
COCKPITS FOR SWISS MUNICIPALITIES – ADOPTING IT TO SUPPORT STRATEGIC- AND INFORMATION BASED LOCAL LEADERSHIP

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The increasing complexity concerning leadership and management of small and medium size municipalities in Switzerland, poses high demands on executive authorities. An information based cockpit can simplify political leadership in municipalities by assisting decision-making and thus, help to achieve strategic goals. For this reason, it is essential to derive measurable goals from strategies. We are developing IT based cockpits for small municipalities in Switzerland within a Research & Development (R&D) project. The cockpits are built on top of a web-based platform to incorporate collaborative functions and data that is analyzed and structured using Business Intelligence methods including data warehousing, On Line Analytical Processing (OLAP), data mining, balanced scorecard based performance management, and reporting. Thorough analysis of strategy and decision-making processes are necessary to achieve a tight alignment between the municipality's processes and the cockpit environment. The chances, challenges and the approach of implementation of such an instrument will be discussed.

Keywords: communal cockpit, strategic management, annual planning, cockpit architecture

1. Cockpits for Municipalities: An Overview

Municipalities are the smallest political entities in Switzerland. Including their own responsibilities and tasks that are allocated to them by the Confederation or their canton, municipalities are in charge of various matters, such as managing the registry of residents, organizing civil defense, providing social services, local planning, taxes etc. Due to increasing responsibilities, the complex nature of political issues and interdependencies within the public, small or medium municipalities can increase their chances of achieving their goals, strengthen their political leadership, and accomplish more transparency towards their local target audience. The cockpit provides decision-makers with structured basic and aim-oriented information, allows identifying dependencies and synergies, and may give an overview of strategic goal conflicts.

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To adopt a cockpit as management instrument, municipalities need to develop a strategy which formulates goals with measurable indicators. This necessitates an alignment between the (local) business and the IT-view in order to reach integration between the cockpit and the municipality's processes [1]. In order for the policy making process to rely on an IT-based information system, it must be ensured that a mayor, respectively the communal council, has access to the required and accurately structured information in the right process phase. To ensure this, it is necessary to model the process on a management, respectively political level, and the architecture on a technical level (data and applications), so that the relevant interfaces for selected situations can be defined. In order to achieve interoperability between the information systems, the technical, semantic, and organisational interoperability must be guaranteed.

Within a R&D Project which started in 2007, we develop management cockpits for small and middle municipalities in Switzerland. The project is supported by the Innovation Promotion Agency (CTI) of the Federal Office for Professional Education and Technology (OPET). As partner, the project includes three academic institutions, and seven pilot municipalities from the cantons Berne and Valais. To ensure a sustainable utilization the project team also works with strong industrial partners, such as the Bern Cantonal Office for Municipal Affairs and Land Use Regulation as well as the Swiss Municipal Association.

The interdisciplinary project team works on two research perspectives: a management- and a technical perspective. The researchers dealing with the first perspective work closely with the municipalities and have to raise their awareness for strategic leadership, understand their policy making and administrative processes, and need to identify as well as support the development of strategy based indicators. The more technical oriented part of the team has to develop and implement the cockpits for the municipalities adapting Business Intelligence (BI) methods and technologies. It has to ensure the import, storage and processing of data and its presentation in the cockpits.

In this paper we will discuss both, the business and the IT view, focusing particularly the municipalities' annual planning and reflecting the IT view on the state of the project, pointing out critical aspects and further proceedings.

2. Reflecting the Business View: Requirements, Instruments, and a Concrete Example

All organizations are on a journey – a never ending voyage where the focus is on improving how things are done for the benefit of stakeholders. People are struggling to communicate with each other on how to best organize their workload. They explore questions such as: Which steps are really necessary? How should they be executed? What results are to be expected and how will they be monitored? [2] The cockpit is not a magic box that will give the answers to every single question, however by summarizing the relevant information from heterogenic data sources and presenting them in a centralized environment, clearly it will have an impact to the data based leadership. Now the key point to successfully implement a cockpit instrument for municipalities is to precisely feed the business view interface and aligning it with the IT perspective.[3] In this chapter we present an overview of the requirements and the approach to break down their complexity.

