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Application management from a
lifecycle perspective
A case study at the Social Insurance Agency

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Abstract

The development of Information Technology is, according to the Swedish Government, the most important area of development. The costs of IT in governmental agencies are somewhere in between 20 to 25 billion SEK, paid by taxpayers and one of the largest cost items in the Swedish governments resources. Despite this, every third Swedish governmental agency lacks an IT-strategy and is unable to meet needs for flexibility and control. The study aims to reveal barriers that prevent an active application lifecycle management (ALM) at Swedish governmental agencies and to answer the question: “How do Swedish authorities handle their proprietary applications from a lifecycle perspective; financially and technically?” The case study will be conducted at the Social Insurance Agency (SIA). The SIA distributed, in 2010, about 6 % of the Swedish GDP and is mainly funded by grants and loans from the Swedish National Debt Office. The survey will be studied from a management accounting and ALM perspective. Management accounting is the actions within organizations to achieve financial goals. ALM is the lifecycle of an application that consists of the phases; requirements specification, development, testing, deployment and maintenance. The study will also investigate the technical debt at the governmental agencies. Technical debt refers to the work which has to be completed before an application can be considered finished. The survey is a qualitative study based on interviews with an exploratory purpose. The results are generalised to reflect a greater part of the Swedish authorities and showed that Swedish governmental agencies have inadequate handling of their proprietary applications and that each application is financially linked to one or more projects simultaneously. The models made are to facilitate the understanding of the different stages of ALM in synergy with the management accounting. Theoretically, the Maintenance phase allocates approximately 90 % of the total costs, whereas in governmental agencies it stands for about 20 %. Theoretically 10 % of the total costs are allocated to the Development phase, whereas in governmental agencies the corresponding amount is 80 %. A consequence of this is increased technical debt. The technical debt at Swedish authorities is often funded with loans, which is not allowed according to the Swedish National Debt Office. The SIA exceed budgets without asking for increased funds and according to the Swedish Audit Office, so does also 1/3 of the Swedish governmental agencies, meaning that they must handle the financial complications internally by moving funds amongst different departments and projects, also spending money meant for development on maintenance. Future studies can be made as investigations on how management accounting and ALM can be implemented on a safe and effective manner in a governmental agency.

Keywords: Management accounting, Application Lifecycle Management, Technical debt.
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Table of Contents

1 Introduction ........................................................................................................1
1.1 Background and Problem Motivation .............................................................1
1.2 Study purpose and problem statement .........................................................2

2 Case study presentation .......................................................................................3
2.1 The Social Insurance Agency ........................................................................3
2.1.1 The IT department ..................................................................................3
2.1.2 The ITA division ....................................................................................4
2.1.3 The Development plan ...........................................................................4
2.1.4 IT projects ..............................................................................................4
2.2 The Swedish National Financial Management Authority .........................5
2.3 Funding .........................................................................................................5
2.3.1 Grants .....................................................................................................5
2.3.2 Loans .......................................................................................................5
2.4 Intangible assets at the SIA .........................................................................5

3 Financial management .......................................................................................6
3.1 Management Accounting ..............................................................................6
3.2 Assets ...........................................................................................................6
3.2.1 Tangible assets .......................................................................................7
3.2.2 Intangible assets ....................................................................................7
3.3 Cost ..............................................................................................................7
3.3.1 Direct cost ...............................................................................................7
3.3.2 Indirect cost ...........................................................................................7

4 Application Management .................................................................................8
4.1 Application program .....................................................................................8
4.2 Application Lifecycle Management ...............................................................8
4.3 Technical debt ...............................................................................................9

5 Reviews from the Swedish National Audit Office .........................................11
5.1 IT-developing governmental agencies .........................................................11
5.2 Budget overruns at Swedish governmental agencies ....................................11

6 Methodology .....................................................................................................13
6.1 Choice of method .........................................................................................13
6.2 Question formulation ...................................................................................13
6.3 Delimitations and generalisations ...............................................................14
### Table of Contents

6.4 Implementation ................................................................. 14  
6.5 Ethical aspects........................................................................ 15  

