, and the system continues to receive updates and improvements to implement new MTESS features.

The main components of the PAIL IT system were launched in 2017. As planned in the enterprise architecture, this system will eventually merge with the MTESS database. A milestone in the process of improving and scaling up the system was the launch of the region's first labor market intermediation engine powered by artificial intelligence. This IT system strengthened the MTESS as an institution and expanded its service coverage, positioning it to provide better solutions to the problems of the Paraguayan labor market.

As of March 2022, the ParaEmpleo platform's artificial intelligence component was being replaced to optimize the experience and customize the service even more. However, thanks to the enterprise architecture framework, this work did not affect any of the other technological components and applications that were implemented to optimize the performance of the SPE. The SPE continues to operate normally with no data losses, since data continues to be updated from transactions in the ministry's other modules.

Just as building a building requires multiple blueprints (electrical, concrete, hydraulic, etc.), an enterprise architecture provides the high-level blueprints for the different dimensions of information systems: processes, data flow, applications, and infrastructure. Like a wall at a construction site that can be demolished without affecting other parts of the building, changes can be made to information systems while preserving the integrity of the other systems, databases, and support infrastructure, as long as the architectural blueprints are available.

The process of deploying this SPE system was completely modular and phase-based (Figure 4).[26] During the first year, paper forms were replaced with electronic ones in a temporary database, an achievement considered a "quick win." Also that year, the project prepared the

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[24] A semantic web is a space where information is well structured and defined. The ontology defines the domain, components, and relationships that exist between the objects belonging to that domain. By applying ontologies in a semantic web, users can extract, understand, and infer information for IT systems.

[25] One frustration employers shared during the process of designing ParaEmpleo was that a candidate would withdraw from a hiring process upon finding a job closer to home or with better transportation connections. Evidence shows that job seekers and workers prefer jobs that, due to distance or transportation connections, cost them less in terms of time and money. For example, LeRoy and Constele (1983) show how is more likely for low-income people to work near public transportation lines, while Moreno-Monroy and Román-Ramos (2020) find a correlation between better-quality urban transportation and higher formal employment rates in an urban area.

[26] The system was developed in phases, first implementing quick solutions that would later be replaced by more complex systems.

artificial intelligence engine that used the distance variable to add value by connecting people with job openings near where they live.

To give a clearer picture of the modular system architecture, Figure 4 shows the main components of the information systems architecture.

Figure 4. MTESS Information Systems
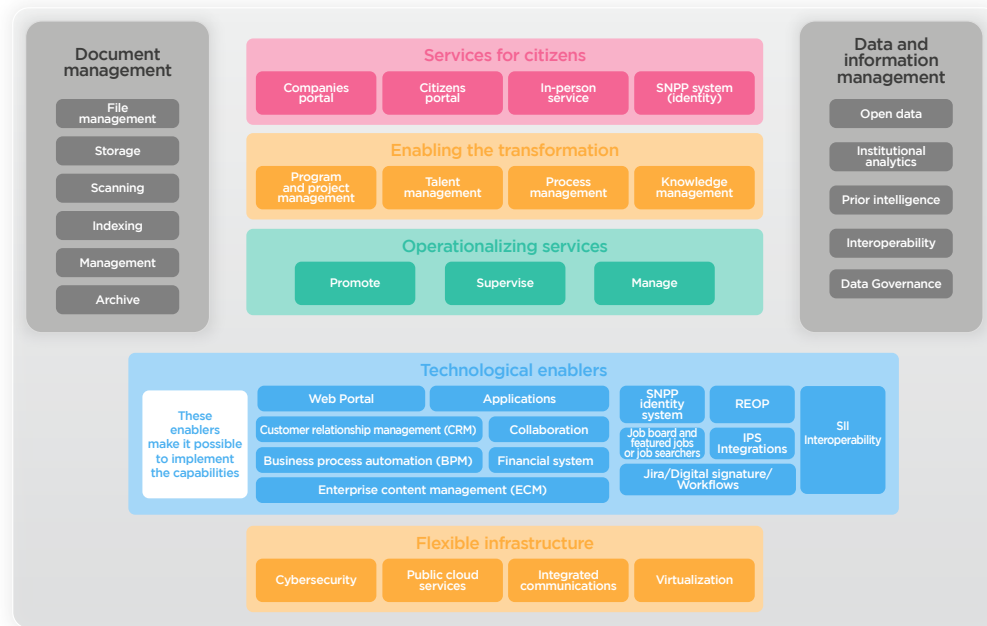
Source: MTESS enterprise architecture.

