

A Case Study on Taxpayer Segmentation

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ABSTRACT

In this paper we describe a reorganization project that took place between 2004 and 2007 in a Swiss Cantonal tax administration. The information system was built from scratch by adding a new module each year and the organization was transformed accordingly.

We will show what the initial objectives were and their evolution as the project went on. We will also describe the lessons learned, particularly regarding the automation and semi-automation of tax declaration assessment and more generally in terms of governance.

Keywords

Reorganization, process reengineering, IT governance, taxation, automation.

1. INTRODUCTION

In 2002 the Administration Cantonale des Impôts (ACI) of the Canton of Vaud in Switzerland decided to develop a new information system in order to be able to process 360'000 tax declarations a year. Previously these tax declarations were processed over a two-year period but the amount of tax assessors remained equal. Indeed the Federal Tax Harmonization Law changed the rules for personal income and wealth taxes: taxation every second year on the average income of the previous two years (biennial praenumerando) became taxation every year on current income (annual postnumerando) [2]. For details on the Swiss Federal, Cantonal and Communal tax system, see [3]. In 2003 and 2004 a computer-aided taxation system called TAO-PP (Taxation Assistée par Ordinateur – Personnes Physiques) was developed by the ACI, the Chief Information Office (DSI) of the Canton and SQLI Group. Since 2004 this web-based system has been functionally enriched and is still evolving; it is working well and there is not much to say about it, except that tax assessors still worked with the paper files in order to have access to appendices, bills, letters, and so on. Apart from some appendices, all tax declarations were scanned or integrated in the system from a code-bar available on the tax declaration for those who used commercial tax software or the tax software provided free of charge by the Canton. What we will describe in this paper are the following steps of the project and the lessons learned after three iterations.

Section 2 describes the automated taxation subproject that was developed in 2005. Section 3 presents the semi-automated taxation system that was built in 2006 on top of this automated tax system. In section 4 we will explain how the semi-automated concept was extended in 2007 to introduce the idea of “semi-manual” tax assessors. In section 5 we will show how in 2008 taxpayer segmentation was used to identify and qualify complex tax declarations in order to route them towards specialized tax assessors.

Section 6 will conclude this case-study with lessons learned, section 7 lists ideas for future developments and section 8 contains our conclusion.

2. AUTOMATED TAXATION

In 2004 the ACI decided to process simple tax files (e.g. people with no income or with very stable tax declarations over the years) automatically and set the following objectives:

- Processing 50'000 to 70'000 tax declarations automatically in 2005 and 100'000 to 140'000 in 2006.
- Storing paper tax files in a centralized warehouse and sending scanned copy of files to tax assessors (tax offices are decentralized all over the Canton).

We defined three standard sets of analysis rules (students, singles, married with kids) and each of the 200 or so rules would check what the taxpayer declared, what the system calculated and what the previous year's decisions were. If all rules could be applied the tax file was considered as eligible for automated taxation. If any one of the 200 rules could not be applied, the analysis process was interrupted and the tax declaration was treated manually within TAO-PP by a tax assessor.

In 2005 only 28'000 tax declarations could be processed automatically, which was clearly below expectations. Furthermore, detailed analysis showed that 35% of tax declarations that should have been processed automatically were rejected because they were incomplete, because of taxpayers' mistakes or because of scanning mistakes.

We thus introduced the idea of a semi-automated treatment where operators would correct taxpayers' or scanning mistakes, complete missing calculations and check-proof a few elements of the tax declaration.

3. SEMI-AUTOMATED TAXATION

In 2005 the ACI decided to set up a new centralized operational center (CEDI) with "cyber" tax assessors that would be able to process a simple tax declaration in 10 minutes by using the results of the analysis done by the automated taxation batch. The objective of the ACI was to reach 30% of semi-automated tax declarations for selected organizational units. Indeed, for this first year the semi-automated process was not applied to all regional tax offices.

