ChileAtiende: A Case Study in Guiding the Architecting of a Public Sector Service Organization

by

Maximiliano A. Calderón Montecinos

B.S., Industrial Engineering
Universidad Técnica Federico Santa María, 2010

Submitted to the System Design and Management Program
in Partial Fulfillment of the Requirements for the Degree of

Master of Science in Engineering and Management

at the

Massachusetts Institute of Technology
February 2017

Author: Signature redacted
.....
Maximiliano A. Calderón
System Design and Management Program
January 19, 2017

Certified by: Signature redacted
.....
Dr. Donna H. Rhodes
Thesis Supervisor
Principal Research Scientist
Sociotechnical Systems Research Center

Accepted by: Signature redacted
.....
Dr. Warren P. Seering
Weber/Shaughness Professor of Mechanical Engineering

This page intentionally left blank

ChileAtiende: A Case Study in Guiding the Architecting of a Public Sector Service Organization

by

Maximiliano A. Calderón Montecinos

Submitted to the System Design and Management Program
on January 19, 2017 in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Engineering and Management

Abstract

The delivery of government services is currently a problem that many countries around the world are trying to solve by centralizing operations and by incorporating technology and digitized processes; however, very few have been truly successful. The main challenges faced concern the high complexity in terms of components (agencies and procedures) the organization has to manage, the need for strong coordination with the arm of the government in charge of the information and communications technologies (ICTs), and the integration of administrative processes with legal frameworks and political influences. In Chile, efforts in this matter have been made for almost two decades, but still enormous improvements are needed in order to catch up with developed countries. The ChileAtiende project is the initiative of the government of Chile whose goal is to design and implement the system of services delivery at the country level.

The present work is an application of the Architecting Innovative Enterprise Strategies (ARIES) Framework, developed by Nightingale and Rhodes, to ChileAtiende, in order to support the architecting process at an organizational level. In addition to ARIES, several other techniques are used along the way, such as a comprehensive stakeholder analysis, a network analysis of the agencies and procedures incorporated into the system, and the formulation of an optimization model to prioritize and rationalize the product portfolio in the early phases of the initiative.

The results obtained show that ChileAtiende should be built having a long-term architectural target, which can be reached by dividing the project into three main phases: first, the reorganization of the product portfolio and a process- and technology-driven boost; second, an expansion of the offerings to capture the majority of the services provided by the government; and third, the pooling of the resources to capitalize on the greater efficiency derived from smaller operations. This research shows how a systemic view can effectively address public sector challenges, and how a model-based approach can provide clarity regarding the future of a complex organization.

Thesis Supervisor: Donna Rhodes
Title: Principal Research Scientist, Sociotechnical Systems Research Center

Acknowledgements

I would like to acknowledge the *Unidad de Modernización del Sector Público* (Unit of Public Sector Modernization) of the Ministry of Finance of the Government of Chile, and the ChileAtiende project team for all their help, expert guidance, coaching and provision of data. I would especially like to thank Randall Ledermann, José Inostroza, Cecilia Saint-Pierre, Sebastián Troncoso and Marco Zúñiga for their contributions to this work. In addition, I would like to thank the *Comisión Nacional de Investigación Científica y Tecnológica (CONICYT)* of the Government of Chile, and the Fulbright Student Program for their support with my graduate studies in general.

I would also like to express my sincere appreciation to the SDM faculty, other professors at MIT, and, most importantly, to my advisor, Dr. Donna Rhodes, who kindly guided my research from the very beginning, and nurtured my work with valuable insights.

Finally, I would like to thank my loved ones: first, my parents Sergio and Dora for their support and encouragement from a distance; and even more importantly, I would like to express my sincerest gratitude to my wife Mariapaz, who supported me at all times and was the fundamental source of my strength throughout this process. Thank you, *Pacita*, not only for being my life companion and my best friend, but also for your tolerance, understanding and love.

Table of Contents

List of Figures

List of Tables

List of Acronyms

Acronym	Definition	Spanish translation if applicable
AMPL	A Mathematical Programming Language	
APIC	Agenda for Productivity, Innovation and Growth	*Agenda de Productividad, Innovación y Crecimiento*
CEPAL	Economic Commission for Latin America and the Caribbean (ECLAC)	*Comisión Económica para América Latina y el Caribe*
COMPIN	Commission of Preventive Medicine and Disability	*Comisión de Medicina Preventiva e Invalidez*
CORFO	Economic Development Agency of Chile	*Corporación de Fomento*
FONASA	National Healthcare Fund	*Fondo Nacional de Salud*
IBD	Inter-American Development Bank	
ICT	Information and Communication Technologies	
ILP	Integer Linear Programming	
IPS	Social Security Institute	*Instituto de Previsión Social*
ITIL	Information Technology Infrastructure Library	
JUNAEB	National Board of School Support and Scholarships	*Junta de Auxilio Escolar y Becas*
MILP	Mixed Integer Linear Programming	
MINDES	Ministry of Social Development	*Ministerio de Desarrollo Social*
MINEDUC	Ministry of Education	*Ministerio de Educación*
OECD	Organization for Economic Cooperation and Development	
OIRS	Information, Claims and Suggestions Office	*Oficina de Informaciones, Reclamos y Sugerencias*
SEGPRES	Ministry of Presidency	*Secretaria General de la Presidencia*
SERVIU	Housing and Urbanization Services	*Servicios de Vivienda y Urbanización*
SVN	Stakeholder Value Network	
TOGAF	The Open Group Architecture Framework	
UMyGD	Unit of State Modernization and E-Government	*Unidad de Modernización y Gobierno Digital*
WSO	Weighted Stakeholder Occurrence	

Chapter 1: Introduction

ChileAtiende is at the intersection of several interesting factors. First of all, it is a public organization, facing all the challenges of the public administration, such as the volume of the operations, a political environment, and bureaucracy. Secondly, ChileAtiende is a service organization, which means that it is intended to create value through having satisfied customers – in this case, all citizens of the country. And, last but not least, ChileAtiende is immersed in a changing environment, where citizens are more informed, demanding, and technologically engaged; where politicians and the public sector are under high public scrutiny; and where economic conditions and higher budgetary restrictions make necessary efficient public administration as a whole.

In these conditions, the delivery of government services is a keystone of modern public administration. A well-executed initiative would place Chile among the most advanced countries in this respect; and more importantly, it would generate an excellent reception from the citizens by allowing better service and access for millions of Chileans to the benefits and products, to which they are rightfully entitled.

1.1. Motivation

ChileAtiende is one of the many efforts of the Government of Chile to boost the modernization of the public administration. The government has tried to implement several initiatives during the last 20 years, in order to become part of the select group of OECD countries with superior results in this area. All of this work has been done in a context of rising citizen expectations in terms of more transparent, accessible, and responsive services from the public sector; and of increasing budgetary pressures.

Some of the main trends in the new public administration are a wider use of information and communication technologies (ICT), simplification of the administrative processes, and the movement toward a more citizen-centric type of service delivery system. ICTs and digital government initiatives can have a substantial impact on government's capacity to effectively

design and implement policies, and on the transparency and accountability of their outcomes – since ICTs may enhance civil servants' productivity and can also change how governments plan and deliver services (OECD, 2016). Simplification of the administrative processes is key to reducing bureaucratic burdens through data and resources sharing, and integration of processes and operations to enhance coherence and eliminate redundancies (OECD, 2016). A citizen-centric approach is basically the design of the service delivery system based on the understanding of the citizens' needs and priorities instead of the government's requirements and processes (McKinsey & Company, 2015). Delivering services to citizens is at the heart of what most government agencies do. Tasks like renewing driving licenses, paying taxes, applying for benefits, and asking for information are often the most tangible interactions citizens have with their government. Services are therefore critical in shaping trust in and perceptions of the public sector.

The multi-channel delivery of public services, which aims to improve service quality and simplify access to them, is a key strategic component of the digital government. This is also a key element to enable administrative simplification and overall state modernization. Chile, as well as many other governments, has made efforts to develop the ChileAtiende project, based on the concept of "one-stop shop". ChileAtiende is composed of an online portal, a centralized call center and a network of branch offices where services of several agencies of the government can be delivered in a single location. Nevertheless, this project has faced several issues in terms of governance, organizational structure, scalability, and quality of service; these issues make it an outstanding case study of a highly complex sociotechnical problem.

1.2. Research Questions

This work aims at finding answers in an organizational context within the public sector, which is by no means an exact science. In contrast, this study intends to apply techniques relevant in the past for other issues and industries, and evaluate their validity in the context of the Government of Chile and specifically their application to ChileAtiende.

This work seeks to address the following research questions:

1. How can a systems approach inform the architecting effort in the public sector context?

2. How can a model-based approach be useful in assessing and managing the complexity of a public organization?
3. What should the long-term architecture of ChileAtiende be to achieve and sustain its goals?

These questions are phrased as open-ended, because there is no single correct answer. Nevertheless, there are several wrong answers, and part of the intention of this work is to help the decision makers of this initiative to evaluate different alternatives and avoid poor choices.

1.2.1. Objectives and Focus of the Study

The objectives of this study are the following:

- Answer the research questions from a methodological standpoint, so that the approach can be used as a reference framework for future studies in the public sector.
- Provide design criteria and relevant insights for the decision makers related to the ChileAtiende project.
- Develop a recommended future architecture for ChileAtiend that, independently of the actual structure, is described in an understandable fashion so that it is possible to replicate the analysis under other assumptions for ChileAtiende itself, or it can be used for other organizations.

Although other countries' experiences are assessed, and other agencies and bodies of the government are studied as well, the main focus of the study is consistently on ChileAtiende and its context within the Government of Chile.

1.3. Methodology and data collection

This study follows the 7 steps of the ARIES framework (Nightingale & Rhodes, 2015) to analyze the organization under research, until a future architecture is generated and recommended. The framework has proven to be a well-thought-out methodology for assessing the organization from its foundations, providing valuable insights, and making the research progress coherently.

- Steps 1 to 3 ("Understanding the Enterprise Landscape", "Performing the Stakeholder Analysis" and "Capturing the Current Architecture") rely heavily on interviews with

subject matter experts in the Chilean Government, reports of previous studies developed by internal and external sources, and a careful literature review of techniques and best practices in use in the public sector. These were extracted from case studies of countries that have experienced similar transformations, consulting firms' reports, and independent studies from institutions such as the Inter-American Development Bank (IDB), the United Nations (UN) and the Economic Commission for Latin America and the Caribbean (ECLAC).

- Steps 4 to 7 ("Creating a Holistic View of the Future", "Generating Alternative Architectures", "Deciding on the Future Architecture" and "Developing the Implementation Plan") are a blended approach, using both tools and techniques that are part of the ARIES framework itself, and external tools of diverse natures, going from techniques used in systems engineering to optimization methods.

In addition, a dataset extracted manually from the current ChileAtiende website, and data retrieved from the ChileAtiende Google Analytics tool allowed quantitative analysis of the current structure of the organization and making estimates of future plausible states.

Chapter 2: Context

2.1. ChileAtiende explained

ChileAtiende is defined as a multichannel and multiservice network belonging to the Government of Chile, which seeks to bring closer the benefits and services provided by the public institutions of the central government to the citizens, through efficient and effective interactions.

Throughout this project, the government has tried to meet the citizen's needs regardless of the channel used to interact with the administration, simplifying the delivery and access to public services and aiming at the improvement of citizen's satisfaction. At the same time, from the state's perspective, the ultimate goal is to implement more cost-efficient processes that support the services provided, based on greater integration, data sharing and data-driven decision-making.

To date, ChileAtiende serve citizens through these three channels:

1. In-person: ChileAtiende has a network of 206 branch offices and 5 vehicles on site, offering the possibility of process about 90 different formalities from 29 institutions, with which it holds signed agreements.
2. Call Center (number 101): ChileAtiende provides information – only – about over 2,500 formalities.
3. On-line: It consists of the portal www.chileatiende.cl - and accounts on social networks (Twitter and Facebook) where information about over 2,500 formalities is available.

This organization is composed by actors from two main institutions: (1) *SEGPRES* (General Secretariat of the Presidency), which is the responsible organization of the ChileAtiende program with a strong support from the Unit of State Modernization and E-Government (*UMyGD*) - which depends on *SEGPRES*; and (2) *IPS* (Social Security Institute) which is the operator of the ChileAtiende network (Branch Offices and Call Center).

2.2. Motivation for Change

ChileAtiende has become an important step forward in the state modernization process and it has initiated significant progress in improving the delivery of public services. Nevertheless, the model used to support its implementation has shown substantial weaknesses from institutional and operational perspectives, which makes it difficult at the moment to ensure its long-term sustainability and scalability (OECD, 2016). The following issues define the main motivations for change, which trigger the transformation process that the organization will experience up until 2018:

- **Absence of a sufficiently robust governance and management structure**, with roles and functions properly defined and distributed. ChileAtiende was implemented under the co-ordination of the *UMyGD* using the public service platforms of the *IPS*, based on informal agreements between the authorities leading the efforts at that time. This situation derived into an unclear institutional framework, which has undermined the management capacity needed to ensure continuity and strengthening of the service, and has shaped a lack of strategic direction.
- **Focus on integrated services applied to the front office but not to the back office**, meaning low process automation and integration among formalities and services from different agencies, while an integrated service is advertised in the front office. As a result, the multiple service channels are not integrated with each other and traceability between channels is not feasible, leading to poor service quality. Additionally, transactions can only be carried out to a limited degree through the "in-person" channel, while the call center and website have an informative function only.
- **Growth of supply of services defined by internal processes and not by citizens' needs.** Several services included in the "in-person" channel were added as part of the agreement signed with the various institutions without necessarily addressing the users' needs. In several cases this created a supply structure that was perceived more as an additional burden by the officials working on ChileAtiende –who had to be trained and required access to the various platforms of each institution– than a real benefit for the users.

- **Remote channels do not allow transactions.** As stated previously, the website and call center do not allow real transactions to the citizens; therefore, they still have to go to the branch offices to complete their procedures. Thus, a big opportunity to drive demand towards the –much cheaper– remote channels is lost.

The design and implementation of the ChileAtiende project shows the complexity of providing a general "umbrella" model for integrated public service delivery; and presents the complexity of coordinating various actors and linking different strategies within the government. The initiative, regarded as a good practice from other OECD countries at its inception, has led to fewer results than expected, the main reason being that it is not completely aligned with a unique digital strategy across the different institutions and agencies of the government.

2.3. Boundaries of the organization and scope of the transformation

In order to best describe how ChileAtiende works, a top down structure will be used, starting from the Head of the Government, the President of Chile. The Government is composed by 23 Ministries, and 4 of them have direct relationship with ChileAtiende, which are described below:

- Ministry General Secretariat of the Presidency (*SEGPRES*): It is the advisory governmental body at the highest level, responsible for facilitating and coordinating the development and implementation of the programmatic and legislative agenda of the government (Ministerio Secretaría General de la Presidencia, 2016).
- Ministry of Finance: Responsible for efficiently manage public resources through a modern state service for citizens; creating conditions of stability, transparency and competitiveness in a globally integrated economy that promote sustainable and inclusive growth (Ministerio de Hacienda, 2016).
- Ministry of Labor and Social Security: It is the highest body in labor matters and social security. It must propose and evaluate policies and related plans, study and propose rules applicable to the sector, ensure compliance with regulations, allocate resources and monitor the activities of the sector (Ministerio del Trabajo y Previsión Social, 2016).
- Ministry of Economy, Development and Tourism: Responsible for promoting the modernization and competitiveness of the productive structure of the country, private

efforts and efficient action of markets, development of innovation and consolidation of the international integration of the country's economy to achieve sustained, sustainable and equitable growth (Ministerio de Economía, Fomento y Turismo, 2016).

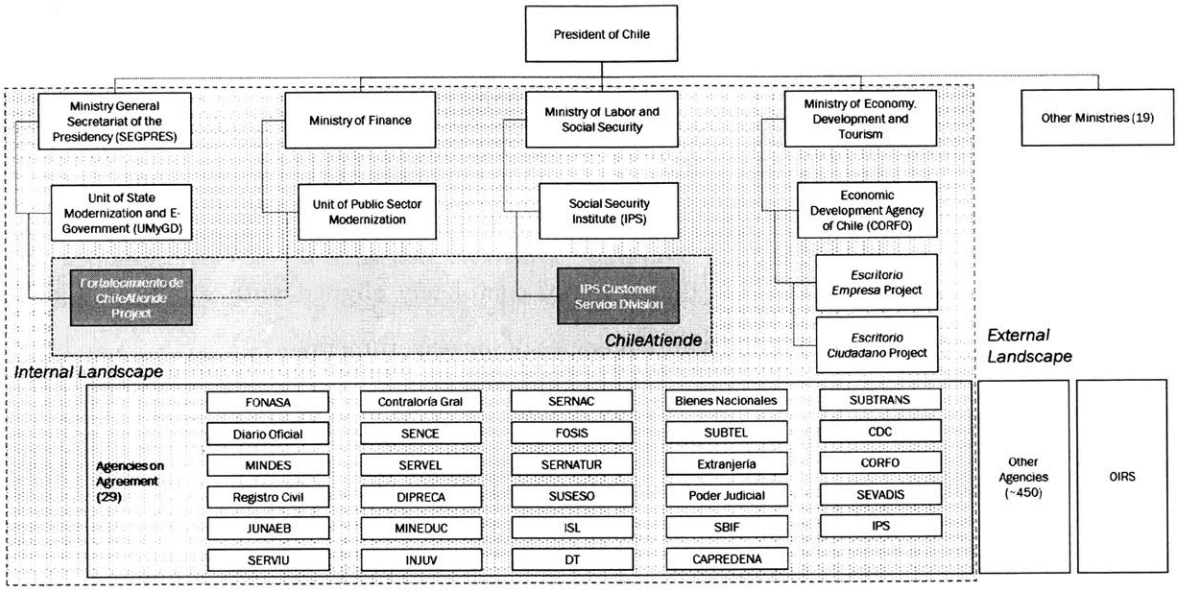


Figure 1: ChileAtiende is inserted under 3 different Ministries, currently having a complicated coordination process

SEGPRES through its Unit of State Modernization and E-Government is currently designated as the controller of the strategic decisions concerning ChileAtiende; nevertheless, it had a dedicated team of only one person in charge of it up until July 2017, who was responsible of formalizing the normative aspects of ChileAtiende and creating awareness on certain areas where decisions have to be made at upper levels of the government organization. The Unit of State Modernization and E-Government (*UMyGD*) was created to lead the transformation on the administrative side of the Government toward a digital administration, embracing the technology revolution and the different opportunities being created because of it. *UMyGD* is, in consequence, the owner of the online channel of ChileAtiende, being in charge of the maintenance of the website, design and improvements in the *look and feel*.

On the Ministry of Finance's side, there is an organization called Unit of Public Sector Modernization, which is both a namesake and a demonstration of the duplication of roles among departments of the government, since the scope of this units is similar and there are unavoidable

overlaps. For ChileAtiende's purposes, this latter unit is leading a project funded together with the Inter-American Development Bank (IBD) to improve the administrative process throughout the different institutions and agencies that belong to the government, implementing digital and other solutions to enhance the operations, service and decision making processes. One of these projects is ChileAtiende, which is part of the "Digital Agenda 2020" launched by the President of Chile. The "Digital Agenda 2020" compromised under its action number 22, the *"strengthen of the ChileAtiende's digital channel, with the goal of simplifying the required transactions to access to the public benefits, implementing and promoting the use of digital channels that produce cost savings for the citizens and the State, making the interaction among them more efficient and effective"* (Gobierno de Chile, 2016). This project has a budget of ~ US 3 million and is expected to be completed by 2018.

The third ministry involved in strategic decisions is the Ministry of Economy, Development and Tourism, which is the owner of the Agenda for Productivity, Innovation and Growth (*APIC*), another set of measures announced by the president. The Economic and Development Agency (*CORFO*), which belongs to the ministry, is in charge of leading two projects that affect ChileAtiende: *Escritorio Empresa* (Business Desk) project and *Escritorio Ciudadano* (Citizen Desk) project. The latter is declared as a joint effort between *CORFO* and *SEGPRES*, and it is currently understood as the project designated to define and design the digital platform for ChileAtiende.

Last but not least, and probably the most important actor in ChileAtiende's functioning is the Institute of Social Security (*IPS*), which belongs to the Ministry of Labor and Social Security. The *IPS*'s Customer Service Division manages the network of branch offices and the call center, having direct contact with the citizens. This network was originally designed to serve in matters of social security only, but from 2012 it has borne additional workload from the new services integrated to its portfolio.

Chapter 3: Literature Review

The present chapter describes suitable theories, frameworks and techniques in the context of the public sector, the enterprise architecting effort, and service management. These three main factors build upon each other to create the unique nature of ChileAtiende and, in consequence, are studied in depth.

3.1. Public Sector Management

There are two important factors that are pressing governments around the globe to improve the way they manage the Public Sector: rising citizens' expectations and budgetary constraints. The former is a very strong trend nowadays, since citizens are more informed thanks to a more accessible media through digital channels. Citizens are more aware of the news, local and national-wide issues and their rights, therefore they are more demanding than ever (Willen, et al., 2014). Also, citizens are taking for granted the availability of services provided by the private sector, such as contact with their bank, telephone or internet provider, et cetera, and they expect a streamlined interaction when dealing with government issues. On the other hand, budgetary constraints are more like a continuous reality, governments are expected to do more with less, putting pressure over budgets and fostering a quest for more efficient processes.

There are many initiatives and best practices that governments can implement and follow to satisfy the citizens' expectations, going from managerial practices in the human resources area to very technical ways to manage projects. As can be seen in Figure 2 below, two out of all these initiatives are of special importance for this work, taking into account that the organization under analysis, ChileAtiende, is the project designed to improve the delivery of public services in Chile. (1) The Digital Government initiative, which is the advancement in the use of Information and Communication Technologies (ICT) in all processes within the government; and (2) the Enhanced Delivery of Public Services –ChileAtiende, which is the way of the government to interact with the population, providing a great deal of benefits, information and other services.

From Figure 2 an important fact can be depicted: ChileAtiende is different than the establishment of a Digital Strategy in the government. ChileAtiende comprehends other areas that cannot be solved only with digital tools, such as all the operations in service that belong to the in-person and phone channels.

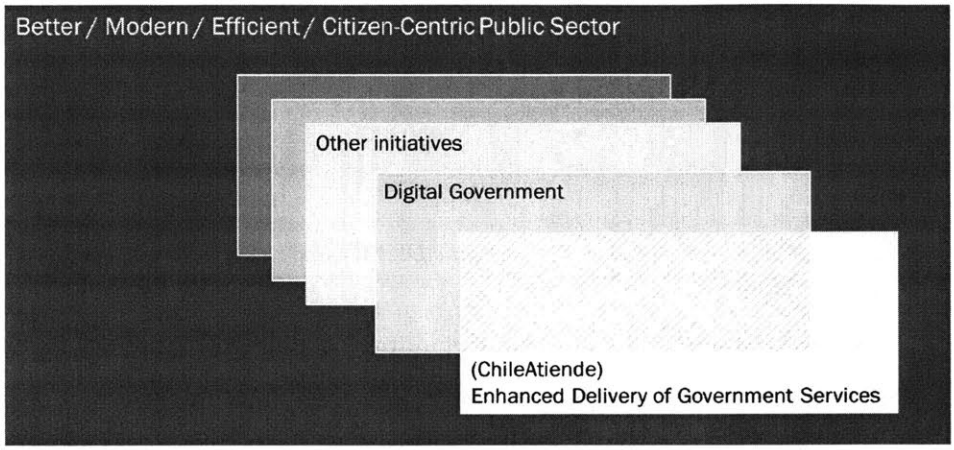


Figure 2: Digital Government and an Enhanced Delivery of Government Services can be seen as initiatives to get a better Public Sector

Nevertheless, ChileAtiende needs a clear digital strategy with a government-wide scope, thus the principles that could lead to a successful Digital strategy would directly benefit ChileAtiende. In the same way, other efforts to improve the general functioning of the public sector in Chile would create benefits for the Digital Government initiative and ChileAtiende, as it is illustrated in Figure 3. On the other hand, improvements in Digital Government and Service Delivery topics, impact positively to the main strategic goal of the government: the well-being of the citizens. This is relevant, since the strategy and the culture of the organization should reflect this goal, and most of the initiatives carried on by the government should contribute toward it.

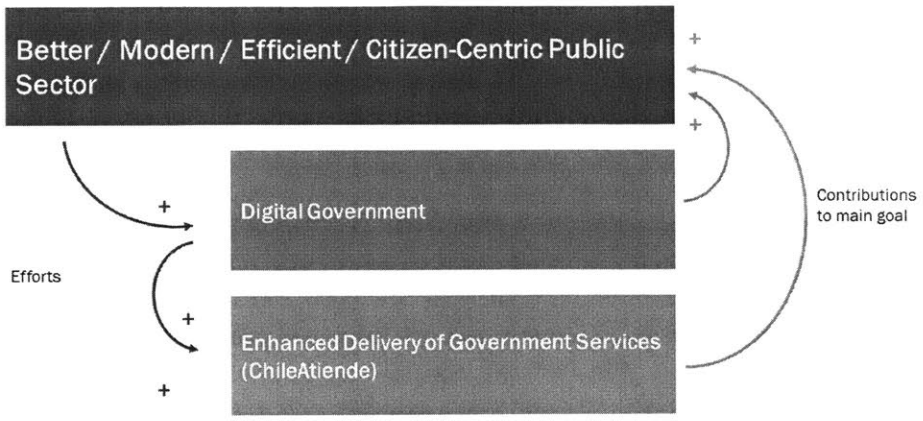


Figure 3: Improvements in Public Sector Management benefit a Digital Government initiative, and this benefits the Delivery of Government Services

This chapter intends to summarize the most important trends in the improvement of the Public Sector, including key concepts, insights and best practices that the top performers are implementing. The focus is on Enhanced Delivery of Government Services, which is the main topic of this research.

3.1.1. A better, modern, efficient, citizen-centric Government

Probably one of the main concerns of governments is to make progress on society's biggest problems and boost the well-being of their citizens. Their concern increases when trying to set priorities given a context of swift technological change, budgetary constraints and the need for transformation and change. Plus, people demand transparency, better services and are scrutinizing financial targets more than ever (Willen, et al., 2014).

A first approach to solve this issue, which is not only simple but also deeply true, is to focus on what citizens want. This is called by the literature a Citizen-Centric approach, which is to keep the citizens at the center stage of any government intervention (Chandra Misra, 2006). Governments can be in different stages of development regarding how citizen-centric they are.

Table 1: Characteristics of different stages governments go through to become citizen centric. In gray probable stages where Chile is. Adapted from (Willen, et al., 2014)

	Citizen neutral	Citizen aware	Citizen motivated	Citizen centric
Strategy	No clearly defined strategy for anticipating citizen needs	Citizen needs acknowledged. Short term strategy, but no long-term vision. Crisis-influenced decision making.	Citizens seen as primary strategic element. Partial link between strategies and objectives.	Citizens at the center of strategy. Clear, consistent link between strategies and objectives.
Organization	No team to manage citizen relationships. No collaboration or information sharing with other organizations. No KPIs to measure service performance.	Limited resources to handle citizen concerns. Limited collaboration and information sharing with other organizations. Some elements of service KPIs measured but not systemically tracked.	Citizen service desk with clearly defined roles. Collaboration and information sharing with other organizations. Consistent tracking of some elements of service KPIs.	Central citizen relationship team across divisions with well-defined roles. Maximum collaboration and information sharing with other organizations. Well defined and disclosed service performance KPIs.
Processes	No processes for receiving and analyzing citizen feedback.	Limited process for receiving and analyzing citizen feedback.	Well defined process for receiving and analyzing feedback reflected on organization effectiveness and efficiency.	Optimized process for receiving and analyzing citizen feedback. Continuous process improvement.
Systems	No use of media, social media, internet or other mechanisms to communicate with citizens.	Limited use of media and internet to communicate with citizens.	Opportunistic use of media, social media and internet, mainly to communicate policies and services (push model).	Systematic use of media, social media and internet to capture feedback (pull model). Integrated tools and systems for real-time communication with citizens.

(Farrel & Goodman, 2013), (Corydon, et al., 2016), (Willen, et al., 2014) provide several insights to enhance the public sector in the current context:

1. **Better evidence for decision making.** This goes in line with doing what matters to citizens, reading data from citizens' feedback, internal processes and make better use of that data (for instance to prioritize initiatives and drive focus of efforts). For this to work, the following related initiatives are necessary:
    - Collecting credible performance data, keep track of Key Performance Indicators.
    - Benchmarking consistently against pairs.
    - Using data to design, improve interventions and prioritize efforts. While it is easy to identify a long list of things that governments want to do, the challenge is often what they are not going to do.
    - Generate big data expertise and to have a data analytics team to deal with big complex problems across government.
2. **Greater engagement and empowerment of citizens.** The trend for involving citizens in decisions and boost participation is creating big opportunities in the modern government. Examples of innovative ways to engage the population are growing. Some of the necessary steps are:
    - Using innovative channels to make services more citizen centric. Australia has at least two great examples:
        - Use of mobile government offices (one-stop-shop for government services for people living in remote areas, similar to the mobile offices "*Oficinas móviles*" that ChileAtiende has).
        - Local governments are using blogs to interact with citizens, explaining issues and then soliciting feedback in a two-way conversation that allows agencies to tailor services to meet citizens' needs.
    - Soliciting citizen input to improve public services.
    - Tapping citizens to help deliver better services at a lower cost.

- A great example is the New York City's Open 311 platform http://www.open311.org/, a citizen report system for different issues (reporting from infrastructure to safety problems and other civic issues).

3. **Talent management, investments in expertise and skill building.** People is always the most important asset of organizations, and in consequence the Government has to invest in the employees to deliver a better service. For instance, although government agencies have started to embrace "lean" principles for process improvement, many are unable to sustain the impact from these initiatives because they haven't been careful about building internal capabilities. Some key initiatives are:
    - Using adult-learning practices to build core capabilities (management skills).
    - Developing specialized capabilities in critical sectors.
    - Acquire and inject new talent earlier into the system, bringing fresh talent from industry into the mid-levels and, in some instances, at more senior levels.
    - Manage performance, create reward systems with monetary and non-monetary incentives.
    - Including data analytics, project management and problem solving methods into the curriculum of the new civil service.
    - Sharpening strategic and risk-management skills.

4. **Closer collaboration with the private and social sectors.**
    - Improving Government's procurement of products and services.
    - Unleashing Government's power as a provider of public goods.
    - Refining Government's role as an economic shaper and integrator.

5. **Keep a balance between agility and stability.** Governments tend to be less agile than private sector since processes are designed to be more stable. Law and decrees have that function. However, agility can be learned. It's also important to note that there is no need to make everything agile. There is this notion of two speeds; there are some things the administration wants to be stable, but the public sector has to learn the agile skill as well.

- There has to be a language around change management and transformation, simplification of processes, operational excellence and continuous improvement. Many institutions are stuck in a historical paradigm that states that it is necessary to improve operations and meet current goals before moving on to more innovative ideas and concepts.
- Design an organizational structure that allows decisions to be made quickly and implemented effectively.
    - The organization structure should meet a country's long-term vision, strategic outlook, customer expectations, and economic dynamics.
    - Avoid setting up multilayered management hierarchies that create excess administrative positions, are inefficient, and delay decisions.
    - A good government's structure has an unobstructed flow of information and clearly defined roles and responsibilities.
    - Resources are allocated to meet citizens' changing needs, and the culture makes room for improvements, especially by listening to and incorporating constructive feedback from citizens.
- Citizen-centric public institutions allocate more flexible, available financial resources to respond to new challenges. In addition, the process of making use of these resources are less complex.

6. **Establish a culture and values.** Every organization has an inherent culture and values. When organizational values coincide with personal values, positive attitudes are generated, as well as work satisfaction, loyalty and improved performance. While senior managers dictate the main strategy of the organization, it is the role of middle managers to interpret the strategy and guide the implementation within their areas of responsibility; which is why this layer is so relevant for the whole purpose of the government.
    - Integrate departments (for instance IT) with the main purposes of the government. There has to be a bigger purpose behind day to day actions to actually drive them through.

There is empirical evidence on a correlation between the agility or effectiveness of public agencies of countries and their competitiveness. World leaders are Denmark, Switzerland, Singapore, Sweden, Australia, Canada, UK, France and the US (Willen, et al., 2014).

The list above is not a comprehensive recipe for success. There are more best practices in the public sector world; however, if these concepts are internalized, the odds for a successful implementation of a Digital Government initiative and an improved delivery of government services increase dramatically.

3.1.2. Digital Government Strategies

Digital Government refers to the use of digital technologies, or Information and Communication Technologies (ICTs), as an integrated part of governments' modernization strategies, to create public value. It relies on a digital government ecosystem comprised of government actors, non-governmental organizations, businesses, citizens' associations and individuals which supports the production of and access to data, services and content through interactions with the government (OECD, 2014).

ICTs can have a substantial impact on government's capacity to effectively design and implement policies, and to be transparent and accountable in delivering outcomes. Not only can they enhance civil servants' productivity, but they can significantly change how governments plan and deliver services; making them more user-driven, convenient to access, and tailored to needs when bringing the users' voice into their design (OECD, 2016).

Nevertheless, implementation of digital technologies in the public sector is not an easy task at all. Compared to the private sector, the public sector must cope with additional management issues, such as multiple agencies, a range of organizational mandates and constituencies, longer appropriations timelines, and the challenge of maintaining strategic continuity even as political administrations change. Digital transformations require changes, to both processes and IT systems, which are more challenging to implement in the public sector than in the private sector (Dilmegani, et al., 2014).

When systems and data are owned by several different functions and departments, it can be difficult to align requirements and functionalities, therefore invest at scale is a challenge. Silos, fragmentation, and the absence of a central owner for government-wide IT infrastructure and common components can make it hard to connect the internal "plumbing" to create a seamless experience for the end user, a government worker, a business user, an average citizen, or another intergovernmental office. It doesn't make the task easier when the complexity of large-scale digital projects requires specialized skills and expertise that come at a high price and are often in short supply. In consequence, many e-government efforts fall short of their promise.

In order to overcome these challenges, OECD published in 2014 a set of recommendations on digital government strategies, which are summarized on Table 2.

Table 2: OECD Recommendation of the Council on Digital Government Strategies. Retrieved from (OECD, 2016)

I. Engage citizens and open up government to maintain public trust.	1. Ensure greater transparency, openness and inclusiveness of government processes and operations.
	2. Encourage engagement and participation of public, private and civil society stakeholders in policy making and public service design and delivery.
	3. Create a data-driven culture in the public sector.
	4. Reflect a risk management approach to addressing digital security and privacy issues, and include the adoption of effective and appropriate security measures.
II. Adopt cohesive approaches to deliver public value throughout government.	5. Secure leadership and political commitment to the strategy.
	6. Ensure coherent use of digital technologies across policy areas and levels of government.
	7. Establish effective organizational and governance frameworks to co-ordinate the implementation of the digital strategy within and across levels of government.
	8. Strengthen international co-operation with other governments.
III. Strengthen government capabilities to ensure returns on IT investments.	9. Develop clear business cases to sustain the funding and focused implementation of digital technologies projects.
	10. Reinforce institutional capacities to manage and monitor projects' implementation.
	11. Procure digital technologies based on assessment of existing assets.
	12. Ensure that general and sector-specific legal and regulatory frameworks allow digital opportunities to be seized.

This approach is not too different from the one proposed by (Dilmegani, et al., 2014), which posits that governments can achieve a successful digitalization of the public sector applying these six best practices:

Table 3: Best practices in Digital Government strategies by (Dilmegani, et al., 2014)

1.	Win government-wide and agency-deep commitment to specific digital targets.
2.	Establish government-wide coordination of IT investments.
3.	Redesign processes with the end user in mind.
4.	Hire and nurture the right talent.
5.	Use big data and analytics to improve decision making
6.	Protect critical infrastructure and confidential data

Main decisions to be made in the design of an Organization for Digital Government

- Governance and organizational structure

One of the most important issues governments have to address is governance (stated as number 7 in Table 2 and reflected in numbers 1 and 2 in Table 3. This is highly relevant, because that structure will define the level of influence, political levers, speed and scope the IT transformations might have within the government.

Governments have to balance how much political capacity, influence, speed and ability to align different stakeholders, with the stability of the figure created. This way, the establishment of the organization responsible for the digital transformation plays a critical role. Depending upon if this organization is created under a law or a decree, and if it is a Unit/Direction, an Agency or part of a Ministry will shape how vulnerable the organization will be to administration changes, and how likely it will be able to align different ministries and other stakeholders.

- Leadership

Another decision to be made is the allocation of a head of digital transformation and define to whom he or she should report to. It seems to be a well-accepted practice the existence of the figure of a Central Government Chief Information Officer (CIO) or equivalent position

(OECD, 2016). In some cases, the CIO's role is complemented by more experimental institutions or units depending on governments' priorities and efforts.

As the leading governing structure for the use of ICT in the public sector, government's CIOs are generally responsible for coordinating strategies, design and implementation, developing standards and supporting online service delivery. However, their traditionally greater focus on efficiency and the internal priorities of the administration lead many governments to put services online without substantial transformation of administrative procedures and processes.

- Coordination mechanisms

It is observed across OECD countries and also in Chile, that governments are still organized around units responsible for the use of technology, often several in different ministries, each of them with distinct responsibilities; and with substantial problems to integrate their work. This is a major challenge in the creation of broad political commitment and ownership; in order to integrate the digital government initiatives into a general public sector reform strategy. Governments need to ensure that their own capacities, norms, structures and risk management models are aligned with their strategic digital government vision, and vice-versa.

Given this scenario, coordination among different stakeholders is key. Some countries have sorted out this issue through strategic committees, with the participation of representatives of different ministries and agencies that need to be involved in the decisions about the digital government. Sometimes these committees take the form of a board of directors that set the strategic goals, priorities, and challenge the budget.

By the same token, the relationship with the Ministry of Finance and how IT budget is expedited is also a source of coordination needs that has to be addressed. Some countries use the figure of a PMO or steering group reporting to the Ministry of Finance.

- Process View

Last, but not least, processes are important in this context because there are two main factors that have to be considered: (1) Processes should be designed thinking about the citizen and not only about the current state of the internal processes. (2) Processes not only have to be digitized, but reengineered, which means that this is an opportunity to simplify and design more streamlined processes, avoiding a translation of current old fashioned processes into digital without giving them further thought. There should be an effort on aligning and dedicating resources to this task, which is far more complicated because it implies not only IT expertise, but a more general and process deep view of the transformation. In consequence, this transformation should aim at a *digital by design* perspective.

Table 4: Summary of decisions to address the governance issue in a digital government initiative

Decisions	**Alternatives**	**Pros**	**Cons**
Organizational Structure	Unit, Office or Direction	Good coordinating capacity, knowledge of political agenda	Vulnerability to the political cycle
	Agency	Higher independence	Fewer political levers
	Ministry or similar	Higher political influence	Vulnerability to the political cycle
Creation mechanism	Law	Higher stability	Rigidity
	Decree	Flexibility to be updated	Vulnerable to changing priorities
Leadership	Existence of CIO figure	Higher coordination and government-wide alignment	Prone to bureaucracy and slower decision making. Focus on IT processes in spite of a broader view
	Nonexistence of CIO figure	Decentralized decision making, higher speed	Coordination more difficult to achieve. Fragmented efforts with lack of a clear strategy and agenda
Coordination mechanisms	Strategic Committee	Coordination and visibility at high level in the organization	Difficult to organize and sustain over time
	Board of Directors	Coordination at high level in the organization. Formal reporting process.	Difficult to set formal responsibilities
	None		Likelihood of lack of strategic alignment

Table 4 (Continued)

Decisions	Alternatives	Pros	Cons
Relationship with Finance Ministry	Central role	Major influence in budgetary issues	Focus on efficiency only, instead of other factors such as citizen satisfaction
	Audit/Control role	Better balance between technology, efficiency and citizen satisfaction	Less control over budget, other pressure factor
Process view	Digitalizing only	Easier to implement	Loss of potential of improvement in user experience
	Process reengineering	Simpler, digital by design processes	More difficult to achieve and coordinate

3.1.3. Delivery of Government Services

Citizens' expectations are rising today regarding more transparent, accessible, and responsive services from the public sector. Government agencies around the world are under internal and external pressures to become more efficient by incorporating digital technologies and processes into their day-to-day operations.

Best practices

(Dudley, et al., 2015) frame the best practices in the matter as a set of four main ideas, which are required in order to implement transformation efforts that aim to increase citizen satisfaction and reduce costs:

1. **Measuring Citizen Satisfaction**
    - Let citizens tell the government what matters most, but without asking them directly.
    - Identify natural break points in customer satisfaction: Striving for zero wait times and one-click transactions across the entirety of government services is likely to prove both unrealistic and costly. Government leaders can find a balance between delivering high-quality, responsive services and managing resources effectively by using citizen-satisfaction metrics to determine acceptable service levels.

- Combine public feedback with internal data to uncover hidden pain points.

2. Getting a detailed understanding of the entire citizen journey

Government agencies that skillfully manage the end-to-end journey report higher levels of citizen satisfaction. This means considering the entire citizen journey, from the time the person begins looking for the agency that is best suited to meet a need until the task is completed.

- Identify the journeys that matter most to citizens.
- Develop a map of how citizens experience those journeys.
- Identify the internal processes that shape those journeys.

3. Translating improvement opportunities into front- and back-end solutions

Typically, improvement initiatives fall into one of three categories: managing demand better by preventing journeys that are unnecessary in the first place, cutting out duplicative steps along necessary citizen journeys, and improving the availability, usability, and accessibility of information. Features and actions with positive results are listed below:

- Proactive notifications and status updates.
- Improved functionality of self-serve channels.
- Polite, professional, and consistent communication.
- Improve back-office operations. Speed, simplicity, and efficiency—factors largely driven by the back office— are often the most powerful drivers of citizen satisfaction.
- Single database.
- Protect citizen's and government's critical information and confidential data.