CRM: Customer relationship management (sistema de gestión de relaciones con clientes). BPM: Business Process Management (Automatización de procesos). ECM: Enterprise Content Management (Gestión de contenido empresarial)

SNPP: Servicio Nacional de Promoción Profesional. REOP: Registro Obrero Patronal. IPS: Instituto de Previsión Social

SII: Sistema de Intercambio de Información.

*JIRA is a software for project management, and errors and incidents follow-up. It is used for the judicial management in Legal Advisory of the MTESS. Source: https://www.atlassian.com/es/software/jira

The architecture also generated a roadmap that was then modified along the way as needed. Figure 5 contains the most recent version.

Figure 5. 2020-2023 MTESS Project Roadmap

PROGRAMS	2020	2021				2022				2023			
	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter
Define the governance for the transformation	Create PMO and governance for EA												
	MTESS Change Management Team												
Strengthen the value chain	Define processes	Automate SNPP, REOP, and inspection processes											
						Automate intermediation processes							
										Automate management processes			
	Create a citizen service team												
	Create a document management team												
Strengthen analytical capacity	Define data and information management model	Descriptive analytics											
						Advanced analytics							
Strengthen technological services domain		Strengthen technological infrastructure											
			Strengthen service capacity management										
				Strengthen operation management									
Strengthen the information security management system	Implement the information security management system												
			Strengthen infrastructure security										

Source: Prepared by the MTESS.

The enterprise architecture made it possible to roll out the SIL in stages. The first phase was to launch a system to shorten the time it takes for both job seekers and companies to register. This also facilitated the transition to online searches for resumes and job openings. In the second stage, the project launched the region's first job matching system powered by artificial intelligence. The system remained in place until after the project ended, although the ministry later returned to a traditional matching system as a result of a problem with the provider. Figure 6 shows the phases for rolling out the SPE.

The architecture allowed the MTESS to incorporate and then remove the artificial intelligence engine, with no consequences for its labor market intermediation capacity, as seen in the number of people and job openings registered. In 2019, the employment offices registered 14,292 people and 5,348 vacancies. After disabling the artificial intelligence engine, registrations continued to climb to 51,961 job seekers and 7,513 job openings in 2020, 69,350 job seekers and 11,277 vacancies in 2021, and 32,757 job searchers and 22,258 openings registered in 2022. Meanwhile, 30,197, 65,077, and 52,867[27] people were connected with job opportunities in each respective year.

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[27] The number of connections is higher than the number of new registrations because people who received services in years past can request new services without registering again.

Figure 6. Phases of launching the SPE system

Source: Prepared by the authors.

SMS:Short Message Service (Servicio de mensajes cortos). IA: Inteligencia Artificial. CRM: Customer relationship management (Sistema de gestion de relaciones con clientes). REOP: Registro Obrero Patronal. IPS: Instituto de Previsión Social.

The labor market intermediation portal had a notification module consisting of an automatic call system, a connector for text messages (SMS), and a channel for sending e-mails, all for contacting users. The portal also had a customer relationship management (CRM) system to guide users in their process of becoming more employable and sorting through jobs offered by employers. The CRM allow the MTESS to register job seekers arriving through virtual channels and those seeking services through traditional channels like phone calls and in-person appointments at employment centers.

The portal was launched through online job fairs, where job openings were collected and registered on the platform and matched to job searchers across the nation. Users could create a profile and upload their personal details and information about their skills. The MTESS held a total of 35 job fairs in 2016, 40 in 2017, and 41 in 2018. This encouraged job seekers to register, and the results exceeded expectations.

One aim of the MTESS data architecture was to build a solid structure as a foundation for the different units' processes and functionalities. It therefore included a database with information on all employers in the country that interoperates with the MTESS databases. This database provides up-to-date information on how many job seekers they employ, the number of openings they post in a given period, and their compliance with administrative obligations, among other information. Several sub-entities at the ministry are now familiar with the employer database and consult it for multiple processes.

By setting up a Unified Worker Registry (RUT), the MTESS was able to create a database of the services it has provided to users. It can look at all trainings, job placement services, and other services that the worker has used and track their trajectory based on all these processes. Creating this registry, along with the labor market intermediation system, allowed the MTESS to offer companies and job searchers a single gateway, keeping it from having to repeatedly ask users seeking a new service for information and documents that other MTESS units already have.