7 Results ................................................................................... 16  
7.1 Capital flow at the SIA ......................................................... 16  
7.2 Bookkeeping of proprietary governmental applications from a lifecycle perspective ........................................... 18  
7.3 Unfinished projects .................................................................. 21  
7.4 Technical debt at the SIA ....................................................... 22  
7.5 Funding technical debt by loans ............................................ 22  
7.6 Governmental Management .................................................. 23

8 Analysis .................................................................................. 24  
8.1 Proprietary applications lifecycles ....................................... 24  
8.2 Development and maintenance .......................................... 25  
8.3 Lifecycle and bookkeeping .................................................. 26  
8.4 Bookkeeping of tangible and intangible assets ..................... 27  
8.5 Financial versus ethical aspects .......................................... 28  
8.6 Reopening projects .............................................................. 28  
8.7 Technical debt ...................................................................... 28  
8.8 Applications traceability from a lifecycle perspective ........... 29

9 Conclusions ............................................................................. 30  
9.1 Future work ......................................................................... 31

10 Bibliography ........................................................................... 32
Terminology

Abbreviations and acronyms
ALM Application Lifecycle Management
ESV Swedish National Financial Management Authority
GDP Gross domestic product
ITA Information Technology Application Unit at SIA
PLM Product Lifecycle Management
SEK Swedish Crowns
SIA Swedish Social Insurance Agency
VBU Operational decision support

Translations
The Capital Insurance Regulation Kapitalförsörjningsförordningen
Operational Decision Support Verksamhetsbeslutsunderlag
The social security Socialförsäkring
Public Administration Öffentlig förvaltning
1 Introduction

The Swedish government states that the most important area of development in the Public Sector is the development of Information Technology (IT) [1, p. 15]. Each year the costs of IT in governmental agencies cost taxpayers somewhere between 20 to 25 billion SEK and it is the third largest cost item of the Swedish government’s resources, second only to salaries and local costs [2, p. 14].

1.1 Background and Problem Motivation

Every third Swedish governmental authority lacks an IT strategy that is able to meet future needs for flexibility and control, and the more stringent requirements imposed by the Swedish people [3]. Agencies that increase the amount of proprietary applications encounter difficulties in controlling, monitoring and integration since there are weaknesses in how governmental agencies report their IT costs, which makes it difficult to achieve effective economic governance [2, p. 57]. Control over the management accounting is vital, to the best of our knowledge, for government agencies to have an active lifecycle management of applications. Effective use of ALM can support a distributed project by facilitating communication, coordination and cooperation [4]. [2, p. 10]

Management accounting does not always evolve at the same pace as the changes in the business environment, a reason for this is the increasing demands made on the external accounting and thereby that organizations frequently neglect the on-going projects and their corresponding internal accounting. This approach creates problems when financial accounting does not delivering enough information; making management and control of organizations challenging. The management accounting is the link between the senior and sub-ordinate managers and when management accounting reports are varied and does not mirror the economic and technical reality of the operations made, a considerable amount of time is needed to grasp the concept of reports and making the right decisions. [5]

Application Lifecycle Management (ALM) is important for organizations since it affects processes within the company’s control and also has
an effect on the organizations economy. In the industry it is common for software development and process management to grow apart, even in the same organization. Software development and process management are respectively often evolving in different directions. Aging infrastructure does not integrate well with applications and is limiting to the development team as the development becomes more complex, leading to the need for better coordination within different areas in an organization. [6, p. 293]. [7, p. 1]

1.2 **Study purpose and problem statement**

The study aims to reveal barriers that can prevent an active lifecycle management of applications in governmental agencies that develops IT applications. To meet the purpose, the management accounting of proprietary applications at a Swedish governmental agency will be reviewed and analysed from an ALM perspective. The expectation is that the survey can be used as a basis for further studies and also provide incentives for possible improvements or change.