2.1 Strategic Management: From a Vision to Operative goals with Indicators

A legislative period in municipalities lasts four years. During this period elected politicians are responsible for a sustainable development which follows the commune's long term vision. Figure 1 shows the successive steps of refinement from a long term global vision to a specific and short term implementation.

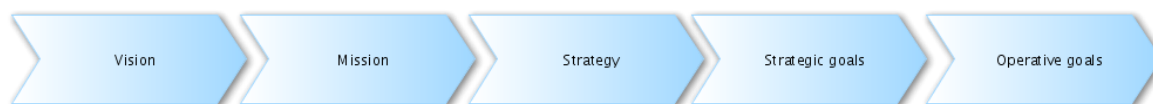


Figure 1: From a Vision to Operative goals

The vision defines the desired or intended future state of an organization in terms of its fundamental objective and/or strategic direction on a long term view. The mission describes the fundamental purpose of an organization, what one intends to do, aim for or achieve. Whereas the strategy is the combination of the goals an organization strives for and the policies by which it is seeking to get there [4]. With the strategic and operative goals the objectives are executed. In the seven pilot municipalities we learnt, that the normative idea is far away from reality: Few municipalities have written visions and developed strategies. In most cases the main processes are neither documented nor modeled. In that sense we had an impact sensitizing the municipal project members for the relevance of strategic knowledge-management.

In further phases of process analysis following the steps in Figure 1, we were able to identify approachable fields of usage for the cockpit that are depicted in Figure 2. Namely these are the assessment of the situation as a whole for decision-making, on the strategic level to measure effectiveness and on the operative level to improve efficiency and interdepartmental coordination. Furthermore, the cockpit can be employed as a controlling instrument. The cockpit supplies all of these processes with information and serves as a connecting element. It helps to perceive problems, opportunities and threats and it helps to close the gap between strategy definition and implementation.

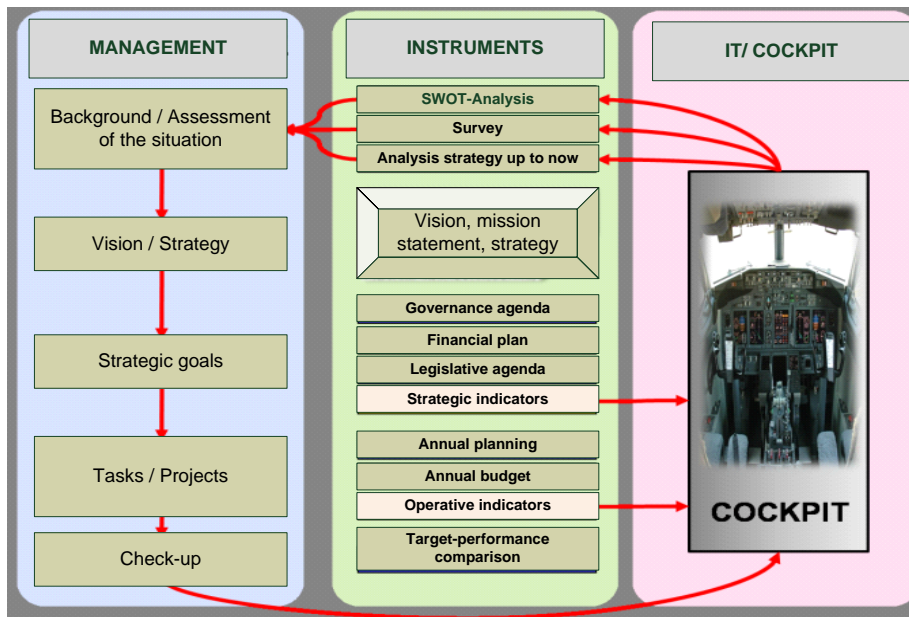


Figure 2: Management Process with Instruments [14]

We provided the pilot municipalities early in the project with a simple cockpit prototype. This allowed them to get a first impression working with such a management instrument and which was very helpful to raise awareness of the connected challenges and chances. Early prototyping is advisable for proactive analysis and discussions of roles, responsibilities and requirements during workshop- and interview sessions with the municipalities [5]. A further consequence of this step revealed the importance of the identification of effective indicators, which led to a better understanding. These indicators measure the strategic goals and allow the visualization of the current implementation status. Naturally there is a lot of information that is relevant for this measurement. Therefore, it was important to identify different roles and sets of information needed on their level. The complexity of the information varies on the different layers and decreases on higher levels of aggregation. The cockpits presentation layer has to take this point into consideration.