Integrating the systems makes it easier for them to interoperate with other Paraguayan government systems (Figure 7) to perform a strong analysis of indicators that draw from a rich database. The MTESS' integrated system will therefore bring together the different internal systems and also external systems linked to the IT system developed by the project to create synergies.
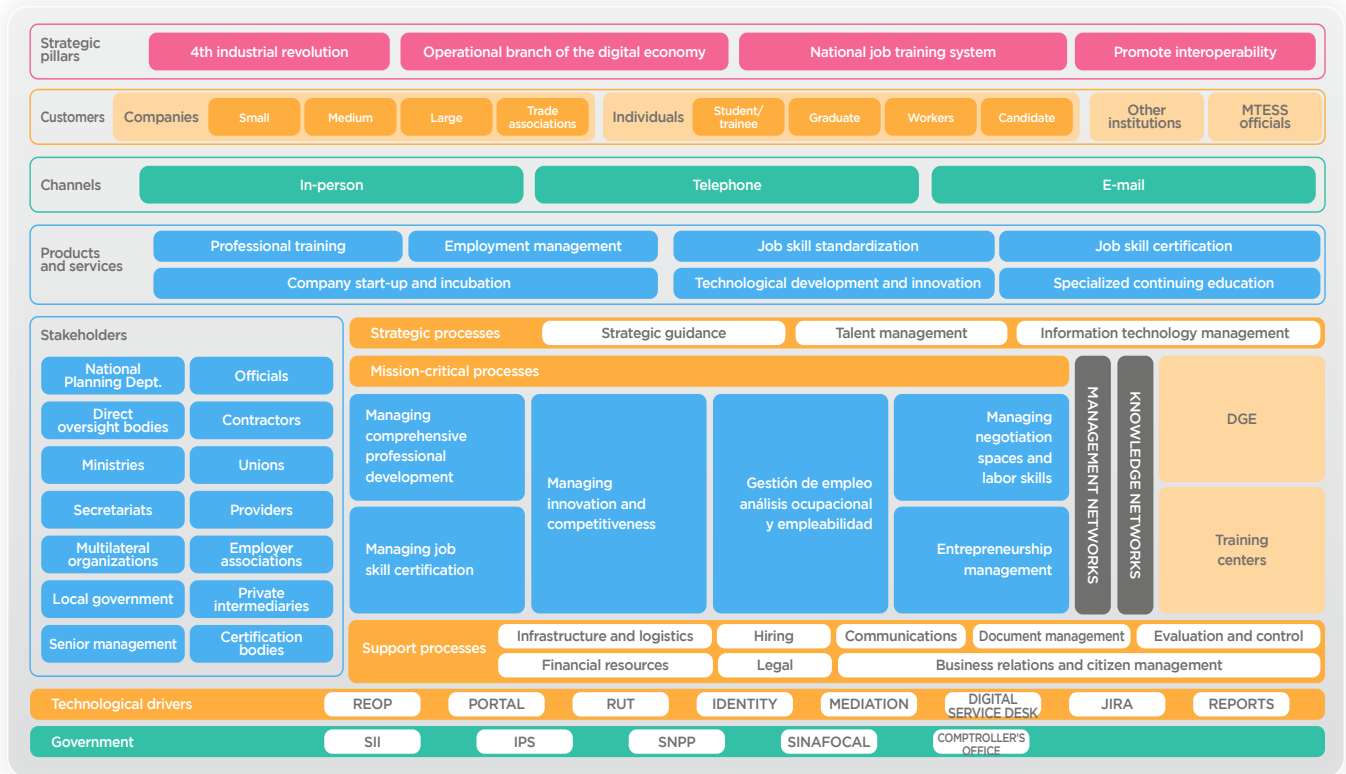
Figure 7. Networked service connections to other institutions as of November 2022
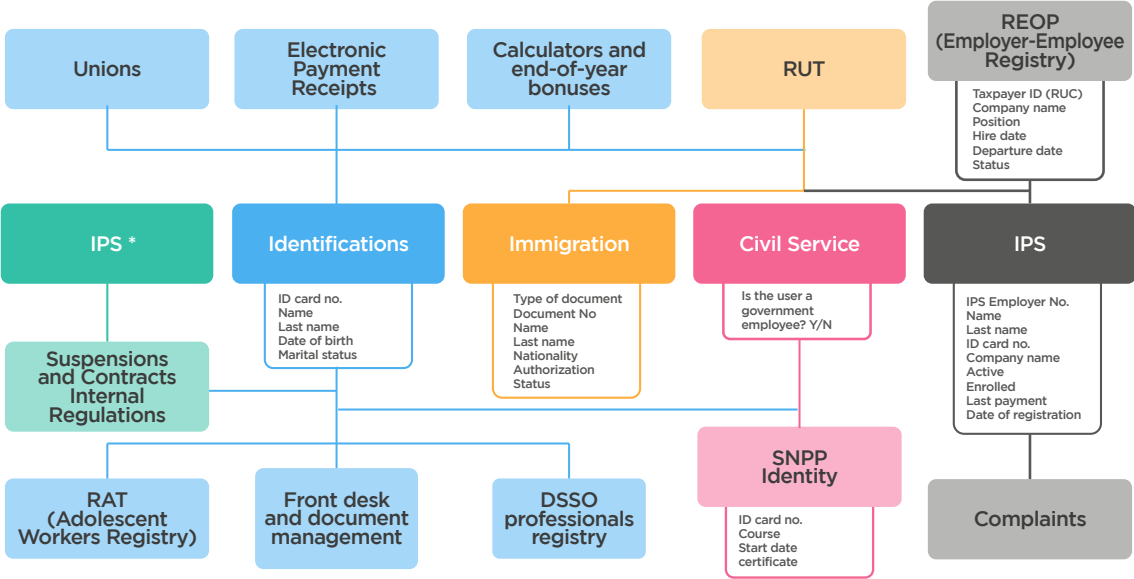
IPS: Social Security Institute. RUC: Taxpayer ID. SNPP: National Professional Development Service. CI: government-issued ID document. DSSO: Occupational Health and Safety Directorate. RAT: Adolescent Workers Registry.