The purpose of the study will be to answer the following question: “*How do Swedish authorities handle their proprietary applications from a lifecycle perspective; financially and technically?*”
2 Case study presentation

This survey will be conducted at the Social Insurance Agency (SIA) at the IT Application division (ITA) which develops, produces and manages applications and is a subordinated division to the SIA’s IT department at Sundsvall, Sweden. [8]

The current management accounting is not based on uniform principles and lacks transparency to applications in the application portfolios, and this derives problems with planning and monitoring future expenses. [8]

2.1 The Social Insurance Agency

The Social Insurance Agency is a Swedish governmental agency that are responsible for paying social security to people who live and work in Sweden. The social security is a safety measure that exists in Sweden and includes aids and benefits paid to families with children, sick and disabled people. At 2010 the SIA distributed 211 billion Swedish crowns (SEK), representing approximately 6 % of the Swedish gross domestic product (GDP), to the Swedish population [9]. The SIA is an independent organizational unit [10] and its subordinated divisions are geographically spread across the country. At 2013 there were 13 353 employees at the SIA. [11]

2.1.1 The IT department

The SIA consists of several sub departments where the IT department represents one of these. The IT department is further divided into several sub sections, including the ITA division, see Figure 1, and has in recent years become an increasing part of the SIA’s organization and currently comprises about 880 employees [8]. Figure 1 also illustrates the Development plan, further described in chapter 2.1.3 The Development plan. Other divisions, alongside the IT department and the ITA division that do not add value to the survey has been omitted.
2.1.2 The ITA division
The ITA is a division within the SIA and a subdivision to the IT department as illustrated in Figure 1, in chapter 2.1.1 The IT department. The ITA division is delivering IT-solutions, both internally and externally, and their main responsibilities include new development, architecture, basic software functionalities and testing. [13]

2.1.3 The Development plan
The Development plan is a central tool for the SIA that includes the projects that together represents a project portfolio. The tool can be assimilated with a long-term project and has the goal to plan and schedule development projects. The Development plan is driven by managers from different department of the SIA and the projects are funded with both loans from the Swedish National Debt Office and grants from the state budget. [14]

2.1.4 IT projects
A project can be defined as a collaborative enterprise that involves people, research and planning, to achieve a particular goal [15, p. 26]. The projects that are undertaken by the Development plan and constitutes of the SIA’s project portfolio are called an IT-project [16, p. 5] [17]. Each project contains one or several applications [18, p. 5] [16, p. 5], which in this survey refers to the proprietary applications that are developed for the SIA’s own use [19, p. 13].

Figure 1: Organizational chart covering the SIA’s IT department. [12]
2.2 The Swedish National Financial Management Authority

The Swedish National Financial Management Authority (ESV) develops the financial management for the Swedish governmental agencies by developing accounting rules, issue regulations and general guidance. The ESV governs appropriations, grants, donations, capital, fees and compensation input tax and also makes forecasts and analyses the state’s economy. [20]

2.3 Funding

Chapter 2.3.1 Grants presents the concept of grants and how it is related to the SIA. Chapter 2.3.2 Loans describe loans from the Swedish National Debt Office granted to the SIA.

2.3.1 Grants

The SIA is mainly funded by grants. Grants are an amount of money allowed from the national budget, following a parliamentary decision, and can only be used for particular ends [15, p. 5] [21]. The funding is controlled according to financial principles and it must be equivalent to the SIA’s costs and cannot generate either surpluses or deficits [15, p. 29].

2.3.2 Loans

The SIA can be offered loans from the Swedish National Debt Office to cover the difference between revenue and payments [15]. The Swedish National Debt Office is a public authority [22, p. 4] and the money lent from the Swedish National Debt Office has to be invested in assets and cannot contribute to payments of costs. The Swedish National Debt Office is also responsible for the Finance Ministry [23].

2.4 Intangible assets at the SIA

The SIA Accounting model defines an intangible asset as an asset with a purchase value higher than 500,000 SEK [15, p. 34]. For assets produced internally, only the development phase of the asset is considered an intangible asset [15, p. 34]. The SIA has chosen to interpret the capital insurance regulation (1996:1188), §5, intangible assets such that: proprietary software programs booked as intangible assets have to be finances with loans [24].
3 Financial management

Chapter 3.1 presents management accounting, followed by chapter 3.2 that defines tangible assets and intangible assets; chapter 3.3 presents direct and indirect costs.