4. Thinking Long Term

In the case of citizen-satisfaction transformations, government leaders can use a citizen-centric approach to design performance management and governance systems, so they can continue to drive—and sustain—improvements.

- Measure and manage performance: Metrics and performance management are in many ways a means to an end—the ultimate goal is to promote continuous improvement. Citizen-care forums can help. These forums consist of small, cross-functional teams of employees who review decisions that affect the public.
- Build the right governance system: Policy governance focuses on top-line metrics and monitors overall quality of service to design and maintain a unified, positive citizen experience. Operational governance tracks citizen satisfaction and metrics at the channel and journey levels and encourages improvements by designing and carrying out customer-care initiatives at a process level.

Agile development

Agencies have been trying to streamline and automate workflows and processes using antiquated systems-development approaches. This also prevents IT organizations from quickly adapting to ever-changing systems requirements or easily combining information from disparate systems. Despite the emergence, over the past decade, of a number of productivity-enhancing technologies, many government institutions continue to adhere to old, familiar ways of developing new processes and systems.

A few agencies, however, have been able to change mind-sets internally, shed outdated approaches to developing new processes and systems, and build new ones. Additionally, they have embraced newer techniques such as agile development and have succeeded in accelerating the digital transformation in core areas of their operations (Lundqvist & Braad, 2016).

In IT development, there are two major methodologies to manage projects: waterfall and agile. Whereas waterfall has been the more regular approach, agile has been gaining adepts lately. The waterfall method is so named because a plot of its steps resembles a series of waterfalls, from requirements gathering to process analysis to coding, and so on. The development team cannot proceed to the next step until it has completed the previous one. On the other hand, the agile approach involves a methodology in which requirements and solutions evolve through the collaborative effort of self-organizing cross functional teams (Collier, 2011). This approach proved to be much more effective than the waterfall method. Emphasizing customer needs, for instance,

has given project-team members from the business and IT sides clearer priorities and a common vocabulary. Successful implementations such as the one carried out in Denmark have followed this approach, with excellent results.

Critical elements to adopt an agile methodology in the digitalization of public services are listed by (Lundqvist & Braad, 2016) as follows:

Table 5: Critical aspects of an agile approach

1. A customer-centric focus
2. Strong Governance and swift decision making
3. A flexible IT architecture
4. A clear systems-development road map
5. An agile organization and processes
6. Outsourcing development to multiple partners
7. A culture of trust

Other relevant idea mentioned by several authors is the need for a single database for this implementation (Lundqvist & Braad, 2016), (Willen, et al., 2014). This eliminates the requirement that the agency's people manually reenter information from one database to the next, which is an extremely inefficient and even annoying issue for civil servants and citizens.

3.1.4. Successful cases

United Kingdom

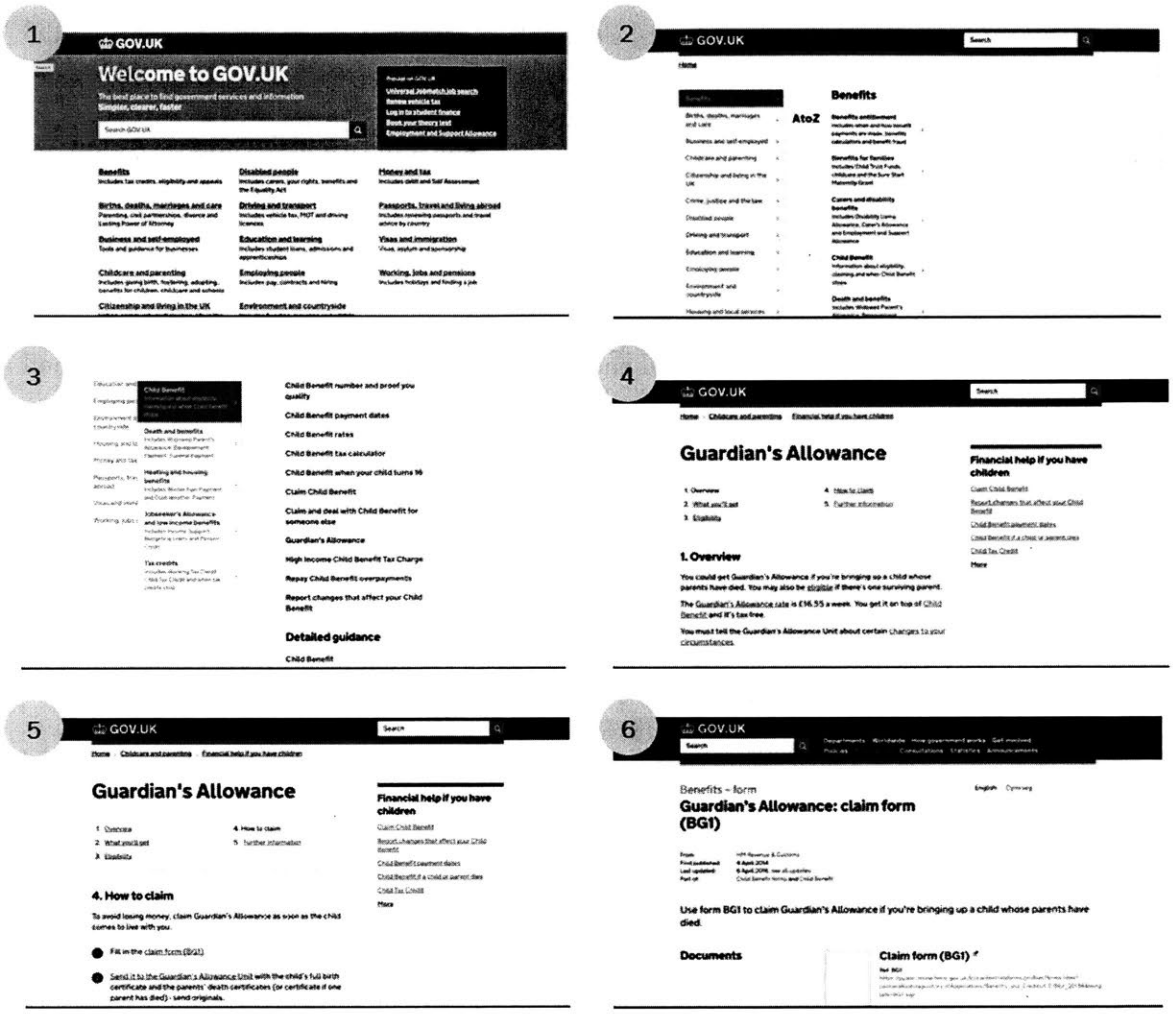
The United Kingdom's https://www.gov.uk/ site serves as a one-stop information hub for all government departments. Launched in 2012 with a budget of £1.7 million, it marked the creation of one of the most accessible digital-government services in the world and current Nº1 service by the World e-Government Ranking of the UN (United Nations, 2016).

- Its success in providing citizens, businesses, and government users with accurate, streamlined, and comprehensive services is the result of strong central leadership and implementation provided by the UK's Government Digital Service.
- This unit of the government's Cabinet Office was charged with overseeing the country's digital strategy and implementing the transformation of its service provisioning to what it described as *digital by default*.
- gov.uk saved £42 million in government spending within a year of its launch. In October 2013, it had, for the first time, two million visits in one day.

Table 6: Summary of United Kingdom's service delivery initiative

Name	**Gov.uk**
Launched	2012
Organization	15 categories, sorted alphabetically
Categories	Benefits; Births, deaths, marriages and care; Business and self-employed; Childcare and parenting; Citizenship and living in the UK; Crime, justice and the law; Disabled people; Driving and transport; Education and learning; Employing people; Environment and countryside; Housing and local services; Money and tax; Passports, travel and living abroad; Visas and immigration; Working, jobs and pensions.
Ability to complete procedures online	Yes
Availability of statistics	Yes. Volume of transactions and costs.
Institutions, agencies and other organizations involved (Fully integrated / Being moved to / Separate website)	25/0/0 ministerial departments, 8/0/13 non-ministerial departments, 167/10/198 Agencies and other public bodies, 77/0/1 High profile groups, 1/0/9 Public Corporations, 0/0/3 Developed Administrations. Fully integrated: 278 / Being moved to: 10 / Separate Website: 224 Total 512 Institutions
Services	802
Transactions	2.4 billion / year

Figure 4: Sequence of screens to apply to a child guardian's allowance in gov.uk[1]



The UK site is well organized, easy to navigate and the user remains in the website to apply for a benefit. Numbers 1, 2 and 3 show how the benefits are organized by categories; while numbers 4, 5 and 6 show how the benefit is displayed in the website.

[1] Source: https://www.gov.uk/

Denmark

The Danish portal http://www.borger.dk/ is the online site that citizens can use to access the public sector and its e-government services. It was developed by all levels of government (central, regions and municipal). The project was developed in two major stages: from 2006 to 2008 it focused on information and answers to typical questions from the citizens. From 2008, it focused on a more advanced experience including digital signatures to access to personalized services (OECD e-Government Studies, 2009).

- Denmark designed a cyber-secure digital entity for each citizen. Danish can access an email account provided by the government where they receive all their communications with the government, and it is also an account to interact with it through the website in the section "My Page".
- To better coordinate large-scale IT projects across the government and generate cost efficiencies, Denmark established IT Projektraad, a digitization council reporting to the Ministry of Finance, to act as its central IT steering group.
- This project was developed under an agile approach.

Table 7: Summary of Denmark's service delivery initiative

Name	**Borger.dk**
Launched	2007
Organization	18 categories, sorted non-alphabetically
Categories	Family and Children; School and Education; Health and Disease; Elderly; Disabilities; Work, unemployment benefits and vacations; Economy and Tax; Pension and early retirement; Housing and relocation; Environment and Energy; Transportation, traffic and travel; Danes abroad; Foreigners in Denmark; Society and rights; Police, judiciary and defense; Culture and leisure; Internet and security; Digital post
Ability to complete procedures online	Yes
Availability of statistics	Yes. Volume of transactions and timings.
Institutions, agencies and other organizations involved	116
Services	278
Transactions	~8.1 million / year

3.2. Organizational Design and Enterprise Architecting

Organizational Design and Enterprise Architecting are different approaches with very distinctive features. The objective of this segment is to depict these two approaches and understand the different applications where one can be more suitable than the other.

3.2.1. Organizational Design

Organization design is the deliberate process of configuring structures, processes, reward systems, and people practices to create an effective organization capable of achieving the business strategy (Kates & Galbraith, 2007).

Jay Lorsch defines the goals of the organizational design decisions as follows (Lorsch, 1975):

1. To create an organization design that provides a permanent setting in which managers can influence individuals to do their particular jobs.
2. To achieve a pattern of collaborative effort among individual employees, which is necessary for successful operations.
3. To create an organization that is cost-effective

Lorsch also states that the characteristics of organizations are contingent on the nature of the environment in which they operate, the tasks that members must perform to achieve the organization's strategy and the psychological characteristics of the members. This is known as the Contingency Approach.

Henry Mintzberg declares that effective organizations achieve a coherence among their component parts and they do not change one element without considering the consequences to all the others (Mintzberg, 1981). He proposes that organizations are composed of five basic elements: Strategic Apex, Middle Line, Operating Core, Techno-structure and Support Staff; and that organizations differ given the alternative arrangements of these elements, creating five main configurations: The Simple Structure, Machine Bureaucracy, Professional Bureaucracy, Divisionalized Form and Adhocracy.

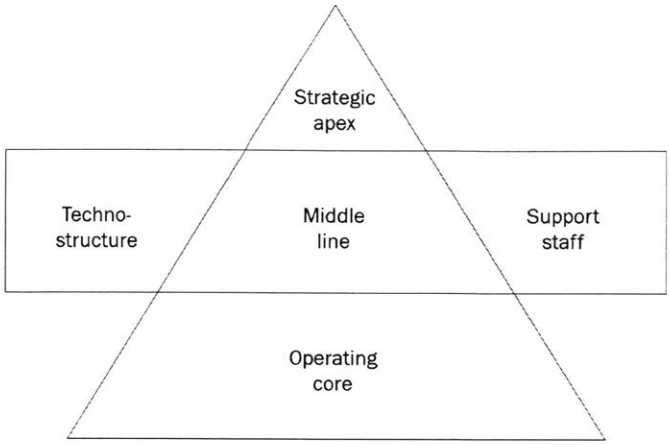


Figure 5: The five parts of the organization (Mintzberg, 1981)

Kates and Galbraith also describe six components of the organizational design through their Star Model: Strategy, Capabilities, Structure, Processes, Rewards and People.

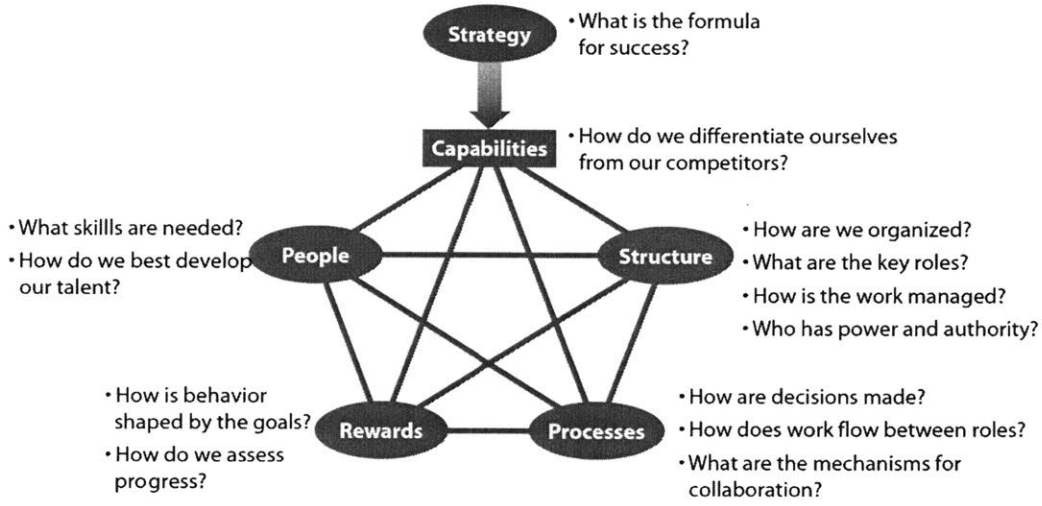


Figure 6: Star Model (Kates & Galbraith, 2007)

The classic textbook approach of organization design is described by Johnson, Scholes and Whittington. They state that the fast-moving, knowledge-intensive world raises two issues for organizations: 1) A static concept of formal structure is less and less appropriate and 2) Organizations are constantly having to reorganize themselves in response to changing conditions (Johnson, et al., 2008). They also argue that formal structures and processes need to be aligned with informal processes and relationships into coherent configurations; and the organization's

configuration consists of the structures, processes and relationships through which the organization operates. The main configurations are Functional, Multidivisional, Matrix, Transnational and Project; but in reality, few organizations adopt a structure that is just like one of the pure structural types (Johnson, et al., 2008).

3.2.2. Enterprise Architecting

Architecting is the act of creating a blueprint for the enterprise to follow in order to achieve its desired vision of the future, which involves the generation of options, the evaluation of those options and the selection of the future architecture, before the enterprise change commences (Nightingale & Rhodes, 2015). This process is supported by the three main roles of the systems architect (Crawley, et al., 2016):

1) Define the boundaries, goals and functions of the system.
2) Create the concept.
3) Manage complexity by choosing a decomposition of the system.

The ARIES Framework

Developed by Donna Rhodes and Deborah Nightingale, the ARIES framework focuses on effectively exploring the enterprise's possible alternative futures, weighting these options, and methodologically selecting the architecture to be the basis for the transformation. It consists of:

1) The Enterprise Element Model, which represent ten unique lenses for looking at the enterprise (shown in Figure 7).
    i. Ecosystem: The external regulatory, political, economic, market, and societal environment in which the enterprise operates.
    ii. Stakeholders: Individuals and groups who contribute to, benefit form, and/or are affected by the enterprise.
    iii. Strategy: The strategic vision, associated business model, goals and performance management system.
    iv. Information: Information the enterprise requires to perform its mission and operate effectively in accordance with its strategy.

v. Infrastructure: Systems, information and communication technology, and physical facilities that enable enterprise performance.

vi. Products: Products the enterprise acquires, markets, develops, manufactures or distributes to stakeholders.

vii. Services: Offerings derived from enterprise knowledge, expertise and competencies that deliver value to stakeholders.

viii. Process: Key leadership, lifecycle, and enabling processes by which the enterprise carries out its mission and creates value.

ix. Organization: Culture, organizational structure and underlying social network of the enterprise.

x. Knowledge: Competencies, expertise and intellectual property resident in the enterprise.

2) The Architecting Process Model, composed by seven activities (shown in Figure 7).

3) A set of selected techniques

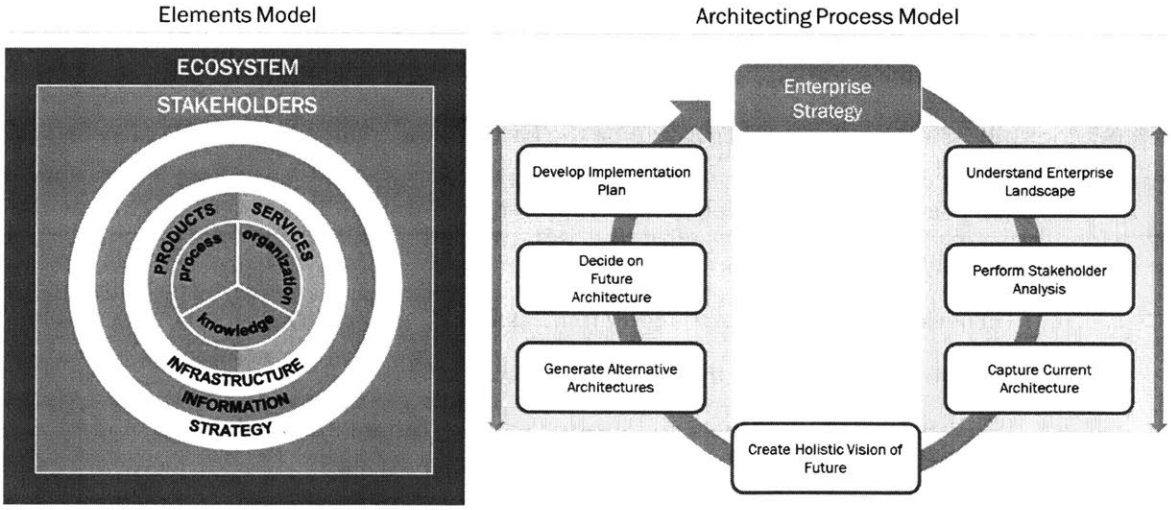


Figure 7: Elements model and Architecting process model from the ARIES framework[2]

The ARIES framework is a powerful methodology to guide the architecting process; however, it becomes more insightful when is complemented with other frameworks that go deeper into the

[2] (Nightingale & Rhodes, 2015)

nature of the enterprise architecture itself. There are four major Enterprise-Architecture methodologies, mainly developed in the context of IT enterprises (Sessions, 2007):

1) The Zachman Framework for Enterprise Architectures
2) The Open Group Architectural Framework (TOGAF)
3) The Federal Enterprise Architecture
4) The Gartner Methodology

The first two methodologies are described below, being the most relevant for the current analysis.

The Zachman Framework for enterprise architectures

It is a two dimensional classification scheme for descriptive representations of an enterprise (Zachman, 1987). The first dimension is described as six artifacts that answer the what, how, where, who, when and why of the project (also named in the enterprise-specific context as data, function, network, people, time and motivation, respectively). The second dimension is described as six different perspectives: planner, owner, designer, builder, subcontractor and enterprise (also named in the enterprise-specific context as scope, business model, system model, technology model, detailed representations and functioning enterprise, respectively). These two dimensions are typically represented in a 6x6 grid.

The value of this framework is that it is supposed to deliver a comprehensive representation of the architecture if all its cells are completed. The cells vary in the detail level required, thus it is not intended to be a one-pager; but it still provides a good approach for decomposing methodologically the different layers of the architecture.

The disadvantages of the Zachman framework (and the reason why it is blended with the ARIES framework and others throughout this study) are that it does not provide a process to achieve a specific architecture, and furthermore, it does not deliver insights on how to choose one architecture over another. In consequence, it is a great description tool that can be used jointly with other approaches.

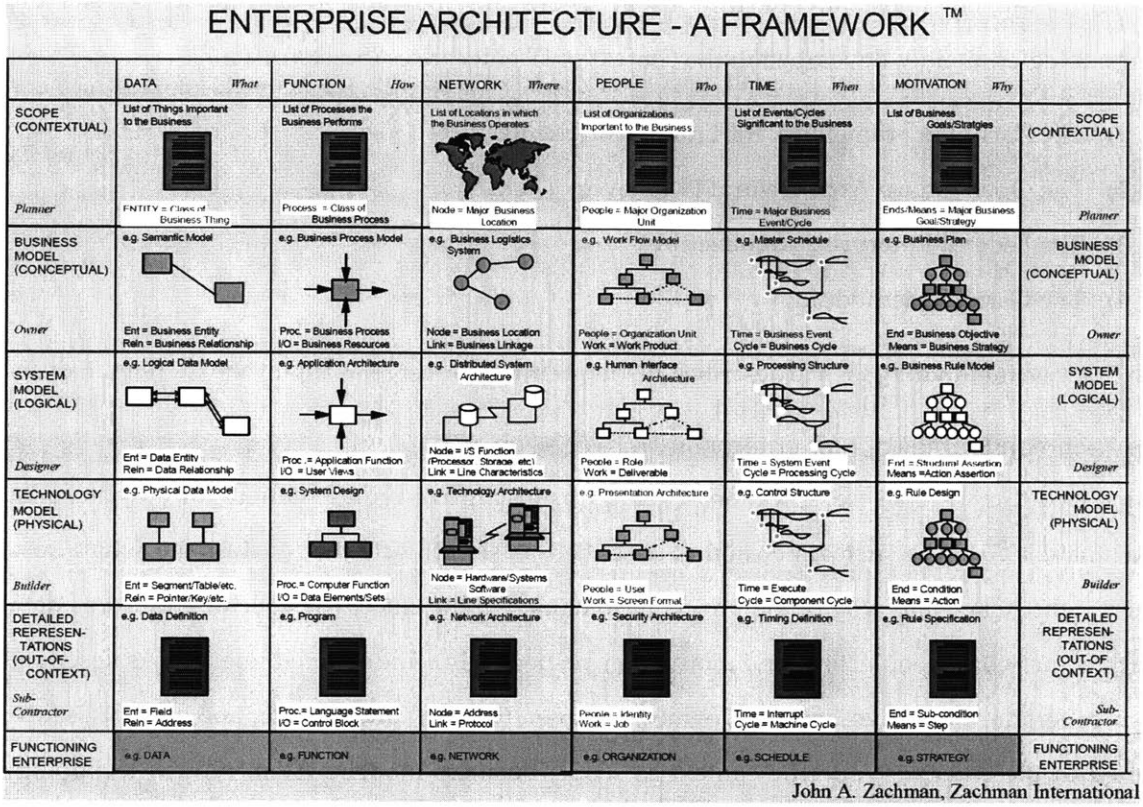


Figure 8: The Zachman Enterprise Architecture Framework (Zachman, 1987)

The Open Group Architecture Framework (TOGAF)

The TOGAF framework, owned by The Open Group, divides the enterprise architecture into four categories (The Open Group, 2011)

1) Business Architecture: defines the business strategy, governance, organization, and key business processes.
2) Application Architecture: provides a blueprint for the individual applications to be deployed, their interactions, and their relationships to the core business processes of the organization.
3) Data Architecture: describes the structure of an organization's logical and physical data assets and data management resources.
4) Technical Architecture: describes the logical software and hardware capabilities that are required to support the deployment of business, data, and application services.

TOGAF also provides a process for developing architectures, somehow similar to the ARIES framework. It called Architecture Development Method (ADM) and has the following nine phases:

- Preliminary Phase. Describes the preparation and initiation activities required to create an architecture capability.
- Architecture Vision. Describes the initial phase of an architecture development cycle. It includes information about the scope of the architecture development initiative, identifying the stakeholders, creating the Architecture Vision, and obtaining approval to proceed with the architecture development.
- Business Architecture. Describes the development of a Business Architecture to support the agreed Architecture Vision.
- Information Systems Architectures. Describes the development of Information Systems Architectures to support the agreed Architecture Vision.
- Technology Architecture. Describes the development of the Technology Architecture to support the agreed Architecture Vision.
- Opportunities & Solutions. Represent an initial implementation plan and the identification of delivery vehicles for the architecture defined in the previous phases.
- Migration Planning. Addresses how to move from the Baseline to the Target Architectures by finalizing a detailed Implementation and Migration Plan.
- Implementation Governance. Provides an architectural oversight of the implementation.
- Architecture Change Management. Establishes procedures for managing change to the new architecture.
- Requirements Management. Examines the process of managing architecture requirements throughout the ADM.

The value of the TOGAF framework is that is well known in the industry, its documentation is extensive and it is flexible for working with other frameworks, specifically in the areas related to Portfolio, Program and Project Management, Solution Development and Operations Management.

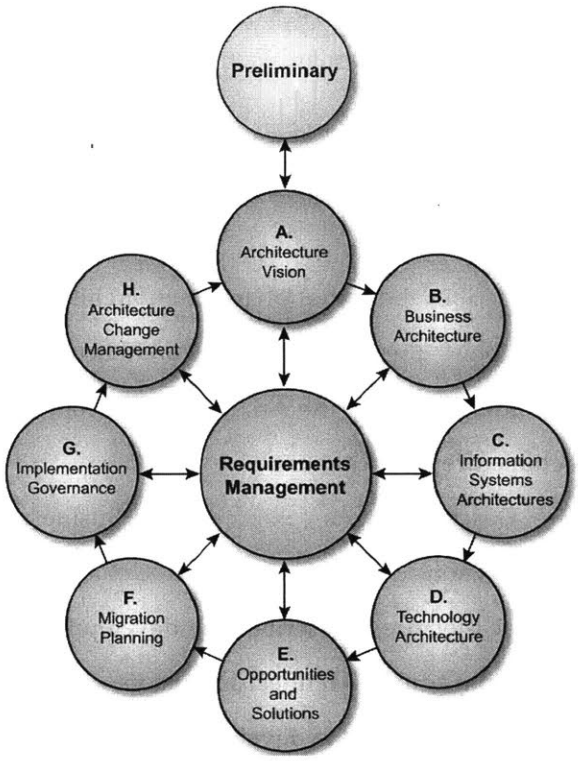


Figure 9: Architecture Development Model, within the TOGAF framework (The Open Group, 2011)

3.3. Service Management

Products and services are different, but sometimes the difference is subtle since many products are not sold or delivered alone, but accompanied by some facilitating service. However, there are several distinctive characteristics of service operations (Fitzsimmons & Fitzsimmons, 2008):

- Participation: The customer participates in the service process.
- Simultaneity: Services are created and consumed simultaneously.
- Perishability: Since services cannot be stored, are lost forever when not used.
- Intangibility: Services are ideas and concepts, contrary to products, which are things.
- Heterogeneity: Services vary from customer to customer because of their intangible nature and the participation of the customer in the process.

The Service Package is defined as a bundle of goods and services with information that is provided in some environment. It is composed by the supporting facility, facilitating goods, Information, explicit services and implicit services.

Services can be grouped by using the service process matrix, which classifies services across two dimensions that significantly affect the character of the delivery service process: degree of labor intensity and degree of interaction and customization (Schmenner, 1986).

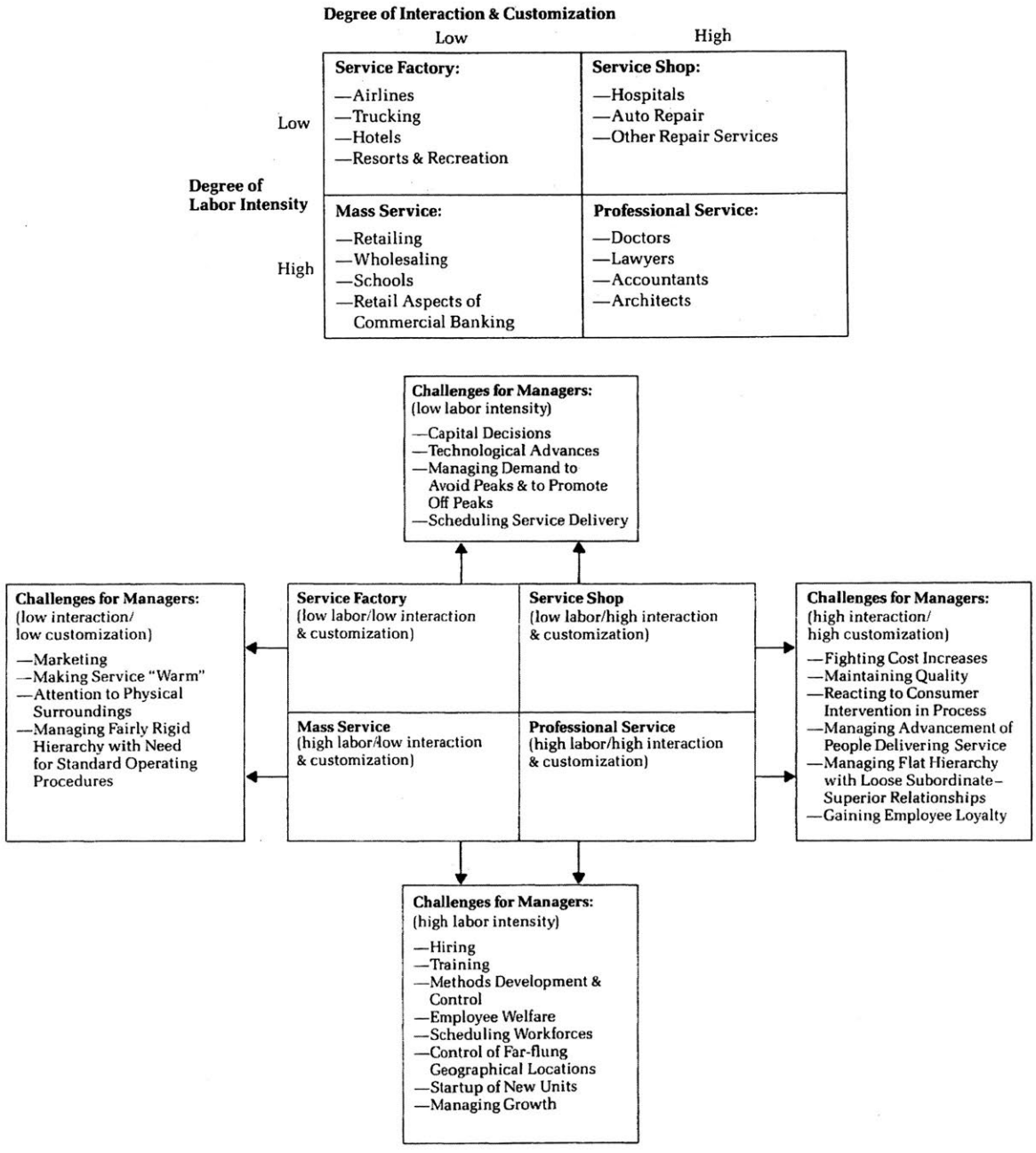


Figure 10: The service process matrix and challenges for service managers (Schmenner, 1986)

The service process matrix allows to better understand ChileAtiende. Since ChileAtiende delivers services that are fairly rigid, very low customization is required; and in addition, the service is currently delivered by a large team of employees. Therefore, it is clear that ChileAtiende is classified in the third quadrant as a mass service.

The value of understanding this is that the issues faced for any of the groups above are similar within the category; therefore, best practices can be found in industries different from the public sector in the case of ChileAtiende. It would be worth looking at what the retail or commercial banking industries have been doing when making efforts to grow and cover greater geographic areas, or when they have been required to improve the services or decrease their operating costs.

By the same token, there are well-studied approaches in terms of Service System Design. The generic approaches are as follows:

1) Production line approach: Attempts to translate successful manufacturing concepts into the service sector, applying the following features:
   - Limited discretionary action of personnel
   - Division of Labor
   - Substitution of Technology for People
   - Service Standardization
2) Customer as a co-producer: Attempts to take advantage of the participation of the customer in the process. It applies techniques such as:
   - Self service
   - Smoothing service demand (using appointments and reservations)
   - Customer generated content
3) Customer contact approach
   - Degree of customer contact
   - Separation of high and low contact operations (back office vs front office)
4) Information Empowerment: Aims at taking advantage of Information Technologies (IT)
   - Employee empowerment
   - Customer empowerment

Figure 11 shows the relationship between the type of service designed, costs of delivery and the skills required from the customer and the employees, in a sales context. The same logic can be applied for ChileAtiende, and it can be seen from Figure 11 that the more protagonist the customer becomes, the lower are the costs for the organization delivering the service. If ChileAtiende is looking for efficiency, the right path would be to target greater customer participation and a higher technological development.

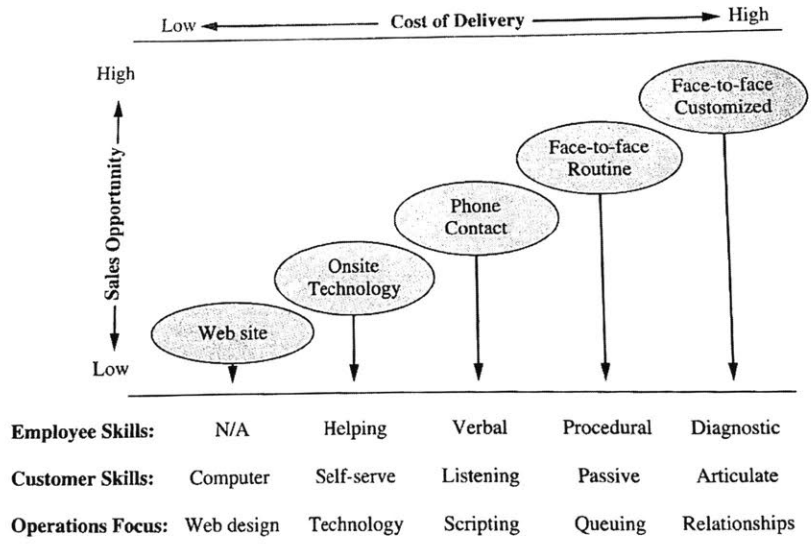


Figure 11: Sales Opportunity and Service Design (Fitzsimmons & Fitzsimmons, 2008)

The Information and Technology Infrastructure (ITIL)

It offers a systematic approach to the delivery of quality IT services, developed in the 1980s and 1990s by the Office of Government Commerce (OCG) under contract to the UK Government (de Jong, et al., 2008). ITIL is also a certification that provides training to professionals interested in the application of this knowledge to the industry.

ITIL treates service management from a lifecycle perspective, which consists of five well-explained phases:

1) Service Strategy
2) Service Design
3) Service Transition

4) Service Operation

5) Continual Service Improvement

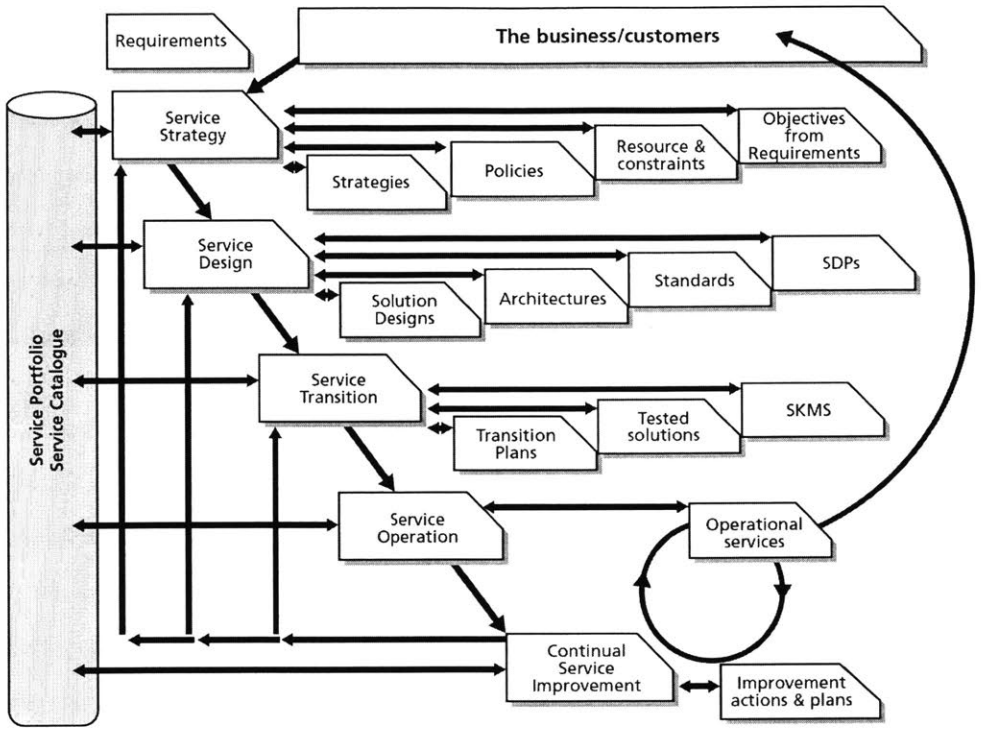


Figure 12: The most important relationships, inputs and outputs of the Service Design[3]

This framework is interesting because is similar in the concepts to the ARIES framework or the TOGAF framework, having a path from a current state to a future, desired state. Nevertheless, its value is in the applicability to service organizations with a strong IT orientation.

3.4. Complexity Management

According to (Crawley, et al., 2016), a system is complex if it has many interrelated, interconnected or interwoven entities and relationships. It is fair to notice the difference between systems that are complicated and systems that are complex. Complicated systems are those so large or detailed that no single individual can fully understand how they work (Sinha, 2014).

[3] (de Jong, et al., 2008)

Complex, on the other hand, often means that interactions between the parts of the system can result in unexpected behaviors that are difficult to anticipate (Sturtevant, 2013).

Complexity can be measured (Sinha, 2014) and also can be managed. Systems Engineering is based on complexity management techniques (decomposition, hierarchies, logical relationships, et cetera). Other fields such as System Dynamics, Graph Theory and Optimization Methods such as Linear Programming can also help reduce and control the complexity of the organizations.

3.4.1. System Dynamics

System Dynamics is a field of study, developed at MIT by Jay Forrester and currently led by John Sterman. The methodology is thoroughly explained in his book Business Dynamics (Sterman, 2000), and it is based on the concept of dynamic complexity. According to Sterman, dynamic complexity arises because:

- Systems are dynamic
- Systems are tightly coupled
- Systems are governed by feedback
- Systems are nonlinear
- Systems are history-dependent
- Systems are adaptive and counterintuitive
- Systems are policy resistant and are characterized by trade offs

The basic components of system dynamic models are:

- Variables and links
- Feedback loops: Capture and communicate sources and implications of interactions among connected variables, and feedback within a system.
- Stocks and flows: Differentiate the elements that define the state of the system (stocks) from those that define the rate of change of system states (flows).
- Delays: Recognize the lag between actions and their consequences elsewhere in the system.

The value of Systems Dynamics is its ability to represent and model complex non–linear relationships, which are present in the ChileAtiende project. It is relevant also as a tool for understanding the system and communicating the analysis performed.

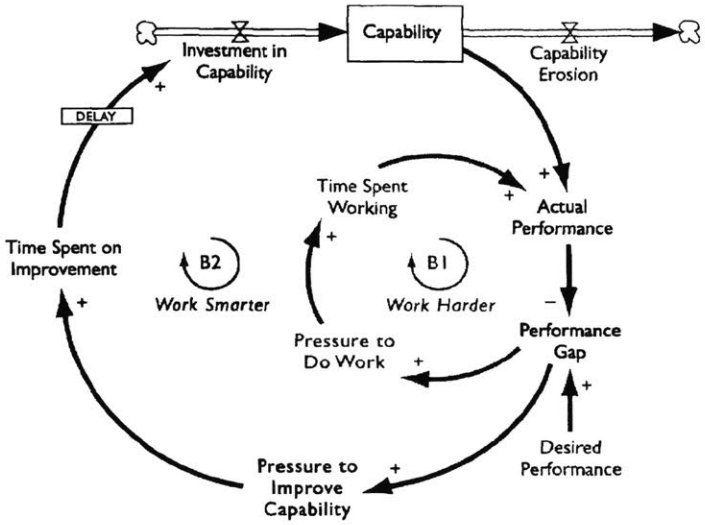


Figure 13: Simple Systems Dynamics model[4]

3.4.2. Network Theory

De Weck, Roos and Magee state in their Engineering Systems book (de Weck, et al., 2011) that there has been an evolution in engineering, going from products to systems. They cite examples such as the invention of the telephone in the late 1800s and the development of a whole communication network today, composed of not only ground lines but cell phones, VOIP and satellite communications. The same idea can be elaborated with the invention of the automobile as an isolated product, and the current state of transportation systems, including highways, traffic rules, and more recently self-driving cars. This idea of engineering more and more dedicated to solve systemic issues has demanded for tools to analyze these systems, and Network Theory is one of them. Melanie Mitchells argues that network theory had not been seen as a field by itself; mathematicians studied abstract networks structures in Graph Theory, neuroscientists studied

[4] Extracted from N. Repenning and J. Sterman, "Nobody Ever Gets Credit for Fixing Problems that Never Happened", *California Management Review*, Vol. 43, No. 4, 2001, p.68

neural networks, sociologists studied social networks and airline managers studied transportation networks for optimizing profits, to name a few. All these groups worked independently, generally unaware of one another's research (Mitchell, 2009). Just after the publication of papers such as "Collective Dynamics of Small World Networks" by Duncan Watts and Steven Strogatz, and the "Emergence of Scaling in Random Networks" by Albert-Lázló Barabási and Réka Albert, the scientific community became excited about the field and advancements came faster.

In Graph Theory, a graph (concept that can be used interchangeably with the concept of network, although a graph is more related to the abstract mathematical models) is a pair of sets (V, E) where V is the set of vertices and E is the set of edges, formed by pair of vertices (Ruohonen, 2013).