Figure 8 illustrates the operating model, including strategic pillars, processes, technologies, products, and how they interact.

Figure 8. MTESS operating model

Source: Prepared by the authors.

The Unified Worker Registry (RUT)

Designing an information system model was a key step in the development of the MTESS units involved in creating employment policies, programs, and projects, especially those related to giving DGE the resources it needs to perform well as a centralized service desk. This model benefited from the creation of the RUT and from interoperability with other government agencies (like Social Security and the tax authority) and other MTESS systems. This integration gave the Vice-Ministry of Employment and Social Security the administrative data it needs to analyze the labor market.

These factors led the MTESS to create the RUT, with IDB's support. This comprehensive database,[28] provides a more complete picture of each user, and it is interlinked with systems from other institutions through application programming interfaces (API). The RUT connects to the employer database to register applicants, employees, and users who, due to unemployment or inactivity, receive allowances and social assistance, among other benefits.

[28] This database is meant to be a repository of information on all users who interact with the MTESS in any way, regardless of their employment status.

The new connections also allowed companies to publish their postings through their RUT user accounts. This benefited users by facilitating digital communication and management between companies and citizens. The MTESS was able to use online validations to proactively cleanse its records, helping it produce unique, updated, complete, comprehensive, and high-quality data.

The 'Identity' system

After launching the RUT, the MTESS, through the PAIL and as part of designing the applications architecture,[29] also worked to roll out the "Identity" system to fully interlink job-training with the relevant information. The MTESS can use this system to keep track of the courses that job searchers take to improve their skills and automatically generate certificates for them.

The Identity management system is based on digitalizing the educational process. It compiles complete information on students from their enrollment to their certification and connection with the labor intermediation and entrepreneurship system. The easily accessible system contains a public instructor registry and allows all courses to be monitored on an ongoing basis.

People first register through a double verification process using their government-issued ID. This process is interlinked with the Identifications Department using the Information Exchange Service (SII) to validate their details (especially age) , and it means they no longer have to submit a photocopy of their ID document. This validation is all it takes to complete online registration with the National Professional Development Service (SNPP), and no document submissions or in-person appointments are required. Due to the integration between the MTESS and the financial system, people can pay any fees they owe at any financial entity or pay point.

Users can then choose any courses that interest them, as long as their schedules do not conflict. They are then automatically enrolled as students, and the system notifies them of their enrollment and course schedule.

● Results of the solutions implemented

ParaEmpleo used digitalization to expand SPE's coverage and effectiveness, offering users better job placement processes. Figure 9 shows some of ParaEmpleo's figures through 2019. That year, the service recorded 5,348 job postings, a number which rose to 7,513 in 2020, 11,277 in 2021, and 22,258 in 2022. Meanwhile, the service assisted 14,292 people in 2019, 51,961 in 2020, and 69,350 in 2021.[30] In 2022, there were 32,757 new entries in the job exchange and 53,867 job connections were made (this figure includes people who had registered in previous years and were returning for additional job search support).