We kept and updated the analysis rules defined for 2005 and we added a standard set of rules for single parents. We also introduced the concept of "nonconformity": data where analysis rules could not be applied, to be verified by tax assessors. We accepted up to 6 nonconformities for semi-automated taxation. There was also a set of stop conditions that would interrupt the analysis when met. In order for the "cyber" tax assessors to have a global view on the tax declaration and to be able to check nonconformities quickly, we defined special screens that would display the equivalent of an A3 sheet on a 24 inches monitor.

Formulaire de taxation semi-automatique

Viser	Contribuable seul / Époux seul			Épouse			
	Code	VD	VP	VA	VD	VP	VA
Activités salariée							
<input type="checkbox"/> Rémunération (Salaires net fi)	100	151051	156196	156196			
<input type="checkbox"/> Accessoires (Salaires net fi)	105						
<input type="checkbox"/> Allocations (familiales, naissances)	110	3840	4390	4390			
<input type="checkbox"/> Autres revenus divers	120						
<input type="checkbox"/> Transport (Cib - épouse)	140	-	4680	7466			
<input type="checkbox"/> Repas ou séjour hors du domicile	150	-	3000	3000			
<input type="checkbox"/> Autres frais prof. / frais de portect	160	-	3800	3800			
<input type="checkbox"/> Frais activités access. sel. (20%)	165	-					
Activités indépendantes (CTB seul.e / époux)							
Principale (Cib, épouse)	180						
Accessoire (Cib, épouse)	185						
Perte commerciale non compensée	186						
SNC / rsi commandite	190						
Autres revenus de toutes natures (CTB seul.e / époux)							
Autres revenus de toutes natures							
Indemnités pour perte de gain (CTB seul.e / époux)							
Ass chômage et serv. militaires (APD)	200						
Maladie et accidents (ind. jour)	210						
Assurance-Invalidité (ind. jour)	220						
Autres frais prof. / frais de portect							
Total des codes 100 à 220	230	144065	144065	144065			
Déduction pour double activité	235						
Rentes et Pensions (CTB seul.e / époux)							
1er piller - rentes AVS / AI et LAA	240						
2e piller - rentes prévoyance prof.	250						
3e piller a - rentes prévoyance liée	260						
3e piller b - autres rentes et pensions	270						
Pension alimentaire octroyée	280						
Primes et cotisations d'assurances (CTB seul.e / époux)							
Autres ass. de pers. / cot. famille	300	-	6200	6200			
Prévoyance liée 3e piller A	310	-					
Rachats d'année d'ass. (3e piller)	320	-					
Cotisations des indépendants-e-s	330	-					
Autres cotisation des salariés	340	-	1175	2349			
Total CTB seul.e / épouse	350	136690	144357	144357			
Report total épouse	355						
Cumul (350 + 355)	400	136690	144357	144357			

Viser	Revenu			Fortune			
	Code	VD	VP	VA	VD	VP	VA
Titres et autres éléments							
Total 100-400 (Cib, épouse)	400	136690	144357	144357			
<input type="checkbox"/> Titres et gains de bourse	410	1299	982	982	184485	208232	208232
<input type="checkbox"/> Numéraire, billets de banque	420						
<input type="checkbox"/> Successions non partagées	425						
<input type="checkbox"/> Autos, motos, chevaux de selle, collection	430						
<input type="checkbox"/> Assurance sur la vie/taux de rachat	435						
<input type="checkbox"/> Objets mobiliers	440						
<input type="checkbox"/> Autres fortune et revenus de fortune	445						
<input type="checkbox"/> Exploitant du sol	450						
<input type="checkbox"/> Fortune de SNC/Commandite	460						
<input type="checkbox"/> Autres actifs d'exploitation	465						
<input type="checkbox"/> Déduction intérêt de créancier d'épargne	480	341		341			
<input type="checkbox"/> Frais administration des titres	490			312			
<input type="checkbox"/> Mises loteries en cas de gain	495						
Immubles, terrains et forêts							
Immubles privés	500	19565	17335	17337	530000	530000	530000
Immubles commerciaux	510						
Droit d'habitation gratuit, sous-location	530						
Frais entretien immeubles privés	540	-	3913	3467			
Intérêt et dettes							
Privées	610	-	17435	12700	480000	480000	480000
Exploitation	615						
Déductions spéciales sur le revenu							
Rentes et charges déductibles	620						
Pension alimentaire payée	630						
Cotisation AVS / AI / APD / AC	640						
Revenu net	650	135865	146033	146033			
Déduction sociale pour le logement	660			0			
Déduction pour frais de garde	670						
Déduction pour personnes(s) à charge	680						
Différence (Code 650 moins 660 à 680)	690	135865	146033	146033			
Déduction pour contribuable modeste	695			0			
Revenu / fortune intermédiaires	700	135865	146033	146033	234485	258232	146033
Frais médicaux et dentaires	710						
Versements à des inst. d'utilité publique	720						
Sous-total (code 700-720)	730	136865	146033	146033			
Revenu imposable	800	136800	146033	146000	234000	258000	146000
Quotient familial	810	2.8	2.8	2.6			
REVENU DÉTERMINÉ POUR LE TAUX	820	48500	52200	52100			