3.1 Management Accounting

Management accounting is the performance and operations within an organization to achieve financial goals, by influencing managers to satisfy the company’s overall goals. Traditionally the management accounting has been focused mainly on the financial target, but has evolved to also consider customer and employee satisfaction. [25]

By management accounting the overall goals of the organization are broken down to concrete and easily measurable budgets, which are distributed to various managers and departments responsibilities. Management accounting is also about following up and monitoring the budgets made. A person working with management accounting is generally called a comptroller. [25]

3.2 Assets

In management accounting, an asset is defined as an economic resource that produces value and can be converted into cash. Assets can be cash, cash equivalents, real property, personal property and investments. The assets earlier events and expected future economic benefits are controlled continuously. [26, p. 272] [27, p. 14] [28, p. 40]

Assets represent one side of a balance sheet and are equal to liabilities and ownership equity together. The net worth of an organisation is calculated by subtracting liabilities from assets. [28, p. 50]

One way of classifying assets is to divide them into tangible and intangible assets depending on their physical substance [29, p. 8]. Tangible assets are further described in chapter 3.2.1 Tangible assets but this survey will only focus on intangible assets, which are more thoroughly described in chapter 3.2.2 Intangible assets.
3.2.1 **Tangible assets**
A tangible asset is defined as an asset that has a physical form and will most likely contribute with benefits and service in the future. Examples of tangible assets are inventories, machinery or buildings. [15] [29, p. 6]

3.2.2 **Intangible assets**
Intangible assets are assets that usually do not contain material, but if it does it is not the physical substance that dominates. Examples of intangible assets are computer programs, licenses, goodwill and patents [19, p. 8]. Cash contained by a bank is not defined as an intangible asset [30]. An intangible asset is accounted for in the balance sheet and it is likely that it will provide future benefits and assets [15, p. 9]. The depreciation of the asset is typically adapted to the asset's economic life [15, p. 20] [31]

3.3 **Cost**
A cost is defined as a quantity that has to be paid in order to obtain something. In accounting, a cost is an expenditure that belongs to a certain period of time and is accounted when the cost is consumed. [32] [33]

3.3.1 **Direct cost**
A direct cost can be explicitly allocated to a specific product or service. Examples of direct costs are salary, costs of material, equipment and operating costs. [15] [34, p. 35] [35]

3.3.2 **Indirect cost**
Indirect cost is the opposite of direct cost and it cannot be explicitly allocated to a specific product or service [15, p. 5]. Costs that cannot be attributed to the cost bearer, but still are necessary costs, are referred to as indirect costs. The amount of an indirect cost can be difficult to estimate [36]. Examples of indirect costs are manufacturing overhead and administrative expenses. [15, p. 43] [34, p. 49]
4 Application Management

Chapter 4.1 Application program is introducing the concept of an application program. Chapter 4.2 Application Lifecycle Management is presenting theories about ALM. Chapter 4.3 Technical debt is presenting the concept of technical debt.

4.1 Application program

An application program is software that processes data for users. All software, except system software, that provides infrastructure in a computer, is an application program. [37] [38]

An application portfolio is a collection of related application programs, run by one specific organizational body. [39] [40] [41]

4.2 Application Lifecycle Management

Application Lifecycle Management (ALM) is the lifecycle for applications that corresponds to the processes, information and people is organized as a flow of activities in a repetitive sequence [42] [43, p. 1] [44, p. 4]. Every application lifecycle is different, but a generalization can be seen in Error! Reference source not found., showing also the different phases of a lifecycle. These phases are: requirements specification, development, testing, deployment and maintenance. The goal within lifecycle management is to optimize the profits of each product over its lifetime [42]. [45] [46] [47]
The requirements specification phase is the starting point of the lifecycle, where the idea is formulated and the stakeholders define requirements needed to support the business case. The next step in the lifecycle is the development phase, which is the creation of the application. The goal of this phase is to develop the application according to the prerequisite requirement specifications. The testing phase, that usually started parallel to the development phase, is where the system is continuously tested until the product meets the requirements and is good enough to be released. After the development and testing phase the application is deployed into production and from there on it is going to need maintenance until it has served its purpose and will be retired, recycled or start the cycle all over again. Maintenance is commonly the longest phase of the lifecycle. About 90% of the expenditures of an applications lifecycle are considered to be maintenance [48]. [47]

ALM is also effective in the management process and not only in software development. The explanation for this is that many activities for process management shows similarity with management activities in software development. The thesis showed that ALM was the solution for the process management between the studied units because the units increased their understanding of other divisions. [6, p. 8]