As of 2019, 80,000 job seekers had used ParaEmpleo. One of the PAIL project's early

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[29] One advantage of an applications architecture is that it allows the possibility of creating systems that are coordinated with the efforts of other units and even with other institutions under the authority of the MTESS because it can integrate independent components and functionalities.

[30] PCR for loan agreement 2660/OC-PR.

Figure 9. ParaEmpleo's results as of the end of 2019

ParaEmpleo applicants (cumulative)
Target: 13.300

	2015	2018	2019
Presencial	500	1.196	19.331
Autocarga			3.230
Sistema Quick win		56.741	56.045

● Presencial ● Autocarga ● Sistema Quick win

ParaEmpleo job postings (cumulative)
Target: 1.100

	2015	2018	2019
Presencial	80	150	5.480
Autocarga		12	1.139
Sistema Quick win		9.019	9.019

● Presencial ● Autocarga ● Sistema Quick win

Registration time (in minutes)

90' Baseline   30' Target   15' Result

Applicant-to-hire ratio *(as of December 2019)*

18% ● Total employed
82% ● Unemployed

Source: Project Completion Report for the Job Placement Support Program (PAIL)

successes was registering approximately 56,000 people in person with the initial systems, which replaced paper forms with electronic forms in a database. When ParaEmpleo launched, it initially had 23,000 users, of which 19,000 used the portal in person (meaning they went to the offices and filled out the forms with help from a facilitator). Around 3,000 completed the forms autonomously. This marked a shift toward online access to labor market intermediation services. As described earlier, these systems cut registration times from 90 to 15 minutes, with the additional advantage that interoperability with the identification service completely eliminated name errors.

In terms of job opening, the initial systems registered approximately 9,000 job posts autonomously and 5,480 in person, achieving an applicant-to-hire ratio of approximately 18%. This means that 18% of all job seekers registered in the PAIL project are now employed.

The digital transformation also managed to eliminate paper documents and speed up the pace of service. Now, an employment counselor needs about 15 minutes to enter the job matching data, considerably less than the 90 minutes previously required.

There are three main reasons behind this improvement: it is faster to find information in the database; information already recorded in other ministry systems (for workers, job seekers, and employers) is automatically entered through interoperability with other government agency services; and this interoperability can be used to confirm users' information. For example, a person's information can be populated from the Identification Directorate once their ID card number is entered. Interoperability with other systems and entities also reduces data entry errors, which in turn saves time that would be spent on reviewing and correcting information.

Lastly, the SNPP averaged over 300,000 students enrolled per year, and in the REOP system, 100% of employer-employee reports were submitted electronically, eliminating physical payroll forms. Through integration with the financial system for tax and fine payments, and by automating certification processes, the REOP increased the funds collected by the MTESS by 40%. It also eliminated cash transactions and reduced the time it took to impose, assess, and pay fines. Previously, these procedures took a week; now they only take a minute.

Thanks to the synergy between the new DGE IT system and MTESS' digitalization process, as well as the DGE's expanded coverage and strategy of connecting with job searchers and organizing job fairs, the DGE was able to increase the number of people it served from 500 in 2011 to 14,292 in 2019. This service capacity has only increased since, to 51,961 people in 2020, 69,350 in 2021, and 53,867 in 2022.

CHAPTER 3
Key success factors

One key factor behind the MTESS' digital transformation was the government's commitment to the project, which spanned administration changes. The PAIL loan's planning was done in 2012, the enterprise architecture was implemented under the next administration in 2015, and the adoption phase took place under the administration that took office in 2018. One reason why the project continued on despite the administration changes was the backing and commitment of the different labor ministers. The participation of the ministry's top official at each stage helped the project overcome obstacles, conduct periodic management, measure results, and get units to cooperate when their support was needed. The ministers also facilitated direct communication with other authorities.

The Job Placement Support Program was not the sole source of funds for the MTESS' digital transformation.[31], The Ministry itself also allocated its own resources for this process. Two improvements that it funded on its own are the Employer-Employee Registry and the Identity system. Since December 2018, new companies can quickly, efficiently, and securely register in the MTESS Employer-Employee Registry from anywhere in the country, at no cost. New employers can register on the MTESS web portal and obtain a user number and password. All they need is a valid email to process the registration. After this first step is completed, they can fill out the electronic form with all the fields required by the ministry. Then companies can upload the required documents to the portal in digital format. These documents are verified, and the company is notified that its registration is complete within 72 hours.