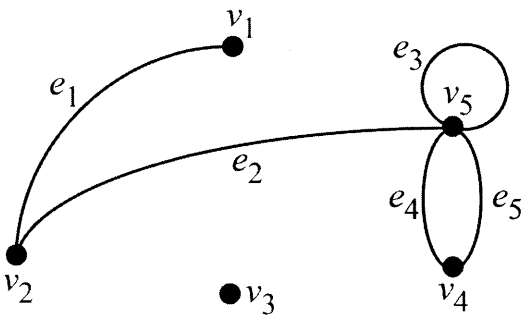


Figure 14: Simple Graph

The terminology in Graph Theory is as follows (Ruohonen, 2013), (Hoppe, 2008):

1) The two vertices u and v are end vertices of the edge (u, v).
2) Edges that have the same end vertices are parallel.
3) An edge of the form (v, v) is a loop.
4) A graph is simple if it has no parallel edges or loops.
5) A graph with no edges (i.e. E is empty) is empty.
6) A graph with no vertices (i.e. V and E are empty) is a null graph.
7) A graph with only one vertex is trivial.
8) Edges are adjacent if they share a common end vertex.
9) Two vertices u and v are adjacent if they are connected by an edge, in other words, (u, v)

is an edge.

10) The degree of the vertex v, written as d(v), is the number of edges with v as an end vertex. By convention, loops are counted twice and parallel edges contribute separately.
11) A pendant vertex is a vertex whose degree is 1.
12) An edge that has a pendant vertex as an end vertex is a pendant edge.
13) An isolated vertex is a vertex whose degree is 0.
14) Graphs can be undirected (unordered pairs of nodes) or directed (the two directions are counted as being distinct).
15) The neighborhood of a vertex v in a graph is the set of vertices adjacent to v.
16) The degree of a vertex is the total number of vertices adjacent to the vertex. It is denoted deg(v).
17) In a directed graph, indegree is the number of head endpoints – arrowheads – of the vertex, and the outdegree is the number of tail endpoints of the vertex.
18) The density of a graph G = (V, E) measures how many edges are in set E compared to the maximum possible number of edges between vertices in set V.
19) The average degree of a graph G is another measure of how many edges are in set E compared to number of vertices in set V.
20) A path in a graph represents a way to get from an origin to a destination by traversing edges in the graph.
21) A directed path is a path in a directed graph where the directions of edges in the path match the directions of edges in the directed graph.
22) The length of a path is the number of edges that it uses.
23) The distance d(x, y) between two vertices x and y is the length of the shortest path from x to y, considering all possible paths in G from x to y.

3.4.3. Linear programming

The term "programming" have been used from 1940 to describe the planning or scheduling of activities within large organizations. These problems are composed by *variables* – level or amount of a product / activity whose value wants to be determined, *constraints* – the restrictions inherent in the planning or scheduling problem, and an *objective*, a function of the variables, such as cost

or production, that can be used to decide if a solution is better than another. The term mathematical programming is used to describe the maximization or minimization of an objective function of many variables, subject to constraints on the variables (Fourer, et al., 2003). Linear programming is a case of mathematical programming, where the objective function and constraints are linear (Sallan, et al., 2015).

The linear programming formulation can be expressed in matrix form as follows (cap bold letters represent matrices and cap small bold letters represent column vectors):

$$\text{MAX } z = c'x$$

$$\text{s. t. } Ax \leq b$$

$$x \geq 0$$

The formulation of linear programming states implicitly that variables are real numbers. However, for some models it may be required that all decisions variables are integer. If that is the case, an integer linear programming (ILP) is created. In other occasions, only a subset of the decision variables is required to be integer: that is an instance of mixed integer linear programming (MILP). A special case of integer variables are binary variables, integer variables that can take only 0 and 1 values. Through binary variables, decision-making processes can be modeled and logical constraints can be introduced.

This type of mathematical programming problems can be solved nowadays by a large number of solver packages (glpk, LpSolve, AMPL, CPLEX, MINOS, CLP, Gurobi and many others). Solvers can deal with problems as big as a few millions of variables and / or constraints, being CPLEX the fastest (Sandia National Laboratories, 2013).

The possibility to use these models and the availability of software is an opportunity for ChileAtiende, given the nature of its portfolio and the clear interconnections among the products and agencies of the network. Examples in the industry of similar approaches can be found, such as the portfolio rationalization project carried on by Hewlett Packard, that allowed them manage the complexity of their too-wide product offering by using Operations Research tools (Ward, et al., 2010).

Chapter 4: ChileAtiende Landscape, Stakeholder Analysis and Current Enterprise

4.1 ChileAtiende's Landscape

In order to correctly understand ChileAtiende's functioning and interactions within a larger system, it is indispensable to look at the influences the organization receives from its ecosystem and from the actors in the internal landscape. These influences are strongly defined by the dynamics generated in the governmental setting ChileAtiende is inserted in, thus it is important to analyze these factors in detail since they shape the history of the organization and its possibilities of change and improve.

Following the directions of the ARIES framework, the landscape of the organization is divided into the Ecosystem or External Landscape, and the Internal Landscape, recognizing differences in the degree of influence ChileAtiende might have over the different actors and forces belonging to one side or the other.

The main actors related to ChileAtiende are shown in Figure 1, where these are classified in three different groups:

- ChileAtiende: Those entities that can be seen as the internal components of ChileAtiende.
- Internal Landscape: Those entities that can be seen as important influencers to ChileAtiende and those that can be influenced in a certain degree by ChileAtiende.
- External Landscape: Those actors that are considered out of ChileAtiende's scope of influence, but have influence in ChileAtiende.

4.1.1. Ecosystem (External Landscape)

The main forces and influences over ChileAtiende are named briefly in Table 8 separated into six main categories, being by far politics, regulations and technology the most important ones.

Table 8: Main influences from the Ecosystem over ChileAtiende

Ecosystem Factor	Main influences and conditions
Politics	• Political cycles change priorities, resources and people leading projects. Knowledge is sometimes lost in these transitions. • Political circumstances the country might be facing can change priorities and relative importance of the project to ministries, delegates and other decision makers. • Multiple agendas (Digital Agenda 2020, APIC) and multiple responsible actors belonging to different leaderships accountable for progress of these programs, which translates in coordination issues.
Regulation	• Regulation has a huge impact in the government setting. Agencies and institutions are recognized if there are laws or norms that establish the institution, providing stability. In the case of ChileAtiende, there is no law or norm that formalize the creation of the institution, being currently very fragile to the priorities of the current government. • Speed of approval of norms and laws is very low. There is no certainty on that ChileAtiende is going to be formalized by the end of the current presidential period ending in 2018.
Economy	• Changes in macroeconomics might shape changes in priorities and the budget assigned to the project. • A low growth period is foreseen during the rest of 2016 and 2017.
Market	• Difficulty to find consultants with experience in the public sector, therefore several studies requested have brought low quality recommendations. • IT suppliers tend to deliver good results. • Strong acceleration in the access to internet in population, including low income people; although it is not always translated in actual use of digital platforms as interaction medium with the government.
Technology	• Improved internet speed and suppliers of internet applications. • High penetration of mobile devices. • Different levels of technology adoption across institutions.
Resource	• Availability of budget due to the participation of the Digital Agenda 2020 and the Agenda for Productivity, Innovation and Growth.

As it can be seen in the table above, politics has an important influence in the way on what ChileAtiende moves, since the decision making process and the information flows are determined by the dynamics of the government. The great variety of stakeholders involved and the participation of four different ministries definitely produce an impact on the velocity of the initiatives defined.

Other important factor not mentioned in the table is history. ChileAtiende has several previous attempts as a concentrator of the transactions between the government and the citizens. Older initiatives such as "*Trámite Fácil*" in late 90's, "*ChileClic*" and "*Chile sin Papeleo*" in early 2000's were conceptually very similar to what ChileAtiende is today. It is necessary to recall that ChileAtiende was launched under the administration of the former president of Chile; and in spite of being in operation since 2012, was never formalized under any law due to the rejection of the bill initialized in 2013 that proposed the creation of the "*Servicio Nacional de Atención Ciudadana, ChileAtiende*" (Piñera, 2013), after the discontent mainly of IPS employees. The last point is relevant, because this lack of constitution under regulatory terms brings a great deal of instability and fragility in terms of its institutional structure and governance.

Technology is relevant to ChileAtiende for several reasons. First, the success of this organization depends on the level of integration achieved among the 29 institutions that have an agreement with ChileAtiende, and the more than 400 institutions that are potential additional clients of the services of ChileAtiende as a one-stop-shop. Then, the level of adoption of information technologies is relevant: the presence of databases, websites, digitalization of processes and other information systems define the speed at which additional institutions can be added to the network. The technological adoption is very different across the institutions, creating complexity on the management process. In second place, there is the issue of the adoption of technology, particularly of the internet by the final users, the citizens. In Chile 70% of the population have internet access (Subsecretería de Telecomunicaciones, Gobierno de Chile, 2015), therefore, there is a great potential to serve a big sector of the population via digital channels. Although one of the concerns is the actual behavior of the people regarding the internet; which is currently being used largely for purposes different than formalities, such as entertaining, information, and communication.

4.1.2. Internal Landscape

Thus far, the main elements of the external landscape and the main reasons for a change in ChileAtiende have been analyzed. What is still missing is the internal landscape, looking into the current operations of the organization and the internal dynamics that govern the functioning of

it. Then, the next stage in the diagnose is to analyze some internal elements in ChileAtiende: Identity, Ideology and Core Values and the Enterprise Capabilities.

Identity

As it has been stated before, ChileAtiende is not an enterprise by itself. It is led under the strategic view of the Unit of State Modernization and E-Government (*UMyGD*) and operated by the Institute of Social Security (*IPS*). Therefore, the identity of ChileAtiende is highly determined by the identities of these two actors.

In the first place, *UMyGD* is a relatively new –created in 2011– and small group of people; whose mission is the coordination, orientation and support the various ministries and public agencies to improve their administrative processes through the strategic use of ICTs. Their vision is to reach a state more trustworthy, inclusive, participative and open; to interact with the society in a proactive, friendly and efficient way, with the aim of creating wellbeing and equity conditions (Ministerio Secretaría General de la Presidencia, 2016). This is a strong technical team of professionals –mainly engineers and lawyers– focused on the implementation of technologies and streamlined processes on different institutions of the Government. They have several projects going on at the same time, with different levels of priority, although there is a dedicated person for ChileAtiende leading the coordination efforts of the ChileAtiende project to be started this year. There are also non-dedicated resources that do all the ChileAtiende website maintenance, in coordination with the Contents group at *IPS*.

On the other hand, the *IPS* is the agency in charge of the administration of the pensions system in Chile, being an older agency with nation-wide coverage, and composed of more than 2,500 people. Its mission is the contribution to the social security of the state, managing the pensions system, distribution regimes and reparatory laws, and also paying social benefits dictated by law and/or agreed with the institute. Their mission statement also talks about operational excellence, serving the citizens in a relationship of trust and making the exercise of the public rights and obligations of universal access. Thus, the *IPS* is highly service-oriented, being awarded with the Service Excellence prize –which is given to the three best governmental institutions of the year in terms of service quality– during the 10 previous years to the addition of ChileAtiende to its

pipeline of services (Sotomayor, et al., 2014). *IPS* has not been able to win this prize again after this. Under this scenario, it is worth mentioning that *IPS'* employees were one of the main opponents to the idea of creating ChileAtiende under a law, taking over the administration of the network of branch offices and call center from *IPS*. They also showed disagreement with the step taken toward the offer of "integrated" services in the front offices whereas the services were not integrated in the back office, given the unfeasibility to meet citizens' expectations and provide a good service; and also because of the additional workload and training they had to go through.

Core values

As the public mainly interact with the *IPS'* staff, their values are probably the most important in ChileAtiende operations and its interaction with other institutions of the state. The values at *IPS* are listed below:

- Excellence and merit: Show high performance standards in our operations, performing in a responsible and committed way.
- Transparency: Act in the right way when performing our job, delivering timely and high quality information to our internal and external customers, strengthening the exercise of probity, effectiveness and trust.
- Equity and no-discrimination: Deliver a fair and egalitarian treatment, sustained in respect, transparency and dignity of all the people; based on merit and objective facts and regardless variables such as socioeconomic status, gender, ethnicity, sexual orientation and disabilities.
- Collaboration and Respect: Contribute in a collective and constructive way to the strategic objectives of the IPS, through respect, reciprocal support and participation, divergence of ideas and inputs from people of different backgrounds.
- Sense of duty: Keep a trustworthy and empathic treatment towards our customers, focusing on understanding their needs and solve them in a timely and efficient manner.
- Flexibility: Show openness and disposition to adapting to the challenges of the environment, modifying the behaviors and attitude to face new experiences and respond to the new challenges for the institution.

IPS is openly recognized as an institution that delivers an excellent service, with personnel highly qualified and with strong service spirit. It is clear that the majority of these values above have to remain unchanged; although the integration of the digital channel adds the need for a digital and technology oriented focus to bring the required efficiency in the processes and integration with the rest of the agencies belonging the state.

Enterprise capabilities

The current situation evokes and organization that deliver a good service through the "in-person" channel, which is highly appreciated by the customers; and at the same time has made a lot of progress in the information provided to the citizens through the website, which currently delivers information on more than 2,500 different formalities in interaction between society and the Government. Nevertheless, this is still far away from the desired future state: a single window for all the interactions that society might have with their government. No wrong doors, no long queues, no derivations from one office to the other. Instead, processes available online, with a friendly interface, and traceability throughout the process regardless the preference channel; being equally feasible to complete a procedure in a branch office, the call center or from home via the internet.

For this to be possible, some enterprise capabilities are a must. In the table below there are the most important capabilities for a successful implementation of the ChileAtiende project, including the standard definition (Nightingale & Rhodes, 2015), (de Weck, et al., 2011) in this context and what actually means in the specific context of ChileAtiende:

Table 9: Most important enterprise capabilities for ChileAtiende

Capability	Standard Definition	Specific definition in ChileAtiende context
Evolvability	Capacity of an enterprise to transform by leveraging successful features of the current architecture	Being able to adapt and embrace the technological changes Chile is undergoing. Both ChileAtiende's processes have to evolve towards a digital model, whereas its organization evolves from the current model to a new structure that allows a better service delivery.

Table 9 (continued)

Capability	Standard Definition	Specific definition in ChileAtiende context
Flexibility	Ability to change into different configurations that allow the system to perform multiple functions	The organization, their people and the supporting processes have to be flexible enough to serve their customers through any of the channels available. Continuation of service from one channel to another have to be possible.
Interoperability	System that can function independently in their own right but can also work together as a larger whole, even if they are owned and operated by different entities and were not designed originally to work together	ChileAtiende would concentrate services from many different institutions and agencies, which have to operate integrated and also be able to operate independently. The definition of the service, their updates and improvements have to come from the specific owner agency. The adoption of these changes have to be possible rapidly through systems integration and data sharing.
Replicability	Ability to reproduce enterprise entities (e.g., products/services, business units) effectively to create or sustain value delivery	The service quality, responses and outcomes have to be similar, maintaining certain level of standardization.
Resilience	Ability of an enterprise to cope effectively with changing circumstances and recover from disruptive events	The external conditions and specific situations might create disruptions in the service delivery (random phenomena, accidents, intentional disruptions) which have to be taken to the very minimum to ensure the continuity of business.
Responsiveness	Ability to respond in a timely and effective way to emergent stakeholders need, threats and opportunities	The service have to be respond rapidly to changes, updates in the services, peaks in demand and new needs from the citizens.
Scalability	Ability to expand or contract the enterprise to meet the changing circumstances in order to sustain value delivery	Probably the most important fact today for ChileAtiende. It has to ensure it can manage new services from institutions and agencies which do not have an agreement with ChileAtiende yet, still delivering a good quality service and being a good place to work.
Sustainability	Capacity of an enterprise to endure over time as related to environmental, economic, and/or social dimensions	Finally ensure the regulatory aspects of the organizational structure and governance are formalized under the law, so that ChileAtiende does not suffer from instability or fragility because of regime changes.

4.2. Stakeholder Analysis

ChileAtiende project, whose task is to define and design the legal figure of the organization, their dependences, organizational structure, scope and responsibilities; is a highly complex socio-technical project given the large quantity of stakeholders involved in the decision making process and entities that have a stake in the development of it.

The stakeholder analysis performed is composed of a descriptive approach followed by a quantitative analysis to prioritize these stakeholders. The first step taken in the process of understanding the relationships and the relative importance of these stakeholders, is the creation of a list of stakeholders and a brief description of them. Then, a Stakeholder Value Network (SVN) is built, which is transformed into a Design Structure Matrix to quantify the value flows under a *benefit / supply importance* framework. The result is a ranking of stakeholders given the value exchanges, taking into account not only the direct value exchanges between the project and the stakeholders, but also considering indirect exchanges that flow into the project as value loops.

Table 10 below shows the most important stakeholders present in the immediate environment on which the project interacts. The first row, ChileAtiende Project Team, represents the focal organization. The descriptions of the stakeholders are written in the context of the project and focused on the specific function they perform on this issue, and do not necessary represent the overall description of the entity.

Table 10: List of Stakeholders for ChileAtiende project and their descriptions

Stakeholder	**Description / Function**
ChileAtiende Project Team	Technical Team to develop ChileAtiende Digital as one of the initiatives of the "Agenda Digital 2020". They are currently in charge of maintenance of ChileAtiende website.
Citizens (Natural Persons)	End users of the services provided through ChileAtiende.
Coordination Committee ChileAtiende	Committee that took over decision making responsibilities in regards to ChileAtiende. Meets sporadically.
Citizen Desk Project	Project which will develop part of the digital platform on which ChileAtiende Digital will be based.
IPS Customer Service Division	Operator of ChileAtiende for the "In-person" and Call Center channels.
IPS Leadership Team	Owners of ChileAtiende's operational network.

Table 10 (continued)

Stakeholder	Description / Function
Public Institutions / Agencies	All the public institutions and agencies of the government that are able to provide their services to the public through ChileAtiende.
SEGPRES Leadership Team	Accountable for the ChileAtiende Digital initiative at the strategic level.
State Modernization (Ministry of Finance)	Accountable for the progress of the project funded with BID and the budget.
Unit of State Modernization and e-Government (*UMyGD*)	Accountable for the ChileAtiende Digital initiative at the tactical level. Hierarchically depends on *SEGPRES* Leadership Team.
Ministry of Finance Leadership	Accountable for the bundle of projects of State Modernization at the strategic level.
Ministry of Labor and Social Security Leadership	Accountable for the correct functioning of *IPS* and the delivery of their core responsibilities in social security matters.
OIRS	Network of independent offices that deliver information and gather requests, claims and suggestions from citizens in regards to their public agency or institution.
IDB	Funded part of the project.
Enterprises	End users of the services provided by the Public Institutions through Business Desk.
Clave Única Project	Project whose mission is to bring access to the citizens to interact with the government through digital channels with a unique user in several platforms.
Consulting Firms	Suppliers of technical studies and recommendations.
Business Desk Project	Project which is developing a digital platform to perform formalities for companies through digital channels in an integrated manner.
IT Service Providers	Suppliers of technical solutions in ICTs.
Ministry of Economy, Development and Tourism	Accountable for the initiatives owned by *CORFO*.
CORFO Leadership Team	Accountable for *Escritorio Empresas* and *Escritorio Ciudadano* projects. Hierarchically depends on the Ministry of Economy, Development and Tourism.
Biblioredes, Inforedes and Telecentros	A secondary network of available points (public libraries and other public offices) to add access to digital channels free of charge to the poorer part of the population.
Government Lab	Agency of the government in charge of the design of new procedures, process improvements and studies to enhance the operation of public institutions.
OECD	Supplier of knowledge and experience of countries that have faced similar problems as a way to do benchmarking.
Congress	Supplier of regulatory approval and stability through a law that creates ChileAtiende formally.

4.2.1. Stakeholder salience framework applied to ChileAtiende

After identifying the relevant stakeholders of the case, it is important to understand the type of relationship these stakeholders have with the ChileAtiende project. The framework developed by (Mitchell, et al., 1997) for stakeholder salience will be used to classify the stakeholders into categories that shed light upon the degree of attention, dedication and effort the organization should devote in order to cultivate a beneficial relationship to fulfill the objectives of the project.

Salience is the degree to which managers give priority to competing stakeholder claims, and this factor depends on basically three attributes: Power, Legitimacy and Urgency (Mitchell, et al., 1997). The combinations of presence of these attributes on the stakeholders determine seven different classes of stakeholders, which can be organized in three groups of increasing level of relevance: Latent (possess only one out of the three attributes), Expectant (possess two out of three attributes) and Definitive (possess all three attributes).

For the ChileAtiende project, the classification of the stakeholders on the list in Table 10 is decided as shown in Figure 15 below. The most relevant stakeholders given their high salience are: Citizens, *IPS* Customer Service Team, State Modernization (Ministry of Finance), the Unit of State Modernization and e-Government (*UMyGD*) and the *SEGPRES* Leadership Team. These stakeholders represent the Definitive Stakeholders group for the ChileAtiende Project; therefore, managers should have a clear and immediate mandate to attend and give priority to them. These stakeholders stand out by having:

- Power to get ChileAtiende to do / implement actions that would not otherwise done.
- Legitimate claims, that are accepted and desired under an agreed view.
- Urgent claims, such as a better service (citizens), better work conditions (*IPS* Customer Service Team), efficient use of resources (State Modernization), actual improvements in operations (*SEGPRES* Leadership, *UMyGD*).

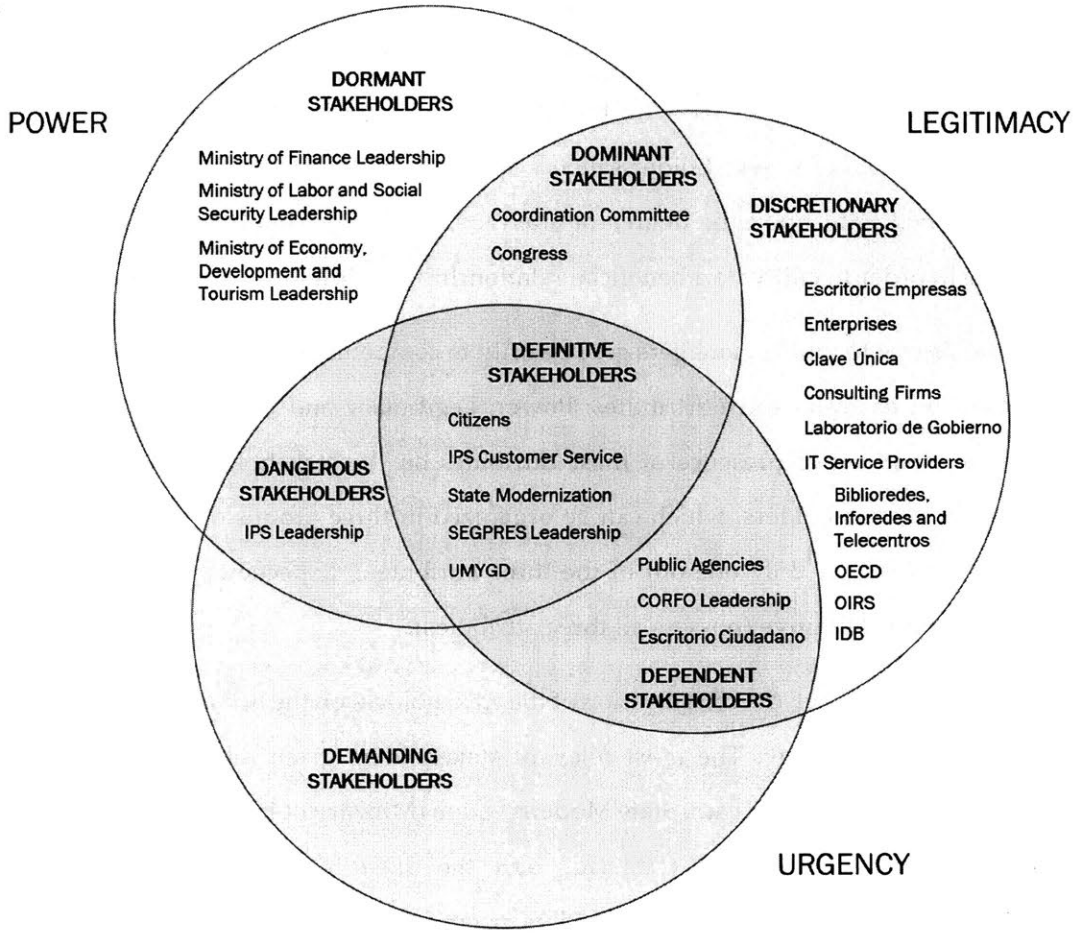


Figure 15: Stakeholder Salience for ChileAtiende Project

The second group of interest is the Dominant Stakeholders, comprised of the Coordination Committee and the Congress. They possess the Power and Legitimacy attributes, and in consequence they should have a formal mechanism in place that acknowledges the importance of the relationship with ChileAtiende. The Congress is thought of this way because of the importance that a law that formalizes the existence of ChileAtiende as a Public Agency; hence, there must be a formal way to interact with them. In the case of the Coordination Committee, it is relevant because the integration of the different entities related to the project is absolutely imperative.

The third important group of stakeholders are the Dependent Stakeholders, who possess legitimate and urgent claims. This group consists of all the Public Agencies that are feasible to

integrate to the ChileAtiende network (or are already integrated), the *CORFO* Leadership, and its project Business Desk. As they lack of power to impose their will to ChileAtiende, they will likely look for guardianship of other stakeholders, such as the Ministries' Leadership of their respective chain of command. Strong coordination is recommended since their claims are mostly valid, and they should be taken into account.

The fourth and last group of medium-high relevance is the *IPS* Leadership, which under this classification is a Dangerous Stakeholder. This means that their claims on the project are urgent, not necessarily legitimate (in the strict sense of the overall picture instead of a local optimum for *IPS*) and they have power over the organization, since they control the operations of two out of the three channels. The relationship has to be carefully cultivated, informing constantly and negotiating with them whenever an action anticipates an unfavorable situation for them.

The rest of the stakeholders continue to be relevant, but they are Latent Stakeholders. The framework being used for this analysis states that the attributes of the stakeholders are not static, but dynamic. This means that even though in certain stage of the project or under specific conditions the relevance of these stakeholders is relatively low, under other conditions or in other stage they might have a higher salience.

4.2.2. Stakeholder Value Network

Based on the list of stakeholders shown above and the main value exchanges discovered after several interviews with personnel involved in the project, a Stakeholder Value Network (SVN) is created; showing direct and indirect value flows for the project. The indirect relationships are very important for the focal organization to appropriately estimate the power of its stakeholders and grasp the opportunity to influence them in an indirect manner (Feng, et al., 2010).

In Figure 16 the SVN of the project shows four different value exchanges: Political, Financial, Goods and Services, and Information. Wider arrows represent more important relationships and dashed-lines represent relationships that should occur but currently are poorly developed.

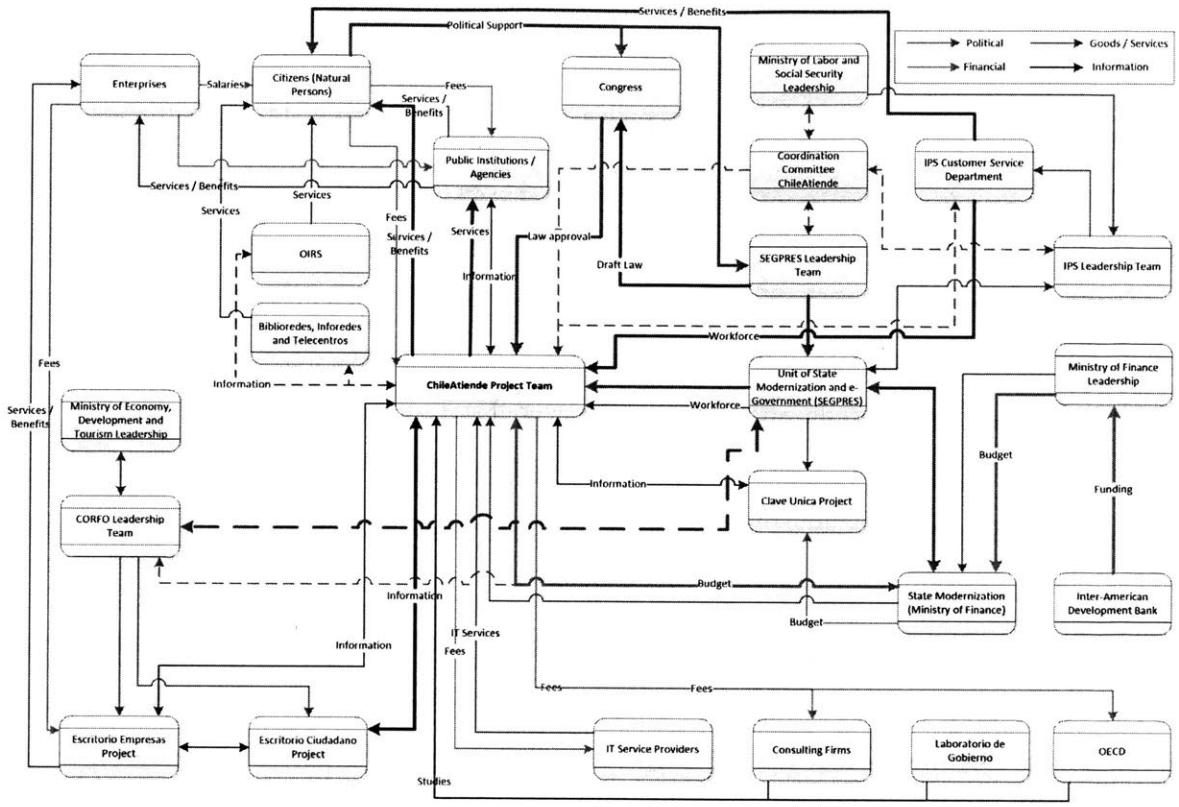


Figure 16: Stakeholder Value Network (SVN) for the ChileAtiende project

The crowdedness of the SVN indicates at a certain degree the complexity of the project in terms of relationships that have to be developed and cultivated. One interesting fact that can be seen by a simple exploration is that there are several "loops" or "cycles"; value exchanges that go from the ChileAtiende project, pass through other stakeholders, and go back to ChileAtiende in the same or in a different way. For instance in Figure 17, the loop generated from the delivery of services and benefits from ChileAtiende to the citizens, goes back to ChileAtiende through the following path: Satisfied citizens show their political support toward the Government, represented by *SEGPRES*. They can draft the law that set the creation of ChileAtiende as a public Agency/Service, which has to be approved by the Congress. This simple path shows the relevance of understanding the value cycles, in order to manage the important indirect relationships in a more effective way.

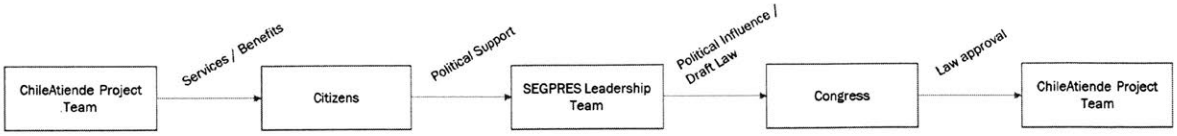


Figure 17: A value cycle can be tracked following indirect relationships

A quantitative approach to prioritize stakeholders

Once the Stakeholder Value Network is complete, the next desired step is the understanding of the relative importance of the stakeholders and, even more important, discover those that are the top priority for the organization. One approach to quantify and rank the stakeholders of the project is the one developed by (Feng, et al., 2013), where the stakeholder map is converted into a quantitative model, through scoring value flows by the perceived utility of the recipient stakeholders and defining a propagation rule to calculate scores of different value paths and cycles.

Each value exchange in the SVN was assigned a numeric score according to the satisfaction level perceived by the stakeholder who receives the benefits from that value flow; following the classification of the matrix shown in Figure 18. This matrix shows the demand and the supply side of the relationship, measuring in a non-linear scale the intensity of the benefit perceived and in a linear scale the criticality of the supplier who delivers that benefit (Cameron, 2016).

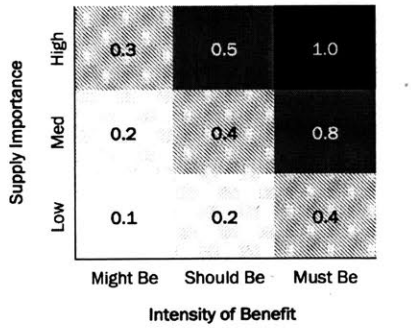


Figure 18: Matrix to evaluate value flows under a Benefit / Supply Importance framework[5].

[5] *Adapted from Cameron, 2016*

Each of the 70 different value exchanges received a classification in these two dimensions, following the criteria above. As an example, the value flows arriving in the ChileAtiende project in the SVN are shown in Table 11 below.

Table 11: Classification of value flows towards ChileAtiende project

To Stakeholder	Value Flow	From Stakeholder	Benefit	Supply Importance	Weigh of Flow
ChileAtiende Project Team	Fees	Citizens	1	1	0.1
	Information (Data Sharing)	Public Institutions	3	3	1
	Law Approval	Congress	3	3	1
	Politic / Technical Influence	Coordination Committee ChileAtiende	2	2	0.4
	Politic / Technical Influence	*IPS* Customer Service Division	2	2	0.4
	Workforce	*IPS* Customer Service Division	2	3	0.5
	Politic / Technical Influence	Unit of State Modernization and e-Government	3	3	1
	Workforce	Unit of State Modernization and e-Government	3	3	1
	Information (Data Sharing)	Clave Única Project	2	3	0.5
	Budget	State Modernization	3	2	0.8
	Politic / Technical Influence	State Modernization	2	2	0.4
	IT Services	IT Service Providers	3	1	0.4
	Studies	Consulting Firms	1	1	0.1
	Studies	Government Lab	1	1	0.1
	Studies	OECD	2	2	0.4
	Information (Data Sharing)	Citizen Desk Project	3	3	1
	Information (Data Sharing)	Business Desk Project	2	3	0.5
	Information (Data Sharing)	*Biblioredes, Inforedes and Telecentros*	2	3	0.5
	Information (Data Sharing)	*OIRS*	2	3	0.5

Doing the same with the other 24 stakeholders present in the SVN, plus the undirected network graph of it, it is possible to find all the cycles in the network using Matlab®; which have different lengths. In the case of this specific network evaluated as an undirected network obtained from an its adjacency matrix, the network has 25 nodes (stakeholders) and 40 edges (undirected value flows). This produces 4,037 different value cycles (see Figure 19 below), going from length 3 to 17.

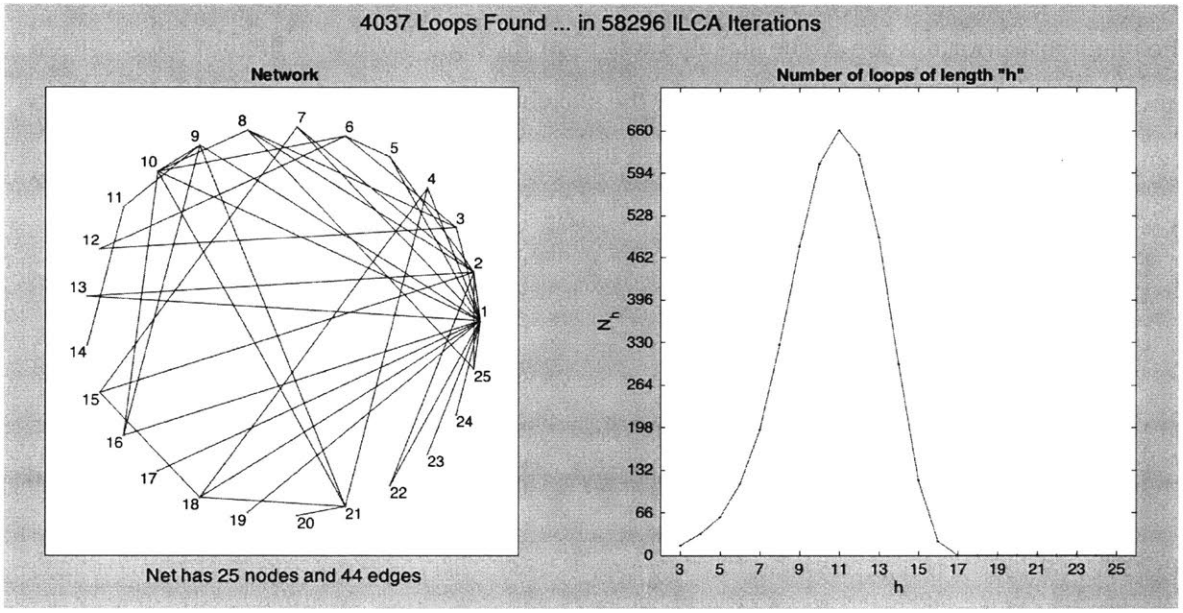


Figure 19: The SVN described produced 4,037 different loops

Then, the loops that start and finish in the project are validated as a sub conjunct of total number of loops. For this value network, this is a subset of 35 valid value cycles that start and finish in ChileAtiende project (node 1 in the network above). Finally, given the direction of the value flows, these are assigned their respective value under the classification above [0,1], and the value of the cycle is evaluated as the multiplication of the value flows in the network.

The relative value of a determined stakeholder is evaluated as the sum of the utility scores for all the value cycles on which the stakeholder participates. This score is called Weighted Stakeholder Occurrence (WSO), (Feng, et al., 2013) (Cameron, Value Network Modeling: A Quantitative Method for Comparing Benefit across Exploration Architectures. Master Thesis, Department of

Aeronautics and Astronautics & Engineering Systems Division, 2007), where "W_j" denotes the utility score of cycle "j", "S_{ij}" indicates whether or not stakeholder "i" participates in cycle "j", and "n" indicates the total number of value cycles for the focal organization.

$$WSO_i = \frac{\sum_{j=1}^{n} W_j * S_{ij}}{\sum_{j=1}^{n} W_j}$$

Equation 1: Weighted Stakeholder Occurrence

The result is a prioritization of the stakeholders from the biggest value to the lowest, given the sum of utility scores of the cycles on which the stakeholder "i" participates. The results can be seen for ChileAtiende's stakeholders in Figure 20.

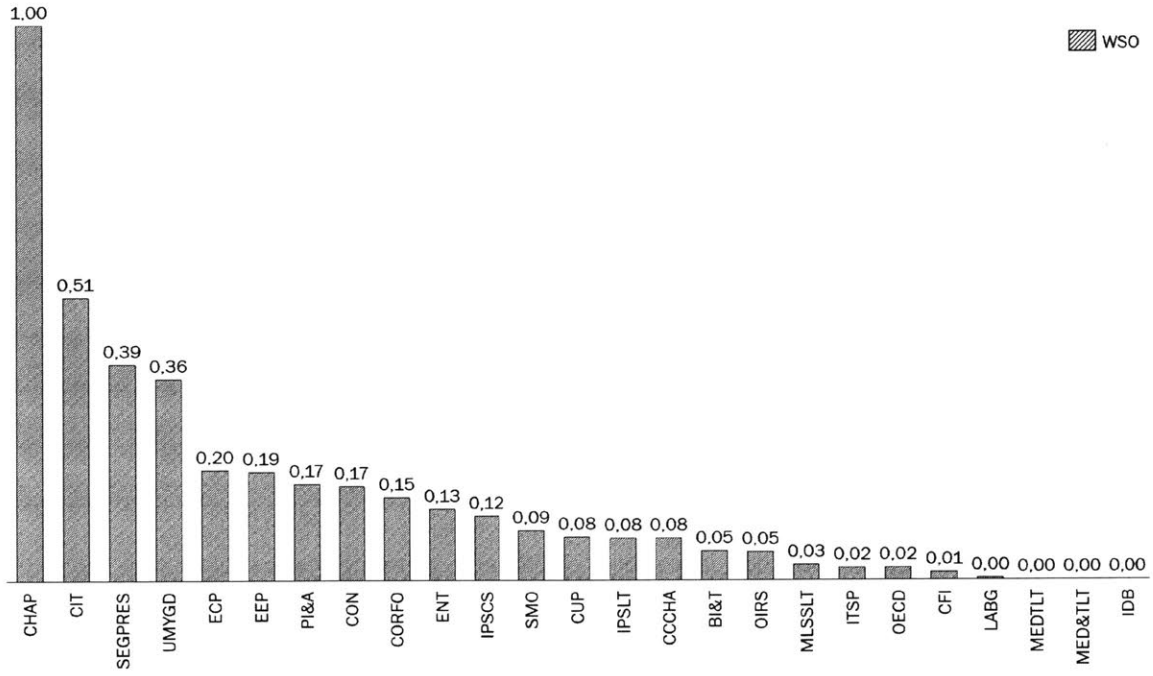


Figure 20: Ranking of stakeholders by utility measured with the WSO score

From this ranking it is possible to deduce and corroborate several facts. First, the most important stakeholder for ChileAtiende project are the Citizens (CIT) with a WSO of 0.51, which is interpreted as a participation of them on the 51% of the total utility to ChileAtiende project. In reality this should be true, because they evaluate the actual value perceived and there are indicators of satisfaction with the service that are measured and closely tracked by the

Government. If this KPI shows good results, the project gains momentum and priority if the Government sees it as a factor that can influence in political support. Actually, the final goal of the project is to increase utility for the citizens of the country.

The second and third places in terms of importance are *SEGPRES* and *UMyGD*. These two entities are accountable for the success of the project; thus they will not only devote resources and time to the project, but also political and technical influence over other leadership teams belonging to the other ministries involved in the landscape, which might have conflicting or competing needs with ChileAtiende project.

The following important stakeholders are Citizen Desk and Business Desk projects (ECP and EEP, respectively), which have to work coordinately with ChileAtiende in order to create synergies. Citizen Desk has the mission of building the IT platform and information structure for the services available for citizens, based on the progress made by Business Desk, project in charge of doing the same for enterprise, achieving positive results.