Figure 1. A3 Format Screen.

Nonconformities are highlighted in yellow on the screen and users just have to tick a check-box to accept a nonconformity (see figure 1). If a semi-automated tax file cannot be processed in less than 10 minutes, it is sent to the regional offices. If it can be “closed” in semi-automated taxation, the corresponding paper file is stored in the centralized warehouse and the electronic copy of the declaration is available for consultation through the TAO-PP application. One important limitation of the cyber tax assessors’ work is that they cannot contact tax payers by phone or mail. As soon as such a contact is needed, the declaration has to be processed by regional tax offices.

Regarding the productivity improvements brought by larger displays, let us mention that researchers at the University of Utah tested how quickly people performed tasks like editing a document and copying numbers between spreadsheets while using different configurations: one with an 18-inch monitor, one with a 24-inch monitor and one with two 20-inch monitors. They found that people using the 24-inch screen completed the tasks 52% faster than people who used the 18-inch monitor; people who used the two 20-inch monitors were 44% faster than those with the 18-inch ones. However productivity dropped off again when people used a 26-inch screen [1].

In 2006 47’000 tax declarations were processed semi-automatically (with a limited number of tax offices participating in the project) and in 2007 100’000 tax files were treated within the semi-automated taxation. With the addition of declarations treated fully automatically, 33% of all declaration files were treated through a paperless tax process [4].

We thoroughly analyzed the nonconformities in order to have more insights on semi-automated tax processing. They were very widely distributed (about 60 different nonconformities, with none representing more than 9 % of the total and 20 of them representing less than 1% of the total) and there were rather few nonconformities per declaration (95% of all files had between 1 and 5 nonconformities).

Globally the semi-automated taxation was a success and the two main outcomes of this project's iteration were:

- Extension of the A3 global view on the tax declaration to all regional tax offices.
- Preservation of the cyber tax assessors' work (previously, if they could not close the file in less than 10 minutes, what they had been doing was not saved) and transmission of this work to the regional tax offices.

4. SEMI-MANUAL TAXATION

As the semi-automated taxation worked very well at the centralized operational center, the ACI decided to extend this concept to all regional tax offices and they called it "semi-manual". The main objectives for 2007 were:

- Keeping automated and semi-automated taxation operating the same way as the previous years.
- Increasing productivity in regional tax offices by processing 30% of their tax files "semi-manually".

The general principles of the system remained the same, except that "cyber" tax assessors could remove or add nonconformities before transmitting files to regional tax assessors. These files that could not be closed semi-automatically were identified as "semi-manual" but some tax declarations were also sent directly to "semi-manual" by the system, without having first gone through the semi-automated process (new rules were introduced to that effect).

Tax assessors working in semi-manual mode still had the full paper file, but they also had large A3-like 24 inches monitors. They had to process standard tax declarations (neither simple neither complex) with yearly productivity objectives, which was not the case previously. The remaining complex tax files were processed "fully manually", meaning they were treated as usual within the TAO-PP system.