In 2020, the MTESS launched the new digital system for education management called Identity. This system is designed to make educational processes more transparent, promote inclusive employment, and ensure quality in work-oriented education.

Another important factor in the project success was that it incorporated the labor sector's

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[31] IDB loan agreement 2660/OC-PR.

perspective into its design. Implementing these systems is often seen as the domain of technology experts, but properly designing them requires a good understanding of the processes and expected results. It is therefore important to include stakeholders and the specific sector's perspective in the process. This input also provides options for improvements and added value that can be achieved by adjusting the design and implementation.

Other factors that played an important role in the project's success are discussed below.

● Enterprise architecture design

Digital transformation processes require an overarching design that structures planning and priorities, and an enterprise architecture is ideal. Using this tool, system designers can create a map to decide which modules should be implemented first and then scaled up. This modular and interconnected design allows the system to be rolled out in phases without having to redo work.

The MTESS was able to use an enterprise architecture design to launch this type of modular technological solutions. This approach also facilitated a long-term process of expanding and improving the systems, instead of having to foresee all necessary characteristics and functionalities from the outset. The architecture design also made it easier to remove components without causing negative spillovers that could cripple the employment services.

● Quick wins

The online job portal that was launched as a predecessor to ParaEmpleo (Figure 10) was a quick win. This portal, internally referred to as the "quick win system," offered guidance on preparing resumes, recommendations for job interviews, and a jobs board.

In addition to job services, the portal also covered training and entrepreneurship. It also included the option of contacting the job search team by chat (now WhatsApp). This service allowed the DGE to continue operating during pandemic lockdowns and handle the heightened demand resulting from the pandemic.

Figure 10. Initial job portal

🟢 Workshops and training

The project organized workshops for employers, published articles in the media, held in-person and online fairs, and worked with employers to register job openings on the platform.

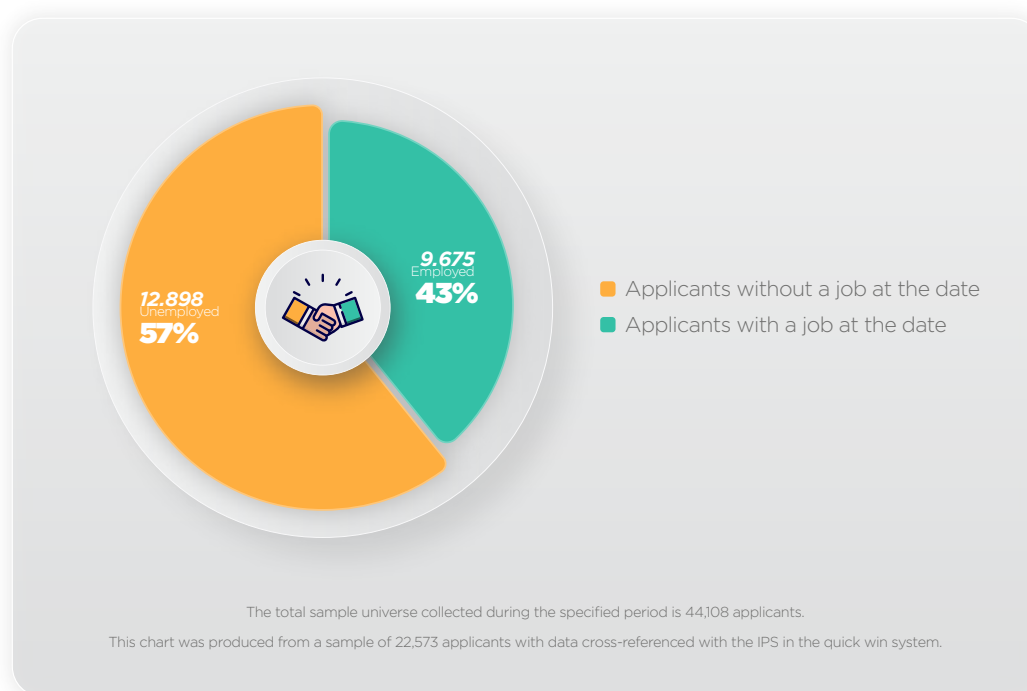**A workshops for job seekers and employers**

Photo: Gloria Ortega

● Management and uptake indicators

The MTESS reported the results of its digital transformation process based on analytic measurements and indicators from the first set of data recorded. Figures 11 and 12 show some of the graphs created and periodically updated to display management and uptake indicators for the new platform.