4.3 Technical debt

Technical debt is a concept that was invented and named by the programmer Ward Cunningham in 1992 [49] [50]. The concept of technical debt is usually used in data programming and it refers to the work which has to be completed before the program can be considered finished [49]. This reflects the extra development work that arises when short-term solutions on the project have been applied instead of exerting the best overall solution [49]. The concept is about to manage and decrease the technical debt while the performance and the availability are unaltered that also is the challenge for many organizations. [50, p. 2]
Technical debt is often created when executives make conscious decisions of delivering an application before it is finished. The benefits of delivering a product in an earlier stage are weighed against the cons of having a suboptimal source code. Technical debt is incurred whenever something is wanting in the source code and creates, like financial debt, an interest in form of increasing costs in maintenance and support. [50, p. 3]

When a variety of people make assumption about the source code of an application and add their own contribution, problems occur. Technical debt is something most organizations have to face unless the code is very short lived or very well documented. [50, p. 3]
5 Reviews from the Swedish National Audit Office

This chapter presents results from the Swedish Audit Office reviews of governmental agencies; chapter 6.1 IT-developing governmental agencies presents the Swedish National Audit Office review of IT-developing governmental agencies, chapter 6.2 Budget overruns at Swedish governmental agencies presents a review from the Swedish National Audit Office over governmental agencies financial predicament of exceeded budgets.

5.1 IT-developing governmental agencies

According to the Swedish National Audit Office several of the Swedish governments has problems in management accounting when it comes to IT-costs. The Swedish National Audit Office has made findings of weaknesses in several agencies internal control due to decentralized and fragmented IT-operations. [2, p. 10]

Large quantities of proprietary applications pose difficulties in governance, monitoring and an overall integration of IT operations. Often governmental agencies do not know what the IT-operations does and how it works. [2, p. 10]

5.2 Budget overruns at Swedish governmental agencies

In 2009 the Swedish National Audit Office made a review of 73 governmental agencies. The results showed that one third of the IT-projects driven by Swedish governmental agencies exceed their budget. The total amount of budget overrun is usually somewhere between 200 to 300 million SEK, which is approximately an overrun of an average of 30 % - 55 %, depending of the size of a project. [1, pp. 10, 11, 18]

Even though there is a big overrun of budgets in governmental agencies, none of the 73 agencies asked for increased funding, but handled it internally instead. This has led to suffering of other projects that received less funding, which in turn lead to delays or quality losses. The overruns of projects could also affect other departments or units, which,
according to the Swedish National Audit Office, were also common and
could result in extended processing times for users of the applications.
[1, p. 11]

A conclusion made by the Swedish National Audit Office was that the
governmental agencies presented in the review from the Swedish
National Audit Office couldn’t, from the lack of routine in the manage-
ment accounting, create a relevant risk management or make reasonable
resource calculations. Another conclusion made by the Swedish Nation-
al Audit Office was that routines adapted to the organization and its
internal control would provide better conditions for development of
projects. The Swedish National Audit Office also concludes that gov-
ernmental agencies often reliant on of consultants in many projects. In
2009 half of the budgeting for IT-development was related to consulting
expertise. [1, p. 11]
6 Methodology

A case study is a research method that is used with the aim to investigate. According to Robert K. Yin a case study is;

“An empirical inquiry about a contemporary phenomenon (e.g., a “case”), set within its real-world context—especially when the boundaries between phenomenon and context are not clearly evident” [51, p. 18]

6.1 Choice of method

The approach of this research will consist of a qualitative pilot study based on interviews with an exploratory purpose. The interviewees are considered to be experts within the subjects of whom they are interviewed. The goal of this approach is to generate a basic knowledge in the chosen research with the intention of analysing and detecting underlying factors that currently prevents a lifecycle management approach within a governmental agency. In order to assess the internal and external factors that are affecting the organization, an organizational analysis will be used as a tool and aims to provide an understanding of different behavioural relationships [52].

6.2 Question formulation

To answer the question; “How do Swedish authorities handle their proprietary applications from a lifecycle perspective; financially and technically?” the following questions will be answered in chapter 7 Results:

• What are the relations between bookkeeping and funding of IT-projects?

• How is governmental agencies effected by management accounting and ALM of IT-projects and how does this relate to technical debt?
6.3 Delimitations and generalisations

The study will be made at the SIA and is restricted to the ITA department, within the IT Department, and the Development plan. The study will also be delimited to the management accounting and the ALM within the SIA. Due to the sensitive nature and confidentiality surrounding the interview questions, a filtered version that only reveals the essence of the responses, will be presented in this report.