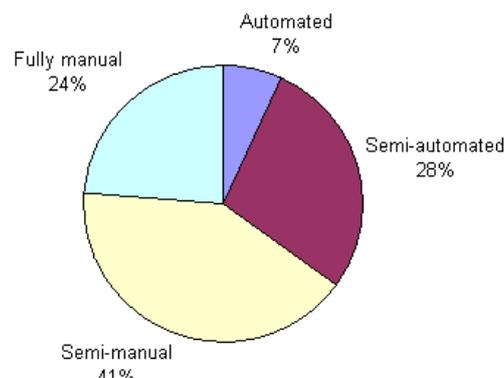


Figure 2. Results of Simulation for Segmentation.

In order to prepare the reorganization of the regional tax offices, we had to be able to plan how many tax declarations would have to be treated semi-manually. We ran a large scale simulation of segmentation that indicated that 35% of the tax declarations could be processed "paperless" (7% automated and 28% semi-automated) and that 41% of the tax files were considered as not complex and potentially to be processed semi-manually (figure 2).

It turned out that our simulations were rather accurate, as table 1 shows: these are the actual figures of taxations, with the semi-manual pilot project in Lausanne and the generalization of the semi-automated taxation for the whole Canton.

Table 1. 2007 Taxation Figures (10/31/2007).

Taxation's mode	City of Lausanne (53'000 files processed)	Canton of Vaud (257'000 files processed)
Automated	8%	7%
Semi-automated	27%	23% (58'000 files closed by cyber tax assessors out of 86'000 sent to semi- automated mode)
Semi-manual	41% (16'000 files sent directly to semi- manual mode and 5'900 that cyber tax assessors could not close)	Not introduced for the whole Canton
Fully manual	24%	70%

What is really interesting here is the qualification of tax declarations in terms of complexity. Previously there was no differentiation between the processing time of a simple file and of a complex file. This approach paired with the introduction of a reporting system set the grounds for a system where productivity objectives could be set and where metrics could be established.

A quality control system was furthermore introduced:

- A 2% sample of automatically taxed files was controlled by the cyber tax assessors.
- 2.6% of semi-automated taxations were verified by controllers from the central administration.
- A percentage still to be set of semi-manual files are to be controlled by experienced tax assessors from the “complex tax declaration” group.

No major issue was identified during these quality controls. Another indicator of quality was the number of appeals on tax decisions:

- Automated taxation: 72 appeals on 12'373 files (0.5%).
- Semi-automated taxation: 553 appeals on 38'882 files (1.4%).
- Standard taxation: 2'870 appeals on 86'318 files (3.3%).

It should be said that it is only logical that there are more appeals for standard taxation because such tax declarations are more complex and thus subject to interpretation and discussion. Furthermore the automated taxation does not correct taxpayers mistakes as long as these do not change the taxation's results and taxpayers are less likely to appeal when their tax declaration is not corrected by a tax assessor.

5. SEGMENTED TAXATION

During the year 2007 the concept of segmented taxation was developed, based on the following requirements:

- Keeping automated and semi-automated taxation operating the same way as the previous years and generalizing the semi-manual processing at all regional offices. It is interesting to note that it was only made possible by the large price drop of 24 inches monitors, allowing the ACI to buy dozens of them.

- Qualifying complex tax declarations in order to be able to route them directly towards specialized tax assessors (self-employment, real-estate, benefits, etc.)
- Analyzing all tax declarations and storing all results in order to exploit them in reporting and business intelligence projects. Previously this was not the case, as the analysis process would abort when a stop condition was met.

