An IT Governance Case Study: Distribution Management System

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ABSTRACT
This IT Governance case study analyses the Distribution Management System of the “Services Industriels de Genève” and it shows how we used an enterprise architecture approach to assess both the business processes and the information system in terms of compliance with a new regulation. We will describe the as-is situation in four layers (business, functional, applications, technology), as well as the method we used during the project. The to-be architecture is currently being defined and will not be shown here, even though the general approach will be described.

Keyword: Governance, Information Systems, Assessment, Distribution Management System, Reorganization

1. Introduction
SIG (“Services Industriels de Genève”) is a state-owned multi-utilities company that provides its services to 250,000 customers in the Swiss Canton of Geneva. Its activities cover domains such as electricity, gas, district heating, energy services, drinking water, used water waste treatment and improvement, and telecommunications. SIG has 1,700 employees and its 2007 annual revenue was CHF 900 millions. This case study is focused on one of its activities, the electricity Distribution Management System (DMS).

1.1 Swiss Electricity Market
In 2002 the Swiss people voted against the « Loi sur le marché de l’électricité » (LME or law on the electricity market). This law planned the opening of the electricity market in Switzerland, similarly to most other European countries. However in 2003 the Federal Supreme Court broke the monopoly of the distribution company of the Canton Fribourg which would not allow Migros (the largest supermarket and distribution company in Switzerland) to choose its own electricity provider (Fellay 2007).
On March 23, 2007 the Swiss Parliament voted a new text on the electricity market: the LApEI (law on electricity provisioning). This law also aims towards the opening of the electricity market, but with a strong focus on provisioning quality (rather than promoting a completely open market). Furthermore the market will be opening in two stages: from 2008 on customers’ sites that consume more than 100'000 kWh per year have access to the open market and it will not be before 2013 that all customers will be able to choose their provider.

The LApEI insists on price transparency by separating the cost of transportation from the cost of energy. In order to do so a regulatory authority has been set up to control the « unbundling » principle, that is an accounting separation of production, distribution and commercialization activities. Distribution remains a regulated monopoly and distribution operators must bill transport costs to the seller or “commercializer”. This regulatory authority is called ElCom; it is an independent authority that will control the Swiss electricity market and to whom distributors will have to report on their tariffs and on their customers. However the Elcom has no regulatory authority on the commercialization companies; in their case it is the Swiss Federal Competition Commission that performs this task, as commercialization is a free market (Fellay 2007).

Customers’ sites that consume over 100 MkWh per year had until the 31st of July 2008 to apply for a different electricity supplier, and they have access to this new market since the 1st of October 2008.

1.2 Distribution Management System
DMS refers to a suite of application software that supports electric system operations. Example applications include geographical information systems, topology processor, power transformer and substation management, risk and financial analysis, switch operations, short-circuit analysis, fault management, and loss analysis. DMS applications such as on-line distribution power flow are based on models of electric systems, including connectivity, impedance, equipment, load distribution, and geographic coordinates for all components (Kersting 2006).

As most business processes in the distribution field are almost fully controlled by information systems, the system’s architecture had to be thoroughly analyzed and redesigned. We will not go in the details of all applications and software (around 30) used to support distribution processes, but we will speak about the global Distribution Management System (DMS).
1.3 Impacts on SIG

Until 2008 SIG operated as single entity producing, distributing and selling electricity. Its organization, processes, and information system were designed specifically to achieve these goals. In order to prepare for the progressive market opening SIG has to change and reorganize them. Indeed, the distribution branch of SIG will not be allowed anymore to share all data with the commercial branch, as this would be a strong competitive advantage for the latter over other resellers using the same distribution networks. With the new regulation the DMS must be “insulated” in order to provide only appropriate data to the SIG commercial unit and to other resellers. For example the commercial unit should only have access to data (such as meter readings or billing information) for customers to whom they sell electricity, but not to data for DMS customers that chose other commercial providers.

Furthermore, from January 2009 on, the distribution unit will have to deliver periodical reports to the Elcom regulation authority in order to prove that they comply with the new law and that all commercializers have access to the distribution infrastructure without any information bias.

2. Enterprise Architecture and Governance

Corporate governance is the set of processes, customs, policies, laws and external entities affecting the way an organization is managed or controlled. Corporate governance also includes relationships between stakeholders such as shareholders, management, the board of directors, employees, suppliers, customers, regulators, etc.