It is worth to mention one more relevant stakeholder, the Public Institutions and Agencies (PI&A), who are ChileAtiende's customers, receiving services from them. Coordination and information transfer are highly relevant to implement a high quality service and to maintain it over time.

Main takeaways and recommendations

After a conceptual analysis of stakeholders, and a second that includes a quantitative approach, there are several recommendations to provide to the ChileAtiende project team:

- Maintain the current Coordination Committee and enhance its responsibilities and duties as the entity that has to integrate all the different parties of the project. Formalize a recurrent sequence of sessions and an agenda to keep track of the progress.
- Carefully manage the most important stakeholders: Citizens, *SEGPRES* and *UMyGD* as the participants of the main portion of the value flows that are important to the ChileAtiende project. Give priority to feedback from the citizens and design the processes always having them in mind.

- Keep coordination and information flowing with the other two or three projects that are relevant to ChileAtiende: Citizen Desk, Business Desk and Clave Única projects. Encourage *SEGPRES* to maintain a cordial and candid relationship with *CORFO* leadership, and avoid falling in gray areas.
- Keep coordination with the Public Agencies and Institutions already included or likely to include under the ChileAtiende umbrella. Understand clearly their concerns and requirements.
- Carefully manage relationship with *IPS*. *IPS* might create a lot of noise that can be avoided by understanding their needs and concerns (such as workload, equality in terms of benefits and responsibilities in comparison to other services, et cetera) early in the process. However, it has to be taken into account that they are not the only organization able to provide the service to the customers, other services in the government should be evaluated.

4.3. Current Architecture

The next step required to enhance the understanding of the enterprise is to describe carefully an *as-is* state. If the architecture team does not understand the point of departure for making changes –either small or big transformations– effective transitions may not be possible (Nightingale & Rhodes, 2015).

It is very useful to organize the elements of the current architecture using the eight lenses of the ARIES framework: Strategy, Information, Infrastructure, Products, Services, Processes, Organization and Knowledge. This chapter will be structured analyzing each of these points, followed by a SWOT analysis of the enterprise and finalizing with an analysis of the alignment among Strategic Objectives, Stakeholders and Values, Key Processes and Metrics.

4.3.1. Description of ChileAtiende using the eight lenses of the ARIES framework

The eight lenses of the ARIES framework provide specific points that are extremely useful to describe the whole enterprise in a relatively easy and understandable manner. The intention of this section is to deepen on ChileAtiende's current architecture and compose a "picture" of it.

Strategy

ChileAtiende aims at being the enabler of a simplified, more accessible and unified delivery system of government services. This means its intention is to democratize the information and access of *all* services provided by the Government, utilizing Information and Communication Technologies, creating a better experience for the citizen. In principle, some key factors in terms of strategy are listed below:

- Use of ICT's as main enabler of modernization of processes and experience improvement in the front- and back-ends.
- Capture cost savings through an incremental use of digital channels.
- Deliver better access and more transparent processes in service and benefits delivery to the citizens. By the same token, it represents a sign of care and progress of the country.
- Quest for alignment among different public institutions and agencies, not only in internal processes, but also in strategic alignment.
- Quest for scalability, in terms of the ability to cover as many services as possible while improving the citizen's satisfaction.

Organization

As shown in Figure 1, ChileAtiende holds an organization marked by the presence of 2 main actors: (1) the Unit of State Modernization and Digital Government, which belongs to *SEGPRES*; and (2) the Customer Service Division of Institute of Social Prevision –*IPS*–, which belongs to the Ministry of Labor and Social Security. These two actors play a very different role in the organization: while (1) is in charge of the strategic decisions and also in charge of the digital channel, (2) is in charge of the direct relationship with the citizens through the in-person and telephone channels. Besides, they are in charge of the content displayed in the website. On top of this, they receive influence from the Ministry of Finance, which controls the budget and also progress toward the objectives set for the program.

The points discussed on the previous paragraph are relevant for several reasons. First, the fact that ChileAtiende currently does not employ any people. All employees are actually hires of the *IPS'* Customer Service Division, which has around 1,500 civil servants in the whole country. The

maintenance of the website and other IT tasks are done by part of the Unit of State Modernization and Digital Government. That team is not dedicated to ChileAtiende only. The reason for this is that ChileAtiende does not exist as a legal entity in regulatory terms. There is no law or decree that talks about ChileAtiende as a formal public agency or part of a ministry. Today, the future of ChileAtiende is on *UMyGD*'s hands, which is part of a Ministry (*SEGPRES*) in the center of the government. This implies more powerful politic levers, but the downside is the instability produced by changes in the administration. Therefore, it is key that ChileAtiende is created as a legal entity to provide stability and the possibility to think long term.

Infrastructure

As it has said before, ChileAtiende delivers services to the citizens through 3 channels:

1. In-person: Owned and controlled by IPS, it counts with a wide network of 206 branch offices and 5 mobile offices, and formed by approximately 1,450 civil servants. This network allows to have an office within a range of 10 kilometers to the 77% of the total population in Chile. Besides, this is the only channel that offers the opportunity to actually complete procedures today, since the telephone and on-line channels only provide information, and finally refer the person to one of the offices.
2. Telephone: It consists of a single Call Center, owned and controlled by *IPS*, with a headcount of around 40 civil servants. Through the number 101, citizens can request orientation about the services offered by ChileAtiende, locations and schedules of the offices.
3. On-line: ChileAtiende currently has a website where information about more than 2,400 services is displayed. Citizens can review the prerequisites to apply to a benefit or to get an information; however, it doesn't provide the ability to actually start, track or receive the results of the request. Even in cases when the service is available on-line, citizens would be derived to the website of the institution or agency that delivers that service. This is a cause of attrition, because interfaces are different, the friendly language used in ChileAtiende's website is not the same as the other websites, and the guidance provided by the website is completely lost.

Additionally, ChileAtiende also owns accounts in social media, specifically Facebook and Twitter, channels that ChileAtiende uses to deliver information about new benefits or to answer doubts of the citizens. More information can be found in the following link: https://www.chileatiende.gob.cl/contenidos/que-es-chileatiende.

Products & Services

ChileAtiende is an organization that provides services by definition. These services are different type of interactions between the Government and the citizens, such as information requests, claims for benefits, and authorizations on the creation, modification or extinction of a legal situation or the certification of it (Unidad de Modernización del Estado, 2016). These services have to be designed, maintained and delivered. The delivery, as it was mentioned previously, is through three different channels: in-person, telephone and online.

In order to better understand the size and type of the operations at ChileAtiende, it is relevant to see some key figures.

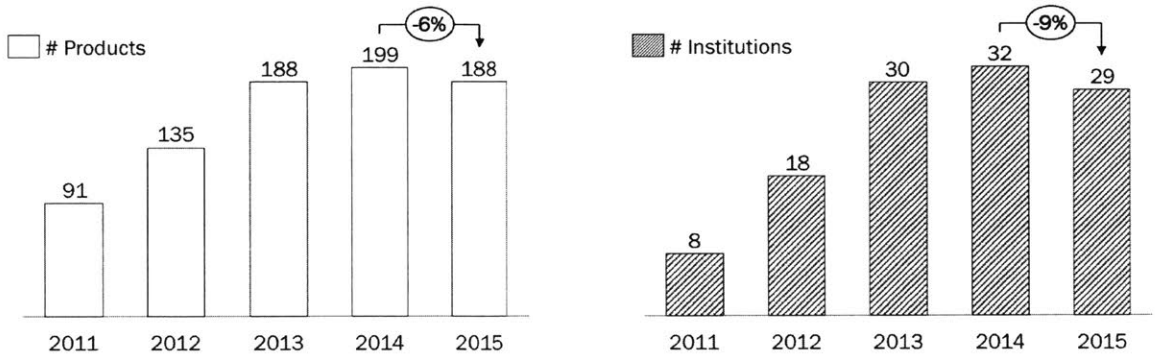


Figure 21: ChileAtiende delivers 188 services from 29 different institutions through the in-person and call center channels. The growth of previous years stopped in 2015.

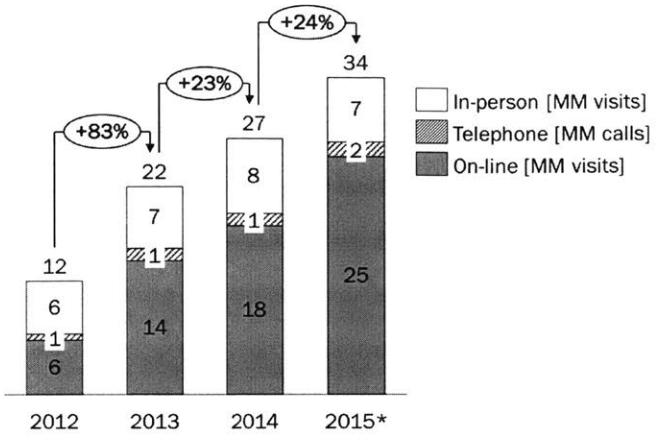


Figure 22: Number of interactions between ChileAtiende and citizens through the 3 channels

Figure 21 shows the number of products delivered through ChileAtiende and their respective institutions. It can be observed that during the first three years of operation, ChileAtiende grew constantly, adding new services and institutions. This high growth rate couldn't be supported by the current operative system; thus some services and institutions had to be removed from the product portfolio. Figure 22 shows how interactions (measured as millions of visits and calls) have grown much more than 20% per year. It also shows how this growth is supported mainly because of the increased use of the online channel.

Additional important points to have into account regarding ChileAtiende operations and services are:

- The ability to start and finish a procedure or service different than pure information is only available through the in-person channel.
- Telephone and the website are only information points, and will drive the citizens to the branch offices to finish their request.
- Despite of having 188 products available through ChileAtiende through the in-person channel, information about other 2,400 services are displayed through the website.
- The 29 institutions in agreement with ChileAtiende represent around the 3% of the total public institutions that have the potential to be part of the ChileAtiende network (there are ~450 potential partner institutions).

- One of the pain points on the service is the lack of tracking ability of the system. The progress of a specific inquire is neither shown nor known by the citizen.
- Derivations are complicated and imply low service quality, since cases cannot be transferred from one institution to the next, thus all progress is lost (it is processed as it was the first time the citizen goes to one branch office).
- 60% of the visits to the ChileAtiende offices are due to services related to the *IPS* (Ministerio Secretaría General de la Presidencia, 2015), which denotes a low awareness of the ability of ChileAtiende to process formalities of other institutions.

Processes

Maybe the most relevant issue regarding the process side of ChileAtiende is the lack of integration among the platforms it has to manage. First of all, people working on the in-person channel have to manage different platforms and credentials to access the different systems. This is a huge disadvantage of not having an integrated system; creating bigger costs in training, difficulty to provide a good service because of the low probability of being expert in 20+ different systems, lack of flexibility in terms of human resources and the overall lack of scalability of the system as a whole. The last point is relevant, because it is highly unlikely that in the current conditions, ChileAtiende is able to expand the scope of its services and can be the one-stop-shop for the Government Services; therefore, a relevant transformation has to happen in order to get to that goal.

This process integration has an important IT component. The ability to provide smooth transitions between platforms and databases, identical interfaces, and ideally a single access at an intermediate user level (civil servants) and at an end-customer level (citizens) will be key to boost satisfaction of both government employees and citizens.

Information

Without doubt, information is one of the most important factors for a transformation like the one ChileAtiende intends to achieve. When people talk about digital, the underlined characteristic is that they are talking about data and information, flows of information and information as a driver to better decision making.

ChileAtiende's project is highly information-intensive, due to the digitalization of processes, interconnections among several services, databases and interfaces. Important facts to be considered in terms of information are listed below:

- **Different IT platforms for different agencies:** ChileAtiende has been building upon current IT platforms that belong to the different services provided by the different public institutions and agencies. Often times, these IT platforms have different architectures, different levels of development, performance and different levels of interconnection possibilities.
- **Lack of performance metrics tracking:** Performance metrics for ChileAtiende may exist, however they are neither shared among public agencies on agreement with ChileAtiende, nor with the citizens. There are scattered datasets gathered for specific studies or ad-hoc requests, nevertheless there are not continuous tracking of "hard" data such as service levels, waiting times, volume of visits; and there is not a continuous tracking of the citizen's perception.
- **Inexistent open data:** There have been efforts to create a more open Government in terms of data. Several datasets are available for download in the Government's website. However, very few information regarding to ChileAtiende can be found.
- **Regulatory restrictions:** Information is many times restricted by the regulatory framework. There are several information transfers, procedures, time slots, et cetera, that are directed by specific laws or decrees. This fact makes necessary to update a law in order to change a process and the information involved.

Knowledge

There have been efforts on the government side in order to preserve part of the knowledge gathered, with a huge number of reports and studies published through the on-line library owned by the different public institutions. These libraries typically contain bases for project and public tenders, studies requested to consultants, reports and presentations. It is unclear if all the public institutions make the effort of publishing their contents with the same rigor; although at least the Ministry of Finance and *SEGPRES* are good examples of this practice.

It is well known that *IPS* personnel had been through different training in order to be able to provide new services of new institutions in agreement, although it is not clear if this practice continuous to happen nowadays. Finally, it is not clear either if IPS employees receive continuous education training in other topics, such as management skills, service techniques, continuous improvement, or data management skills.

4.3.2. SWOT Analysis of ChileAtiende

The SWOT analysis is a well-known and simple technique to organize the results obtained thus far in the understanding of ChileAtiende as an enterprise. Table 10 below summarizes the main takeaways from the previous chapters, including external and internal landscapes, the stakeholder analysis and the current architecture; organizing them into Strengths, Weaknesses, Opportunities and Threats.

	Positive	Negative
Internal	STRENGTHS • Positive evaluation from society (high customer satisfaction) • Large network of offices, high level of coverage • Clear creation of efficiencies in cost and citizen satisfaction of the project is successful • Business already running • Budget for the project approved	WEAKNESSES • Not clear governance, decision making process or clear leader of the organization • No legal basis for ChileAtiende, not being a formal organization within the Government • Low scalability in the current architecture (growth in scope not sustainable) • Lack of integration among platforms, meaning unpleasant work for employees and cluttered experience for citizens • Ability to receive the outcome of processes only through the in-person channel • Lack of visibility of operational data and a continuous process of customer satisfaction evaluation • Low engagement of the organization on continuous improvement practices • ChileAtiende project is focused almost exclusively on the ICTs side of the solution, instead of a more holistic view (including the other channels, and the organization architecture and governance)

	Positive	Negative
External	OPPORTUNITIES • Low endorsement to the government from citizens, need for turning the situation around through iconic projects • Low growth macroeconomics scenario, need for cost cut projects and efficiencies • Higher adoption of internet and mobile access across the population • Infrastructure for communication and internet technologies improving rapidly in reliability and speed • Networks of offices of other public institutions might be available on top of IPS network • There are countries that have gone through similar processes and succeeded. Opportunity to build upon their experience	THREATS • Difficulty to coordinate and align efforts of different institutions, and priorities of participating stakeholders • Several overlapping projects running at the same time, with different owners and somewhat different motivations • Vulnerability to changes in political priorities and administration changes • Tight time frame to create a sustainable and robust project, able to "survive" a change of administration with or without a law to support it • Technical, political and legal difficulties when trying to integrate systems from different entities or share information • Delays on IT developments that can put in doubt the progress and value of the project • Political pressure that IPS can put on the project, adding restrictions to the solutions proposed

Table 12: SWOT Analysis for ChileAtiende

Chapter 5: ChileAtiende Analyzed as a Service Organization

5.1. Overview of ChileAtiende's Service Network

Although some of the basic stats of ChileAtiende were mentioned in the description of the products and services using the ARIES framework, in this part of the chapter the idea is go deeper in the analysis of the three channels and the interactions among the several actors of this network of services.

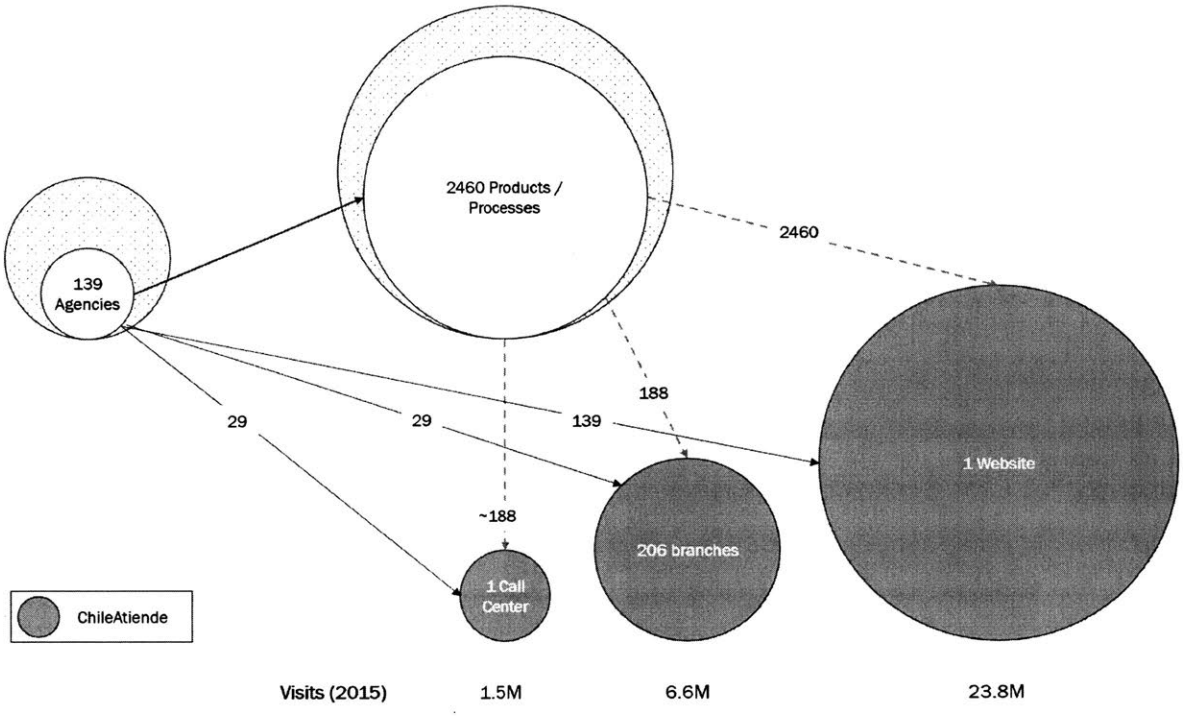


Figure 23: Simplified network for ChileAtiende

Figure 23 shows a simplified way to look at ChileAtiende. From the ~450 agencies that belong to the Government, 139 are currently delivering services through ChileAtiende via any of its 3 channels. These 139 agencies imply ~2460 different procedures displayed in the ChileAtiende website, however only a subset of those are delivered through the branch offices and the call center. Actually, 188 products belonging to 29 agencies are delivered through the channels just mentioned. Finally, in 2015 the call center received 1.5 Million calls, the offices registered 6.6

Million visits and the website recorded 23.8 Million sessions. Nevertheless, the only place where the citizens were able to solve their issues were the branch offices, since the in-person channel is the only one that allows actual transactions. The call center and the website only provide information at this time.

Table 13: Summary of information about ChileAtiende's 3 channels. There was an absolute decrease in visits to offices from 2014 to 2015 and also as a % of total visits to ChileAtiende

	2014		2015		2016 (Jan-Jun)
Visits	[#]	[%]	[#]	[%]	
In person	7,907,886	29%	6,621,732	21%	3,063,926
Call Center	1,428,901	5%	1,478,640	5%	N/I
Website	18,062,707	66%	23,838,323	75%	11,914,115
Products					
In person	199		188		188
Call Center	199		188		188
Website	N/I		N/I		139
Agencies					
In person	32		29		29
Call Center	32		29		29
Website	N/I		N/I		2460
Service					
In person	Transaction		Transaction		Transaction
Call Center	Information		Information		Information
Website	Information		Information		Information

From the table above it is possible to see a decrease in visits to the offices from 2014 to 2015 and an increase in visits to the website, showing a swap of visits from the in-person channel to the online channel. For 2016, even with incomplete data (call center data), we can tell that the trend is still holding. A ratio of In-person visits / Online visits = 0.28 in 2015 versus a 0.26 in 2016 indicates that the visits to the online channel keep increasing faster than the in-person visits. Also, it is possible to foresee a slower growth rate compared to previous years. Assuming a second part

of the year equal to the first six months, the number of visits to the online channel in 2016 is flat versus 2015, and the visits to the offices would decrease 7% versus 2015.

The bottom line with these figures is that citizens are increasingly preferring the online channel to solve doubts and to understand the processes before going to the offices. The visits to the website are not increasing or increasing slower than previous years, because of ChileAtiende stopped adding more services, and people is probably learning how to proceed when they need to get a benefit. Probably the information goal is being fulfilled, however the visits to the in-person channel could decrease further with an online channel that allowed people to finish their inquiries.

Taking into account this scenario, the next step is to zoom in into the different channels to fully understand their operations and how the service is delivered.

5.1.1. Zoom in on Offices and Call Center

Offices

As it has been mentioned before, ChileAtiende has a network of 206 branch office and 5 mobile offices across the whole country. These offices can solve ~188 different processes corresponding to 29 agencies.

The demand is fairly stable, with an average of 586,451 visits per month in the period Jan 2014 – Jun 2016, although it shows a peak in March every year generated by a seasonal demand of the processes of the top 3 agencies in terms of demand (*IPS*, *FONASA* and *MINDES*), plus incremental demand from other agencies such as *MINEDUC*. This peak has been decreasing almost 15% per year in absolute terms during the last 2 years, following the same trend of the overall service in the branch offices.

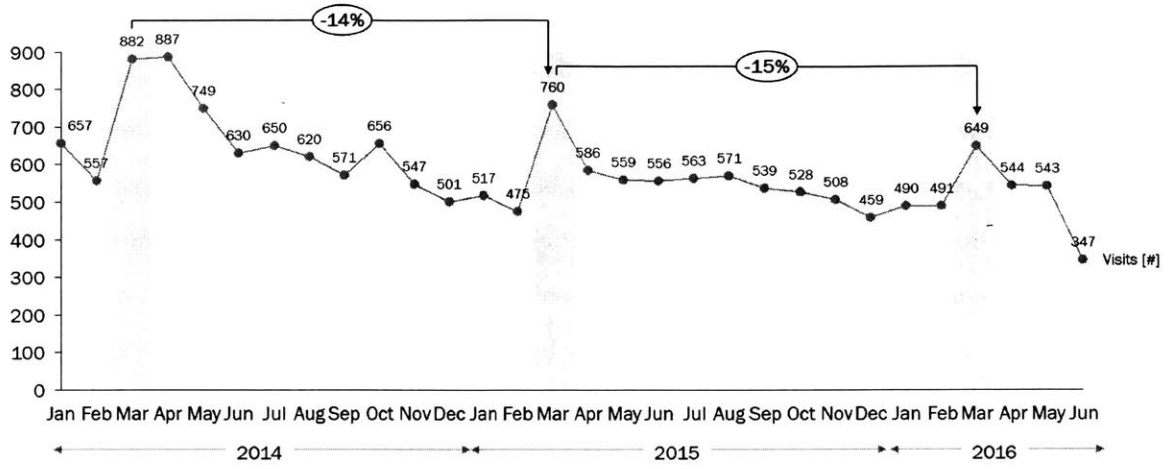


Figure 24: Time series diagram for the number of visits to the ChileAtiende branch offices

Figure 25 below shows the breakdown of visits to the branch offices in 2016 by agency of requirement, which has not had any variation from 2015. It is clear that the majority of the visits are due to *IPS* requests, with 60% of the visits. It is followed by *FONASA* with 18% and *MINDES* with 6%. The *IPS* lead is obviously related to the fact that ChileAtiende operates in the *IPS'* offices, which are branded under IPS/ChileAtiende. The rest of the top 5 agencies share several common characteristics in terms of the services provided, highly related to benefits and certificates needed to get those benefits. The public this benefits target is also quite similar; therefore, the synergies are realized easily.

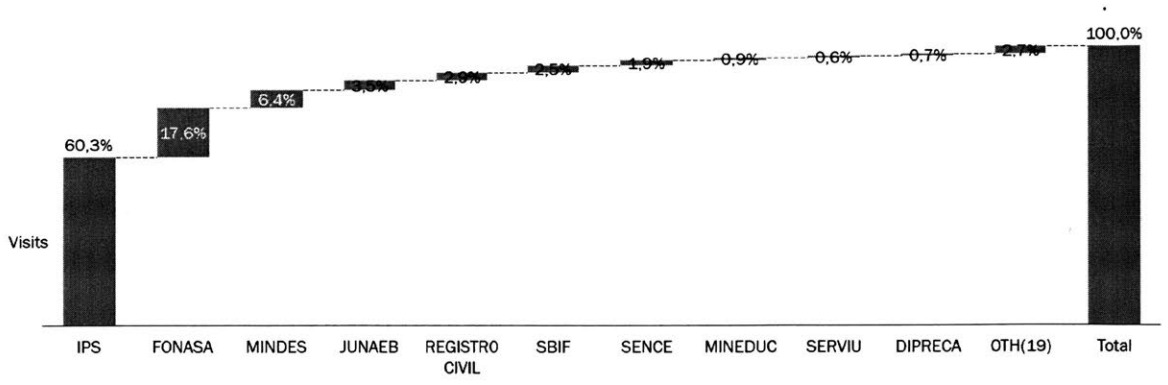


Figure 25: Break down of visits in the In-person channel by agency, data 2016

The figure above shows the 10 more important agencies in terms of requests for ChileAtiende offices. These 10 agencies average more than 350 requests per month and account for the 97% of

the visits, whereas the remaining 19 agencies with a demand under 350 requests per month account for less than 3% of the visits.

It is interesting to note that the fact of having a very low demand does not mean necessarily a low fit with ChileAtiende, or the need of removing that agency from the pipeline. The demand for products of that agency can be that low, that it makes sense to have it under a service which pools several services with low demand, keeping the Government from paying the fixed costs for the service points of each of those agencies. Therefore, keeping those agencies under the ChileAtiende network can have a direct impact on the Government expenses, creating a more efficient use of the resources.

Call Center

When the Call Center is observed, the overall picture does not seem too different at a first glance. However, a deeper dive can show there are several differences in the distribution of the visits (calls) by agency.

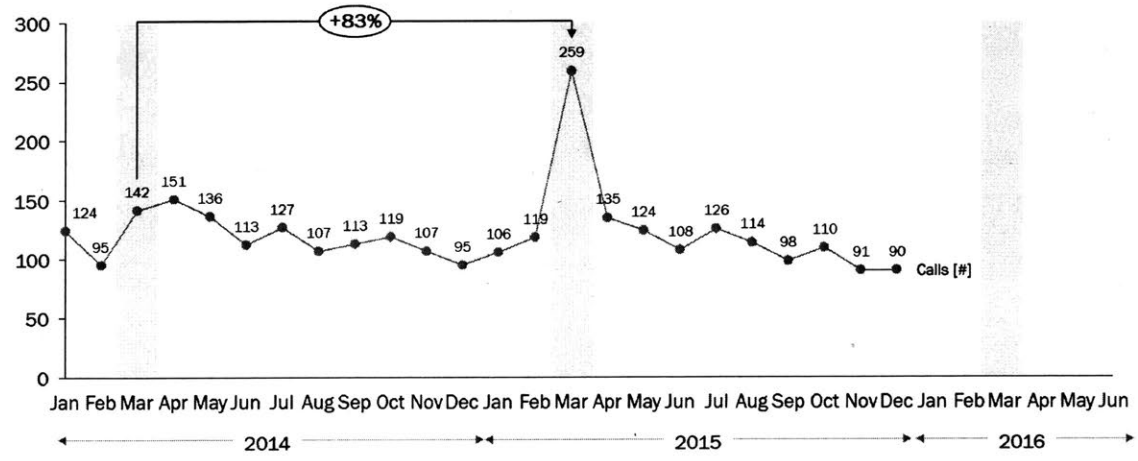


Figure 26: Time series diagram for the number of calls to the ChileAtiende Call Center

The demand is again fairly constant, with a peak in March, which was much more noticeable in 2015 than in 2014. The main reason is the peak in demand for *IPS* services (the biggest contributor of the overall demand); nonetheless *MINDES*, *COMPIN*, *FONASA* and *MINEDUC* also have peaks in March.

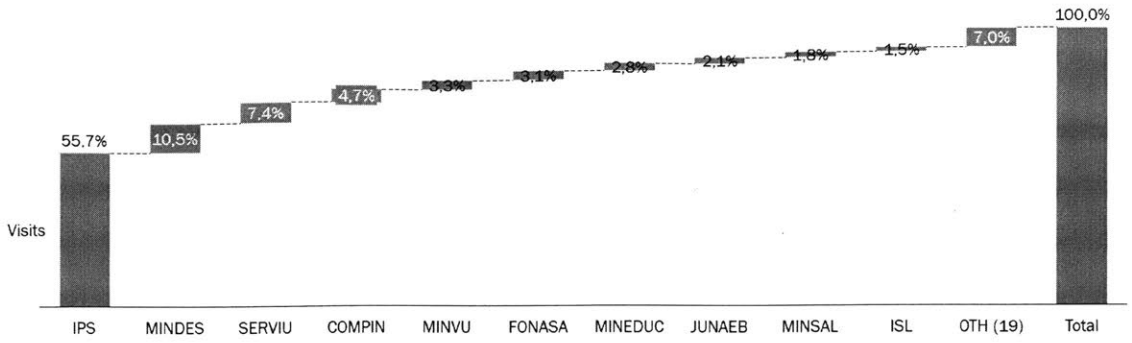


Figure 27: Break down of calls to the Call Center by agency, data 2015

The breakdown for the Call Center shows a relatively different picture compared to the in-person channel. First of all, the relative weight of *IPS* in the total is almost 5pp less than in the offices. Then, the second agency in importance is *MINDES* with 11%, which is the third place in offices with 6%. The following, *SERVIU* and *COMPIN* are not in the top 5 of visits in the in-person channel. *COMPIN* actually is not even in the top 10 for the in-person channel, probably because it has to do with medical leaves, and for sure the person calls before going to the office to understand how to proceed.

It is important to note that the 40-person team responsible for the ChileAtiende Call Center does not provide all the solutions themselves, but a considerable share is transferred automatically to the individual Call Centers of the agencies. In this case, the system also keeps track of these transfers; 37% of the 1.5 Million calls received in 2015 by the Call Center were transferred to other Call Centers to receive the service.

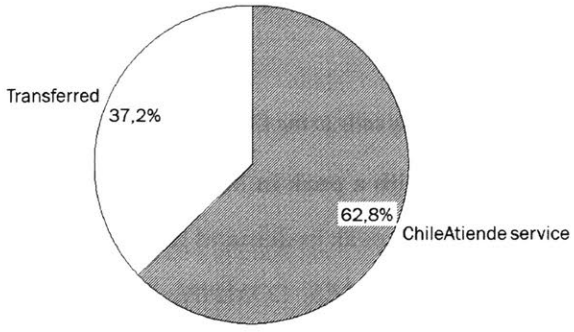


Figure 28: Ratio of in-house service versus transferred calls, data 2015

5.1.2. ChileAtiende website

ChileAtiende.gob.cl is a very interesting source of information, and it is going to be used in this study not only for learning more about this particular channel, but also to infer some information about the behavior of products that are not in the pipeline for the in-person or call center channels, but are included in the website. This approach can be useful to understand the fit between different agencies and the public ChileAtiende serves.

Figure 29 below shows the time series for ChileAtiende website, and the same behavior can be observed in terms of the seasonality. March is also an important month for the website, although the peak observed in 2015 was not repeated in 2016. The months with lower demand are again February and December.

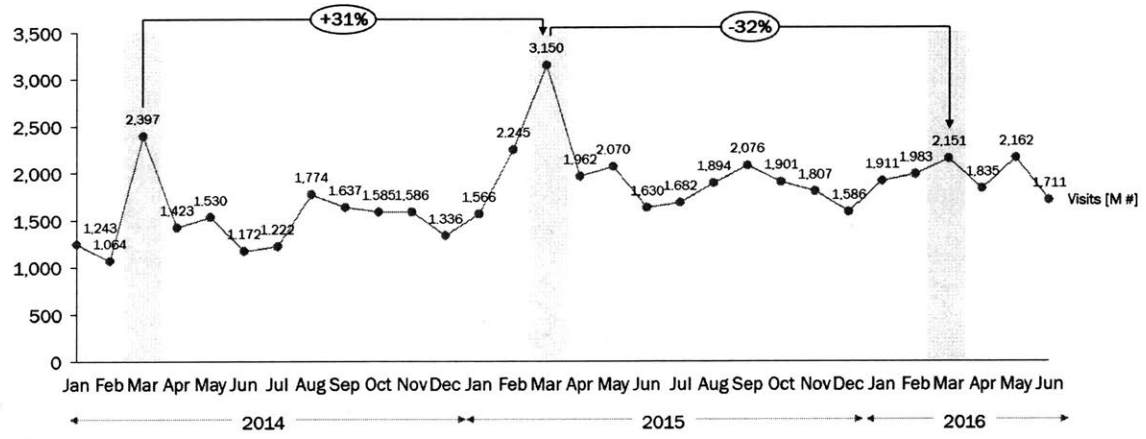


Figure 29: Time series diagram for the number of visits (sessions) to the ChileAtiende Website

In regard to the agencies more demanded in terms of visits (using page views as counter), the picture changes drastically compared to the previous channels. First of all, the universe is larger, with 139 agencies instead of 29. With this new universe, *IPS* is again the agency with most page views, but only with a 15% of the total visits. It is followed by *MINDES*, *FONASA*, *Registro Civil*, MINEDUC and JUNAEB. These 6 agencies account for a 61% of the total page views to any of the record cards (the webpages that provide information about a single service, with information about the services provided by the agencies). The top 10 agencies account for roughly the 70% of the total page views that look for information about any of the record cards.

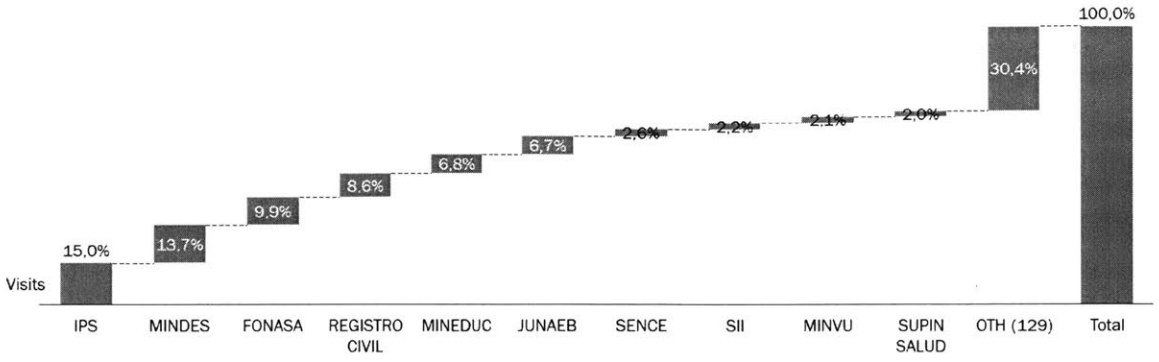


Figure 30: Break down of visits to ChileAtiende Website by agency, data 2015

Page views by product

The data provided by the Analytics tool of the website has several other levels of granularity. An interesting deeper dive is to understand what the actual pages most visited are, to understand if the demand is led by several products or only a few ones. ChileAtiende contains 2,460 record cards or "products". The figure below shows the distribution of products by visits; we can see for instance that the 80% of the page views is represented by 140 products or record cards.

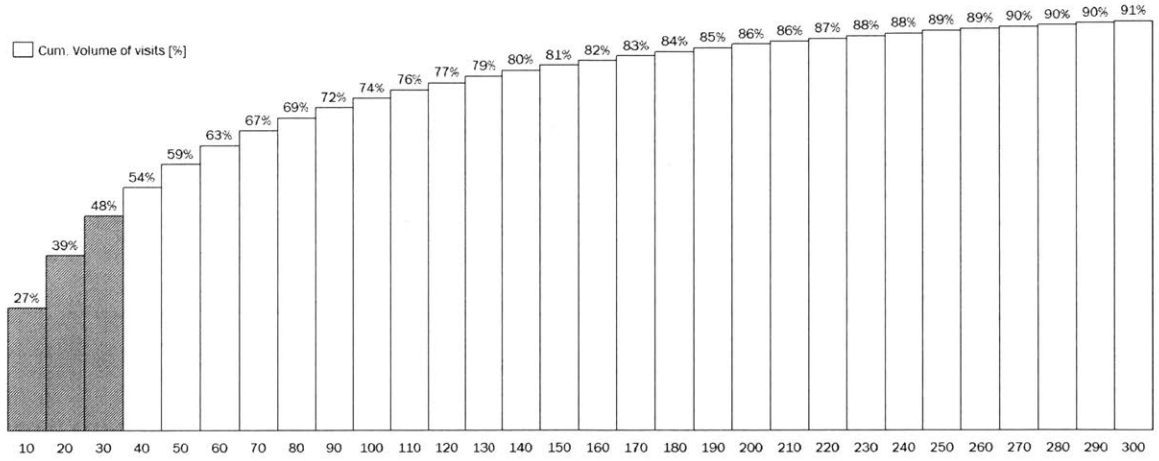


Figure 31: Cumulative distribution of products by visits to the ChileAtiende website

Table 14 below shows the top 20 products in the ChileAtiende website, sorted as percentage of the total page views corresponding to record cards (it excludes visits to the home page, contact us section or search lists). These 20 products account for roughly 48% of the visits to the record cards as it can be seen in Figure 31. From these 20 products, *MINDES* leads with 5 different

products, followed by *FONASA* with 4 products, and *MINEDUC* and *IPS* with 3. The previous point is important, since if the ChileAtiende project would want to prioritize the top 4 agencies and their top products, we would be talking exactly about this group.

Part of the lessons from the figures extracted from the Call Center and Offices data, is the fact that the importance of the agencies is not constant across the different channels. The ChileAtiende website, with better granularity on the data will also deliver better insights about the overall service, although it wouldn't be accurate to say that all the patterns discovered can also apply to the Call Center and Offices. In spite of that, some of the insights will be taken as a general rule for the service as a whole when trying to identify trends of the future of ChileAtiende and fit between ChileAtiende as brand and each of the agencies.

Table 14: Top 20 record cards in ChileAtiende website by page views

	Name of the product / process	Associated Agency	% visits
1	Aporte Familiar Permanente 2016	Instituto de Previsión Social	6.06%
2	Bono por Logro Escolar	Ministerio de Desarrollo Social	4.31%
3	Certificado de afiliación a FONASA	Fondo Nacional de Salud	4.12%
4	Bono por Asistencia Escolar	Ministerio de Desarrollo Social	3.68%
5	Bono al Trabajo de la Mujer	Servicio Nacional de Capacitación y Empleo	1.65%
6	Buscador de farmacias de turno	Ministerio de Salud	1.57%
7	Precio de un bono FONASA (según la prestación)	Fondo Nacional de Salud	1.52%
8	Registro Social de Hogares	Ministerio de Desarrollo Social	1.45%
9	Ingreso Ético Familiar (IEF)	Ministerio de Desarrollo Social	1.39%
10	Simulador de finiquito de trabajo	Dirección del Trabajo	1.39%
11	Comprar un bono de FONASA	Fondo Nacional de Salud	1.37%
12	Bono Control de Niño Sano	Ministerio de Desarrollo Social	1.35%
13	Bono por Hijo	Instituto de Previsión Social	1.31%
14	Afiliación a FONASA	Fondo Nacional de Salud	1.21%
15	Certificado de antecedentes	Servicio de Registro Civil e Identificación	1.16%
16	Certificado de alumno prioritario	Ministerio de Educación	1.11%
17	Devolución de excesos por cotizaciones en ISAPRES	Superintendencia de Salud	1.11%
18	Bono de Invierno 2016	Instituto de Previsión Social	1.07%
19	Subsidio Familiar (SUF)	Instituto de Previsión Social	1.05%
20	Llamados al Servicio Militar 2016	Dirección General de Movilización Nacional	1.02%

Digital vs non-digital products

After a thorough audit to the 2,460 record cards in the ChileAtiende website, a classification was made for each of the products in order to separate them into digital and non-digital.

Even though none of the record cards or products in the ChileAtiende website actually leads to an action within the website, some of them forward the user to the website of the corresponding agency, where some formalities can be requested and completed. For instance, the majority of the processes requested to the *Registro Civil* (Civil Registry) are certificates that can be requested and received on-line.

The audit shows that 48% of the products have a digital part in the web site of the corresponding agency. The criteria used for this figure was defined as the existence / non-existence of the "on-line" tab in the page of the record card in ChileAtiende. All those record cards tagged as "100% digital" were counted as digital as well.

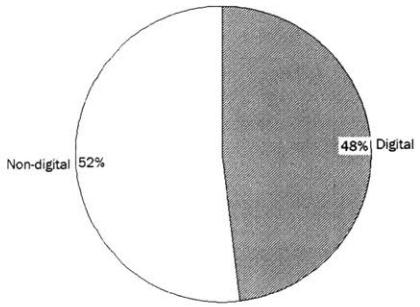


Figure 32: Distribution of digital vs non-digital products in ChileAtiende website (# pages)

The only caveat with this figure is that it can be overestimating the actual percentage of digital products, since the 2,460 record cards also include pages that are simply information, which were counted as digital. Therefore, it is safe to say that more than one third of the products in ChileAtiende don't have a digital process.

Other insights

The Google Analytics tool provides a set of different insights that are interesting to look at, even if they are not necessarily transferrable to the other channels.

1. Most viewed pages

The first thing that can be explored is the number of page views to other pages within the website, to have an idea of volume compared to any of the record cards. From Table 15 it is possible to see that the Home page leads the ranking with an average of 7,527 views, followed by the top 4 record cards leading Table 14. Other important pages to consider are the *Puntos de Atención* (Service Network) and the *Atención en Línea* (Online service).