Figure 11 contains an example of the type of data that digitalizing processes can yield. The data is cross-referenced with social security information to show the number of applicants who still have not found formal employment[32] compared to those who have in a given timeframe.

Figure 11. Example employability measurements (June 2016-July 2018)

9.675
Employed
43%

12.898
Unemployed
57%

● Applicants without a job at the date
● Applicants with a job at the date

The total sample universe collected during the specified period is 44,108 applicants.
This chart was produced from a sample of 22,573 applicants with data cross-referenced with the IPS in the quick win system.
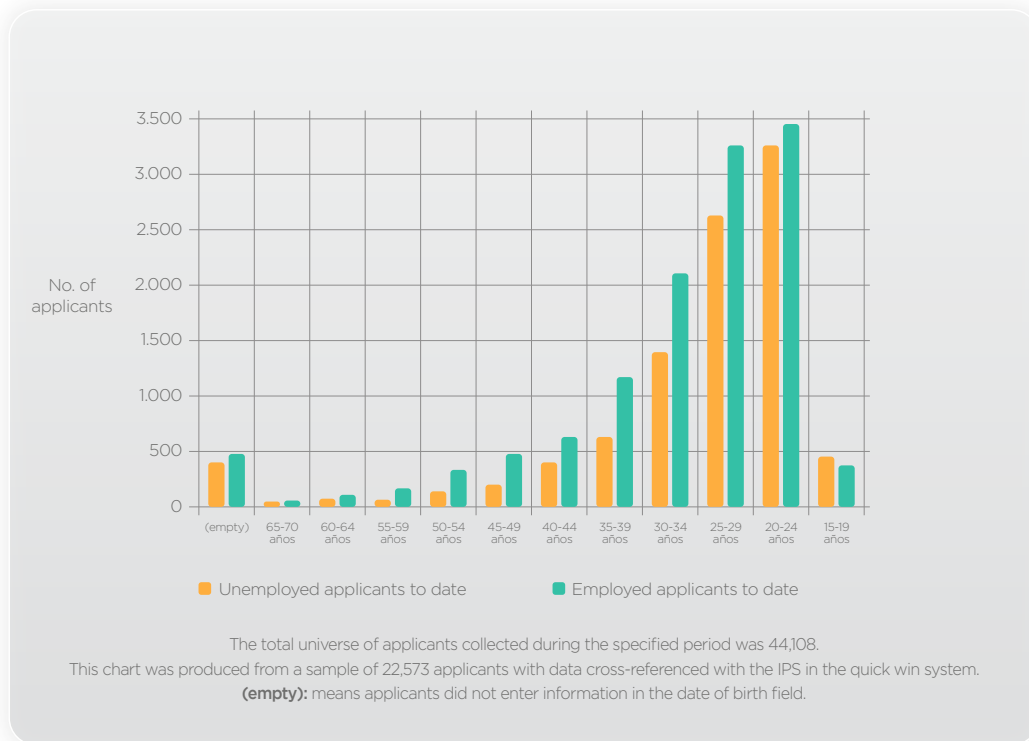
IPS: Instituto de Previsión Social [Social Security Institute]

Meanwhile, Figure 12 shows an example of indicators that can be measured using the new platform, in this case the ages of candidates with or without formal employment at the time of analysis. This data can be cross-referenced with Paraguay's social security database.

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[32] Formal employment is defined as employment in which contributions to long-term social security (retirement pension) are made. Phone or text message surveys have to be used to obtain data on informal employment or self-employment (which in Paraguay does not require long-term social security contributions).

Figure 12. Example indicator based on age of job searchers (June 2016–July 2018)

The total universe of applicants collected during the specified period was 44,108.
This chart was produced from a sample of 22,573 applicants with data cross-referenced with the IPS in the quick win system.
(empty): means applicants did not enter information in the date of birth field.

IPS: Social Security Institute

Applicant-to-hire ratio and reliable database

Two important factors influence the applicant-to-hire ratio. The first is striking a proper balance between the number of jobs available on the portal and the number of job searchers. This balance is important because if there are too many vacancies and not enough applicants, employers may be discouraged by not finding enough talent to meet their needs. On the other hand, a very large volume of applicants with few vacancies discourages job seekers from using the platform. This balance can be maintained by constantly monitoring and managing vacancies through a good relationship with both employers and applicants. Good advertising and job fairs can be used to maintain the balance.