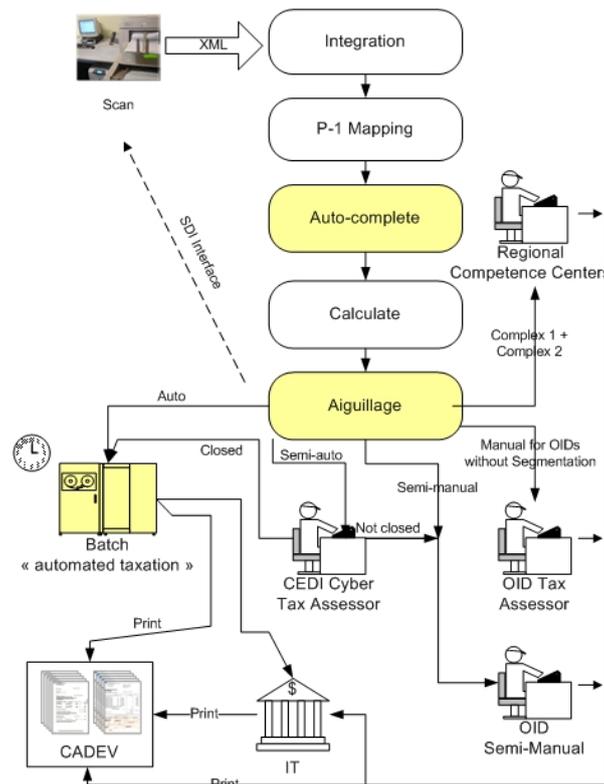


Figure 3. Segmented Taxation Workflow.

In order to process complex tax declarations, the ACI set up regional competence centers grouping tax specialists. As for the previous years, this iteration of the project was introduced only for a selected region (City of Lausanne). The standard regional taxation offices (OID) remained for the rest of the Canton in order to process tax declarations manually, but in the long term these offices should only be doing semi-manual processing of non-complex tax declarations. Figure 3 shows the global workflow, from scanning and data integration until mass printing of tax decisions sent to taxpayers.

The sets of analysis rules remained the same but new rules were introduced for complex tax files segmentation. The idea of generating non-conformities also stayed, with all the analysis' results being stored for future use in business intelligence projects. For more on data mining for tax administrations see [5].

The following table recapitulates taxation modes that were progressively introduced between 2005 and 2007 and their main characteristics.

Table 2. Taxation Processing Modes

Taxation mode	Processing	Tax declaration	User interface
Automated	Centralized	Paperless	None (batch treatment)
Semi-automated	Centralized	Paperless	A3 global view of declaration
Semi-manual	Regional tax offices	Paper file available	A3 global view of declaration
Fully manual (complex tax files)	Regional competence centers	Paper file available	Standard UI + workflow

6. LESSONS LEARNED

All along the project, the ACI had clear objectives in terms of results and IT was used as a leverage to reorganize its operations. The ACI was under strong pressure due to the failure of a previous project and to the fact that, from one year to another, they had to process twice as much tax declarations with the same number of tax assessors.

The first idea that was explored in order to be able to reach this dramatic raise in terms of productivity was the full automation of tax declaration processing. We have shown that the results were far from what was expected: over the years the percentage of automated taxations stayed very stable at around 7 or 8% of the total and we quickly realized it would be impossible to reach the 100'000 or 140'000 taxations that were planned at the beginning (30 to 40% of the total). Indeed a very simple calculation mistake made by the taxpayer, the fact of not copying a total from one page to another, or a scanning mistake made by the system would prevent a tax declaration from being eligible for automated taxation. However it was quite simple for the system to detect these mistakes and to point them out for correction by human beings.

In order to do this the ACI hired young tax assessors and trained them specifically to process a simple tax declaration in less than 10 minutes. It had to be done that way, as tax assessors that were used to work the standard way found it impossible to process a tax declaration in less than two hours. Indeed they were used to control every detail and to check-proof everything, even for taxpayers that pay no or very little taxes in the end (students, people living on social help, and so on). This was however a significant change of organizational culture going from controlling everyone equitably, whether millionaire or living on the streets, to an approach based on productivity and ROI. This is one of the key factors of this project success: taking into account the organizational culture to design the system rather than imposing a system on users that were not used to work that way.