The SIA is a governmental agency representing about 6% of the GDP in Sweden, making it possible to generalize the results to reflect a greater part of the Swedish authorities [9].

6.4 Implementation

The survey will be based on numerous interviews consisting of a panel of experts; Respondent 1, Respondent 2 and Respondent 3. Respondent 1 is Head of the ITA architectural division and has several years of experience in application maintenance and lifecycle management. Respondent 2 is Head Comptroller of the IT department and has worked at the SIA since 2010. Respondent 3 is Comptroller of the ITA’s project unit. The experience of the respondents will assist in generating an equitable depiction of the SIA. [53] [54] [55]

The interviews will be designed as unstructured interviews, meaning that the questions are not predetermined but are formed during each interview session after a theme determined in advance. This type of method tends to create an open dialogue between the involved respondents while encouraging spontaneity. This layup for the study will make it possible to explore the organization in order to create an increased understanding of the problem. [56]

The interviews will be continuously conducted and process different topics. In addition to the interviews a literature study will be conducted of scientific thesis, the SIA’s internal documentation, web-based material, white papers and literature. The variety of sources will be used to strengthen the study’s validity.
The interviews and the literature will be analysed to answer the core question of the thesis. The information will be used as a foundation for creating explanatory figures throughout the result and analysis chapter and will be created with the computer program; yEd Graph Editor.

6.5 Ethical aspects
In this study the following ethical aspects, from the Swedish Resource Council, will be considered: the consent and utilization requirement, the information requirement and the confidentiality requirement. The respondents will be informed, according to the consent and utilization requirement, of their voluntary participation and the right to withdraw contributions. The information will be given orally and translated from Swedish to English, thus leaving room for interpretation. The respondents will have the possibility to approve or consent to the translations post interview; if the interviews are not approved, they will not partake in this thesis. According to the information requirement the respondents will receive information about the purpose of the study and a description of how to implement it. Due to the sensitive nature and confidentiality requirement of the interview questions, a filtered version that only reveals the essence of the responses will be presented in this thesis. [57, p. 7]
7 Results

Chapter 7.1 presents capital flow at the SIA, chapter 7.2 presents bookkeeping of proprietary governmental applications from a lifecycle perspective, chapter 7.3 presents unfinished projects, chapter 7.4 presents technical debt at the SIA, chapter 7.5 presents funding technical debt by loans and chapter 7.6 presents governmental management.

7.1 Capital flow at the SIA

Governmental agency that develops IT-applications is financed with loans from the Swedish National Debt Office and the refund is made from the grants for the coming year or by increased fees [1, p. 17]. The loans from the Swedish National Debt Office are for investments in assets, see chapter 2.3.2 Loans. Some of the divisions at the SIA may also partake in this loan [58]. [14]

Every division at the SIA also receives grants, to execute their own responsibilities and to pay for expenses throughout the year. The grants received are based on the grants received from earlier years with a saving claim of a certain percentage that varies every year. [58]

The Development plan, see chapter 2.1.3 The Development plan, receives both grants and loans from the SIA to plan and support their IT-projects, see chapter 2.1.4 IT projects, at the SIA. These projects contain either developments of applications, further development of existing applications or both. The projects is planned and paid for by the Development plan and the order goes through the IT department and is executed and constructed by the ITA division, see Figure 1. The finished applications are delivered to the SIA. [19, pp. 13-14]

Every year the IT department receives grants [59], see Figure 1, and the ITA division receives a part of this grant to use for the maintenance needed in the application portfolio. Maintenance can for example be needed because of out-dated source code or changes in the law. The maintenance work is executed and paid for by the ITA division and financed with grants; see Figure 1 [54]. [53]
Figure 1: The flow of capital and how projects are financed through the Social Insurance Agency’s Development plan and IT department. In Figure 3 presents the light green box the Development plan. The green boxes represent the divisions at the SIA, the white boxes correspond to the applications and the dotted lines represent the payments. Finally the text without lines describes the capital flows through the divisions. [60]
7.2 **Bookkeeping of proprietary governmental applications from a lifecycle perspective**