Table 15: Ranking of most viewed webpages within ChileAtiende website

Webpage	**Associated Agency**	**Views /day**	**URL**
Home	ChileAtiende	7,527	https://www.chileatiende.gob.cl/
Aporte Familiar Permanente 2016	IPS	4,194	https://www.chileatiende.gob.cl/fichas/ver/38913
Bono por Logro Escolar	MINDES	2,980	https://www.chileatiende.gob.cl/fichas/ver/20063
Certificado de afiliación a FONASA	FONASA	2,848	https://www.chileatiende.gob.cl/fichas/ver/5241
Bono por Asistencia Escolar	MINDES	2,542	https://www.chileatiende.gob.cl/fichas/ver/32613
Puntos de Atención ChileAtiende	ChileAtiende	1,644	https://www.chileatiende.gob.cl/oficinas
Otro	ChileAtiende	1,477	https://www.chileatiende.gob.cl(other)
Listado de búsqueda (bonos)	ChileAtiende	1,361	https://www.chileatiende.gob.cl/buscar/fichas?temas=19
Atención en Línea	ChileAtiende	1,317	https://www.chileatiende.gob.cl/contenidos/en-linea
Devolución de excedentes y excesos de cotizaciones de salud	ChileAtiende	1,315	https://www.chileatiende.gob.cl/fichas/ver/22338
Bono al Trabajo de la Mujer	SENCE	1,139	https://www.chileatiende.gob.cl/fichas/ver/12725
Listado de búsqueda (certificado)	ChileAtiende	1,117	https://www.chileatiende.gob.cl/buscar/fichas?temas=17
Buscador de farmacias de turno	MINSAL	1,087	https://www.chileatiende.gob.cl/fichas/ver/15574
Precio de un bono FONASA (según la prestación)	FONASA	1,050	https://www.chileatiende.gob.cl/fichas/ver/4954
Registro Social de Hogares	MINDES	1,001	https://www.chileatiende.gob.cl/fichas/ver/42344

2. Platforms used (Operative System)

The Operative System the citizens are using to enter the ChileAtiende website is an interesting insight, in order to provide the developers with guidelines and priorities when tradeoffs are necessary in the design of the website, and the features that can work for a specific environment.

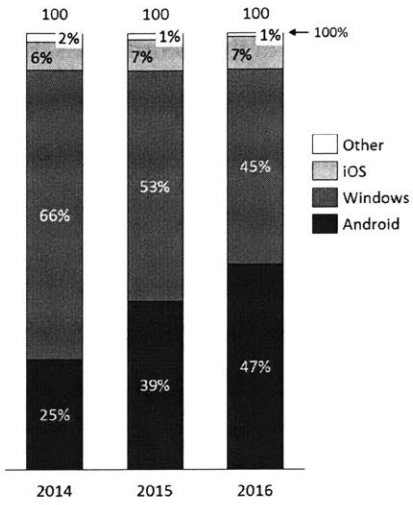


Figure 33: Distribution of operative systems visiting the ChileAtiende website

The message from Figure 33 is that Android is becoming stronger, and for the first time the number of views from Android phones are more than from Windows. This also has to do with access to internet and mobile technologies, meaning that the majority of new users of the website are using their phones, and some of the desktop users are also using their phones to enter the website. ChileAtiende does not have a mobile app, thus this will become a must in the short term if it is not already.

3. Trends related to time

Although it is not comparable at all with the demand that offices can receive, the number of visits to the website are an indicator of the actual desire and availability to do research or make a request, without the constraints imposed by the system itself. Following this idea, the number of visits to the ChileAtiende website indicates that the demand is fairly constant from Monday through Thursday, then falls on Fridays and falls even further during the weekend. A similar

view can be developed at the hour level, where from Monday to Friday the higher volume is concentrated on the working hours and the evenings, while on the weekends the higher volume is concentrated during the afternoon and evening.

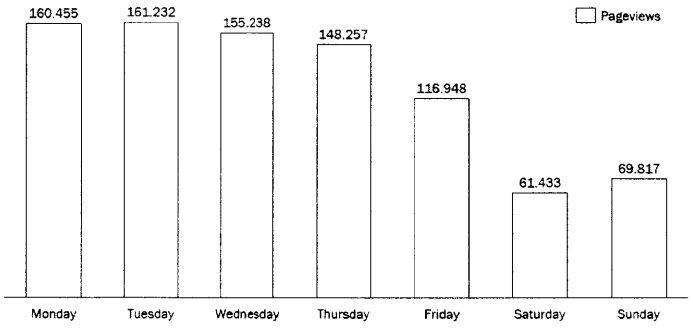


Figure 34: Profile of visits to ChileAtiende per day of the week

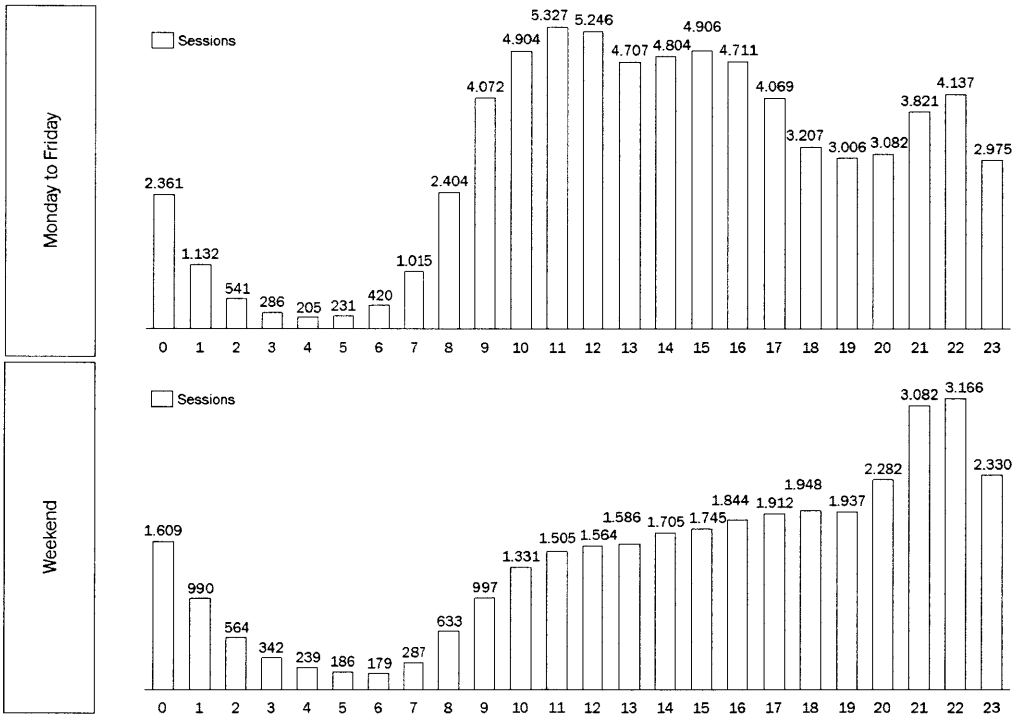


Figure 35: Profile of visits per hour on weekdays and weekends

5.2. ChileAtiende website as a source of information to understand ChileAtiende's complexity

Another view of ChileAtiende is a network view, where not only the nodes (products or agencies) are important, but also their connections. There are several reasons for wanting to have this perspective:

- The individual demand for one product is relevant, but it is also relevant if there is other product downstream that has it as a prerequisite to be completed. This is going to be denominated from now on as *indirect demand*.
- The degree of interconnectivity among products is important because the feasibility of completion of a product may depend on one or several prerequisites.
- The degree of interconnectivity among agencies is important to characterize the dependability between pairs of agencies or clusters of agencies. Demand and interconnectivity could determine the convenience of adding or removing agencies from the portfolio.

In order to create the network for ChileAtiende, the connections (edges) represent prerequisites between two products. For instance if product B needs product A to be completed, we say that A is prerequisite of B, or A → B. The agencies these products belong to are connected in the same direction.

An initial quick view of the product and agency networks in its more primitive way can help develop an initial, qualitative characterization of this system.

Agencies

Figure 36 below shows a representation of the complete network of agencies working with ChileAtiende. At a first glance, the most relevant point is that there is a big group of highly connected agencies (roughly 100 agencies connected at least through one product). On the other hand, there are 35 agencies that are completely isolated. Examples of these are: *Instituto Nacional de la Normalización* (National Institute of Normalization); *Comisión Chilena de Energía Nuclear* (Chilean Commission of Nuclear Energy); *Instituto Antártico Chileno* (Chilean Antarctic Institute);

Comité de Inversiones Extranjeras (External Investment Committee) and *Dirección de Aeropuertos* (Airport Authority). These agencies show a very low fit with the mission of ChileAtiende; therefore, they are candidates to stay present in ChileAtiende website with a low level of attention, but probably out of the scope if we were talking about servicing them from the Call Center or Offices point of view.

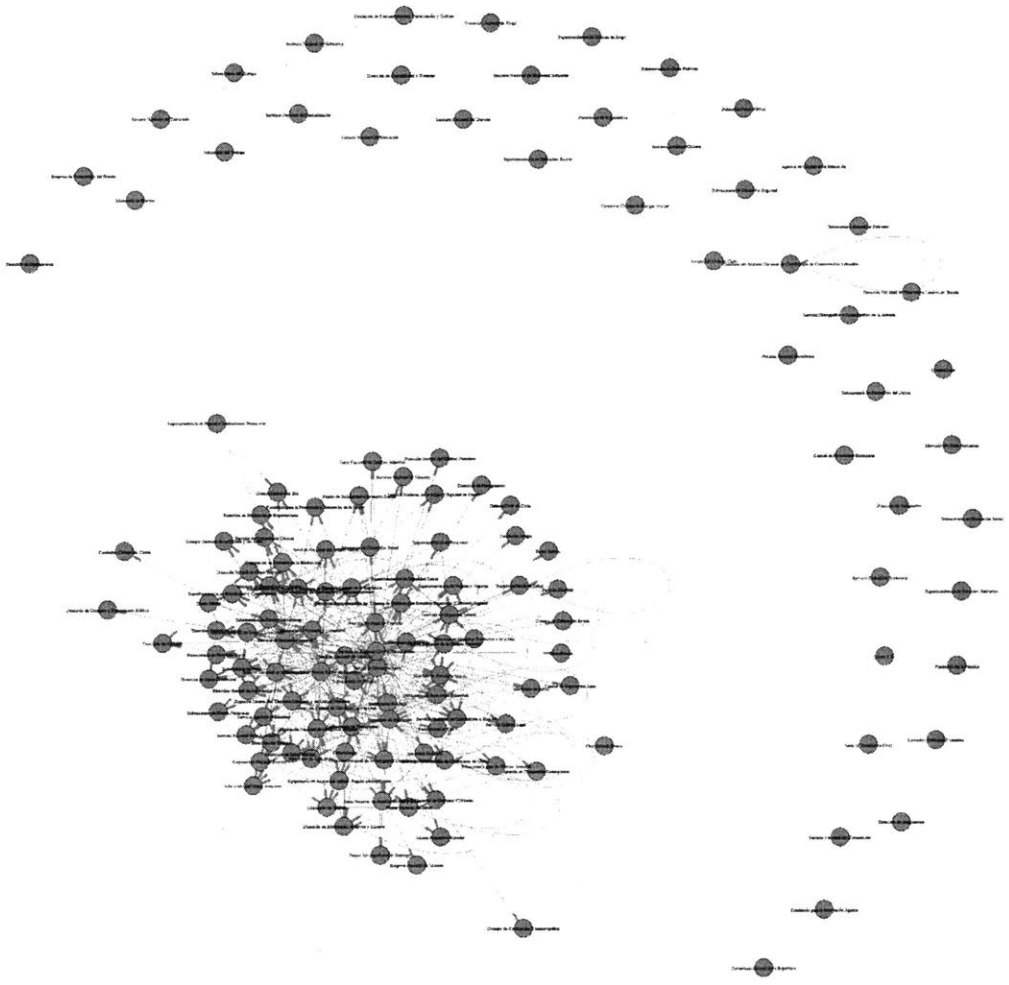


Figure 36: Network representation of the 139 agencies currently included in ChileAtiende

A better visualization is achieved when more data is incorporated to the analysis, in this case volume of page views and number or interactions (number of products requiring other product from a different agency).

- Page views: Are represented by the size of the nodes

- Number of interactions: Represented by the width of the arrows

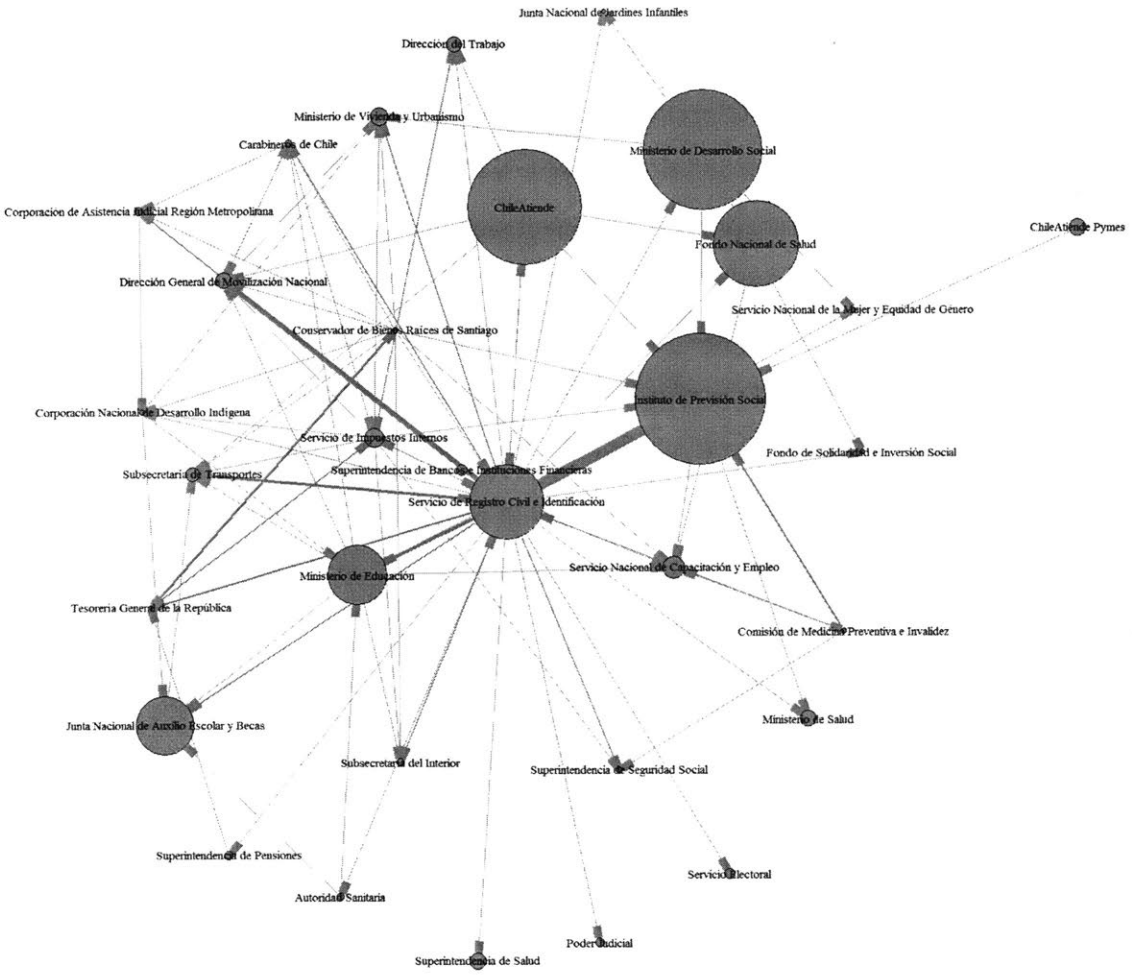


Figure 37: Network of agencies working with ChileAtiende. Filtered by visits > 100,000 and nodal degree > 8

Figure 37 shows in a readable way the most relevant agencies for ChileAtiende in terms of volume and interconnections. It can be seen that the *Servicio de Registro Civil e Identificación* (Civil Registry) is the most connected node, followed by *Instituto de Previsión Social* (*IPS*) and *Ministerio de Educación* (Ministry of Education). The strongest relationship is between *Registro Civil* and *IPS*.

The network shown above does not imply that those are the nodes that have to be taken care of necessarily, there are more factors to include into the analysis to make that affirmation.

Products (Record Cards)

In the case of the 2,460 record cards present in the ChileAtiende website, the picture looks much more crowded, although the message is similar. In this case roughly 50% of the products have at least 1 connection, while the other 50% are isolated.

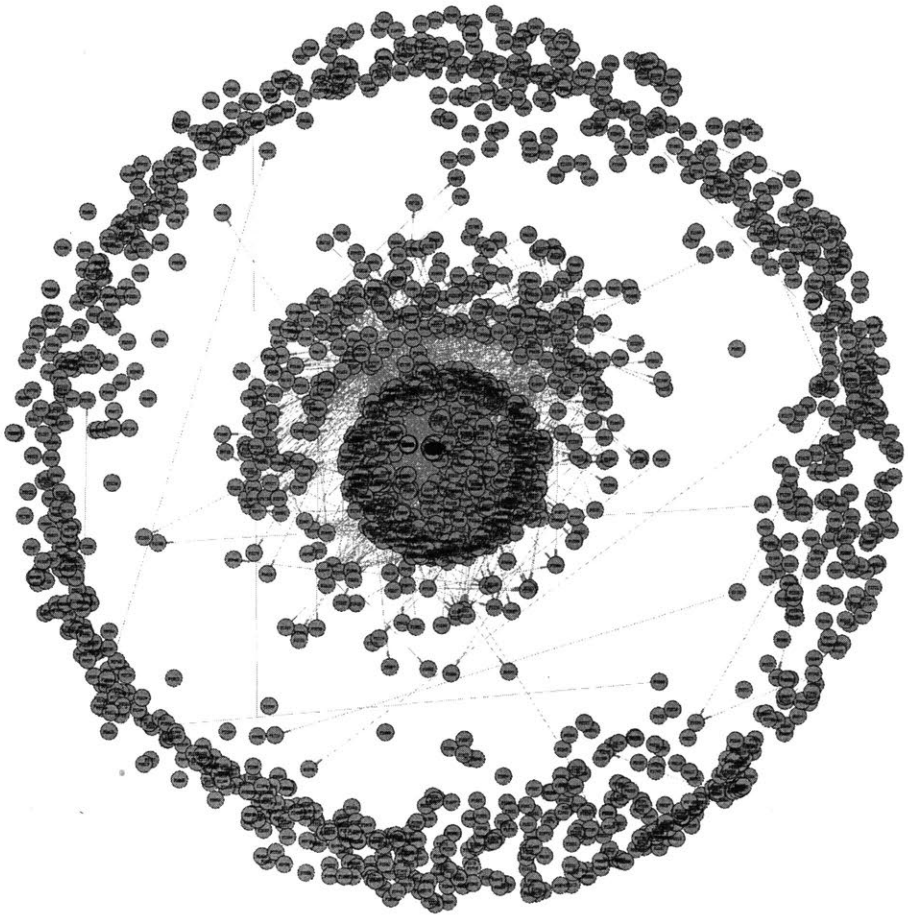


Figure 38: Network representation of the 2,460 products in ChileAtiende website

The simplified view shown in Figure 38 represents all those products with more than 25,000 page views in 2016 to date, and a nodal degree greater than 14, in other words highly connected nodes with a reasonable size. This representation has 2 variables embedded:

- Size of the node: Number of page views for the record card of the product.
- Color of the node: The blue color represents Digital Products, whereas the red color represents Non-Digital products.

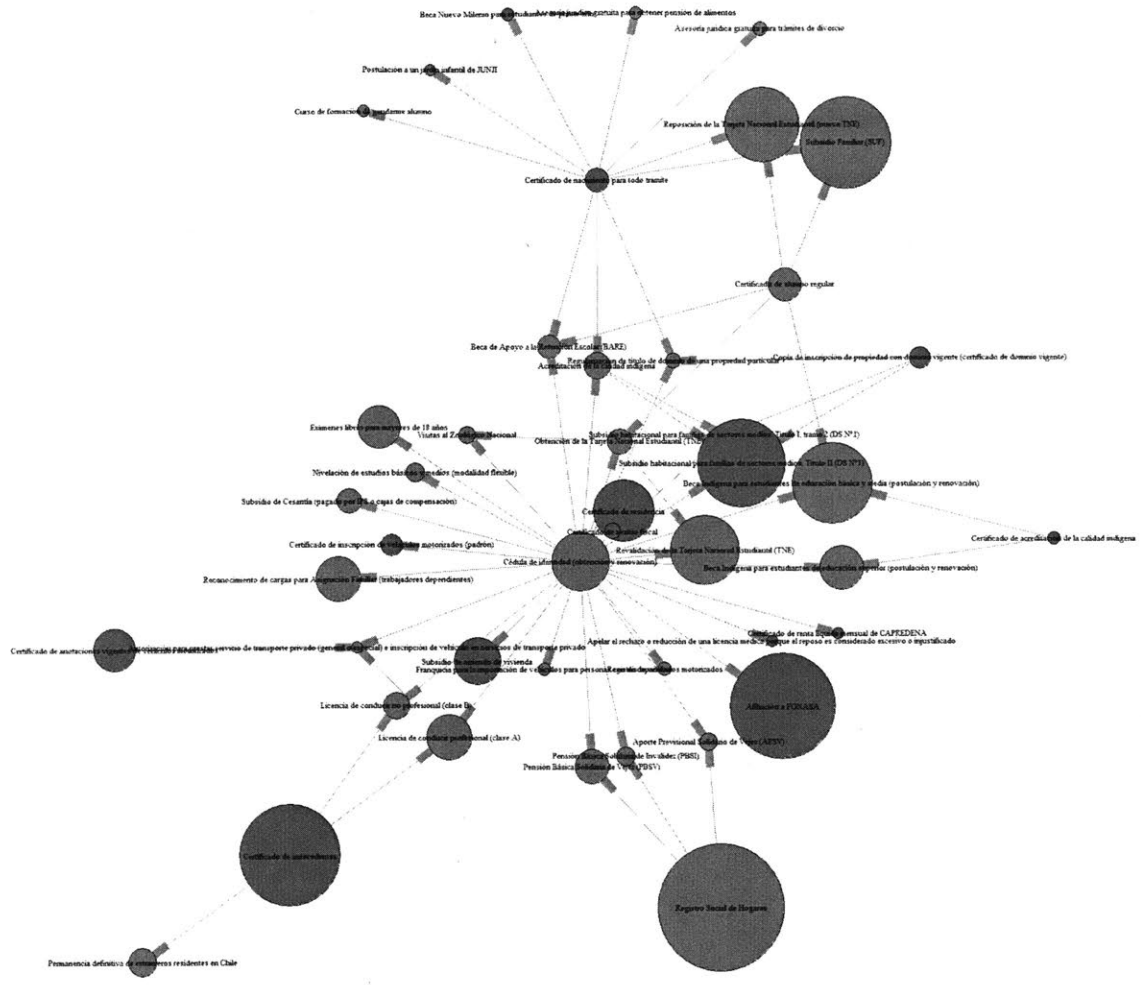


Figure 39: Network representation of ChileAtiende products. Filtered by page views > 25,000 and nodal degree > 14

The most connected node is the *Cédula de Identidad (*Identification Card), which is a feeder for many of other products. It is not a digital process; it has to obtained in person. The *Certificado de Nacimiento para todo trámite* (Birth certificate for all purposes) also stands out for its connectivity, although with a lower volume of visits.

Regarding the most relevant nodes in terms of volume, the most visited is the *Registro social de hogares* (Social Registry of Households), although as it was shown in the ranking of most visited products (Table 15), this one is only in the 8th position. This is because nodes with a larger number of visits were removed from this view as they had a nodal degree < 14; therefore, again, this is not

a final proposal of what products should be selected for a better operation of ChileAtiende, but more of a visualization exercise.

5.2.1. Characteristics of the complete network of ChileAtiende products

In order to describe the complete network of products in the ChileAtiende website, several metrics and lists will be used, which are detailed below:

Number of nodes (number of pages representing products):	2460
Number of edges (number of interconnections / dependencies):	1976
List of the most visited pages (nodes):	Table 14
List of the most connected nodes (by nodal degree, which represents the number of connections per node).	
○ In-degree of node *i*: Number of connections going from others to node *i*. Represents the number of requisites (others nodes) in order node *i* can be completed.	Table 16
○ Out-degree of node *i*: Number of connections going from the node *i* to others. Represents the number of nodes the node *i* feeds or serves.	Table 17

The prioritization of the most important products for ChileAtiende is not trivial, since for each of these variables the most important products are different (the top 10 products for each category are different), therefore it is crucial to find a way to weight the importance of each variable to generate a sound prioritization.

Table 16 shows those products that have the highest In-Degree, which means that require inputs from other nodes in order to be completed. In other words, these products are absorbers or receivers; and these products will be important if the number of visits that they receive is high.

Table 16: Top 10 products with highest In-Degree

	Exact name of Webpage	Deg In
1	*Subsidio habitacional para familias de sectores medios. Título II (DS N°1)*	8
2	*Subsidio habitacional para familias de sectores medios. Título I, tramo 2 (DS N°1)*	8
3	*Programa de renovación de buses de transporte público (Renueva tu micro)*	7
4	*Regularización de título de dominio de una propiedad particular*	6
5	*Autorización para prestar servicio de transporte privado (general o especial) e inscripción de vehículo en servicios de transporte privado*	6
6	*Renegociación de las deudas de una persona*	6
7	*Programa Más Capaz (+ Capaz)*	6
8	*Permiso para el ingreso o la salida temporal de un vehículo desde y hacia Argentina*	6
9	*Solicitar inscripción en el Registro Nacional de Contratistas*	6
10	*Becas para estudios de magíster en Chile*	6

Table 17, on the other hand, shows those products that have the highest Out-degree. These products are used by other nodes in order to fulfill a requirement. In other words, these are feeders. These products are not only important because of their own visits, but also because they enable several other nodes to meet their requirements; therefore, they have a direct demand, and an *indirect demand* within the network. In the case of ChileAtiende, the biggest feeder is the *Cédula de Identidad* (Identification Card), which enables other 732 products; and even though its individual contribution in terms of visits is relatively low, its importance is high because of the indirect effects.

Table 17: Top 10 product with highest Out-Degree

	Exact name of Webpage	Deg Out
1	*Cédula de identidad (obtención y renovación)*	732
2	*Inicio de actividades como empresa e inscripción de RUT*	123
3	*Copia de inscripción de la constitución de una sociedad (con vigencia)*	95
4	*Certificado de nacimiento para todo trámite*	92
5	*Certificado de vigencia de una sociedad*	86
6	*Certificado de antecedentes*	75
7	*Certificado de alumno regular*	48
8	*Certificado de defunción para todo trámite*	48
9	*Certificado de matrimonio para todo trámite*	46
10	*Copia de inscripción de propiedad con dominio vigente (certificado de dominio vigente)*	39

Figure 40 shows a plot of the 30 most relevant nodes, ranked by an indicator defined as the number of visits of the node i plus the corresponding share of the total visits to the website depending on the number of connections (in and out) of the node.

$$Ranking\ value = Number\ of\ visits\ node\ i + \frac{Number\ of\ edges\ node\ i}{\sum Edges\ in\ network} * \sum Visits\ in\ network$$

When these nodes are plotted in a 2-dimension diagram, with In-Degree as the X axis, Out-Degree as the Y axis, and number of visits as the size of the balloon, the behavior of these products is more evident.

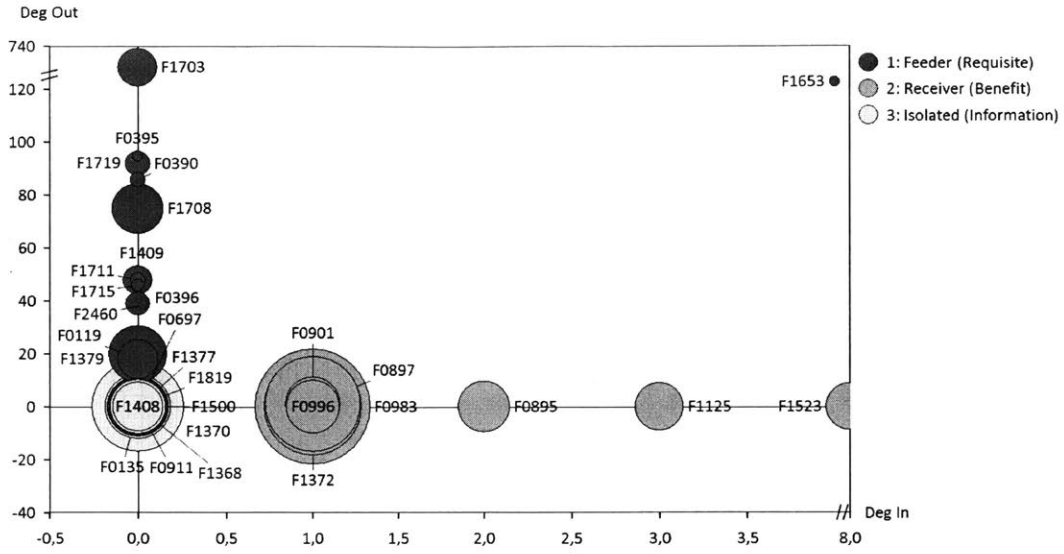


Figure 40: Typical behavior of the products in ChileAtiende website

First, we see a first group (1, in blue) which is along the Y axis, in X = 0, with relatively high Out-Degrees. These are the feeders that will serve other nodes to be completed. These are typically Certificates that are required to do a second transaction (request a benefit for instance). It is interesting that those products have a low (near zero or zero) In-Degree.

The second group is the one along the X axis, with low (near zero or zero) Out-Degree, but with relatively high In-Degree. These products are receivers or absorbers, which means that they need other inputs in order to be completed. These are typically benefits that require some certification in order to be provided to the citizens.

The third group are products with low In-Degree and Out-Degree, but with a fair amount of visits. These are isolated nodes; typically information pages, which do not require any input and don't become inputs to other products either. These information pages are generally part of the information that ChileAtiende provides, whose content are managed by the ChileAtiende team and not necessarily by the Agency responsible for the benefit/transaction.

An interesting fact is that the central part of the diagram is fairly empty. This means that the products behave on the average as either one of the three groups named before, and there are only a few cases that are both Group 1 and 2 (See product F1653 in Figure 40, "*Inicio de actividades*

como empresa e inscripción de RUT", which is both, a certification to access to more products and also requires several other inputs to be completed). Cases like that are not abundant, thus the groups are well defined.

Direct and Indirect Demand

Another way (but related) to look at the importance of a specific product is to evaluate the direct and indirect demand it accounts for. This can be calculated by adding the visits of all products depending on a specific node downstream in the network. The results are shown in Figure 41, where it can be seen the nature of the feeder and absorber groups.

Those products with all or the majority of the bar in blue color (i.e. *Aporte Familiar Permanente 2016*), are typically benefits (a final goal); therefore, they produce low indirect impact.

Those products with a big part of the bar in light gray (i.e. *Cédula de identidad*) are feeders, since only a relatively small part of the impact comes from direct demand, but the most of its impact comes from the input provided to the other products downstream in the network.

Figure 41: Ranking of products in ChileAtiende website by Direct and Indirect demand

Reduced networks

So far, the descriptions provided have been related to the whole network of ChileAtiende (including all products and agencies). It is clear that this scope is not narrow enough to find a solution that provides not only a good service level, but a solution that also drives efficiency and matches the expectations of the citizens in terms of a one-stop shop for Government Services.

The goal is to find a reduced network that maximizes the satisfaction of the citizens through a high level of service, while minimizing development and operational costs. This cannot be achieved by simply ranking products and see what happens with the network.

Taking as an example Figure 39, which is a reduced network by cutting all nodes with In-Degree < 2, all nodes with Out-Degree < 14 and all nodes with visits < 25,000; it is clear that some critical information was lost. For instance, the most visited page (*Aporte Familiar Permanente 2016*) was removed because it is a benefit, thus its Out-Degree is zero and the criteria was to cut all of those < 14. Then whenever a single variable is maximized, there is risk of losing a node that is important on other variable.

Table 18: Reduced ChileAtiende networks with different cut-off points

Cut-off point				Results					
Degree Out	**Degree In**	**Visits**	**Ranking**	**Number Nodes**	**Edge Density**	**Top10 Degree**	**Top20 Degree**	**Top10 Visits**	**Top20 Visits**
0	0	0	0	2460	0.000324	TRUE	TRUE	TRUE	TRUE
0	0	10000	0	290	0.002911	TRUE	FALSE	TRUE	TRUE
0	0	25000	0	165	0.004139	FALSE	FALSE	TRUE	TRUE
0	0	25000	60000	95	0.008399	FALSE	FALSE	TRUE	TRUE
0	**0**	**0**	**60000**	**109**	**0.008919**	**TRUE**	**TRUE**	**TRUE**	**TRUE**
0	0	0	100000	76	0.010175	TRUE	FALSE	TRUE	TRUE
14	2	25000	0	45	0.029798	FALSE	FALSE	FALSE	FALSE
0	0	0	150000	49	0.012755	TRUE	FALSE	TRUE	TRUE

Table 18 shows different iterations with cut-off points for Out-Degree, In-Degree, Visits and Ranking (compound variable generated as explained in equation above). The first row shows the complete network (cut-offs set at zero for all variables). It can be seen that at some point all the

individual variables start failing, removing part of the important nodes in the network. Although not perfect, a network with 109 nodes could be created by setting the cut-off for ranking at 60,000 visits without losing any of the top 20 nodes by visits or by nodal degree.

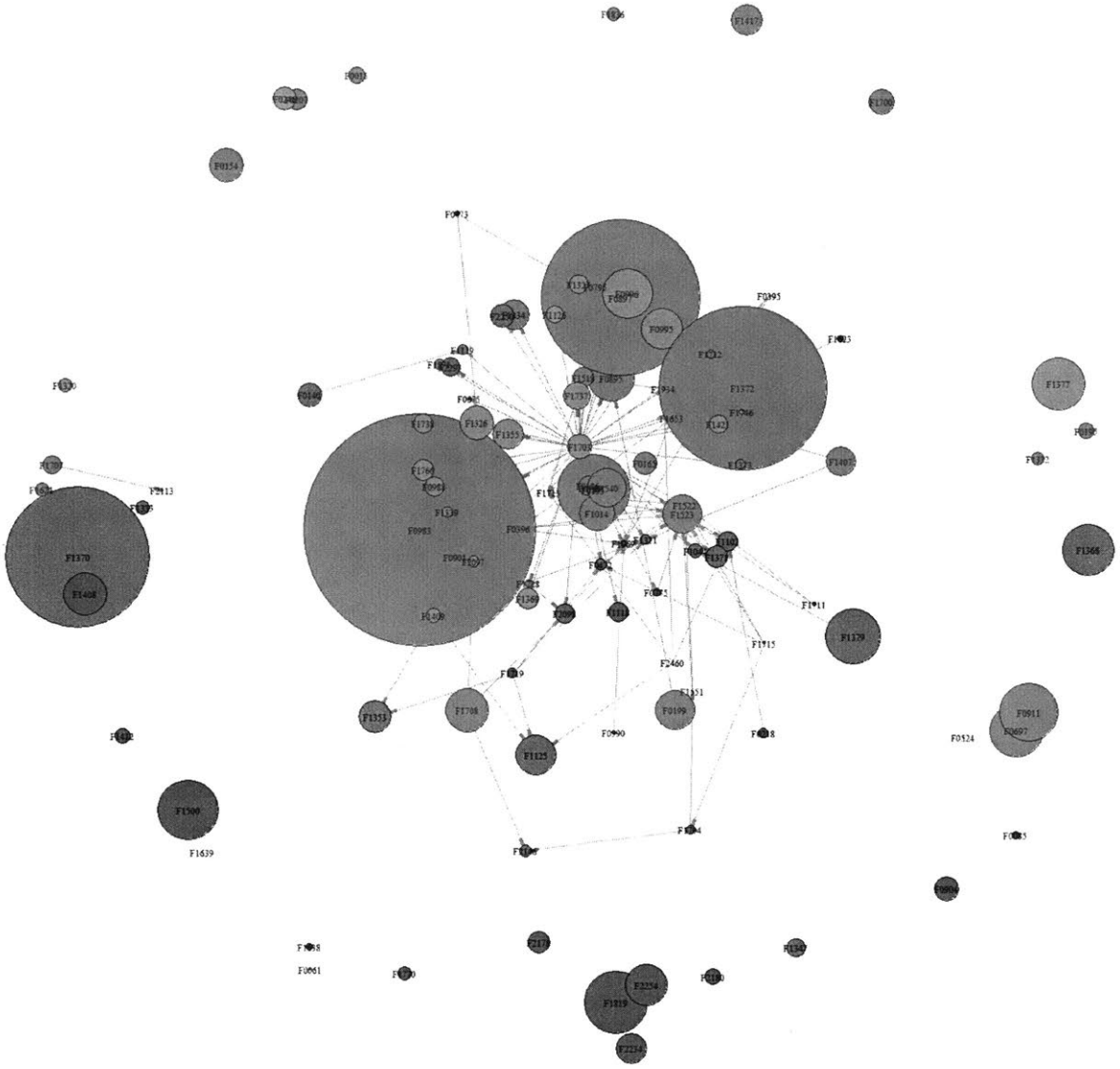


Figure 42: Reduced network for ChileAtiende with cut-off point Ranking < 60,000

This can be a good reduced network; however, it is not clear if 109 is a good number of nodes to be considered or not; there is no information about if products are digital or not, and there is no

insight about costs. Therefore, there are several other variables that should be explored before providing a final recommendation.

5.2.2. Insights and inputs for the design of the ChileAtiende network

Scope (Service and Products)

- The more products available the network has, the more satisfied the citizen will be.
- ChileAtiende has 3 channels. All of them have different levels of costs and service.
- There are services and products that have a better fit with ChileAtiende's mission and target audience (those that are well connected and receive more visits).
- Number of visits / views as an indicator alone, is not a good variable to decide if a product should be considered on the design of the network. Interactions and the indirect demand produced are also factors to add up to the calculations.
    - Two alternative metrics have been developed so far: Ranking Value and Total Demand (Direct + Indirect Demand)
- There are 3 main groups of products:
    - Feeders: Typically certificates or similar that enable other products to be completed (request a benefit). Feeders are important for its indirect impact.
    - Absorbers: Typically benefits or similar that are enabled by other products. Absorbers are important because those are the final goals of the citizens.
    - Isolated: Are not really connected to other products. Typically, these are information cards that can be held online in order to avoid visits to the other channels.
- 52% of the products in ChileAtiende don't have any digital service. Those products that already have part of their processes in digital way are less expensive in development costs than those that don't have any digitization.
- Products are not necessarily in the 3 channels. They can be segmented given the cost-benefit analysis to be performed.

Cost (Cost of Development and from Operations)

- There is a cost of development for each new product integrated to the network.

- Products belong to agencies. If an agency has an agreement with ChileAtiende, an additional product for that agency is relatively cheaper than an additional product of an agency not yet added to the network.
- Numerousness is a source of complexity. The fewer products the network has, the easier it will be to manage the network.
- 290 products represent the 90% of the volume of visits to ChileAtiende. The remaining 2170 products (88.2%) represent the remaining 10% of the products.
- Cost of serving via the Online channel is on average 1/10 of the In-Person Channel.

Cost (Savings and synergies to capture)

- The more products and agencies available in the ChileAtiende network, the more savings generated for pooling effect and reduction of the impact of variability. These savings are capitalized if the agency delegates the service to ChileAtiende.

Time (Timeframe for the project)

- ChileAtiende can be developed in phases, it is not necessary to go for the final design all at once. UK, for instance, is still working on adding new agencies and institutions to its website, although they have been working on the project from 2012. The first stage could contemplate the most relevant institutions and products related for all three channels. Second and third stages could relate to second and third tier agencies and products that could be launched later on, in order to meet other criteria (service, additional savings, consistency, completeness, robustness or other attributes).

Chapter 6: Creating a Holistic View of the Future for ChileAtiende

This chapter discusses step 4 of the ARIES framework, which is much more than simply record a vision statement. This step is a view of the future that includes a set of considerations that must be weighed and accounted, such as the time horizon of the transformation, enterprise culture, ecosystem factors and enterprise capabilities. As discussed in the previous chapter, the ChileAtiende network is quite complex because of the different stakeholders and agencies involved, as well as the omni-channel structure of its service. In addition, there is a need for a centralized structure or umbrella that integrates all these components, which today does not exist.

The immediate questions then are: What agencies and products should be included in the ChileAtiende project? What should be included in the ChileAtiende network in the long term? What are the right channels for the network? What are the priorities? The list of questions clearly does not end here, and the answers are not simple at all. That is why it is necessary to define a set of design criteria and also necessary to use a set of tools that allow us to compare alternatives in order to select those that meet the most important requirements.

Following this line of reasoning, one of the first steps is to understand the needs of the stakeholders as well as the success drivers, and to translate those into goals of the project. In the ARIES framework these goals can be seen as the "holistic view of the future", which are less technical than a well-defined set of requirements a systems engineering program would use; however, from an organizational design point of view, it is a suitable approach.

6.1 Holistic View of the Future

Based on the stakeholder analysis performed earlier, the needs and views from the most relevant stakeholders found after the quantitative analysis shown in Figure 20 are analyzed briefly in this chapter. These stakeholders are: Citizens, *SEGPRES / UMYGD*, Citizen Desk / Business Desk Projects, and Public Institutions & Agencies.

The following paragraphs briefly describe how these specific stakeholders would expect the ChileAtiende project to work five years in the future from a testimonial point of view, technique recommended by the ARIES framework, and called vignette in this context.