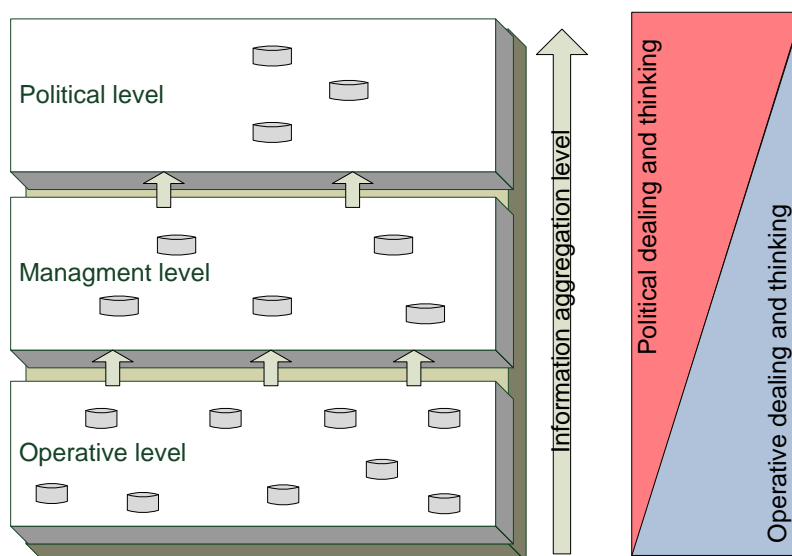


Figure 3: Political and Operative Acting and Thinking – Role Base Presentation and Information Layout

The council which is positioned on the political level (cf Figure 3) needs aggregated information for a quick and a easy to use overview that efficiently supports the decision making process. The management level in the municipalities needs transparency for argumentation purposes. Further, the operational level needs full control of the concrete project execution [6]. The project team working on the management perspective will invest a considerable amount of further analysis in order to find common and highly aggregated sets of indicators, which are to be defined from the municipal vision and strategy map.

2.2 Data Flow Processes in the Annual Planning

As shown in Figure 3, the operational level handles the highest degree of complexity. In order to have a better overview of the requirements and to capture possible impacts, we analyzed the municipal annual process cycle, in order to better support the decision makers with quality data and aid communication as well as coordination within the process. Interviews with the political stakeholders of the seven pilot municipalities have been conducted in order to model the key processes concerning the annual municipal planning. We focused on understanding the data flow (who needs which information when in the process) as well as on measure and project prioritizations (what are they based on). Figure 4 shows the common identified structures and work flows during the annual planning, broken down into organizational units.

Long term investment planning, budgeting, financial simulations and project prioritization characterize the annual process cycle. Every department is assigned to define their investment plans which are afterwards accurately discussed and examined regarding the alignment with the municipality's vision and strategy during a council retreat lasting one to two days. The resulting output mainly requires consolidation work and generally two municipal assemblies to refine and approve the budget.

Figure 4 shows the process on a high abstraction level. Sub-processes define data flows which help to identify the needed information as well as the configuration possibilities for the cockpit's information and document based collaboration system. A simple, concise, and sustainable data distribution platform will lead to more transparency and provide argumentation support.

The requirements from the business perspective are rather demanding and the underlying technology needs to fulfill these requirements. Data is pulled together from heterogeneous data sources and integrated into a common data warehouse environment. Thus a modular, adaptable, and secure system architecture with a concise presentation layer is required.