The rules of the ESV create the foundation of the management accounting in governmental agencies and the SIA must follow the guidelines in the financial bookkeeping of the proprietary applications [15, p. 32]. According to Respondent 2 it creates both limitations and opportunities when applying these rules on a proprietary application lifecycle. Respondent 2 states that there are two ways of bookkeeping the software made at the SIA, either as assets or as direct costs. [54] [53]

Governmental intangible assets have to be financed with loans from the Swedish National Debt Office and, according to the SIA’s internal rules; it has to be handled by *the Development plan*. The development phase at the SIA contains the phases: requirement specification, development, testing and deployment. The development phase is, at the SIA, planned and funded by *the Development plan* and is mainly executed by the ITA, as stated in chapter 7.1 *Capital flow at the SIA*. Planning and education is not, according to the ESV, an asset, and has to be financed with grants, although it is still governed by *the Development plan*. [19] [53]

To accomplish the division of funds, *the Development plan* utilizing a so-called Operational Decision Support (VBU), which are documentations required by the SIA, used to determine the allocations of the funding for each project, usually with an 80/20 rule [55]. The 80/20 rule is a guideline for determining the projects funding, where loans stands for 80 % of the funding and grants stands for 20 % [15, p. 35] [55], i.e. instead of bookkeeping every asset and cost separately *the Development plan* divides the entire projects in 80 % intangible assets and 20 % direct costs, see Figure 2, since grants cannot be used to finance intangible assets [19].
Figure 2 shows the bookkeeping of a project where 80 % represents the percentage that is reported in the balance sheet as an intangible asset and 20 % represents the percentage that is reported in the income statement as a direct cost. The portion of the project that is booked as an intangible asset follows the guidelines for the depreciation and is regulated according to §FÅB [19, p. 20]. The depreciation is adjusted to the asset's economic life, which pertains the time that the investment is considered profitable [19, p. 20]. When the project goes into maintenance the depreciation will start and the asset continues to systematically depreciate for each year [19, p. 20]. Respondent 2 [61] also states that the SIA creates a separate bookkeeping in the balance sheet, that corresponds to the decrease in value of the project and the correlating value is booked as a depreciation in the income statement, see dotted lines in Figure 2 [62].

When then application has entered the Maintenance phase the main focus is bug fixing, upgrading third party software and small portions
of new development [63]. The ITA division is responsible for the maintenance of the applications, only using grants to finance this phase [63]. This maintenance is also booked as a direct cost in the income statement [61].

One of the challenges is to meet the demands of the state and at the same time conform to the laws and the limitations of the funding. The management accounting has well-established procedures for handling finances and bookkeeping, which could be difficult to change in a short timetable. Currently the ITA division lacks the funds needed to finance the required maintenance of the application portfolio. This problem partially derives from a mentality based on “who shouts loudest” together with a maintenance budget based on results from previous years without considerations of possible changes in the application portfolio. The grants that are paid to the different departments are according to Respondent 1 not based the essential necessities because of the lack of visibility into the management accounting. Respondent 1 describes the lack of lifecycle management as a problem for the SIA because of the deficiency of funding of the maintenance and problems with transparency into changes made to each applications lifecycle. [63] [64]

According to Respondent 2, to find a proprietary application lifecycle at the SIA would be a very complicated process. The applications are often booked in projects with several other applications, both development of new applications and development of already existing applications [65] i.e. project can consist of several applications and one application can be a part of several projects in the bookkeeping [66]. According to Respondent 1 there are problems with the current management accounting from an ALM perspective since the bookkeeping does not reveal the proprietary applications and its lifecycle [53]. According to Respondent 1 the lifecycle management of the application is impeded of the project not reflecting one specific application [67].