Databases, especially the job seeker one, must contain high-quality information so that the contact information works when profiles are matched to job openings. It is important to ensure that candidate email addresses and phone numbers are up to date, whether by validating them or using an API[33] and/or by filling out all information in their profiles. After eliminating duplicated, invalid, or out-of-date data, the database will have enough information for matching and a reasonable level of reliability.

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[33] Application programming interface. APIs connect systems, software programs, and applications, and they allow end users to access their information or even a simple spreadsheet to query, change, and store data from different systems without having to log in to them directly. An API exchanges data between different systems to automate manual processes and allow new features to be created.

CHAPTER 4
Challenges and opportunities

Zero paper

Although the MTESS has reduced its use of paper as much as possible through digitalization, the medium is still prevalent both within the institution and with external counterparts. "Zero paper" remains an ideal that the MTESS continues to pursue. This entity and its offices have replaced several administrative processes, and its users have increasingly begun to rely on the digital channel. In most cases, procedures that require providing and storing paper documents are those associated with current government regulations that can only be completed in physical format.

Intermediation engine optimization

The main challenge that ParaEmpleo was meant to address was excessive use of paper, which made the DGE's services very inefficient. The first intervention improved the situation: it allowed the entity to serve more people and companies in less time and eliminated paper from almost the entire labor market intermediation process. This allowed the MTESS to optimize its labor market intermediation tools to provide a better, personalized, and more proactive service to users. The ministry is now exploring new job matching tool options to offer the same benefits as the ParaEmpleo portal and to incorporate other technologies and analytical tools to customize the service to each user.

Comprehensive data management as a strategic pillar

Through comprehensive data management, the ministry is able to produce and process unique, complete, and high-quality information for predictive indicators to prevent situations like mass unemployment in specific industries or regions. This data also helps the ministry stay ahead of changes in skills demand so it can arrange appropriate, relevant, and timely job-training.

CHAPTER 5
Conclusions

The digital transformation continues at the MTESS. Currently, 90% of its services are digitalized through technological solutions within an enterprise architecture that allowed the new system to be deployed in an orderly, modular, scalable, and flexible way. This progress was achieved without excluding citizens with less digital skills or access, offering them services at mobile or physical offices throughout the country, as well as help from employment facilitators trained on the new system. During the pandemic, these systems enabled the MTESS to continue its work remotely and serve users by telephone. It was therefore able to provide mediated job search support without requiring job searchers to physically come to ministry offices to deliver paper documents, which is an example of how a digital transformation can benefit non-digital channels.

The solid structure of databases like the employers registry and the RUT helps data flow more freely within the MTESS and outside of it to be used in different business processes. Through the Information Exchange System (SII), the MTESS now interoperates with the Identifications Department, the Social Security Institute, the State Undersecretariat for Taxation, the Ministry of Industry and Commerce, the Supreme Court of Justice, and the Civil Registry.

The systems architecture allowed the MTESS to implement platforms like ParaEmpleo, which has become a useful support tool for its services. ParaEmpleo has also become a key driver of the Ministry's digital transformation, especially in the challenging circumstances of the pandemic. Several pieces of the architecture are being reused to address challenges like establishing contact with unemployed people, managing temporary suspensions, researching new skills required by employers, identifying relevant job training, and using skills-based matching to place job seekers in jobs that are a good fit. This architecture also made it easier to disengage ParaEmpleo's artificial intelligence engine for job matching[34] without affecting the other technological components of the ministry's digital transformation.

The COVID-19 health emergency tested the systems' resilience, and it became clear that with the MTESS' architecture design, it is no longer necessary to go to its offices in person.[35] Paraguay is therefore leveraging the digital revolution to continue enhancing its labor market and creating opportunities for employers and job searchers.

Today, the digital transformation continues to advance through steps to create user interfaces that are accessible to people with disabilities and other groups. These systems were designed by an internal ministry team that is empowered by an internal implementation model and skill building process that led to it winning a Paraguayan government innovation prize in 2022 for the new version of the RUT.

Digital transformation is synonymous with improved services, but it must also go hand-in-hand with institutional strengthening. Entities need an action plan for the transformation, as well as the skills to implement, maintain, and update its systems. This is the only way to ensure that services meet the needs of employers, workers, and job seekers, and that they transcend the project and become embedded in an organization's culture.

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[34] As mentioned above, the engine was dropped due to a problem with the provider.

[35] However, it continued to place importance on having a component for people with fewer digital skills. Today, those who prefer can go to the MTESS to do their business in person, ensuring their access to the SPE.

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