Corporate governance has as strong focus on accountability and information sharing, and on economic efficiency, but there is also a growing area of governance that is related to compliance. Indeed more and more companies must comply to acts such as Sarbanes-Oxley (Public Company Accounting Reform and Investor Protection Act of 2002, a US federal law enacted on July 2002 in response to scandals like Enron or WorldCom) (Rezaee 2007) or to recommendations like Basel II (an international standard on banking regulations). Information Technology or IT Governance is a subset of corporate governance focused on information systems, their performance, and risk management (Guldentops 2001).

Enterprise architecture is a key component of IT governance because it provides plans and views that represent business processes and information systems, as well as their alignment (Ross, Weill and Robertson 2006).
2.1 General Method

Enterprise architecture is a term used to describe the formal organization of business strategy, structures, resources, processes and technologies that make up an enterprise (Korac-Kakabadse and Kakabadse 2001). Enterprise architecture usually involves describing the current situation (as-is) and designing a target model (to-be). Various sets of stable intermediate reference architecture (migration plans) may also be designed.

There are several well-known enterprise architecture frameworks (Zachman, DoDaf, TOGAF, etc.) and most of them address these four layers:

- Business architecture: strategy, business objectives, business processes, business data, etc.
- Functional architecture: use cases, data reference model, etc.
- Application architecture: application systems, interactions and dataflows between systems, relationships to business processes, etc.
- Technical architecture: machines, components, networks, platforms, operating systems, databases, etc.

The objectives of enterprise architecture are to be able to answer questions such as (Luftman 2003):

- Are our business processes contributing to our strategic objectives?
- Is our information system aligned to our business processes?
- What is the contribution of a given system to a business process?
- What are the impacts on our information system if we want to (or have to) modify a business process?

2.2 Domain-specific Method

The IEC is the world's leading organization for international standards for all electrical and electronic technologies. Amongst the many standards it has developed, the IEC 61968 defines interfaces for the major elements of architecture for Distribution Management Systems (DMS). This Common Information Model (CIM) describes and models components used to manage electrical distribution networks. These include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand-side management, outage management, work management, automated mapping and facilities management.
IEC 61968 furthermore recommends that system interfaces of a compliant inter-application utility infrastructure be defined using Unified Modeling Language (UML) and that data and document exchange be defined in XML.

IEC 61968 defines business domains or functions (see Fig. 1), business sub-functions as well as abstract components (Fig. 2).

**Figure 1**: Distribution Management Domain Model (IEC 61968)

**Figure 2**: Selected Business Sub-functions and Abstract Components (IEC 61968)
3. As-Is Architecture

In order to describe the As-Is architecture we conducted interviews with management, IT and business people. We identified the main business and IT objectives, and we asked the interviewees to weight each objective. We used matrices to link business objectives and business processes, and we measured the contribution of each business process to the objectives it was related to. We furthermore interviewed end-users in order to have them evaluate a sample of applications.

3.1 Business Architecture

We analyzed the business objectives in terms of four generic perspectives:
- Financial
- Customer
- Internal
- Growth and capitalization.

The most important objectives were:
- Service availability
- Asset management optimization
- Business process management
- Compliance
- Transparency.

We used the IEC 61968 sub-functions as our business processes because we did not have the time nor the resources to build a detailed model of existing business processes. We linked each of the 30 sub-functions with business objectives and weighted them according to how much they contributed to a given objective.

By calculating the cross-product of their contribution and of the weight of business objectives, we were able to identify the most important business processes for SIG:
- Asset investment planning
- Substation and network inventory
- Maintenance and inspection
- Meter reading
- Construction and design.

We used the same approach for IT objectives and applications’ contribution to IT objectives. We will not show the details of the applications’ ranking, as the goal of this paper is not to go into such details but rather to present a method. However we
will mention the most important IT objectives:

- Response to needs
- Interoperability
- Availability and quality of information
- Scalability
- Performance
- Specialization.

3.2 Functional Architecture

The functional architecture is made of three main domain models:

- Business data or entities, shown in Fig. 3: objects or objects associations that are manipulated in order to achieve a business process (e.g. an invoice or and order).

- Business processes and business uses cases: a business process represents a collection of activities that takes one or more kinds of inputs and creates an output that is of value to stakeholders; use cases describe activities that take place in order to accomplish a process (i.e. what the process does).

- Organization and roles: actors represent external entities (people or systems) that interact with processes or information system.