1. Citizens

"I went the other day to the ChileAtiende office and I got my birth certificate to apply for a loan in the bank. I also got the aid I receive every March for my kids' school, and I didn't even need to go to the office of the Ministry of Education. I did not know I could ask for that benefit in the same office. Even more shocking is that the kind lady that took care of my case told me I could do this process from home via the internet. I told my neighbor and she did it from home, her son helped her and they requested the benefit from their cell phone. Pretty amazing, ah?" – A citizen of the future

What the citizen of the future describes, is an omni-channel service, where she can do several procedures related to the government's services that are not necessarily interconnected, in the same location. This is the basic concept of a one-stop shop. The citizen also describes the integration of the online service, which provides the same service as the in-person service, without the need to go to the office. Furthermore, the site can be accessed from the cell phone. To summarize, the main characteristics a citizen would like to see are:

- Citizens can request several services and complete procedures from institutions related to the government in one single place (office, call center or website).
- There is no need to go to a physical location to complete the procedures.
- Different channels are seamlessly integrated. Same information is received from the online, in-person or call center channels. Tracking of cases is possible, and from any of the channels.
- The interfaces provide easy access to the different channels. The language used is friendly and instructions are easy to understand and follow.
- The staff is well trained, friendly and helpful. They are capable to provide information and solve cases in real time.
- Information security meets high standards.

2. *SEGPRES / UMYGD*

"We are very proud of this project. The latest survey we did reported that 80% of the people support our Government. We believe that ChileAtiende has a lot to do with this figure, since it is easier to collect the benefits and the information is more transparent than ever. Plus, our friends from the Ministry of Finance are happy too for all the efficiencies we have achieved in terms of reduced operational costs in other institutions". – Future Minister of the General Secretariat of the Presidency

"This project has been very successful. We completed the first two phases on time and within budget, and we are working in the third phase at this moment. We have learned a lot from the rest of the stakeholders, and we have applied best practices from the private sector and from the agencies of the government that historically have been more advanced in IT technologies". – Future Director of the Unit of Modernization and E-Government.

The opinions above of the future versions of the Minister of the General Secretariat of the Presidency and the Director of the Unit of Modernization and E-Government describe a project that has been effective in reducing the visits to the public offices, allowing the government to take advantage of all the efficiencies generated from pooling the demand and reducing the fixed costs of service. They also describe a project that is well perceived by the citizens, since it understands their needs. On top of that is a project that was well managed and controlled, and feasible within the timeline proposed. Finally, it is a project where teams from different agencies have worked together, learning from each other, and levered up the knowledge within the government management team.

Restating and summarizing, what *SEGPRES* (representing a more strategic point of view and the whole government), and UMYGD (representing the middle management within the government in charge of the project) would expect to see from the ChileAtiende project are the following characteristics:

- A project that is evaluated positively by the citizens, because it is a noticeable improvement compared to the situation before the project. Besides, it is a project that has

not caused any disruptions in the normal functioning of the citizens (all the opposite compared to iconic projects such as the Transantiago[6])

- A project well designed, executed and controlled. Phases well defined and coherent, without overcommitting or promising tight deadlines that are not going to be met on time or unfeasible features. In the same logic, the project should deliver the results expected within the budget forecasted.
- A project that shows progress sooner rather than later. The government should not expect to wait 3 years without any tangible results in that period.
- A project that correctly manages interfaces among different stakeholders, making the interrelationships seem smooth and aligning the goals and expectations of the majority of the parties involved.
- A project that can be a strong signal of efficiency in the government, using cutting edge methods and delivering a service that is comparable to the ones found in the private sector. Further savings are achieved by pooling resources among agencies, merging service centers and in the long run having a smaller need for customer facing employees.

3. *Citizen Desk and Business Desk Projects*

"The ChileAtiende Project has been a great complement to the work that has been done here. We have worked together from the very beginning and the developments have been integrated ever since. We are very happy because this experience shows that multi-stakeholder IT projects can work well". – Future Citizen Desk Chief Engineer

Basically, what leaders from other governmental projects should expect is a transparent, continuous and coordinated process that allows them to progress in an organized way, so that the results are coherent and achieved with a minimum rework and overlap. Again, summarizing, partner projects should expect the following:

[6] The Transantiago project was the transformation of the public transport system, launched in 2007. It is sadly famous because of its poor service in its early stages, dramatically changing the way people used to move within the city.

- Integrated design from the very beginning, so that the interfaces do not create problems downstream in the future. Common features such as programming languages, IT architecture, data frameworks and even common vendors are defined early in the project after all relevant stakeholders reach a consensus. Execution is fast after these definitions are made.
- High coordination efforts in order to make organized progress and avoid rework, overlap and double efforts.

4. Public Institutions and Agencies

"ChileAtiende has been great in helping us manage demand. We used to have huge peaks during specific weeks in the year, but now that almost does not happen. We manage several services from 2012, but now the work is relatively easy because all the information is in the platform, which is extremely friendly. Before the ChileAtiende project, we had to sign in into different platforms and we could not be experts in everything, but the situation is totally different now. We are very happy to help people with different requirements and we feel rewarded when they get out of the office with a solution to their problem". – Future Civil Servant at *IPS*.

Public institutions in general have to be supporters of the project. Probably the most important agencies to consider are those who will deliver the service using their resources, role that has been played exclusively by the *IPS* so far, but is not restricted to them.

In the past, *IPS* with fair reasons has been a detractor of the project because of the aggressive implementation plan put in place, without a discrete improvement in technology first. This plan created the operative system we have today, which cannot be escalated further. Because of that limitation, the implementation of the future phases of the ChileAtiende project must include a user-friendly interface for the civil servants because they will be working with products from several institutions at the same time.

Agencies should also be able to improve their own service by using this change in technology, focusing on better in-person service, targeting fast and productive interactions and faster resolution times given that processes have been simplified and streamlined.

Therefore, to synthesize the previous description of features the Public Agencies should expect from the ChileAtiende project, the main expectations from the public agencies incorporated in the ChileAtiende network should be the following:

- Simplified processes and requirements for products that reduce the response time for the front office and the back office.
- Integration of dependent products in the platform (no need to print and scan a certificate that can be obtained internally if the databases are integrated).
- A system for the civil servants who work with the public that unifies the information about different agencies. The initiative is supported by the frontline employees, who typically are a high number and capable of disrupting service if they do not accept the changes proposed.
- Shift in focus toward a better customer service experience from the public institution point of view, provided that the IT platform is solved and there is a lower demand for in-person interactions.

6.1.1. Constraints of the design

Gathering all these points of view it is relatively clear *what* needs to be done: Basically the project team needs to develop a platform that centralizes the delivery of services of the public institutions and allows the government and the citizens to profit from the efficiencies that can be created, accompanied by the right organizational structure which supports the sustainability of the initiative in an environment highly political. Now, the answers to questions such as *how* or *when* are more uncertain, since there are several constraints that need to be taken into consideration.

Budget (Cost)

Clearly, resources are not infinite and there is a budget constraint that cannot be ignored. Generally speaking, the budget for this project is released each year depending on the phase under development. For this project, the resources committed for the next two years are as follows (Ministerio Secretaría General de la Presidencia, 2016):

	2016	2017	2018
Budget [USD]	661,419	1,588,400	922,085

Time

There is a compressed timeline for the project, set by the administration. The first phase of the approved project needs to be completed by mid-2018. There is no fixed timeline for the remaining steps, which implies a *real option* in terms of feasibility to increase the scope of the project if the first phase is successful.

Scope

Most of the stakeholders would like to have a project that includes all the services provided by the Government. However, given the first two constraints (time and budget), the scope needs to be reduced. In addition, it is clear that the returns are decreasing for each additional product introduced to the network, with individual contributions that are very low after the first ~200 products, which cover 86% of the total visits to the ChileAtiende website (the best proxy for the overall demand per product).

Logical dependencies

There are several logical dependencies that need to be addressed in the formulation of this project.

- First of all, to have a service correctly deployed in the human-managed channels (offices and call centers), there is a strong preference for having the processes simplified and digitized beforehand. That is the way to make the centralized service scalable and manageable.
- The dependencies between pairs of products need to be considered. People typically cannot request a benefit without having the certificate that accredits that they are eligible for it. Hence, to incorporate a product, the predecessors or requirements of that product also have to be incorporated.
- An agency is incorporated into the network as soon as one of its products is included in ChileAtiende. This means that when a second product of a defined agency is chosen to be incorporated, it should not bear all the costs of setting up a relationship with the agency,

as happened with the first product. In other words, there are synergies by adding a second or third product of the same agency in the network, since the "fixed cost of incorporation" was paid by the first product included in the network. By the same token, when an agency is incorporated into the network, it does not mean that all the products related to it should be included immediately into the network, since the resources for development could be better invested by adding a product from other agency.

Given all these constraints (and others not yet described), there is a clear need for prioritizing the order in which the products should be included into the ChileAtiende network. Given the results of the analysis previously made, a naïve criterion could be to prioritize by demand volume; however, given the dependencies among the products this is a too simplistic approach (a product with relatively low demand in terms of page views could be critical for other high demand products). Instead, an optimization problem can be set to maximize the demand covered while satisfying the constraints stated above.

6.2. An Optimization Model for the ChileAtiende Network

Given the nature of this problem, where it is desirable to maximize the benefits for the people while meeting the different constraints of the project, an optimization problem is a suitable approach to model this issue.

6.2.1. Extended vs Simplified view

This problem can be examined from different angles, and can have different scope levels. One of the first design rules in modelling is to avoid trying to model the whole world, which means the modeler should try to focus only on those dynamics that genuinely matter for the problem, simplifying it, while still representing the main issue that needs to be solved.

ChileAtiende is a broad concept that incorporates not only its own operations but also the operations of the agencies that are within the network, if it is observed from a wide and systemic perspective. When an agency is included in the ChileAtiende network, their own operations are disrupted by having a strong online channel that modifies the interaction of the people with the rest of the channels.

Extended view

The extended view is represented in Figure 43, through a causal loop diagram following a simple System Dynamics representation. It involves not only the ChileAtiende project or the operations, but also incorporates the interaction between ChileAtiende and the set of Agencies that can be added to the ChileAtiende network. Notice that the arrows in the causal loop diagram have direction, color and a polarity (that is a minus or plus sign that designates the relationship between two variables, all else being constant).

Blue, thick lines represent the total demand distributed among the different channels (ChileAtiende and the Agencies). The sum of the visits to the website, call center and in-person interactions remains constant (or at least equal to the total demand). That means that if demand for one particular channel increases, the number of visits to the others has to decrease to maintain the relationship with the total demand. In other words, the underlying assumption is that an increment in visits to the ChileAtiende channels does not represent incremental demand; it only represents a demand transfer from the agencies.

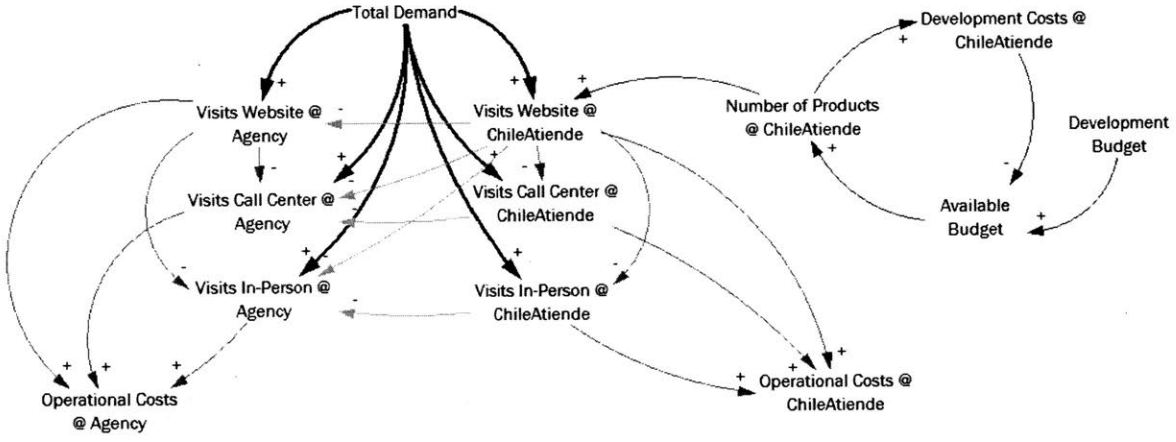


Figure 43: System Dynamics representation of the extended view of ChileAtiende

Red lines represent the cannibalization created among channels of either ChileAtiende or the Agencies. If the visits to the ChileAtiende website increase, the underlying assumption is that the demand for the other two channels decreases (that is why the polarity in this case is negative).

Orange lines represent the cannibalization between ChileAtiende and the agencies. The assumption is that if citizens go to ChileAtiende offices or call the ChileAtiende call center, they do not also go to the agency's office or call center.

Green lines represent the relationship between the visits to the different channels and the operational costs of the project. The more visits the system as a whole receives, the more costs will be accounted for. These costs include fix and variable costs, which increase with the number of visits in linear or non-linear functions, depending on the type of the cost. Although it is not represented in the diagram, the assumption is that given a constant demand, the amount of the operational costs will depend upon the proportion of the visits to the call center, offices or online; where the online channel is by far cheaper, thus the average cost per service will decrease leading to an overall decrease in the operational costs. This representation would also assume that it is possible to downsize if the number of visits to a specific channel decreases noticeably.

Finally, blue, thin lines represent the relationship between the budget of the project, the costs of development and finally the number of products that will be added to the project.

There are several simplifications on this diagram, for instance how the costs are related from the number of visits to the operational costs. In between there are number of employees, square feet of offices and other facilities, utilities, number of servers and direct costs of service such as office supplies. The model could be expanded to a higher level of disaggregation, although there is too much information uncertainty and lack of data that the creation of a model with such level of detail could lead to a higher degree of errors.

Simplified view

A simplified version of the model would leave aside the operational costs component of the model and would rest on the fact that a larger proportion of visits to the website actually decreases the operational costs overall. This simplification would remove the most difficult and data intensive part of the analysis, which is also the one with less available data.

In addition to simplifying the relationships between visits and costs, the model can be simplified by assuming that an increment in the number of visits to the ChileAtiende website will decrease

the overall number of visits to the rest of the channels, either to ChileAtiende call center, offices or any of the channels of the agencies in the network. The effect is to switch a higher or same cost service (if we are talking about the website of the agency under assessment) for cheaper service cost per citizen, since the online service is the cheapest one among the three channels.

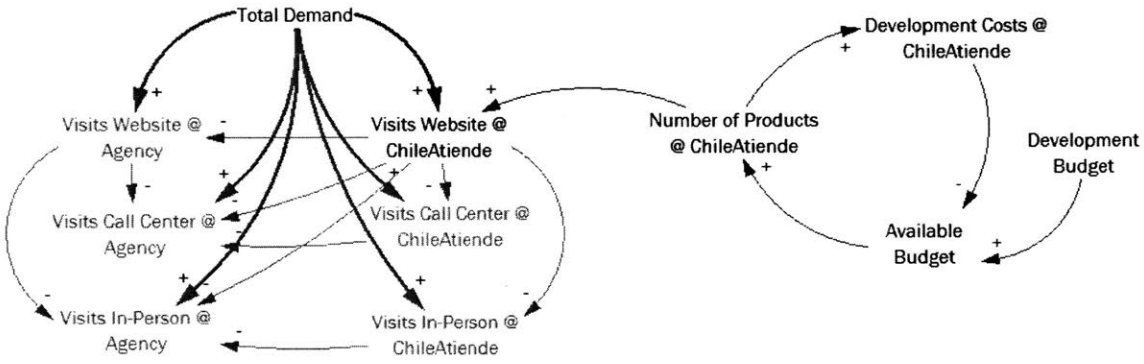


Figure 44: Simplified view of the ChileAtiende project

Besides, it is nearly impossible to be able to scale a project of these characteristics to the offices and call center channels without solving the online version, which requires as a prerequisite simplified, streamlined processes. This means, in the end, that the online channel should be the first to be transformed, passing the benefits downstream to the other channels.

If these assumptions hold, then the problem is simplified to the maximization of the visits to the ChileAtiende website by increasing the number of products in the portfolio, restricted to the limited budget of the project. That is exactly the formulation that is explained in detail in the following pages.

6.2.2. Model formulation and solution

The model is formulated as a Mixed Integer Linear Program, with the objective of maximizing the number of visits to the webpage, and several restrictions. The restrictions of the problem are the budget constraint, the dependencies among the different products, and the correspondence between products and agencies.

Assumptions

The assumptions in this formulation are as follows:

- Each product has a fixed development cost.
- Each product belongs to one agency. To incorporate an agency into the network there is a fixed cost, which is paid only once, as soon as the first product of the agency is incorporated into the network.
- The sum of fixed costs by agency and product introductions cannot be higher than the development budget of the project.
- A product that depends on another product cannot be introduced to the network unless the predecessor is also introduced.
- There are products that already have achieved certain progress in terms of digital development. The development costs of those products are assumed to be lower than a product that currently does not have any digital development in place.

Formulation

The formulation of the MILP is as follows:

$$Max\ z = \sum_{i=1}^{2460} v_{ij}^{p} * x_{ij}^{p}$$

$$s.t.:$$

$$\sum_{i=1}^{2460} c_{ij}^{p} * x_{ij}^{p} + \sum_{j=1}^{139} c_{j}^{a} * y_{j}^{a} \leq B$$

$$x_{ij}^{p} - M * y_{j}^{a} \leq 0 \ \forall j$$

$$x_{ij}^{p} - M * x_{ij}^{p'} \leq 0 \ \forall i$$

$$x_{ij}^{p} = \{0,1\} \ \forall i$$

$$y_{j}^{a} = \{0,1\} \forall j$$

$$M, B \geq 0, Int$$

where:

v_{ij}^{p}: Number of page views to the product i, which belongs to agency j.

x_{ij}^{p}: 1 if product i, which belongs to agency j, is introduced to the network. 0 otherwise.

c_{ij}^{p}: Cost of development of product i, which belongs to agency j.

c_{j}^{a}: Cost of development by introducing agency j to the network.

y_j^a: 1 if agency j is introduced to the network. 0 otherwise.

$x_{ij}^{p'}$: Predecessor of product x_{ij}^{p}.

M: Big number (sum of total page views for all the products).

B: Development budget of the project.

The resulting model has 2599 variables to be solved (2,460 products plus 139 agencies), and it has 4,435 constraints (2,460 that represent correspondence between products and agencies, 1,974 that represent dependencies among products and 1 representing the budget constraint).

The model was solved using R through the package RGPKL (Sallan, et al., 2015), which does not have restrictions on the number of constraints or variables of the model. The code used for this model can be found in the Annexes section.

6.2.3. Results

The output of the model is the subset of products and agencies that should be included in the network at a certain budget level. Although the development costs of products and agencies used in the model may not be accurate, the results can be interpreted as the right order in which the products and agencies should be included in the network as the budget is increased.

Figure 45 shows how the number of products and agencies are included in the ChileAtiende network when the budget is increased. The first thing to be noticed is that once an agency is included in the network, not all its products are introduced to the network. Instead, only those more profitable products are included, and the MILP prefers to introduce a product from another agency if it brings higher returns. The result is an average ratio between products and agencies of 4.8 to 1.

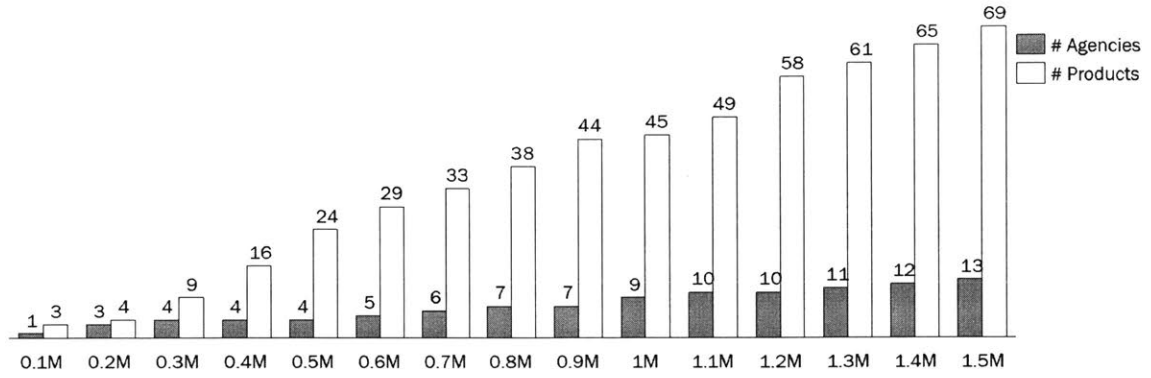


Figure 45: Number of agencies and products included in the network at different budget levels

Figure 46 shows how these products contribute to the number of views captured by the subset of products introduced in the network. It can be observed that the first products to be introduced (the ones introduced at lower budget levels) provide higher individual contributions. This can be seen in the steeper slope in the beginning of the Views curve.

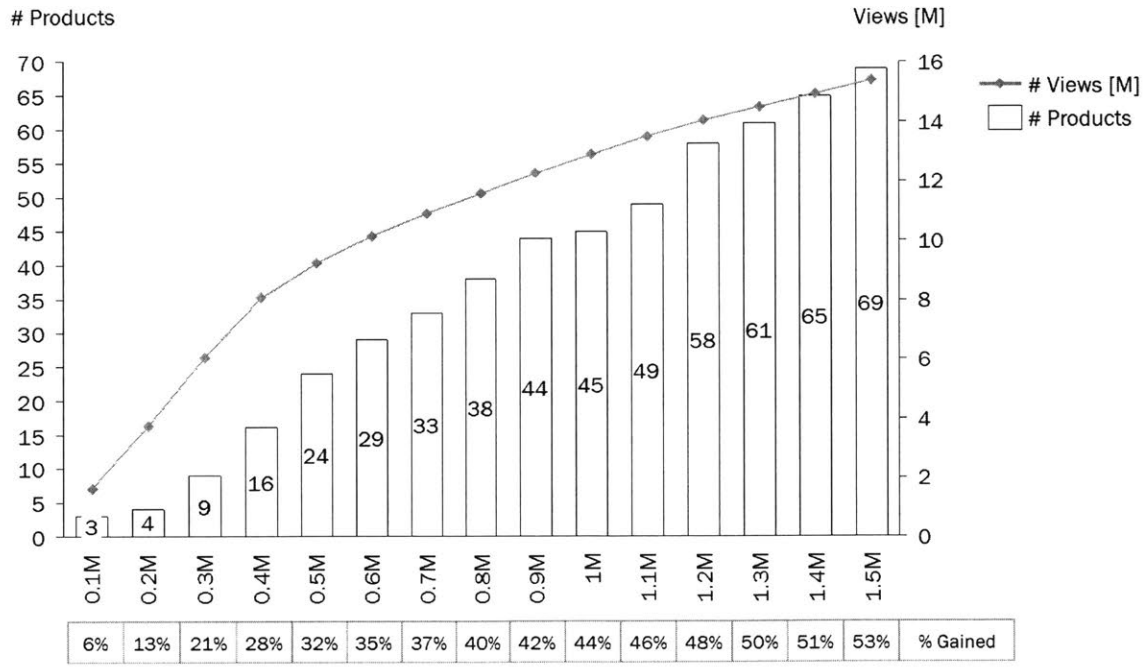


Figure 46: Number of products and views gained at different budget levels

If the number of products is 45, at a $1 M budget, the views gained represent 44% of the universe of current views to the ChileAtiende website. If a 50% larger budget is added to reach $1.5 M, 53% more products are added (to reach 59 products), but only a gain in visits of 18% is achieved.

Figure 47 represents the phenomenon just described in another way. It shows how the reach of additional views impacts on the cost of the project; and it can be seen that in the beginning, at lower levels of views and products, the curve is fairly flat and gets steeper and steeper while increasing the number of views (X axis). This means that additional views are more and more expensive when the network increases the number of parts.

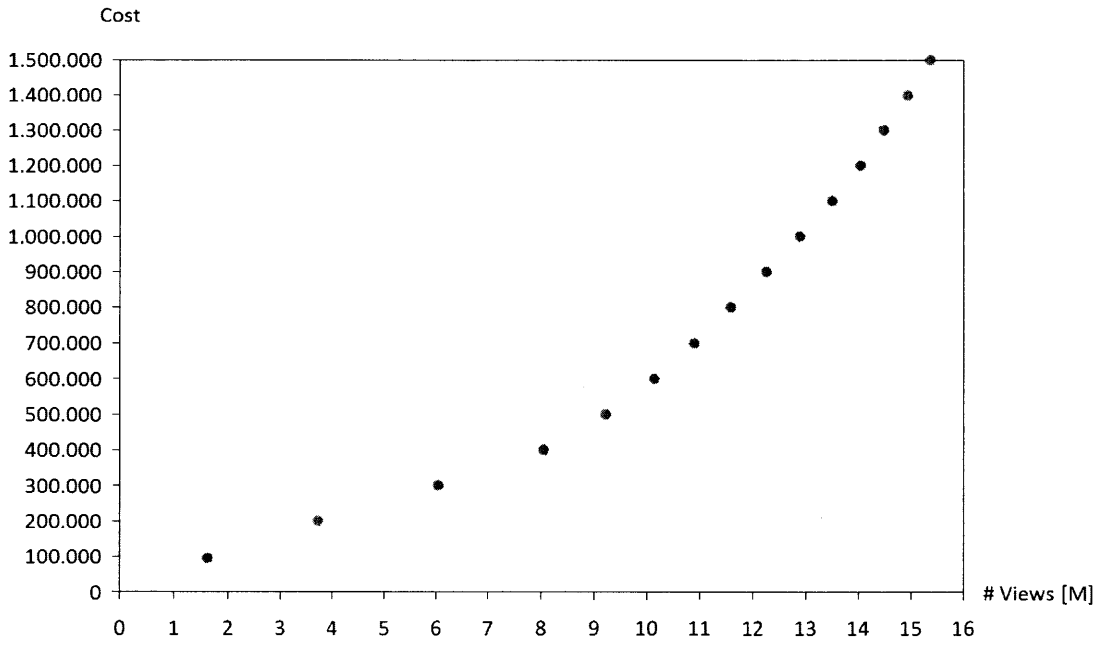


Figure 47: Relationship between # views and cost of development

Table 19 shows the number of agencies and products introduced to the network by the MILP model at different budget levels. The solutions below show how the model looks for those agencies with the biggest potential in terms of views, and by incorporating the dependencies, constraints and the budget, it delivers the optimum subset of products and agencies that captures the maximum number of views.

Table 19: Results of the first 10 iterations and for the MILP model for ChileAtiende.

	Budget									
	100K	200K	300K	400K	500K	600K	700K	800K	900K	1M
# Agencies	1	3	4	4	4	5	6	7	7	9
# Products	3	4	9	16	24	29	33	38	44	45
# Views [M]	1.6	3.7	6.0	8.1	9.2	10.1	10.9	11.6	12.3	12.9
% Views Gained	6%	13%	21%	28%	32%	35%	37%	40%	42%	44%
Agencies										
Fondo Nacional de Salud	0	0	1	1	1	1	1	1	1	1
Instituto de Previsión Social	0	1	1	1	1	1	1	1	1	1
Junta Nacional de Auxilio Escolar y Becas	0	0	0	0	0	0	0	0	1	1
Ministerio de Desarrollo Social	1	1	1	1	1	1	1	1	1	1
Ministerio de Educación	0	0	0	0	0	1	1	1	1	1
Ministerio de Salud	0	0	0	0	0	0	0	1	0	1
Servicio de Registro Civil e Identificación	0	1	1	1	1	1	1	1	1	1
Servicio Nacional de Capacitación y Empleo	0	0	0	0	0	0	1	1	1	1
Superintendencia de Salud	0	0	0	0	0	0	0	0	0	1
Products										
Afiliación a FONASA	0	0	0	0	1	1	1	1	1	1
Certificado de afiliación a FONASA	0	0	1	1	1	1	1	1	1	1
Comprar un bono de FONASA	0	0	1	1	1	1	1	1	1	1
Devolución de cotizaciones de salud pagadas en exceso a FONASA	0	0	0	0	1	1	1	1	1	1
Precio de un bono FONASA	0	0	1	1	1	1	1	1	1	1
Aporte Familiar Permanente 2016	0	1	1	1	1	1	1	1	1	1
Asignación maternal	0	0	0	0	1	1	1	1	1	1
Bono de Invierno 2016	0	0	0	1	1	1	1	1	1	1
Bono por Hijo	0	0	0	1	1	1	1	1	1	1
Fecha de pago de una pensión u otros beneficios	0	0	1	1	1	1	1	1	1	1
Pensión Básica Solidaria de Vejez (PBSV)	0	0	0	0	0	0	0	0	1	0
Subsidio a la cotización de jóvenes	0	0	0	0	1	1	1	1	1	1
Subsidio Maternal	0	0	0	0	0	0	1	1	1	1
Beca de Alimentación para la Educación Superior (BAES)	0	0	0	0	0	0	0	0	1	0
Beca práctica técnico-profesional	0	0	0	0	0	0	0	0	1	1
Beca Presidente de la República para estudiantes de enseñanza media	0	0	0	0	0	0	0	0	1	1
Obtención de la Tarjeta Nacional Estudiantil (TNE)	0	0	0	0	0	0	0	0	1	1
Programa de Útiles Escolares	0	0	0	0	0	0	0	0	1	1
Reposición de la Tarjeta Nacional Estudiantil (nueva TNE)	0	0	0	0	0	0	0	0	1	1

Table 19 (continued)

	Budget									
	100K	200K	300K	400K	500K	600K	700K	800K	900K	1M
Revalidación de la Tarjeta Nacional Estudiantil (TNE)	0	0	0	0	0	0	0	0	1	1
Bono Control de Niño Sano	1	0	0	1	1	1	1	1	1	1
Bono de Graduación de Enseñanza Media	0	0	0	0	1	1	1	1	1	1
Bono por Asistencia Escolar	1	1	1	1	1	1	1	1	1	1
Bono por Formalización del Trabajo	0	0	0	0	1	1	1	1	1	1
Bono por Logro Escolar	0	1	1	1	1	1	1	1	1	1
Cartola hogar	0	0	0	0	0	0	0	1	0	0
Ingreso Ético Familiar (IEF)	1	0	0	1	1	1	1	1	1	1
Registro Social de Hogares	0	0	0	1	1	1	1	1	1	1
Beca Nuevo Milenio para estudiantes de cursos superiores	0	0	0	0	0	0	0	1	1	1
Certificado anual de estudios	0	0	0	0	0	1	1	1	1	1
Certificado de alumno prioritario	0	0	0	0	0	1	1	1	1	1
Certificado de alumno regular	0	0	0	0	0	0	0	0	1	1
Certificado de estudios para fines laborales	0	0	0	0	0	1	1	1	1	1
Concentración de notas de enseñanza media	0	0	0	0	0	1	1	1	1	1
Exámenes libres para mayores de 18 años	0	0	0	0	0	0	1	1	1	1
Buscador de farmacias de turno	0	0	0	0	0	0	0	1	0	1
Bloqueo gratuito de la cédula de identidad	0	0	0	1	1	1	1	1	1	1
Cédula de identidad (obtención y renovación)	0	1	1	1	1	1	1	1	1	1
Certificado de anotaciones vigentes de vehículos motorizados	0	0	0	0	0	1	1	1	1	1
Certificado de antecedentes	0	0	1	1	1	1	1	1	1	1
Certificado de nacimiento para asignación familiar	0	0	0	0	0	0	0	1	0	0
Certificado de nacimiento para todo trámite	0	0	0	0	0	0	0	1	1	1
Obtención de la clave única	0	0	0	1	1	1	1	1	1	1
Pasaporte (obtención y renovación)	0	0	0	0	1	1	1	1	1	1
Bono al Trabajo de la Mujer	0	0	0	0	0	0	1	1	1	1
Subsidio al Empleo Joven (SEJ)	0	0	0	0	0	0	1	1	1	1
Certificado de afiliación al sistema de ISAPRES	0	0	0	0	0	0	0	0	0	1
Devolución de excesos por cotizaciones en ISAPRES	0	0	0	0	0	0	0	0	0	1

A reasonable scenario in terms of similarity in size and scope to the proposed by the ChileAtiende team, is the $1M budget scenario. This one shows 12.9 million views, which represent 44% of the total views of the pages related to products in the ChileAtiende website. This is achieved by

incorporating 9 agencies (6% of the agencies) and 45 products (2% of the products). These numbers seem to be a very good trade-off, reaching a considerable portion of the scope at a very low cost in terms of complexity, by having a reduced number of products and agencies.

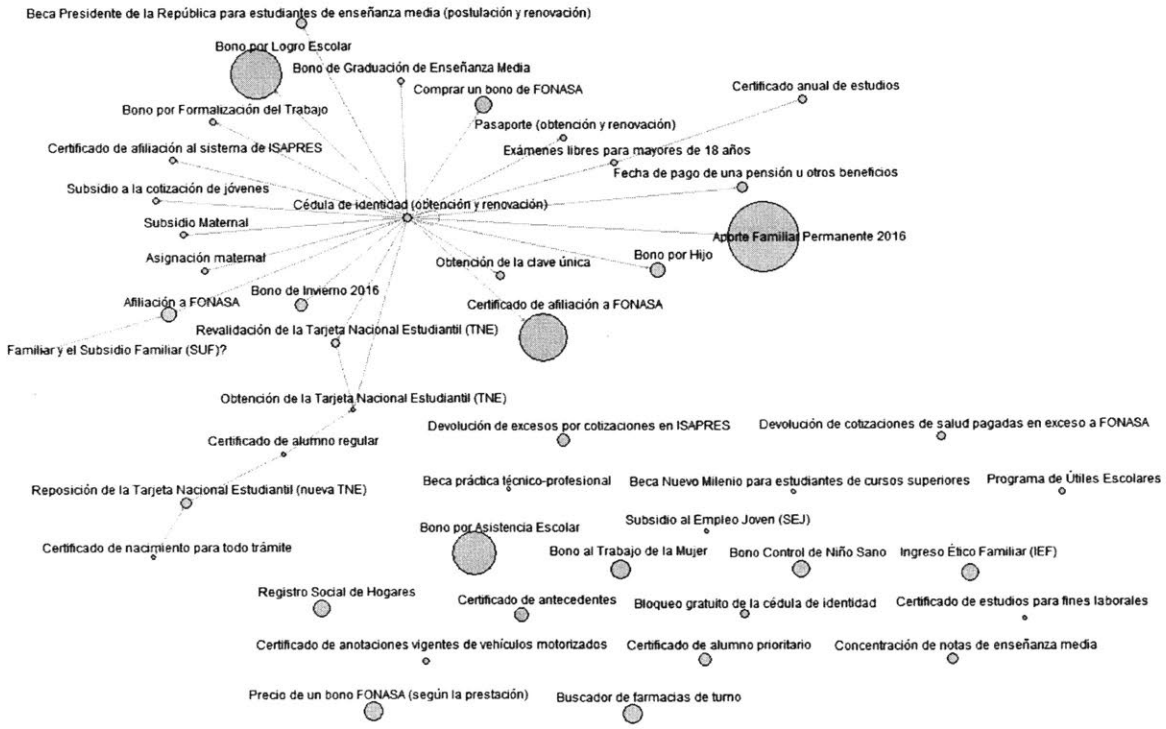


Figure 48: Proposed network for ChileAtiende

Figure 48 is a network representation of the ChileAtiende subset of products selected. It can be seen how the relationships flow among different products. Especially interesting is the role played by the *Cédula de Identidad* (Identification Card), which enables several products. This basically means that the *Cédula de Identidad* is extremely important, and obviously it cannot be left aside when trying to identify the most important products in the network. This would imply that the *Cédula de Indentidad* needs to be digitized in a way that actually enables the rest of the products that depend upon it. Thus, the *Clave Única* project, which incorporates the ability to digitally validate the identity of the citizen, is one of the important pillars for achieving success in the ChileAtiende project.

Impacts that a more powerful website has in the number of visits to the offices

One of the obvious questions after all the analysis is how the strengthened online channel would impact the visits in the offices. This is not easy to answer, since there is no data within ChileAtiende that shows how a website that allows people to complete the procedures they need to complete, impacts the number of visits to the offices. In spite of this, a proxy can be developed if the IPS data is reviewed.

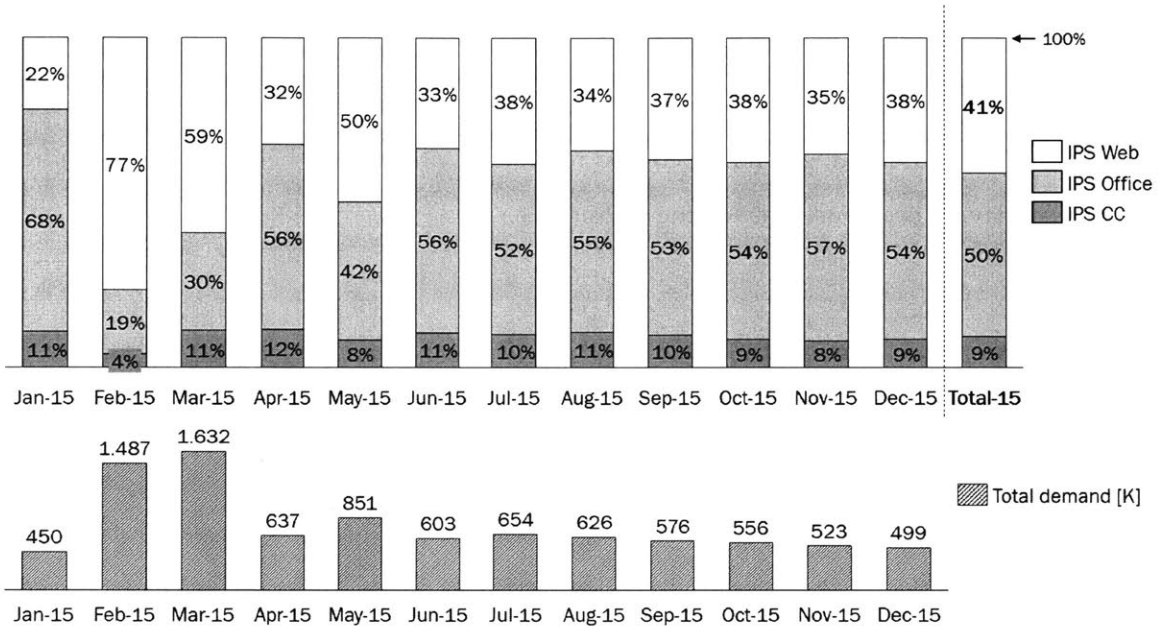


Figure 49: Time series of the total demand for IPS through the three channels during 2015

Figure 49 shows the time series for the total demand for *IPS* in 2015. It is the only agency within the ChileAtiende network whose demand is almost totally represented through the numbers in the ChileAtiende database. This is because the in-person channel of ChileAtiende is controlled by *IPS*; hence, all the *IPS* demand is reflected in the numbers reported to ChileAtiende. It is not the same situation when the figures for the *Registro Civil* (Civil Registry) are reviewed, since although ChileAtiende performs some of the procedures that *Registro Civil* offers, there is a big chunk of the demand that is served by the *Registro Civil* itself, which is not reflected in the ChileAtiende database. The case of *IPS* is different though, because the majority of the *IPS* online demand goes through ChileAtiende.

If these assumptions hold, it is possible to say that ~41% of the total demand of *IPS* is managed by the online channel. However, the citizens currently served through this channel cannot complete the procedures they require; therefore, they then go to the offices or call the call center if they needed more than pure information.

Figure 50 shows an estimate of how the composition would change with a fully operational online channel capable of letting citizens complete their procedures. Assuming a 50% of people who, when visiting the website, are looking not only for information, but also completing a procedure, and assuming they are able to complete it through the website; a decrease in ~20% of the total demand would be observed, given the reduced number of citizens that need to go to the office regardless of having previously visited the website.

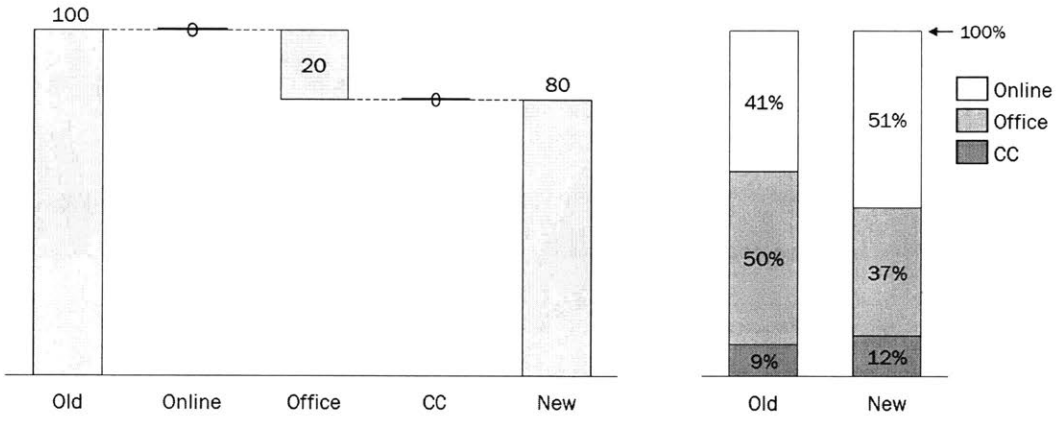


Figure 50: Changes in the composition of the ChileAtiende service by channel

This would change the composition of the total demand, generating the following changes that can be observed on the right side of Figure 50:

- No change in number of visits to the website, but an increase from 41% to 51% of the total (given the reduction of the visits to the offices), including those who only require information and those who require to complete a transaction.
- A decrease of 40% in number of visits to the offices, meaning a decrease from 50% to 37% of the total demand.

- No change in number of calls to the call center, but an increase from 9% to 12% of the total demand.

If this pattern is assumed, it is possible to say that the introduction of a functional website that allows online transactions would cut the demand in the offices by 40%. This is a tremendous insight, and it will be capitalized on only if the decrease of demand in the channels with human interaction is translated either in to a better and more personalized service, or a similar decrease in costs.