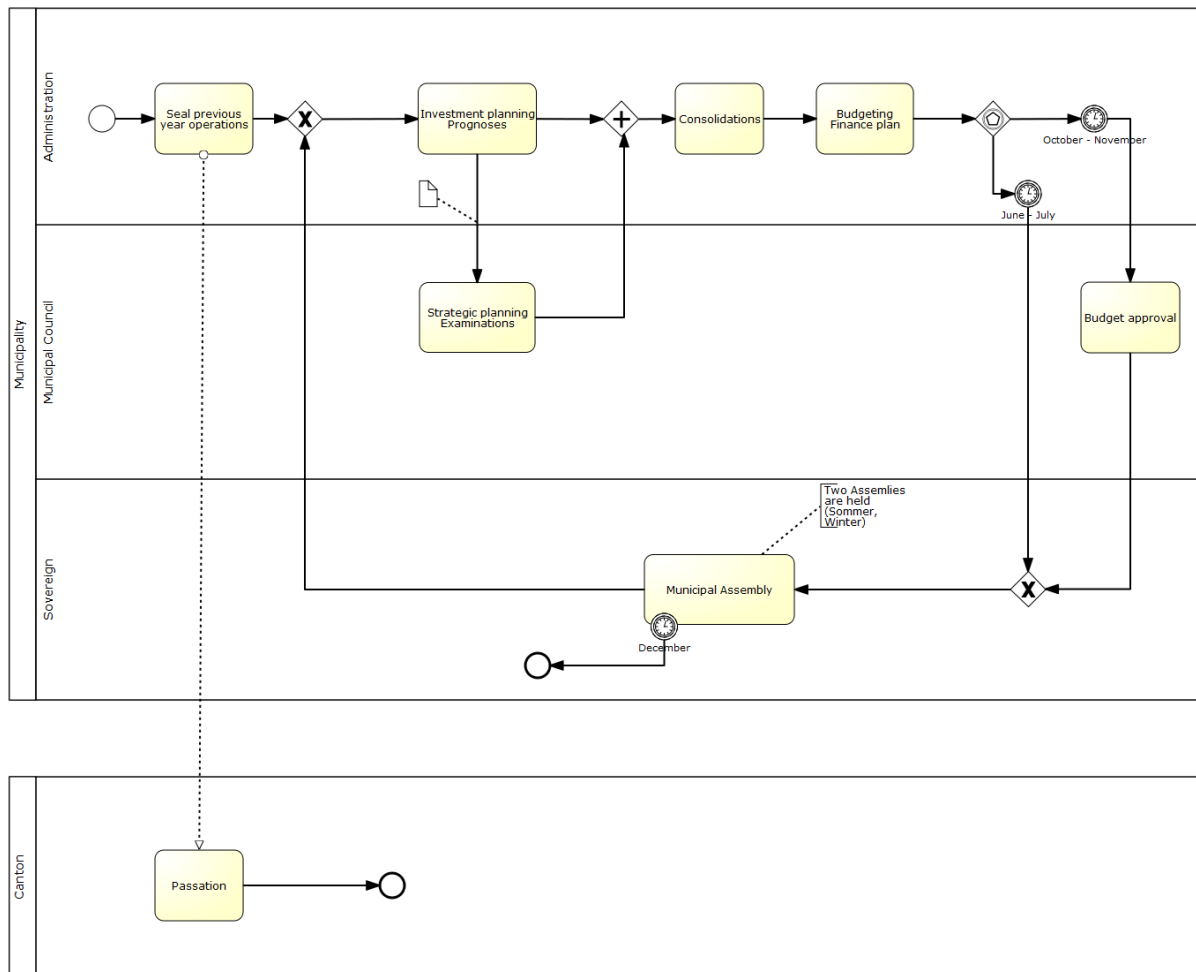


Figure 4: Annual municipal plan cycle

3. Designing Cockpit Architecture

Business Intelligence (BI) methods and technologies including reporting, data mining, data analysis and visualization are used to build dashboards. Dashboards grant a comprehensible overview for distinct subjects or perspectives [7] and thus they can be used to provide properly structured data at the right points of the business processes. While cockpits, dashboards, and BI are commonplace in corporate environments, they are equally attractive for the context of public administration where they can be used for information based management and decision support in policy making. This recently led to first efforts to adapt cockpits and BI for public administrations. Practical examples are found on different levels within the public administration, e.g. the Swiss Federal Office for Sport [8] on a federal level or the research project BASIS in Germany [9], which primarily targets the municipal level.