![Figure 3: Business Entities](image)

Figure 4 shows a simple organizational model of typical IS users’ roles, but it is rather generic and does not show the actual organizational charts of SIG.
As mentioned earlier, we used the IEC 61968 sub-functions as the basis of our business process model. Figure 5 shows an example of business processes in the domain of Network Operation (NO).

For each business process we defined the main business use cases. These were defined in a “technology-free” manner, that is without any link to applications used in order to accomplish them (see example in Fig. 6). They were based on the “abstract components” defined by the IEC standard. However we used matrices to show which business entities are used in the context of a business use case and to link applications and use cases formally. Let us mention that in one case it was necessary to use up to 12 different applications to accomplish a single business use case and that several other use cases required between 6 and 10 different applications.
3.3 Application Architecture

We organized workshops with the IT team in order to define the IT «landscape». As there are close to 30 applications that contribute to the DMS, we will obviously not go into the details here. However let us mention that we identified 3 main software “families”:

- Business software or ready-to-use software sold by large commercial editors (SAP, AutoCAD, PSNext, etc.)
- Tailored business applications, developed in-house.
- Georeferenced software (Geographical Information Software), adapted to SIG needs on the basis of a GeoConcept platform.

We selected seven applications that were to be assessed by user groups. During the workshop with representative users, we used the FURPS+ model (Functionality, Usability, Reliability, Performance, Supportability), developed by HP and now widely used. The results were that all audited applications had good to excellent evaluations individually, but that the integration between these applications was not optimal, especially in terms of data redundancy and actualization. Furthermore users identified weaknesses in terms of roles and authorizations management, particularly in terms of data CRUD (create-read-update-delete). Last, our interviews showed that reporting was too often made in an ad-hoc manner (e.g. with Excel sheets), although dedicated tools were available. Users did not rely on these tools, mostly because they did not know how to use them, and in some cases because they did not even know they existed.

We also defined data flows and dependencies between applications and we described them (synchronous/asynchronous, periodicity, validation, enrichment, transformation,
etc.), as shown in Fig. 7. The little arrows show the directions of data exchanges, and it is possible to expand the cell in order to see the description of a given flow.

![Figure 7: Inter-applications Data Flows](image)

### 3.4 As-Is Architecture Evaluation

The SCD information system is globally aligned with business and IT objectives, with 3 main issues identified:

- There are redundant data and a lack of common data reference.
- Roles and authorizations mechanisms are currently not advanced enough in order to meet requirements brought by the new regulation.
- Existing reporting tools are underused.

However, the IS ensures service availability and quality, thus fulfilling the most important business objectives. Moreover, interviews have shown that the IS covers user needs and is aligned with interoperability, specialization and performance requirements. Apart from the introduction of a global and standardized data reference model, two other opportunities were identified during the project: the introduction of a single georeferenced user interface to all relevant applications and the development of standardized financial and technical reporting tools.
4. To-Be Architecture

After the assessment we made, SIG management decided that the business architecture (objectives, processes, etc.) would not undergo any major evolution and that our focus was to be on the functional architecture. However this case study reports on an ongoing project and the To-Be architecture is currently being defined by a team of SIG collaborators and external consultants.

The target system will be mainly based on a data reference model comprising business entities defined earlier on, and on CRUD (create-read-update-delete) use cases defining which roles have control and access to business entities. Furthermore the To-Be architecture will have to be compatible with the IEC Common Information Model presented in section 2.2. The target functional architecture will be defined using the same method as shown in section 3.2 for the As-Is Architecture.

5. Conclusion

In this paper we discussed that corporate governance is based on:

− Process and policies that affect the way an organization is managed;
− Relationships between shareholders, management, directors, employees, suppliers, customers, regulators, and so on;
− Accountability and transparency.

Our case study covers a subset of this field, IT governance. In order to comply with a new Swiss law, SIG had to reorganize its processes in order to separate distribution and commercialization activities. From January 2009 on, SIG will furthermore have to deal with a new stakeholder, the Elcom regulation authority, and to send them periodical reports on their distribution activities. Theses changes will mainly be implemented by making the distribution management system evolve.

Our goal was to achieve “good” IT governance, and we used enterprise architecture tools in order to model and assess the current situation. These provide a sound foundation for the next step of the project: to define the target architecture for the distribution management system. This job is currently being done, as we write these lines describing the first phase of the project.

5. Acknowledgement

Many thanks to the SIG project team, particularly to Patrick Aebischer that provided very valuable insights on the distribution business, and to the SQLI project team. The author worked at SQLI Group from 2005 to 2008, prior to joining SPAN/IDHEAP.
REFERENCES