The recommended solution for ChileAtiende will comprise three phases. The previous solution to the model at $1M budget is the recommendation for the first phase of the ChileAtiende project. The two remaining phases will be explained in detail in the next chapter, where there is a translation of the mathematical model into the reality of the project and the organizational structure that ChileAtiende should create, which is the final goal of this work.

Chapter 7: Generation of Alternative Architectures, Deciding on the Architecture for ChileAtiende and the Implementation Plan

Step 4 in the ARIES framework, creating the holistic view of the future, is mainly a compilation of goals that come directly from the most relevant stakeholders. This step of the framework in addition to the Optimization Model performed, are valuable inputs for the creation of different architectures of ChileAtiende as an organization. Steps 5 to 7 are the progression from the set of goals gathered in Step 4 into the selection of the most suitable architecture for the organization.

Step 5 is called "Generating Alternative Architectures", which is the creative process of generating different architectures for the project leader to choose from. These alternative architectures are different representations of the organization under the same assumptions, but varying components and interactions through architectural decisions. This create architectures with different performance levels and projects with different *iron triangles* (time, cost and scope).

Steps 6 and 7 are "Deciding on the Future Architecture" and "Developing the Implementation Plan" respectively. These steps represent the selection of the proposed architecture and a high level planning phase that completes the architecting process.

7.1. Generating Alternative Architectures

The specifications of the ChileAtiende project have been described through the "Holistic View of the Future" step of the ARIES framework. Specifications, in general terms, are extremely important in the early phases of development of any project; therefore, the quality of the specifications must be high.

A common pitfall of specifications is their relationship with the solution space. Poor system specifications commonly include clues about an intended solution, which typically narrow down the set of potential options generated (Crawley, et al., 2016). Having this into account, the purpose of this segment of the framework is to create different high-level alternatives for the organizational design of ChileAtiende, including some extreme cases which can be set the bounds of the solution space.

The generation of the different architectures comes from the variation of three important characteristics of ChileAtiende:

- Channels included. This characteristic is limited to two options: 1) Online only and 2) All three channels (Online, Offices and Call Center).
- Products included. This characteristic is limited to two options as well: 1) Those products whose return on investment is high enough to exceed a defined threshold –at least cover the development cost of the product through the benefits generated – which means that the product is relevant to the network. 2) All the products.
- Physical resources used. This characteristic is summarized into four possibilities: 1) None, 2) The *IPS* network only, 3) The *IPS* network and other relevant agencies with availability to support *IPS* and create a wider network, and 4) All agencies are able to dedicate resources to support the ChileAtiende network.

This classification generates the evaluation of eight different architectures that are shown below.

Table 20: Architectures generated and available for evaluation

Channels	Products	Physical Resources	Architectures
Online only	ROI > t	None	1
	All products	None	2
Online + Call Center + Offices	ROI > t	IPS only	3
		IPS and a few other agencies	4
		All agencies	5
	All products	IPS only	6
		IPS and a few other agencies	7
		All agencies	8

7.1.1. Description of Alternative Architectures

The eight architectures developed are described using a modified and simplified version of the Zachman Framework (Zachman, 1987). This representation shows six different descriptions of the organization through the lenses of the planner of the project.

0) Architecture 0 – Current Architecture

The current architecture will be compared against the other eight alternatives. Since this architecture has been extensively described in previous chapters, it is not depicted in detail here. Nevertheless, it is important to note how to read the diagram in the Function section.

A citizen in need of a benefit or a government service, can go either to ChileAtiende or the particular agency that owns the service required. If the citizen goes to ChileAtiende, the service is shown through any of its three channels, although the citizen can complete the procedure if the if the product is available in ChileAtiende and if the channel chosen is the office. If that is not the case, the citizen will receive the corresponding information and will have to go to the particular agency to complete the procedure and receive the service requested. The red arrows represent undesired loops that go backwards and keep the citizens from receiving the service in the first contact.

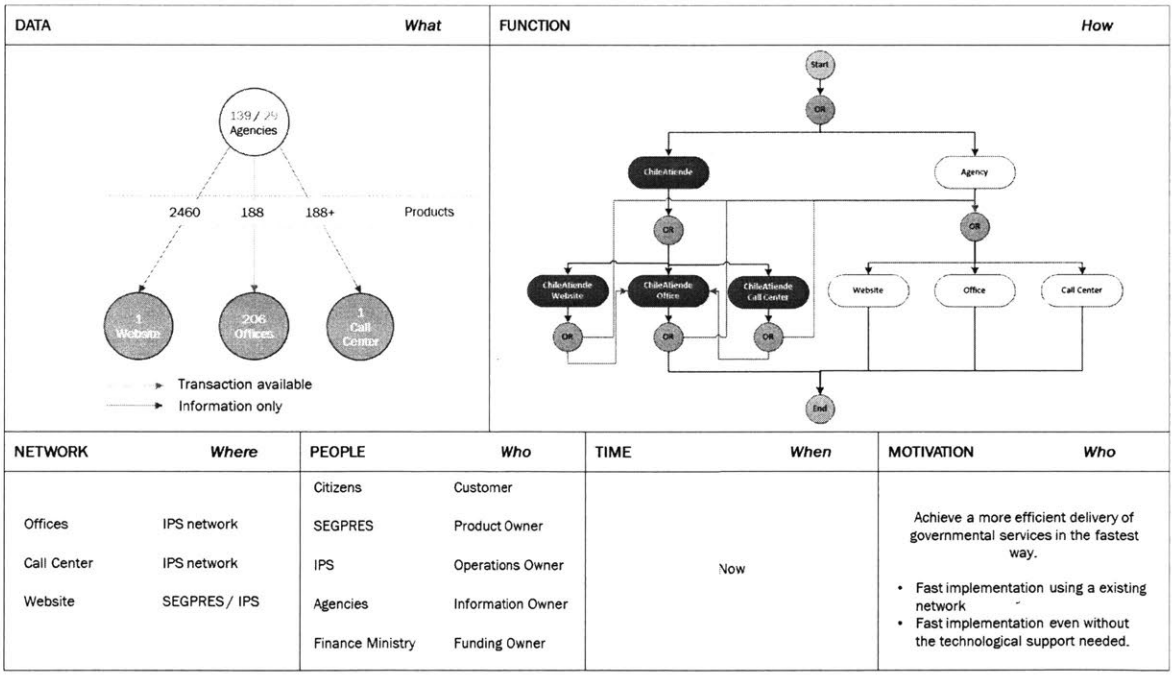


Figure 51: Architecture 0, Current Architecture

1) Alternative Architecture 1 – Focused Website

The first alternative architecture represents ChileAtiende simply as a website that concentrates information of the big majority of the services of the government (around 3,000 products) and it can be used to complete the most important – most demanded – procedures online (around 150 products). This architecture would work as follows: The citizen can go either to ChileAtiende's website or to any of the channels available in the particular agency. If the procedure requested is one of the 150 products available in ChileAtiende, it can be completed immediately. If not, the citizen can go and deal with the corresponding agency instead.

This architecture is simpler and more manageable, with a product that can go to market earlier since the implementation time is shorter. However; it removes the possibility for the citizen to go a one single place and complete the procedure he/she needs. On the other hand, it misses the opportunity to leverage on the existing resources such as the *IPS* network, which would present lower utilization levels if ChileAtiende is withdrawn from their supply of services.

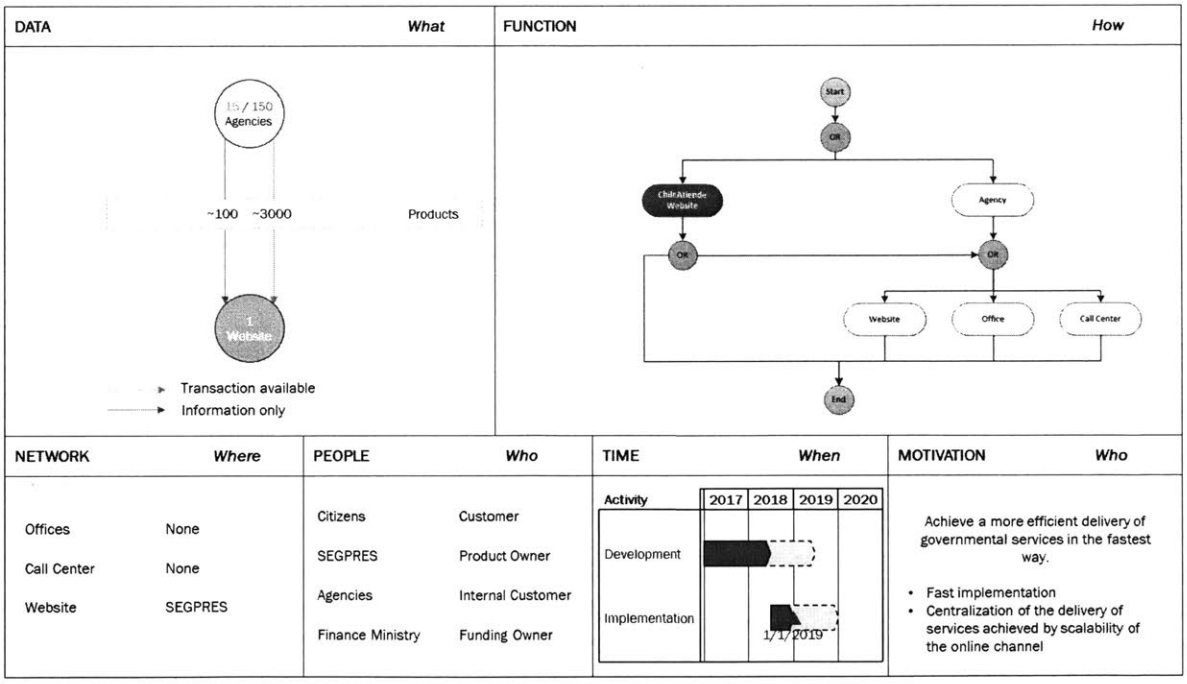


Figure 52: Alternative Architecture 1, Focused Website

2) Alternative Architecture 2 – Unique Government Services' Website

The second architecture is an evolution of the *focused website*, in the sense that it is similar, but it would aim at including all the products the government delivers (around 3,000 products from 450 agencies). It is a more ambitious architecture and because of that, the development costs are much higher. In this case, ChileAtiende would work as the official website to deliver Government services, centralizing the format, language and information of the entire network.

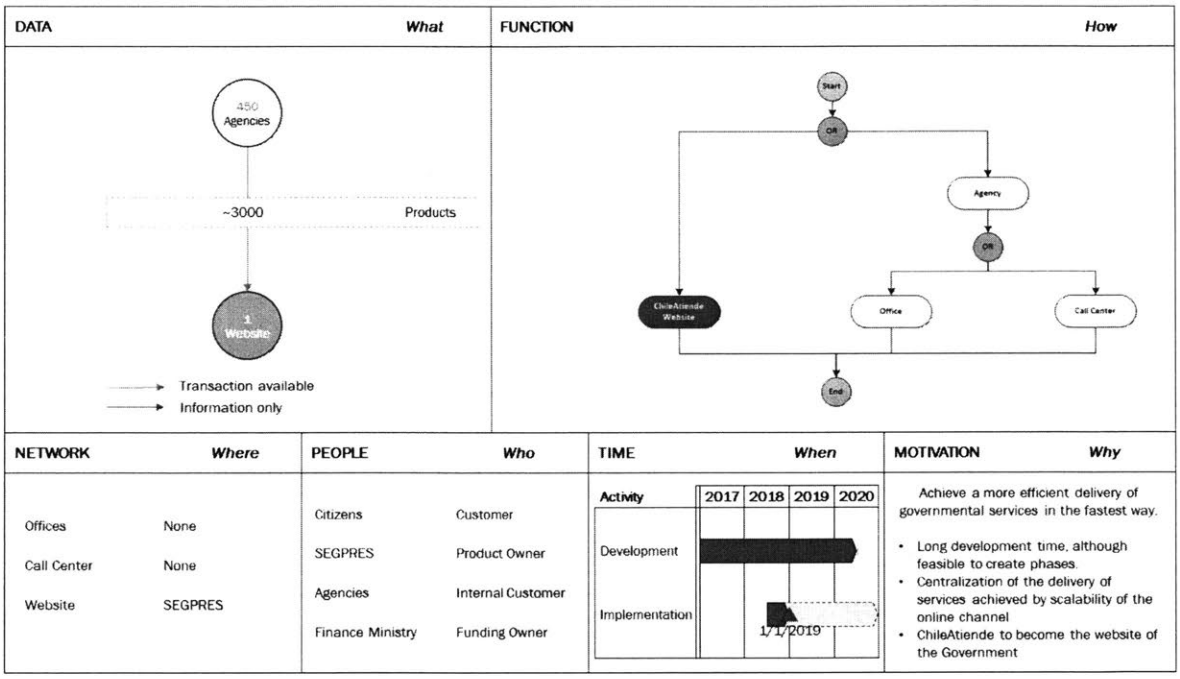


Figure 53: Alternative Architecture 2, Unique Government Services' Website

3) Alternative Architecture 3 – Organized ChileAtiende

This architecture stems from the Current Architecture that has three channels. However, Architecture 3 differs from it because it proposes a more organized approach. The goal of this architecture is to provide the service through the three channels (Online, Offices and Call Center), but including only those products that have been digitized.

If the product is digitized and streamlined, it can be delivered through the three channels. If not, it will only be shown as information in the website. This approach would improve the service time and it would make the life of civil servants easier.

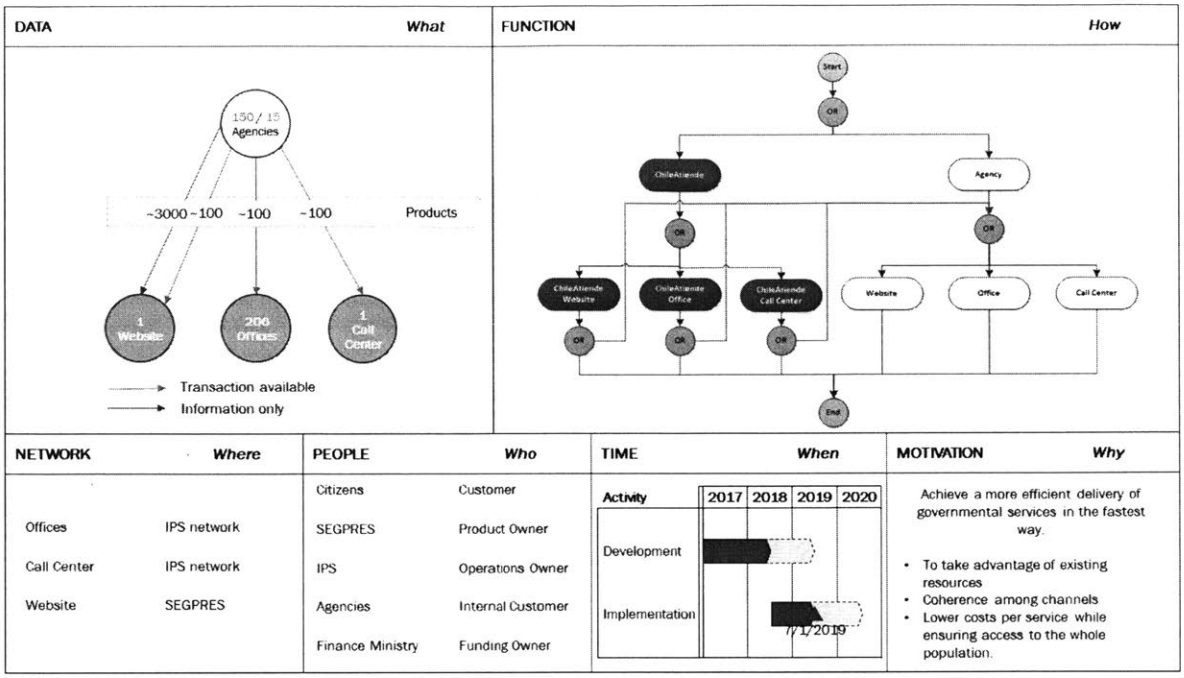


Figure 54: Alternative Architecture 3, Organized ChileAtiende

4) Alternative Architecture 4, Organized ChileAtiende Using Selected Networks

ChileAtiende currently uses the physical resources of the *IPS* network, including its call center, 206 offices and more than 1,000 civil servants throughout the country. This selection of the network was a mutual agreement in 2012 that would deliver benefits to both parties: on the ChileAtiende's side, it would provide the opportunity to start a service without hiring employees and renting offices; and on *IPS*'s side it represented the possibility to absorb a higher workload and improve its utilization levels.

The Alternative Architecture 4 relies on the fact that this relationship with *IPS* could be replicated with other governmental services that own a wide network, such as the Civil Registry office or even the Mail Service. This would be possible if products are digitized and simplified, since the training efforts for the civil servants would be very low. Those products that have not been digitized yet, would be available for completion only at the particular agency of the product required.

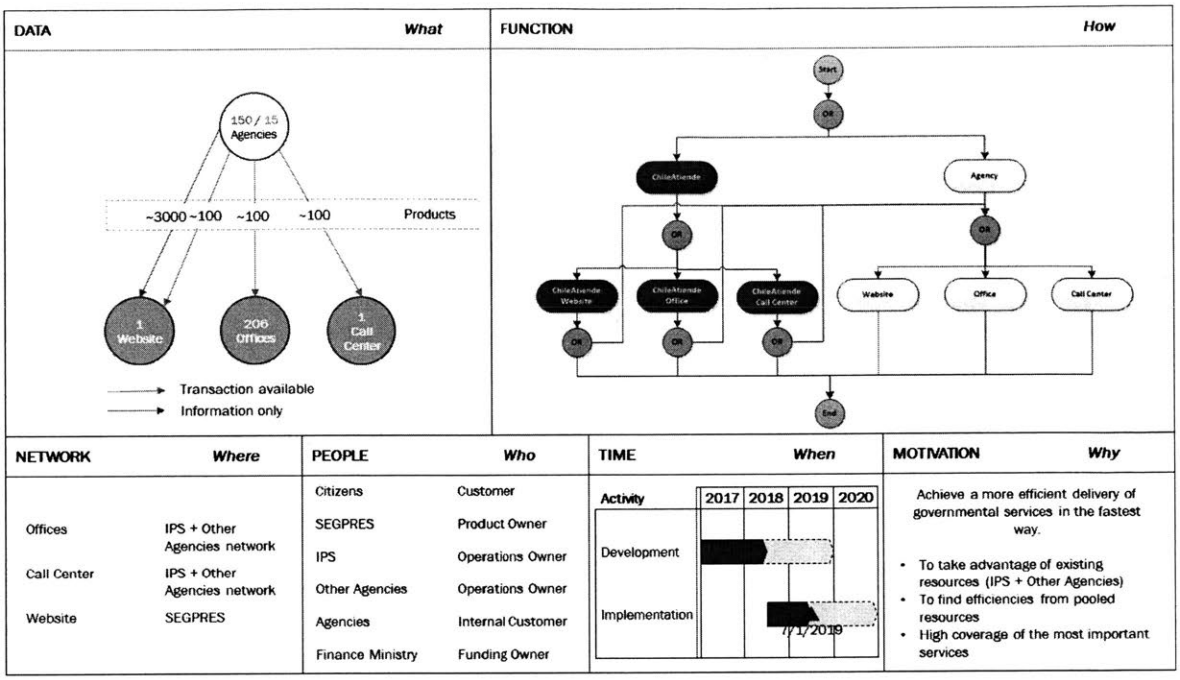


Figure 55: Alternative Architecture 4, Organized ChileAtiende Using Selected Networks

5) *Alternative Architecture 5, Organized ChileAtiende Using All Networks*

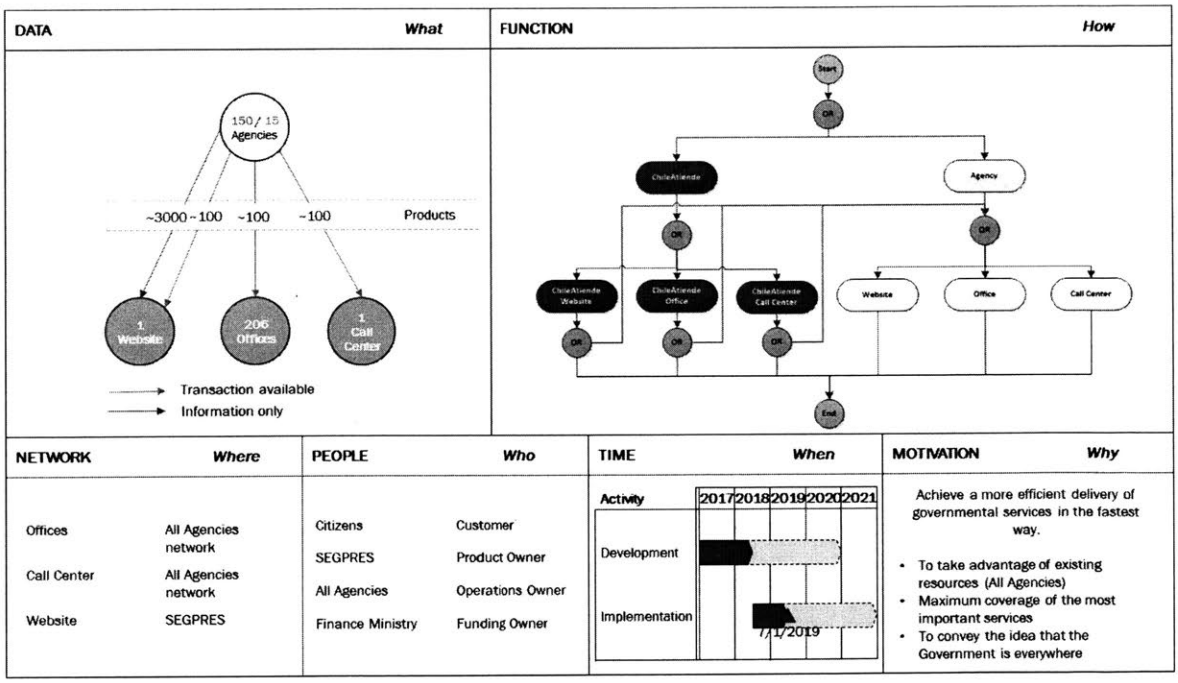


Figure 56: Alternative Architecture 5, Organized ChileAtiende Using All Networks

The Alternative Architecture 5 builds upon the previous Architecture, however it represents a ChileAtiende that delivers the most important services through all the agencies. This is possible because the most important products have been digitized and streamlined, thus it is fairly simple to implement their delivery through all the agencies. This characteristic conveys the idea that the Government is everywhere and it is only one entity; therefore, the citizens can go to any of the agencies of their convenience and complete any of the procedures available.

6) *Alternative Architecture 6, All Products Using IPS Network*

Architectures 6, 7 and 8 are based on a complete supply of products. Architecture 6 restricts the physical resources available for ChileAtiende to the *IPS* network. Therefore, the feasibility of this architecture depends on the existence of the products in the online channel first. In this case, there is no need for the agencies to have their own websites; thus, ChileAtiende's website becomes the website for the delivery of Government services by default.

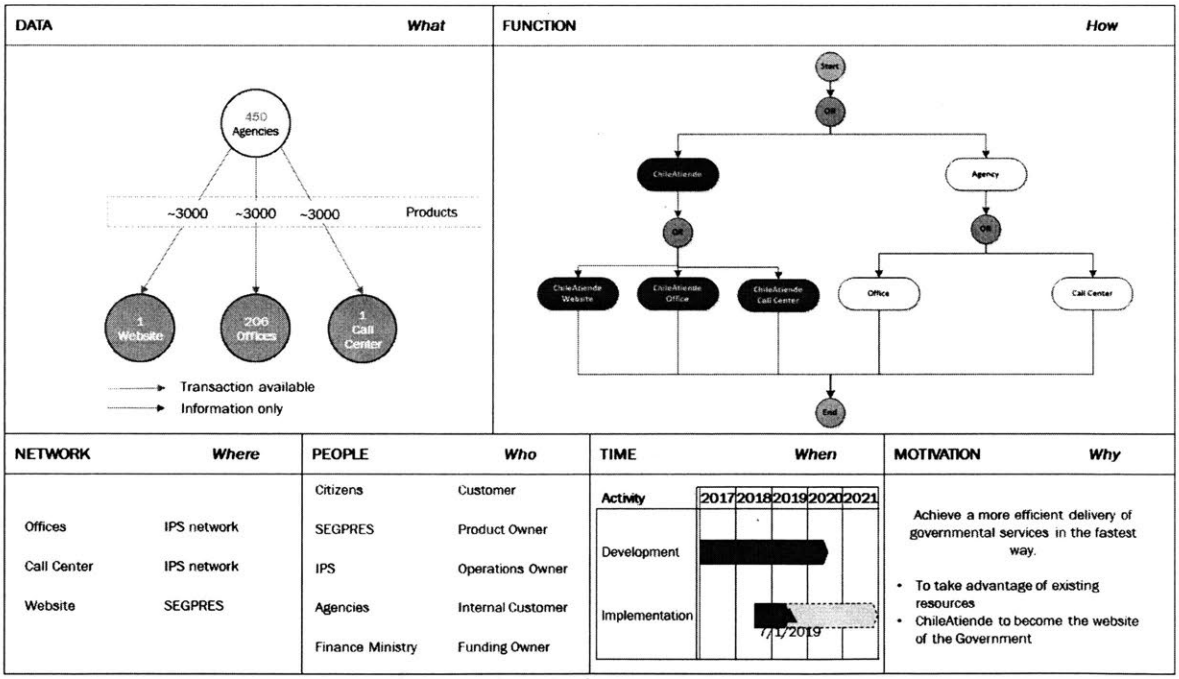


Figure 57: Alternative Architecture 6, All Products Using IPS Network

7) *Alternative Architecture 7, All Products Using Selected Agencies' Networks*

Architecture 7 represents the same idea as Architecture 6, but using a selected set of agencies' networks instead of using only IPS' network.

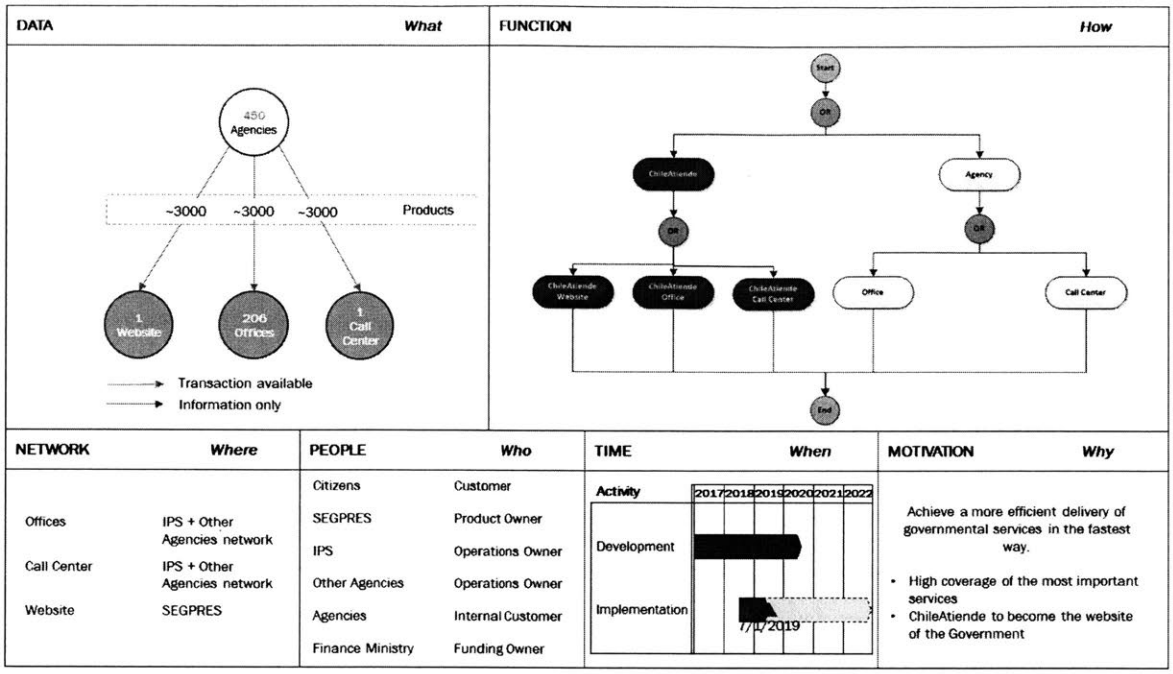


Figure 58: Alternative Architecture 7, All Products Using Selected Agencies' Networks

8) Alternative Architecture 8, All Products Using All Agencies' Networks

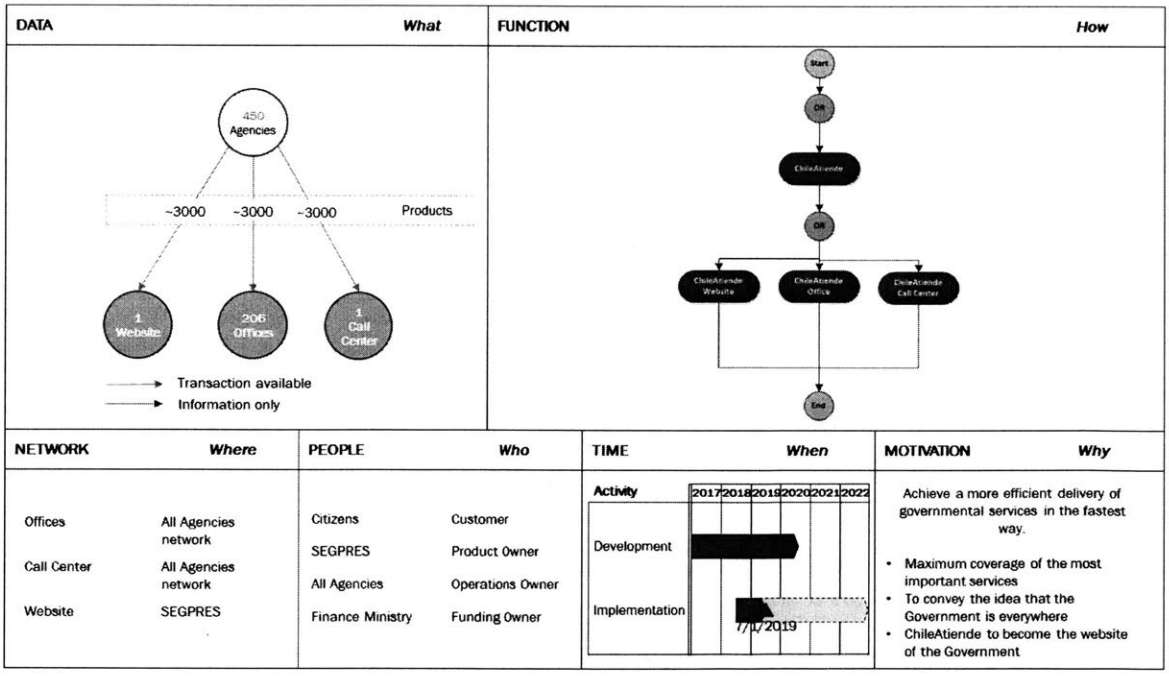


Figure 59: Alternative Architecture 8, All Products Using All Agencies' Networks

The last architecture follows the same idea of the two previously presented; but using all agencies' networks instead of using only a subset of agencies' network. This is the extreme case where all the services of the Government are delivered through a centralized agency called ChileAtiende, and all the agencies are in fact, internal customers of ChileAtiende.

The description of the eight selected architectures is an exercise that does not pretend to find an exhaustive list of possible architectures. The factors chosen could have been different, and the methodology to find these architectures could have also differed. Nevertheless, this list presents a very interesting set of high level architectures that can be developed further, before deciding on the implementation phase; and also works as a revelation for the owners of the project in terms of the different long term alternatives that can be developed making the right architectural decisions early in the process.

7.2. Deciding on the Future Architecture

One of the possible options to evaluate the architectures generated is to compare them among each other and against the current architecture. The criteria to compare them are retrieved from the goals of the most important stakeholders, topic that was developed extensively in chapter 6. The compilation and evaluation of these criteria is shown through the unweighted decision matrix shown in Table 21, where each factor is evaluated in a -1, 0 or +1 scale. -1 means that the architecture being evaluated is worse than the current architecture, 0 means that it is the same as the current architecture, and +1 mean that it is better.

It is relevant to notice that the decision matrix is not conclusive and it is only an organized way to compare the different alternative architectures under the same factors. The final decision can only be made by the person or committee that occupies the role of the architect of the project.

It can be observed that the first two architectures are worse than the current architecture because those only comprise the online channel; then the citizens lose the opportunity to complete procedures in a single location if they want to interact with another person and receive individual feedback. Below the count of how many aspects are evaluated as better, the same or worse than the current architecture, there is a high level evaluation of the iron triangle of these projects (time,

cost and scope). These two first architectures show a relatively short development time and relatively low costs, but at the same time a restricted scope. This means that is a relatively "small project" and probably not very ambitious.

It can also be observed that architectures 6, 7 and 8 are better in almost every aspect of comparison; however, the time and cost are shown as high – probably very high – and obviously these factors have to be evaluated as well when finally deciding on an architecture.

Architectures 3, 4 and 5 are in the middle, and although they show relevant improvements in factors relevant to stakeholders such as Partner Projects, Public Institutions or the Government itself represented by *SEGPRES* and *UMYGD*; they do not represent a dramatic change for the interests of the citizens.

Table 21: Unweighted Decision Matrix for the different architectures generated

			Architecture							
Stakeholder	**Category**	**Criteria**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Citizens	Customer Experience	Complete prodedures in one single place	-1	-1	0	0	0	1	1	1
Citizens	Customer Experience	No need to go to a physical location	0	1	0	0	0	1	1	1
Citizens	Customer Experience	Same information through all channels	0	0	0	0	0	1	1	1
Citizens	Customer Experience	Easy access and friendly language	0	1	0	0	0	1	1	1
Citizens	Customer Experience	Well trained, friendly staff	0	0	0	0	0	1	1	1
Citizens	Customer Experience	Reduced waiting times (front and back office)	1	1	1	1	1	1	1	1
Citizens	Reliability	Information is secured	1	1	1	1	1	1	1	1
Partner Projects	Flexibility	Common IT infrastructure and protocols	0	1	1	1	1	1	1	1
Partner Projects	Flexibility	Modular architecture, capable to adapt if conditions change	1	1	1	1	1	1	1	1
Public Institutions	Customer Experience	Resources unlocked to improve customer service	1	1	1	1	1	0	1	1
Public Institutions	Manageability	Single platform and user-friendly interface	0	1	1	1	1	1	1	1
Public Institutions	Scalability	Simplified and integrated processes	1	1	1	1	1	1	1	1
SEGPRES/UMYGI	Cost, Time and Scope	Cost savings from the operations	0	1	0	1	1	0	1	1
SEGPRES/UMYGI	Customer Experience	Positive evaluation from citizens	0	1	1	1	1	1	1	1
SEGPRES/UMYGI	Reliability	Distributed resources to mitigate disruptions	0	0	0	1	1	0	1	1
SEGPRES/UMYGI	Scalability	Allows growth while complexity is manageable	1	1	0	0	0	1	1	1

-1	Worse than current architecture	1	1	0	0	0	0	0	0
0	Same as current architecture	9	3	8	6	6	3	0	0
1	Better than current architecture	6	12	8	10	10	13	16	16

Time	Lo	Me	Me	Me	Hi	Me	Hi	Hi
Cost	Lo	Me	Me	Me	Hi	Me	Hi	Hi
Difficulty / Scope	Lo	Me	Lo	Me	Hi	Hi	Hi	Hi

Based on this rationale and taking into account all the other considerations previously discussed in earlier chapters, it is necessary to shed light on what the ChileAtiende project team should do in the long term and point out all the current actions toward a contribution to the end goal.

7.2.1. Recommended Architecture and Rationale

After careful consideration, the recommended architecture for ChileAtiende in the long term is "Alternative Architecture 7, All Products Using Selected Agencies' Networks". The reasons for choosing this particular architecture are explained below.

- It represents a dramatic change. It is one of the most ambitious architecture from the list of possibilities, and it would definitely improve the perception of the citizens toward their relationship with the government. It would place Chile as one of the most advanced countries in the topic, sharing the first places of international rankings with the United Kingdom, Denmark, Canada or Singapore.
- It takes advantage of existing resources and promotes efficiency. Creating a strong website without also contributing to centralize the delivery of services through the physical channels is the acknowledgement of not being able to use in a more effective way the current resources of the government. The efficiencies in terms of public administration are achieved when the operational costs are decreased, which is produced when the physical operations are actually reduced or streamlined. This will not occur if the delivery of services cannot be pooled to take advantage of reductions of variability and greater utilization factors. In other words, the productivity per person has to increase if the operations are expected to be more efficient; and this architecture is able to generate that.
- It takes advantage of the digital trends. The author believes that it is impossible to remove the in-person channel from the government design of service delivery. Access issues, regulations, and in the end the need of the citizens to have available persons representing the Government to talk to, keep that scenario from happening. Having said that, the current trends in terms of access to the digital channels make one think that all governmental agencies should have presence in the digital world. If that is the case, those services should be linked and embedded into the ChileAtiende network. In addition, it is well known that online service delivery is several times cheaper that in-person service delivery; therefore, the Government should seek to have all the agencies' services digitized and accessible online.

- It is a reliable configuration that works well in different extreme scenarios. For instance, if the adoption of digital technologies was 100%, the citizens would be happy because they would always find the services available in their preferred channel. On the other hand, if the adoption of digital channels was stagnated and would not increase beyond what we have today, the architecture would still perform well since it would have a strong presence in the in-person and call center channels.

  Other scenarios to test the architecture would be to think about downturns in the economy of the country, or what happens when there are strong changes in the priorities because of a new administration in place. In the former scenario, the architecture would represent a source of efficiency, then it would be likely to represent a model for other structures in the Government and would even be one of the insignia projects to promote a turnaround of the adverse situation. The latter scenario, a change of priorities, would impact several initiatives within the public administration; however, being a source of savings and a demonstration of efficiency, it is unlikely that ChileAtiende would be cut or rolled back.

7.2.2. Comprehensive Description of Recommended Architecture

To fully understand the Alternative Architecture 7, is necessary to go deeper in its description. Figure 58 is a good starting point, but further development should be made. To this end, a suitable description to use is the Business Architecture domain found in the TOGAF framework (The Open Group, 2011), which defines the business strategy, governance, organization and key business processes.

Business Strategy

The purpose of this architecture is to maximize the service level and maximize the efficiency of the operations of the part of the Government dedicated to the delivery of services.

This goal would be achieved by ChileAtiende if it is able to centralize the development and operations of the online service delivery, and also of the other two channels. In order to meet this goal, the main driver is to become a center of excellence within the Government for online development and service model; bringing experts from inside the Government and from the industry to generate the Government's service delivery model.

In this architecture ChileAtiende would work as the expert partner for all the agencies of the government, in charge of managing their contact with the citizens; and it would be capable of performing procedures on behalf of all these agencies. This would allow standardization of procedures and best practices, similar experiences among different agencies, resource pooling, improvements in resilience and disruption management, and several other benefits.

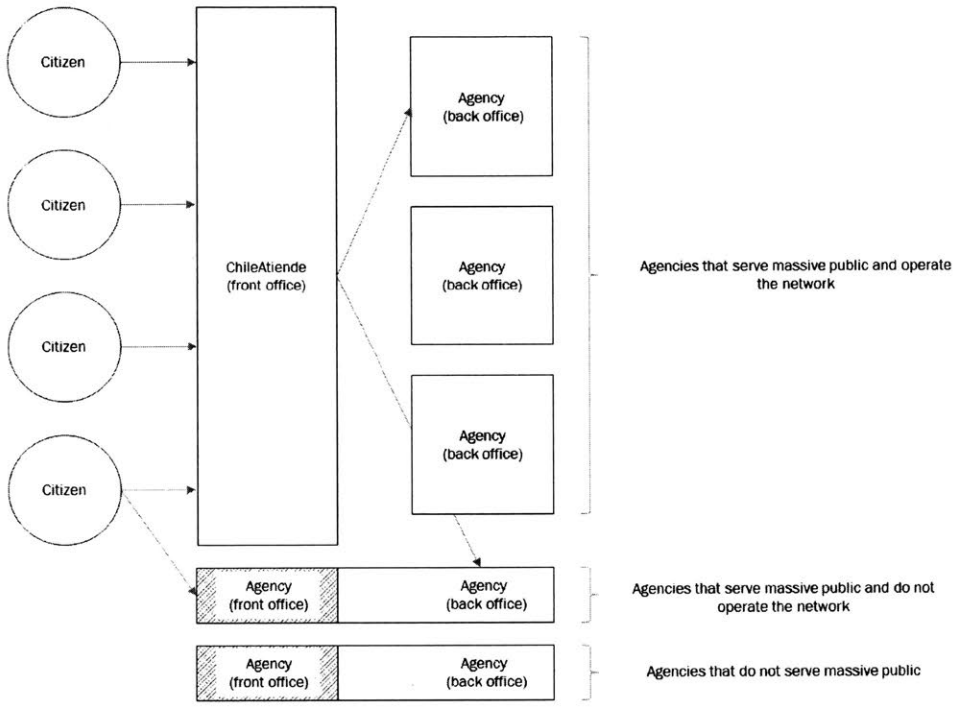


Figure 60: High level service model for ChileAtiende under the selected architecture

There are several details to observe from Figure 60:

- ChileAtiende in this architecture can serve citizens on behalf of all agencies (that deliver any kind of services to natural citizens and do not need specific assets to complete a procedure).
- Agencies would serve as the back office for complex procedures, incidents or problem resolutions; where experts on the matter are needed.
- Not every procedure needs to go to the back office; the ideal scenario is that all procedures can be completed at ChileAtiende.