In order to facilitate accessibility and integration, the cockpit solution is web-based. The municipalities can access their cockpits by means of a secured website. The cockpit solution is designed as a hosted application service offered by service providers. A complete separation between the systems for the cockpit solution and the operational systems of the municipalities is therefore planned. Figure 5 below shows the general architecture of the cockpit solution. From the technical viewpoint, the system architecture can be divided into data, an analysis, and a presentation layer. From the view of the business architecture the

system architecture covers the data and the application layers. The data layer deals with the integration and storage of the data serving as the foundation of the cockpit. Since the cockpit solution is completely separated from the data sources of the cockpit (e.g. accounting applications), the data is imported from intermediate export files and stored in a data warehouse. The analysis layer uses On Line Analytical Processing (OLAP) to analyze the data from the data warehouse. A performance management solution uses the OLAP database as data source. Together with further reports and data analyses, the scorecards are combined with specific dashboards. Finally, on the presentation layer the dashboards are made available to the user as part of the cockpit. A security concept, which controls the access to the cockpit and the underlying data, contains all three layers of the cockpit solution. This is especially necessary because part of the data in the cockpit is, according to law, subject to strict data privacy protection.

The individual cockpits of the municipalities are customized versions of a core cockpit encompassing common features. The customization mainly concerns the two upper layers of the system architecture since the dashboards and views in the cockpits reflect the strategy of the respective municipality. Further, they are tailored for their individual management processes.

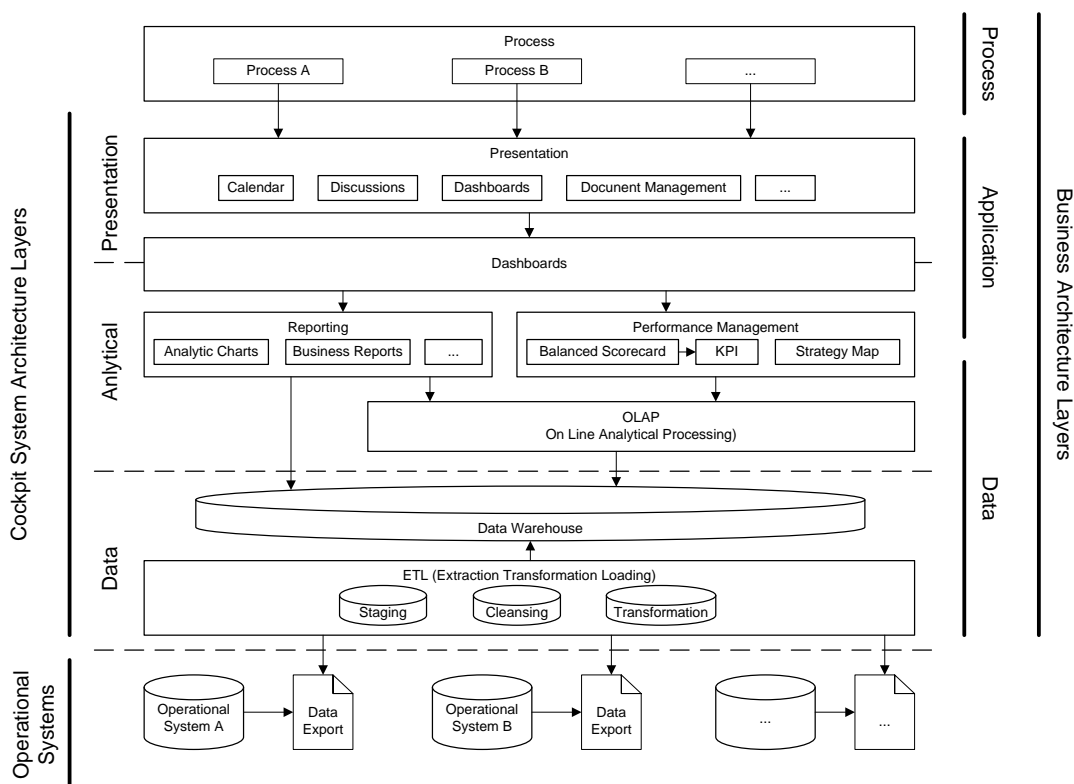


Figure 5: Cockpit Solution Architecture

3.1 Data Warehousing for Cockpits

Data warehouses can be defined as subject oriented, integrated, non-volatile, time-variant collections of data used as data sources for BI solutions, such as cockpits, in order to support management processes and decisions [10]. The data warehouse of the project's cockpit solution has been designed to support data analysis and aggregation. A multidimensional data model has been chosen for the data warehouse schema in order to enable the use of OLAP