Similarly, when the semi-manual taxation was introduced in the regional tax offices, the ACI asked for volunteers for this experiment and trained them thoroughly. They also developed a career path allowing people to start as "cyber" tax assessors, then to be trained to process semi-manual files with more autonomy to make decisions, and even to follow advanced training in order to become tax specialists and to process complex declarations.

We believe that another success factor was the progressive transformation of the organization through the introduction of an information system, with pilot projects followed by full scale introduction of new modules.

7. FUTURE DEVELOPMENTS

It was not emphasized until now, but the segmentation approach presented in this case study was mostly made on the basis of the tax declaration sent by taxpayers to the ACI. In order to refine segmentation, the future developments will probably be based on data analysis from other sources:

- A new income certificate is currently being introduced in Switzerland, and these data are going to be analyzed as well.
- The TAO-PP system is interfaced with citizens' public records and it is also planned that data from these records will be used (such as the profession).
- Financial data.

Another aspect that was not explained in detail up to here is the fact that taxpayers still have to send a paper copy of their tax declaration, even if they filled it on their computer. Although there is a law on digital signature in Switzerland, up to now there is no technical solution that was seen as appropriate for online tax declaration.

However it is planned that by 2012 taxpayers will not only be able to fill their tax declarations online, but also to fill an original appeal on a tax decision. The goal of the ACI is that by that deadline they will only receive 100'000 paper files and that 300'000 tax declarations will be sent digitally. This is realistic as three fourth of the taxpayers already use a tax software and the majority of them rely on a CD-ROM provided by the ACI. If this happens, the ACI will have to down-scale their scanning system and to be ready to store and process 300'000 fully paperless declarations.

The next main goal of the ACI is to be able to process 250'000 non-complex tax declarations in less than 60 days, meaning that these would already be closed when bills for the next fiscal period's down-payments are sent to taxpayers by November 15th. This is not the case right now because there is a bottleneck at the scanning of declarations and in some cases there are long delays for the tax declaration processing.

Once the segmentation will be realized with cross-analysis based on more complete data and if the processing time can be cut to less than 60 days, it is very likely that it will not be possible to optimize the system as such anymore (or at least not by large numbers).

One of the ideas that the ACI wants to investigate is the simplification of the declaration form: it consists of a minimal set of eight pages but it can go up to twenty for a complex tax file. These are only the official forms; in some cases there are dozens of appendices that are required on top of that. Such a simplification would bring dramatic improvements for taxpayers, as (almost) everyone agrees that tax forms are currently too complex. A strong political signal is needed for this simplification to come true, and this is probably the logical conclusion of our case study: once the information system is in place and the reorganization has been done, it is only possible to go further on by changing the tax law. This project started as a consequence of the introduction of a new law, and a new cycle of evolution and reorganization should be initiated the same way.

8. CONCLUSION

Although many definitions for governance exist, we will simply say it is the set of processes, customs, policies, laws and external entities affecting the way an organization is managed or controlled. Governance also includes relationships between stakeholders such as shareholders, management, the board of directors, employees, suppliers, customers, regulators, etc.

In this paper we presented a concrete case study without going into its conceptual analysis in terms of governance. However we want to sum up this case in such terms:

- A Federal legal change impacted Cantonal policies and required new processes to be implemented. New strategic objectives were defined and taxation processes were reorganized accordingly, mainly by using the leverage of a new information system.
- ACI's management took into account stakeholders' interests when they set their objectives for the project. We will only list the most important of these interests here: vision of strategic management, work habits and training needs of tax assessors, technical and resources' constraints of the IT team, and of course better service to taxpayers.
- Objectives, processes and the information system were realigned progressively, according to empirical data and expertise acquired following each iteration of the project.
- Finally the ACI was able to introduce better accountability and transparency practices, notably by setting objectives to tax assessors and by monitoring their activities via their reporting system.

To conclude, let us say that we wrote this case study because we believe it exemplifies a set of good practices in terms of governance in general and of IT governance in particular.

9. ACKNOWLEDGMENTS

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