- Under this architecture, there would be three categories of Agencies:
    - Agencies that serve massive public and also are the operators of the network (this the role that *IPS* is currently playing, and other big player are expected to join – such as *FONASA, Correos de Chile* or others).
    - Agencies that serve massive public, but are not operator of ChileAtiende (currently all the rest of the participant agencies of the network, but in this case these agencies are those that do not have a well-developed network or their points of service do not have a suitable infrastructure for supporting the network – such as *JUNAEB* or *CONICYT*).
    - Agencies that are not intended to serve massive public, so their facilities are not designed to receive public and the interactions between them and the citizens are individual and difficult to standardize (*Junta de Aeronáutica Civil, Superintendencia de Casinos y Juegos*, et cetera).

  In any of these cases, ChileAtiende would be able to serve the public, and the agencies themselves would act as the back office of the service.

For this architecture to succeed, it is necessary that ChileAtiende is accountable for the results of the operation and it can report its performance to the agencies being represented. The agencies, on the flip side, should be able to pull and demand the better service possible at a cost. Therefore, there should be a monetary exchange between the agencies and ChileAtiende for the services provided, or the resources dedicated to the service delivery allocated to each agency should be part of ChileAtiende's budget. Any of these structures would help the Government capitalize on more efficient operations.

Governance

The recommendations about the Governance framework for ChileAtiende will be divided into three major areas: structure, oversight responsibilities, and infrastructure.

i. **Structure.** It is probably the most important feature of the architecture because it defines the coordination mechanisms within the organization and more importantly, across organizations. Since ChileAtiende is by default a multi-stakeholder enterprise, and it is

designed to deal and interact with many agencies, its governance structure is likely to be complex; and for the same reasons it is necessary that it is formalized and it is stable.

Following these requirements, ChileAtiende needs to become a Public Service, depending of a Ministry. Strong candidates are *SEGPRES* (historically has carried the project and also has high political influence and coordination power among different ministries) or the Ministry of Social Development (provided its mission in terms of coordination, consistency and coherence of policies, plans and programs in social development matters, promoting the social integration). This legal status would provide ChileAtiende with the required stability and knowledge of the public agenda, which would be more difficult to achieve being an agency.

ChileAtiende should have a National Director, although the high coordination required for ChileAtiende to work well generates the need of the creation of a Steering Committee that formally session every 2 – 4 months with representation of the following actors:

- *SEGPRES* or Ministry of Social Development (Under Secretary)
- Ministry of Finance (Under Secretary)
- Civil Registry's (National Director)
- Information and Communications Technology at a Government level – CORFO, Digital Agenda Leader (Vice president or equivalent)
- Selected Agencies (Directors or equivalent, rotatory)

ChileAtiende should also have distinctive teams for managing the current operations and the projects agenda; therefore, it is recommended to have 2 divisions: Operations Division and Program Management Division. The capabilities and focus of these two divisions are different, thus it is recommended to have them separated.

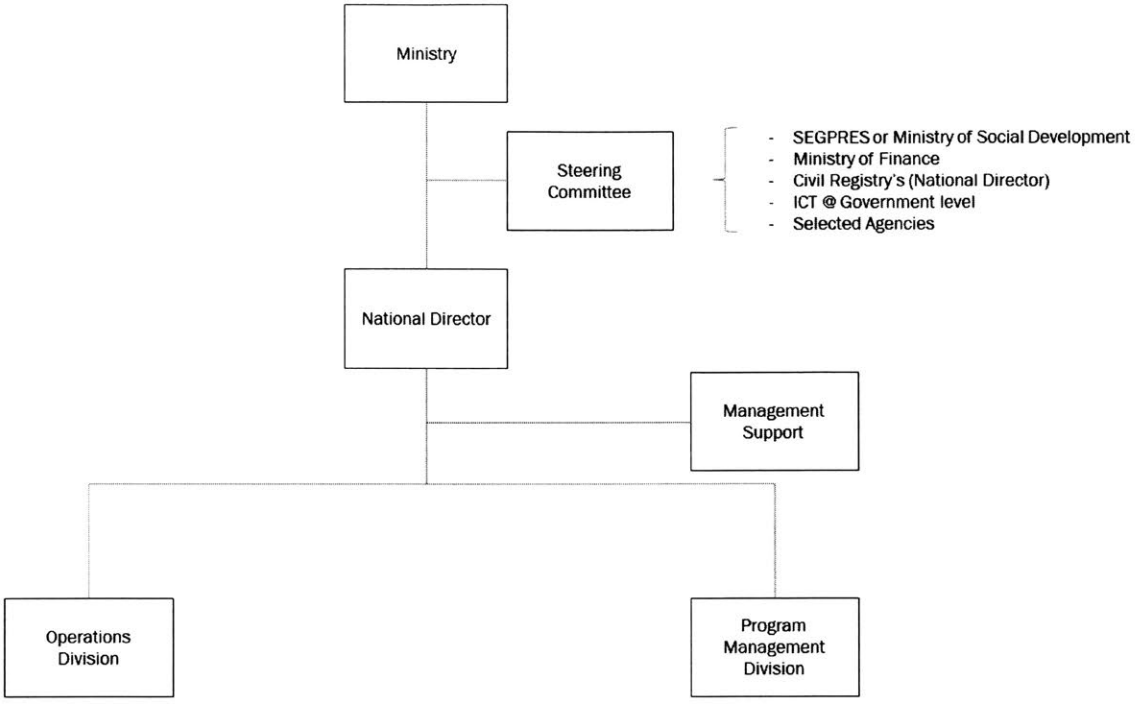


Figure 61: Governance structure for the selected architecture

ii. **Oversight responsibilities**. It represents the description of the responsibilities of the main actors:

a. Minister: Is accountable for the decisions and results of the operations of ChileAtiende.

b. Steering Committee: Is responsible for delivering coordination and representation of the different stakeholders, so that alignment is achieved and ChileAtiende is able to deliver the highest service possible.

c. National Director: Is responsible for the performance of the service of ChileAtiende as a whole.

d. Operations Chief: Is responsible for the operations of all three channels, and the performance of the service. At the same time is responsible for the continuity of business, training of employees, creation of procedures and actualization of contents, and coordination with the agencies in relation to the services provided. Is also responsible for the selection of the right technologies and suppliers for the ongoing services.

iii. **Infrastructure**. This comprises policies and procedures, reports, measures, metrics, rewards and management capabilities.

a. Policies and Procedures. The relevant decisions must be made after consideration and alignment taking advantage of the Steering Committee. The management must make the efforts to bring to the table valuable discussion topics and initiatives to approve and generate swift and agile advancements. Topics to be discussed are not only related to financial or investment decisions in terms of technology or infrastructure, but also related to service policies and guidelines. Decisions made at this level must be followed by the respective teams. Information and Communications Technology decisions should be made taking into account that the Government should follow consistency and coherence regarding the solutions developed or purchased to vendors.

The Service Operations division should also make decisions taking into account that the service should be as consistent as possible, and best practices should be spread out within the organization. Policies in this division should also be very careful with the most important asset: the people. No policy should be a deterioration in the working life of civil servants, and the working environment should be cared since it impacts directly the quality of the service delivered.

Since ChileAtiende's operations are relatively simple and repeatable, standardization is key. All procedures need to be digitized and streamlined first in order to be available in the other channels, and the service with human interactions are designed following standard operating procedures.

b. Reports, measures, metrics and rewards. Given that the service at ChileAtiende is standardized for most of the procedures, measures and metrics are needed to understand the quality of the service. Metrics such as service time, time in the queues, cost per service, productivity per employee, effectiveness or resolution and customer satisfaction – without a doubt the most important one – should be measured daily and followed by the organization.

These metrics should be reviewed at an operational level (daily or in real time), tactical level (weekly by the office managers, performance analysts and the agencies represented) and at a strategic level (monthly by the National Director, quarterly by the Steering Committee). The results should also be reported to the agencies' leaders and discussed in detail if the results are not good enough.

The results of these metrics trigger two main processes: the rewards policy (that must be attached to the performance of the service) and the continuous improvement (which arises from gaps between the target levels of performance and actual levels). Promotions of the employees, benefits (economic and non-economic) and budget policies should be entangled with the performance metrics. In addition, the contractual policies between ChileAtiende and the agencies should also have a variable component that depends upon the results of the operations.

Organization

Figure 62 shows a high-level organigram for ChileAtiende. In its initial conception, ChileAtiende should have separated divisions for the current operations and its portfolio of projects.

The Operations Division should be further decomposed into ICTs and Service Operations. The former would be accountable for the continuity of the business (uptime, reliability), the relationship with technology vendors, the responsibility to acquire new technologies and to maintain the consistency with the new projects under development. The latter would be accountable for three main processes or functions:

- Product Management: It is the function responsible for the service quality, customer satisfaction, financials and the relationship with the internal customers – the agencies – in terms of performance and rewards. Since ChileAtiende would include a few hundreds of agencies in its portfolio, it is expected that each product manager is able to administer between 1 and 20 agencies, depending on the size of the operation.
- Procedures and Content: It is the function responsible to create the standard operating procedures, formalize and publish policies and guidelines, generate handbooks and most

importantly, update the contents on the platforms. This role is very important, since it has to be coordinated with the agencies and with the product management function, so that any change is an improvement for the process and for the citizens.

- Channel Operations: This is the largest unit within the organization it terms of number of people. It represents the complete front line of civil servants in contact with the public, either at the offices or through the telephone.

  These employees work at the offices operated by the agencies that were designated as part of the operator network for ChileAtiende; and they should be ChileAtiende's employees. All expert employees at the back office should be agencies' employees.

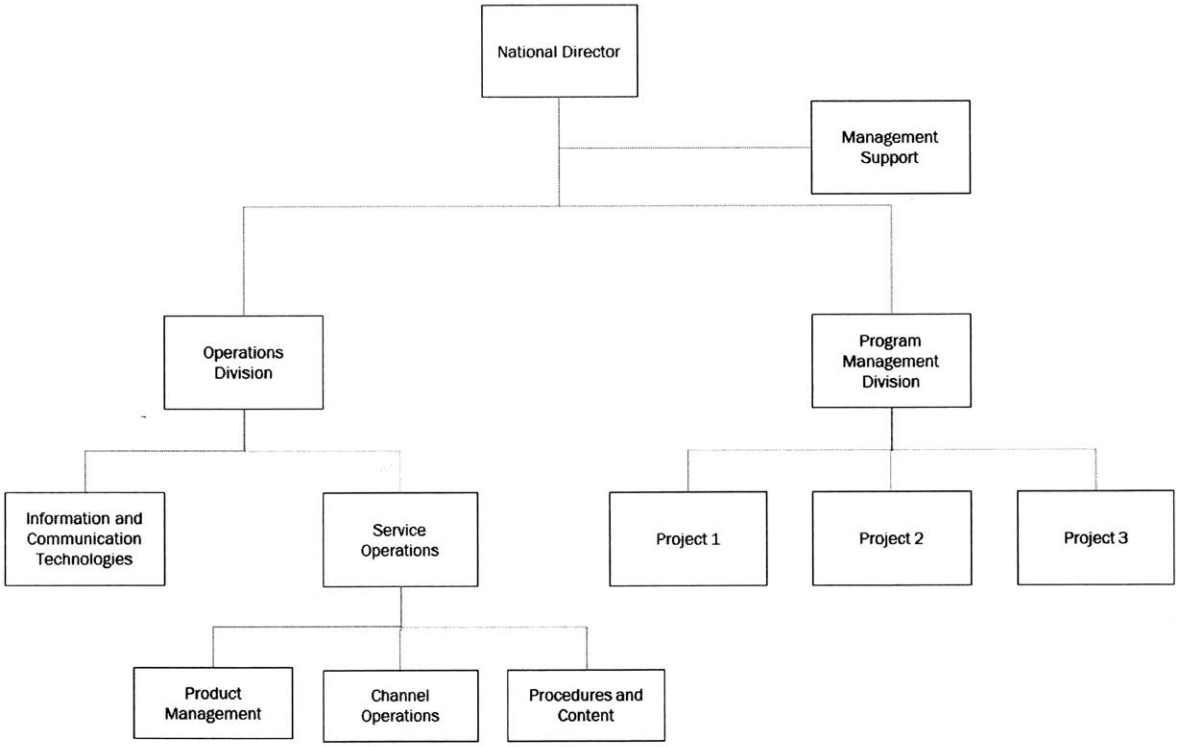


Figure 62: Organizational structure for the selected architecture

The Operations Division is, in terms of Henry Mintzberg, a *Machine Bureaucracy* (Mintzberg, 1981), which is an organizational configuration typical of enterprises that perform simple, massive operations, that are suitable for standardization. This structure provides higher efficiency, and it cannot work without its main components:

- Strategic apex (steering committee, top management)
- Middle line (middle managers such as unit chiefs, in charge of implement the decisions made by the top management)
- Technostructure (represented by engineers and staff in charge of creating the policies, standard procedures and keeping track of measures)
- Operating core (represented by the front-line employees in contact with the public)
- Support staff

The power of the *Machine Bureaucracy* is based on its technostructure that is capable of creating the standardization that generates the efficiencies in the different processes, and in the ability of the operating core to follow those standard procedures. Being one of the basic structures for organizational design, it ensures consistency and coherence among its components.

On the other hand, the Program Management Division is the responsible of making the end goal possible and to take the current ChileAtiende into the one being described above. It should have a configuration determined by the projects under development, and it should be larger in the initial times (today) and becoming smaller and smaller until it becomes a Continuous Improvement Unit that could even be incorporated into the Operations Division.

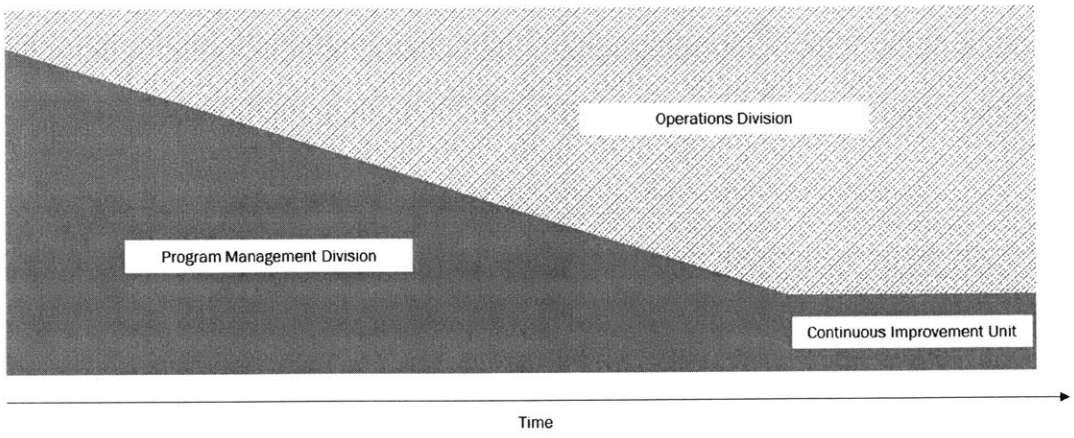


Figure 63: Expected evolution of the two main divisions of ChileAtiende

7.3. Developing the Implementation Plan

The architecture recommended is one of the most complete and also one of the most complex to achieve; and clearly is not a transformation that can be completed in 2 or 3 years. This is a longer term project. In spite of this, the selection of the alternative architecture is an excellent exercise to set a clear strategic direction and to start contributing with every action in the present, to the end game. In between, there is a hard transition period, which is described in this segment.

Figure 64 shows the evolution of ChileAtiende from the current architecture to the final architecture. It can be seen that the improvements are achieved in discrete changes. Today ChileAtiende is functioning on top of muddy foundations since no process is digitized so far and those services are being delivered through brute force at the offices and the call center. The improvement from the current architecture (number 1 below) to number 2, is the organization and prioritization of the products that should be digitized and delivered through the three channels (Chapter 6 provides this answer).

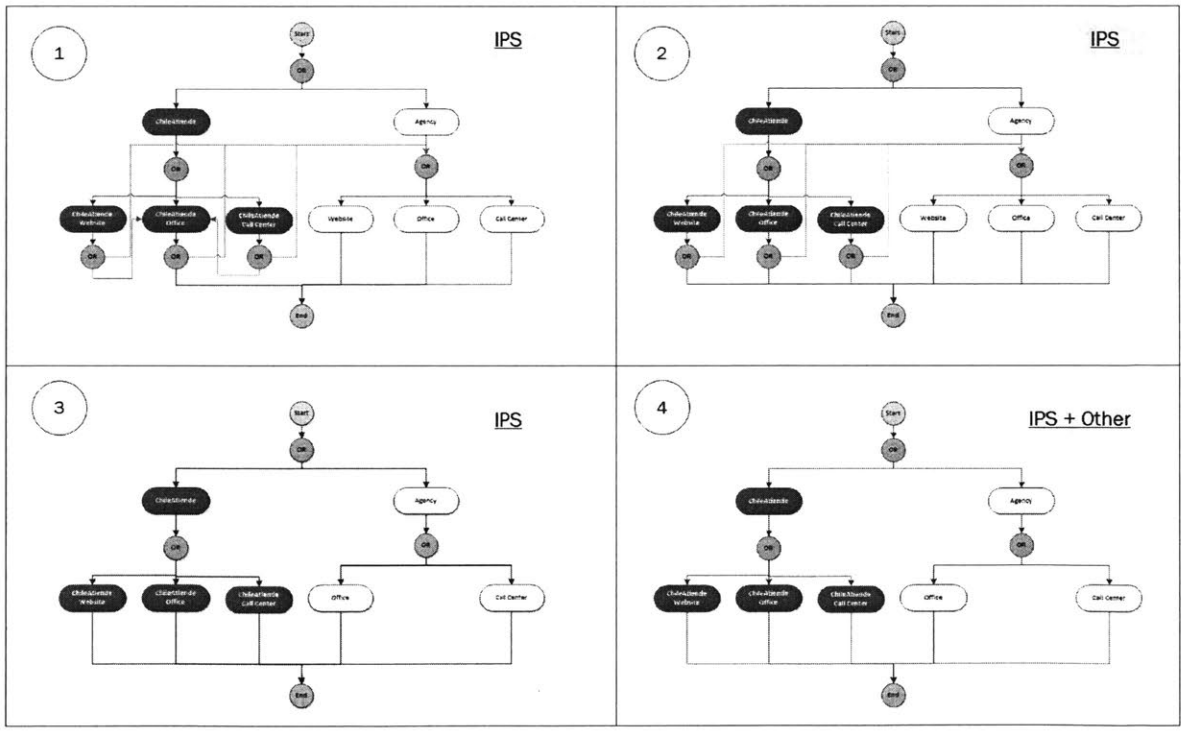


Figure 64: Evolution of the architecture of ChileAtiende

From number 2 to number 3 there is a large gap that will be filled out when all the products from all the agencies are incorporated into the ChileAtiende network; this is, all these products are digitized and can be completed on line. In consequence, they are also possible to complete at the offices and call center with little training of the employees. This is a very long process that can take more than five years, taking as a reference the experience in the United Kingdom where websites and procedures are still being incorporated into the platforms.

The last improvement is to incorporate more operating agencies into the network (From number 3 to 4), in addition to *IPS*. This would expand the coverage of the network and would bring more opportunities to capitalize on the advantages of resource pooling, by decreasing the size of the frontline for some of all the non-operating agencies within the ChileAtiende network. This step would unlock resources to improve the service quality, decreasing back office times or to cut costs if the headcount can be reduced.

Main Challenges and Milestones of the Implementation

- Phase 1 (From 1 to 2):
    - Prioritize the agencies and products to be digitized.
    - Create the foundations in technological terms for the rest of the developments to ensure interoperability and coherence among services.
    - Remove from the offices and call center those products that are not available in digital form.
    - Formalization of the back office processes and information flows.
- Phase 2 (From 2 to 3):
    - Formalization of the Governance and Organizational structure of ChileAtiende, creation of it as a Public Service.
    - Incorporation of the *OIRS* and Municipalities into the scope.
    - Transfer of front line *IPS'* employees to ChileAtiende
    - Strong investment in IT to reach the proposed scope of digitizing the total number of products.

- Achievement of 100% of agencies and products included in the network, using ChileAtiende's guidelines.

- Phase 3 (From 3 to 4):
  - Addition of other agencies to the operating network
  - Transfer of front line employees of other operating agencies to ChileAtiende
  - Implementation and training of the operating network employees in all the procedures
  - The Program Management Division incorporation as a Continuous Improvement unit.

Although the characterization of the implementation plan lacks further depth in terms of planning, including well-defined timelines or accurate budgets, it shows the kind of issues that have to be addressed, and the milestones that have to be achieved in order to create the final desired architecture. It seems to be an extremely difficult path considering the political barriers and endogenous challenges this kind of projects face in the public sector; but doing the right actions in the right order, much of the effort would be direct progress toward the end goal: a centralized, efficient and inclusive delivery of Government services.

Chapter 8: Conclusion and Future Work

This work has aimed at answering questions such as: *What is the right enterprise architecture for ChileAtiende? How can analytical models help with finding that architecture and guiding the architecting process?* And *how complexity can be managed in a public sector organization?* The answers to these questions have been developed throughout this report and are synthesized below.

First of all, architecting an organization is relevant because it sets the direction of a long organization design process, by defining what the enterprise should be in the future before the transformation starts. It is all about aligning the visions of the relevant stakeholders and creating a unified concept, which is selected after comparing it to other valid alternatives; and which will be sought and hopefully achieved in a defined timeframe. In the case of ChileAtiende, the opportunity – in the sense of time adequacy – is just perfect to start thinking long-term, to bring pieces together, and to actually generate a plan for the organization that makes sense from the beginning of the transformation project.

The concept of *Government Service Delivery* is tightly coupled with the need for a *Better, Efficient, Citizen-Centric Public Sector* and the *Digital Government* initiatives; however, the differences and boundaries of all these work streams should be clearly defined in the agenda of the Government, while the teams should work in an integrated fashion. ChileAtiende, the initiative that plans to revolutionize the *Government Service Delivery*, represents essentially a service organization, which needs to embrace huge technology and process improvements. These changes need to be coordinated with the efforts made in *Digital Government* matters, initiatives that need a clear leader – probably a CIO role – overseeing the information and communications technology projects at a government level.

ChileAtiende is currently in a plateau phase after an explosive growth, having this year an almost unchanged demand versus 2015. This stagnation may derive from such causes as the absence of product introductions in the last 12 months or a learning curve in the public that is already aware of their benefits or procedures that they need to complete. There is also a trend toward the use of

the website as an information channel, and the use of mobile phones as a growing access point. These factors indicate that ChileAtiende is ready to go to a new level of development.

To be able to generate a recommendation for the future state of ChileAtiende, it was necessary to understand the nature of the organization, its products – procedures to get benefits or certify a status – and the relationship with the agencies that manage the products. Based on a network analysis of ChileAtiende's products, it was found that there are three types of products: (1) feeders, which are prerequisites for other products to be obtained, such as certificates; (2) absorbers, which are the receivers of the prerequisites and generally represent benefits, and (3) others, which are neither feeders nor absorbers and generally represent information. This categorization aids understanding the actual relevance of a product in the network, since absorbers cannot be completed without the feeders; hence the prioritization of the products should include that consideration.

The Government should seek in the long run to digitize and offer the online channel for every single procedure needed by the citizens; while ChileAtiende should centralize and oversee the service delivery process through the three channels: online, telephone and in-person. This is because it is clear that the online channel offers the lowest cost per transaction, and because in order to capitalize on the operating savings, the number of the customer-facing employees has to decrease, as well as the physical service space, which requires resource pooling to work. In other words, this means that ChileAtiende contributes to the *Better, Efficient, Citizen-Centric Public Sector* objective in at least two ways: lowering the costs for the citizens to obtain their public benefits, and lowering the costs for the Government in the way it delivers these benefits. Since this is a huge and ambitious endeavor, the transformation initiative must be done in phases.

1. Phase 1, going from the current architecture to a *limited 3-channel* architecture.

   The current architecture serves the citizens through the 3 channels available; however, its structure does not allow scalability. Hence, ChileAtiende needs to take a step back and look for a fresh start. It needs to build a limited network of products and agencies in an organized way, streamlining and simplifying processes and adhering to the principle of not offering a product in the non-digital channels unless it is already digitized and ready

to operate through the website. In order to do this, a prioritization is required, which was developed using a mixed integer linear programming model that can be adjusted as needed to select the subset of products that best meets the requirements of the project (such as budget, time or political constraints).

2. Phase 2, going from Phase 1 to a 3-channel architecture incorporating *all products* and agencies of the government, with a *limited physical network.*

   Once the foundations of the service operations are created and feasibility is proven, the next step is an accelerated expansion to all the services and products that depend on the government's administration.

3. Phase 3, going from Phase 2 to a *3-channel* architecture incorporating *all products* and agencies of the government, with a *wide and efficient physical network.*

   Once all the products and services are in place, it is time to capitalize on the investment and start merging operations of different agencies into the single one-stop shop organization that ChileAtiende will have become at that point.

In terms of organizational design and the governance structure, ChileAtiende should be converted into a Public Service through a law or decree that brings stability to its existence. It should have a National Director and should be overseen by a Steering Committee that sets the strategic direction and helps with coordinating the great number of agencies ChileAtiende has to deal with. In addition, ChileAtiende should be seen as the service delivery expert organization within the government, and should be the partner that takes care of that part of the business. In that sense, the incentives and rewards across the different organizations need to be designed carefully in order to ensure the most effective use of the resources of the government.

Finally, after the systematic use of the ARIES and other frameworks and the application of systems thinking, the results obtained are generally coherent; this underscores the value of these methodologies. By the same token, the blended approach of using suitable techniques to support the analysis required has yielded valuable insights to the leaders of the project, affording them a wider perspective of the system and its challenges.

Future Work

The present work is based on a systemic view of the project, taking into account not only the direct relationships between ChileAtiende and the most relevant stakeholders, but also indirect relationships among other stakeholders that may impact the initiative. Yet some simplifications were required in order to create valuable insights with the available information at hand. Several points that deserve to be analyzed individually, and in detail, were left out of the scope of this work, but are certainly important for the final ChileAtiende organizational design.

I. Creation of an extended view of the service model

Probably the most important simplification was made in the mixed integer linear programming model created, which, although it was big (given the number of variables and constraints involved), could have been made more complete by enlarging the boundary of the model. This is a source of future work, and it could be used to evaluate the value of adding more products to the network by considering not only developing costs – as the built model did – but also the benefits for the citizens and the benefits such as cost savings from the service operations. An expanded version of the model could consider the following factors:

1. Development costs of having the product digitized and available in the online channel.
2. Benefits for the citizens by having no transaction costs through the online channel, and lowered costs through the telephone and closer offices. The latter point could include the average distance between the citizens and the offices, using mass centers by city.
3. Benefits for the Government by having more efficient service operations. This should include savings as the outcome of a lower demand for the telephone and in-person channels, which should result in smaller headcount, fewer service facilities, and higher productivity per employee.

Modeling a wider-scope problem like this is possible, but is highly demanding in terms of data, and definitely not the objective of the present work.

II. Modeling the service at the offices

Using operations research techniques such as queueing theory, it is possible to model the impact of lower demand in the offices, which would be a relevant input for designing the customer experience, and for defining the size required of the different offices under different assumptions.

III. Definition of a project structure coherent with the *agile* techniques.

One of the best practices found, and being used by those countries leading the *Digital Government* and *Government Service Delivery* initiatives is the *agile* work method. Since the products and agencies demand individual developments and teams of developers, the design of the project, governance structure, and interactions among teams, are interesting from the point of view of the methodology and the dynamics generated given the highly distributed nature of the project.

IV. Design of the performance management system for ChileAtiende.

The customer-supplier relationship required to maintain a tension between ChileAtiende and the agencies that enables continuous improvement efforts needs to be created. This goes against the current paradigm that says that all the resources come from the *same pocket*, which is absolutely true; however, it does not help to move improvements further. The service that ChileAtiende provides today is free for the agencies that belong to the network, and many times its importance is unnoticed and undervalued. The result is that almost no efforts are triggered from the agencies to improve the servicing of their own products, to the extent that they do not even receive reports to evaluate. In order to implement a powerful initiative, the incentives for ChileAtiende and the agencies participating in the network need to be aligned; and for this purpose the performance management system is the missing component. This can be seen as a project by itself and it would undoubtedly be an interesting initiative to be developed.

Hopefully, these recommended topics can be developed in depth by the project team. Given their high importance, a correct analysis of these issues can yield a much better project overall.

Appendix 1: MILP code for ChileAtiende products in R

```
#Load Data
PageViews = read.table("In_PageViews.txt", header = TRUE)  # PageViews is a dataframe
AgencyCost = read.csv("In_Agencies.csv")
ProdDep = read.csv("In_ProdDep.csv", sep = ",", header = FALSE)
ProdPredec = read.csv("In_Pred.csv", sep = ",", header = FALSE)
Products =  read.csv("In_Products.csv")
ProductCost = read.csv("In_ProductCost.csv")
ProdAgen_Dep = read.csv("In_ProdAgen_Dep.csv", sep = ",", header = FALSE)
ProdAgency = read.csv("In_ProductAgency.csv")
DSM = read.csv("In_DSM.csv", sep = " ")


# Define the objective function
m = 2460 # Number of products
n = 139  # Number of agencies
o = 1974 # Dependencies among products
z = c(PageViews[,2],rep(0,n))                 # Maximize the number of Pageviews
(processes that can be finished online)
M = max(PageViews[1:m,2])+1# Big number for linking constraints

#Define Constraints
ProdProd_constr = 10000*ProdDep-M*ProdPredec  # Matrix of dependecies among products
in form of constraint matrix
constr = matrix(0,m+1+o,m+n)
for(i in 1:m){
  for (j in 1:n){
    constr[1,i]<- t(ProductCost)[i]
    constr[1,m+j]<- t(AgencyCost[,2])[j]
    constr[1+i,i]<- 1*PageViews[i,2]
    constr[1+i,m+j]<- -M*ProdAgen_Dep[i,j]
  }
}
for (k in 1:o){
  for (i in 1:m){
    constr[1+m+k,i]<- ProdProd_constr[k,i]
  }
}
constr.dir = c(rep("<=",m+o+1))
write.csv(constr, file = "Out_Constr.csv")

library(Rglpk)
#Calculate 1 solution
Budget = 1000000 # Total Budget
constr.rhs = c(Budget,rep(0,m+o))
prob.opt2 <- Rglpk_solve_LP(z,constr, constr.dir, constr.rhs, types =
c(rep("B",m+n)), max = TRUE)
TotalCost <- sum((prob.opt2$solution*constr[1,])[1:(m+n)])
num_products = sum(prob.opt2$solution[1:m])
num_agencies = sum(prob.opt2$solution[(m+1):(m+n)])
solution_products <-
cbind(as.matrix(Products[1:m,2]),matrix(prob.opt2$solution[1:m],nrow=m,byrow = TRUE))
```

```
solution_agencies <-
cbind(as.matrix(AgencyCost[1:n,1]),matrix(prob.opt2$solution[(m+1):(m+n)],nrow=n,byro
w = TRUE))
prob.opt2$optimum
TotalCost
num_products
num_agencies
prob.opt2$solution
#Display Solutions in a better format (only necessary for 1 iteration)
write.csv(solution_products, file = "Out_Solutions_Products.csv")
write.csv(solution_agencies, file = "Out_Solution_Agencies.csv")

#Create Network from solutions
library(igraph)
solution_products_simp = subset(as.data.frame(solution_products), V2 == 1)
Sol_complete = merge(solution_products_simp,ProdAgency, by.x = "V1" , by.y =
"Product", all.x = TRUE )
Nodes = Sol_complete[,c("V1","Agency")]
colnames(Nodes)[1] <- "Product"
Adj_Mat = matrix(0,num_products,num_products)
for (i in 1:num_products){
  for (j in 1:num_products){
    Adj_Mat[i,j] = DSM[Sol_complete$Row_Numb[i],Sol_complete$Row_Numb[j]]
    }
}
net = graph_from_adjacency_matrix(Adj_Mat, mode = "directed")
tkid = tkplot(net, vertex.label = as.matrix(Sol_complete[1]), edge.arrow.size = 0.3,
vertex.size = (as.matrix(Sol_complete[6])/45000), vertex.label.family = "Helvetica",
vertex.label.cex = 0.8, vertex.label.color = "black", vertex.color = "lightblue",
layout = layout_with_fr, vertex.label.dist = 1)
lo <- tkplot.getcoords(tkid)                    # grab the coordinates from tkplot
tk_close(tkid, window.close = T)
plot(net, layout=l)
plot(net, vertex.label = as.matrix(Sol_complete[1]), edge.arrow.size = 0.3,
vertex.size = (as.matrix(Sol_complete[6])/45000), vertex.label.family = "Helvetica",
vertex.label.cex = 0.8, vertex.label.color = "black", vertex.color = "lightblue",
layout = lo, vertex.label.degree = 0)

# End of code
```

Bibliography

Cameron, B. (2007). *Value Network Modeling: A Quantitative Method for Comparing Benefit across Exploration Architectures. Master Thesis, Department of Aeronautics and Astronautics & Engineering Systems Division.* Massachusetts Institute of Technology, Cambridge, MA.

Cameron, B. (2016). Systems Architecture: Stakeholders and Networks [Lecture Notes]. Cambridge, MA.

Chandra Misra, D. (2006). Defining e-government: a citizen-centric criteria-based approach. *10th National Conference on e-Governance.* Bhopal.

Collier, K. (2011). *Agile Analytics: A Value-Driven Approach to Business Intelligence and Data Warehousing.* Boston, MA: Pearson Education.

Corydon, B., Grant, A., Lin, D.-Y., & Ma Zecha, C. (2016, June). Making government for the people. The McKinsey Podcast.

Crawley, E., Cameron, B., & Selva, D. (2016). *System Architecture: Strategy and Product Development for Complex Systems.* Boston: Pearson.

Danish Government. (2016). *Borger.dk.* Retrieved August 13, 2016, from www.borger.dk

de Jong, A., Kolthof, A., Pieper, M., Tjassing, R., van der Veen, A., & Verheijen, T. (2008). *ITIL® V3 Foundation Exam - The Study Guide* (1st ed.). Van Haren Publishing.

de Weck, O., Roos, D., & Magee, C. (2011). *Engineering Systems: Meeting Human Needs in a Complex Technological World* (1st Edition ed.). Cambridge , Massachusetts, US: MIT Press.

Dilmegani, C., Korkmaz, B., & Lundqvist, M. (2014). *Public-sector digitization: The trillion-dollar challenge.* McKinsey. Istanbul: McKinsey Insights.

Dudley, E., Lin, D.-Y., Mancini, M., & Ng, J. (2015). *Implementing a citizen-centric approach to delivering government services.* McKinsey. Singapore: McKinsey Center for Government.

Farrel, D., & Goodman, A. (2013). *Government by design: Four principles for a better public sector.* McKinsey Center of Government. Washington, DC: McKinsey Insights.

Feng, W., Crawley, E., de Weck, O., Keller, R., & Robinson, B. (2010, July). Dependecy Structure Matrix Modelling for Stakeholder Value Networks. *International Dependency and Structure Modelling Conference, DSM'10.*

Feng, W., Lessard, D., Cameron, B., & Crawley, E. (2013). Stakeholders, Issues, And the Shaping of Large Engineering Projects. *Engineering Project Organization Conference.*

Fitzsimmons, J., & Fitzsimmons, M. (2008). *Service Management. Operations, Strategy, Information Technology* (6th ed.). New York: McGraw-Hill Irwin.

Fourer, R., Gay, D., & Kernigham, B. (2003). *AMPL, A Modelling Language for Mathematicla Programming* (2nd ed.). Duxbury Thomson.

Gobierno de Chile. (2016). *Gobierno Digital, ChileAtiende digital.* Retrieved June 28, 2016, from Agenda Digital 2020: http://www.agendadigital.gob.cl/#/seguimiento/medida/22

Hoppe, B. (2008). *Introduction to web Science.* Retrieved December 27, 2016, from http://webwhompers.com/graph-theory.html

Johnson, G., Scholes, K., & Whittington, R. (2008). *Exploring Corporate Strategy* (Eighth Edition ed.). London: Pearson.

Kates, A., & Galbraith, J. (2007). *Designing Your Organization Using the Star Model to Solve 5 Critical Design Challenges.* San Francisco, US: Jossey-Bass.

Lorsch, J. (1975). *Note on Organization Design.* Cambridge, US: Harvard Business School Cases.

Lundqvist, M., & Braad, P. (2016). *From waterfall to agile:How a public-sector agency successfully changed its system-development approach to become digital.* McKinsey, Business Technology Office and Public Sector. Copenhagen: McKinsey Insights.

McKinsey & Company. (2015). *Implementing a citizen-centric approach to delivering government services.* McKinsey Center for Government.

Ministerio de Economía, Fomento y Turismo. (2016). *Ministerio de Economía, Fomento y Turismo / Mission and History.* Retrieved June 26, 2016, from Ministerio de Economía, Fomento y Turismo: http://www.economia.gob.cl/mision-e-historia

Ministerio de Hacienda. (2016). *Ministerio de Hacienda / Mission.* Retrieved June 26, 2016, from Ministerio de Hacienda: http://www.hacienda.cl/el-ministerio.html

Ministerio del Trabajo y Previsión Social. (2016). *Ministerio del Trabajo y Previsión Social / Mission and Objectives.* Retrieved June 26, 2016, from Ministerio del Trabajo y Previsión Social: http://www.mintrab.gob.cl/nuestro-ministerio/mision-y-objetivos/

Ministerio Secretaría General de la Presidencia. (2015). *ChileAtiende, Situación Actual.* Santiago.

Ministerio Secretaría General de la Presidencia. (2016). *Proyecto de Fortalecimiento de ChileAtiende.* Santiago, Chile.

Ministerio Secretaría General de la Presidencia. (2016). *SEGPRES / Mission.* Retrieved June 26, 2016, from Ministerio Secretaria General de la Presidencia: http://www.minsegpres.gob.cl/mision/

Ministerio Secretaría General de la Presidencia. (2016). *Unidad de Modernización y Gobierno Digital / Acerca de UMGD*. Retrieved July 4, 2016, from Unidad de Modernización y Gobierno Digital: http://www.modernizacion.gob.cl/es/acerca/

Mintzberg, H. (1981). Organization Design: Fashion or Fit? *Harvard Business Review*.

Mitchell, M. (2009). *Complexity, A Guided Tour* (1st ed.). New York: Oxford University Press.

Mitchell, R., Agle, B., & Wood, D. (1997). Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts. *Academy of Management Review, 22*(4), 853-886.

Nightingale, D., & Rhodes, D. (2015). *Architecting the Future Enterprise* (1st Edition ed.). Cambridge, Massachusetts, US: MIT Press.

OECD. (2014). *Recommendation of the Council on Digital Government Strategies.* Paris: OECD Publishing.

OECD. (2016). *Digital Government in Chile: Strengthening institutional and governance frameworks.* OECD. Paris: OECD Publishing.

OECD. (2016). *Digital Government in Chile: Strengthening institutional and governance frameworks.* OECD.

OECD. (2016). *Regulatory Policy in Chile: Government Capacity to Ensure High-Quality Regulation.* OECD Reviews of Regulatory Reform. Paris: OECD Publishing.

OECD e-Government Studies. (2009). *Rethinking e-Government Services, User-Centred Approaches.* Paris: OECD Publishing.

Piñera, S. (2013). *Mensaje Nº 197-361 con el que inicia un Proyecto de Ley que establece un sistema de atención a las personas y crea el Servicio Nacional de Atención Ciudadana, ChileAtiende.* Gobierno de Chile. Santiago: Gobierno de Chile.

Ruohonen, K. (2013). Graph Theory. Tampere University of Technology.

Sallan, J. M., Lordan, O., & Fernandez, V. (2015). *Modeling and Solving Linear Programming with R.* Omnia Science.

Sandia National Laboratories. (2013). *Comparison of Open-Source Linear Programming Solvers.* Alburquerque: Sandia National Laboratories.

Schmenner, R. (1986). How Can Service Business Survive and Prosper? *Sloan Management Review, 27*(3), 21-32.

Sessions, R. (2007). *A Comparison of the Top Four Enterprise-Architecture Methodologies.* Chappel Hill: Microsoft Developer Netwrok.

Sinha, K. (2014). *Structural Complexity and its Implications for Design of Cyber-Physiscal Systems.* Cambridge: Massachusetts Institute of Technology.

Sotomayor, J., Gutierrez, A., Vargas, E., & Parra, V. (2014). *Solicita Pronunciamiento sobre Proyecto ChileAtiende.* Santiago.

Sterman, J. (2000). *Business Dynamics, Systems Thinking and Modeling for a Complex World.* McGraw-Hill Higher Education.

Sturtevant, D. (2013). *System Design and the Cost of Architectural Complexity.* Cambridge: MIT.

Subsecretería de Telecomunicaciones, Gobierno de Chile. (2015). *Resultados Encuesta Nacional de Acceso y Usos de Internet.* Subsecretería de Telecomunicaciones, División de Política Regulatoria y Estudios. Santiago: Gobierno de Chile.

The Open Group. (2011). *TOGAF Version 9.1.* Reading, UK: Open Group Standard.

UK Government. (2016). *Gov.uk.* Retrieved August 13, 2016, from www.gov.uk

Unidad de Modernización del Estado. (2016). *Proyecto de Fortalecimiento de ChileAtiende.* Ministerio de Hacienda, Chile, Santiago.

United Nations. (2016). *E-Government Survey 2016.* United Nations Department of Economic and Social Affairs. New York: United Nations.

Ward, J., Zhang, B., Jain, S., & Fry, C. (2010). *HP Transforms Product Portfolio Management with Operations Research.* Hanover: Institute for Operations Research and the Management Sciences.

Willen, B., Massa, A., & Zuazua, M. (2014, April). *Agile Government: A Citizen-Centric Approach to Growth.* AT Kearney, Ideas and Insights. AT Kearney. Retrieved 2016, from AT Kearney: https://www.atkearney.com/organization-transformation/ideas-insights/article/-/asset_publisher/LCcgOeS4t85g/content/agile-government-a-citizen-centric-approach-to-growth/10192

Zachman, J. A. (1987). A Framework for Information Systems Architecture. *IBM Systems Journal,* Vol. 26, no. 3.