cubes. On Line Analytical Processing (OLAP) systems are optimized in terms of functions and performance for the requirements of data analysis. Compared to a normal On Line Transactional Processing database system, OLAP systems are primarily more efficient in executing the complex queries including complex joins and aggregations that are prevalent in data analysis applications [11]. The cockpit solution uses multidimensional OLAP cubes for analyzing the data in the data warehouse. The cubes are complemented with data mining models for more complex analyses (e.g. trend analysis) and predictive modeling (e.g. demographic development).

3.2 Data Import for Cockpits

The data import is a crucial step for integrating detailed data from different sources into the cockpit. The challenge here is the number of different software solutions used by the municipalities. To support as many applications as data sources in an economic manner, it is necessary to use a common interface. This requires a certain level of standardization. The increasing trend of collecting data electronically on the federal level (be it for statistical or for other purposes) lead to the creation of a number of standardized and well supported interfaces. A R&D project like ours benefits a great deal from such existing interfaces.

The analysis of the municipalities' needs has shown that operational systems for accounting and resident register are the two most important data sources. An automated import process of these two data sources has been developed and integrated into the cockpits. For the citizen control data we profited from the fact that a nationwide harmonization of the registers of residents is in action. For that purpose the Federal Statistical Office (FSO) in cooperation with the standardization organization, eCH defined an XML based interface standard called eCH-099 [12]. This interface was implemented by all major software vendors including those of the software used by the project's pilot municipalities. Concerning the finance data a suitable interface is still in development. The FSO, in cooperation with the Federal Finance Administration, defined the data exchange interface ED-ÖFIN (Elektronische Datenerhebung für die öffentlichen Finanzen: literally Electronic data acquisition for the public finances) [13]. This XML based interface is used to collect finance data from municipalities and cantons for statistical purposes. So far only one of the two software systems used in the pilot municipalities supports this interface. For the second system an import from a proprietary interface was developed but will be replaced by the ED-ÖFIN interface once integrated.

3.3 Web-Based Platform for Cockpit Presentation

The presentation layer plays a central role in the cockpit solution since it serves as an interface between the IT systems and the user, as well as a point of integration between the IT solution and business processes. The site is secured and presents to users a customized cockpit based on their role-based access rights. The cockpit sites present the strategy based dashboards and process specific views. During the third and last year of the R&D project period we will also focus to design a workspace combining the cockpit elements with collaborative functions such as document management, appointment management and discussions on the operational level of the cockpits view in order to integrate their workflows and processes.

The web-based nature of the cockpit is also vital for using the cockpit solution in inter-municipal cooperation. The basic design of the cockpit solution explicitly allows building cockpits addressing different needs on a regional- or agglomeration level. A cockpit website can be used as a collaboration platform for various municipalities, e.g. when carrying out a common project or working together in the agglomeration.

4 Conclusions and Further Activities

In municipalities with approximately 5'000 inhabitants and a political militia system, the principle of strategic thinking is less popular than direct problem solving. In this context, decision-makers are generally not used to measurements in the political context. The early prototyping has proven to be a valid approach for developing management cockpits for municipalities. The early contact of the end users with the prototypes increases their understanding of the subject and generates more valuable feedback during the interviews and workshops of the requirement analysis. This feedback helps the research team to better understand the municipalities' business requirements and in turn also helps to align the IT perspective of the cockpits. Therefore a win-win situation between the stakeholders and the research team was generated.

For the remainder of the R&D project the main challenges will be the analysis and integration of a project/measurement planning tool into the cockpits' environment. Also, the support of GIS information started to become an interesting and relevant component throughout the discussions with the municipalities. In that sense, a detailed technical requirement analysis, and a possible scenario prototype, will be considered. Further, user training will also be a major activity in order to strengthen the knowhow and integrate the cockpit into the municipalities' daily business, as well as the part of the industry partners, ensuring the long term operation of the cockpits. The final wrap-up terminates by publishing an acquired knowledge-based guideline.

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