The bookkeeping is not done in a standardized way according to Respondent 2 [54] where the intangible assets are manually booked in excel files and to trace a specific applications lifecycle, the only way is to find all projects that this specific application has been a part of.
The tangible assets are booked in a sub module of the programme *Agresso* that shows the tangible assets and what modifications have been made. According to Respondent 2 there are several individuals at the SIA who are resistant to bookkeeping intangible assets in for example *Agresso*, since this would require a lot of manual labour, trying to trace the applications and also possibly sort out and rebook every intangible asset. [68]

### 7.3 Unfinished projects

The ITA division has extended their application portfolio the recent years [63]. Although most of the projects that have gone through the development phase is rarely completely finished from a technical perspective at the delivery state and the hours left of the project are transferred to the ITA division and the Maintenance phase. When the project is transferred the project closes and the remaining development is prescribed in a residual list. [66]

From a financial perspective the projects development phase is over, meaning that the remaining development that is covered up as maintenance will be financed with grants and booked as direct cost. This created an overlap of Development phase and Maintenance phase, where the ITA division is forced to finance the development part of the project. The Development phase, from the financial perspective, will be booked as both intangible assets and direct costs, probably by the 80/20 rules presented in chapter 7.2 *Bookkeeping of proprietary governmental applications from a lifecycle perspective*. [65]

The reason that the projects are not finished from a technical perspective at the delivery state is due to i.e. limitations in budgeting or limitations in time [68]. A project can in theory be reopened, but seldom are [62]. If the project is not reopened the work done in the residual list cannot be booked as an intangible asset, because of the fact that the work done on the residual list is considered not to add financial value to the SIA but is instead considered to be a cost [61].

An incentive for this problems are that *the Development plan* many times are not allowed to borrow enough money to finish the projects and therefore place the expense on the ITA division instead [55]. This financial dilemma becomes a burden for the ITA division that does not
have enough money for maintenance of already existing applications [63]. This results in that the ITA receives large expenses for maintenance, which also leads to technical debt [64]. Respondent 3 states that the managers of the Development plan often in advance knows that the resources of the projects will not be enough to finish the projects. [54] [53]

7.4 Technical debt at the SIA
Limited time, money or knowledge often leads to a technical debt. The source code does not need poor construction to be considered a technical debt. At the SIA technical debt also refers to when implemented functionality does not match the functional demands. One technical debt at the SIA is old legacy source codes that need replacement due to outdated technique and lack of specialist who master the programming language. According to Respondent 1, changes in this type of technique are very complicated and expensive. [66]

“In a complex solution, expertise might be needed regarding the specific problem, and we are not talking about excellence in Java but rather expertise concerning the core of the problem.” - Respondent 1 [66]

Respondent 1 also states that technical debt can refer to problems arising from source code being limited to a certain size or amount of programs. This contributes to constraints in later stages of the lifecycle when new functionalities need implementation and, according to Respondent 1, a big part of the source code may need to be replaced. [69]

If a technical debt is not reduced it will instead increase but a technical debt can also increase if i.e. infrastructure is changed, according to Respondent 1. If an application has a technical debt and changes in the infrastructure are made, the problems will escalate. Changes in one application or hardware can also affect i.e. applications, hardware or infrastructure. [69]

7.5 Funding technical debt by loans
Technical debt needs to, by law, be financed with grants, according to Respondent 2, but the grants received by the ITA division are not enough to fund the debt created. At the same time the technical debt
needs to be maintained and the ITA division has solved this by taking
loans from the Swedish National Debt Office by the Development plan.
The loans are often taken to fund development of a new application, but
for more money than needed for the application. The amount of funding
borrowed is used to fix technical debt at the same time as developing
the new application. This contributes to making the projects look
extremely expensive and slow. Each year patches are made to fix
technical debt and Respondent 2 means that nothing is done to the
actual problems but to the symptoms. [62] [69]

7.6 Governmental Management

A governmental agency is not allowed to generate either surplus or
deficits [15], which often are the main goal of a profit driven organiza-
tion. According to Respondent 3 the ethical aspects are, in a governmen-
tal agency, often more important than the financial aspects. Respondent
3 explains that an important goal of the organization is that the staff is
well and has a good working environment. Respondent 3 describe that
some of the factors that are important to the SIA are “ethical factors”,
that is about humanity, working environment and taking responsibility
for the people that use the support of the SIA. The annual report of the
SIA for 2013 describes that the top managers is given new roles and
responsibilities for how to treat customers within each different situ-
tion [11, p. 1]. [70]
8 Analysis

Chapter 8.1–8.8 presents the analysis from the theory chapters integrated with the results.

8.1 Proprietary applications lifecycles

Chapter 7.2 *Bookkeeping of proprietary governmental applications from a lifecycle perspective* presents management accounting from a lifecycle perspective. Figure 3 is an abridged model of the application lifecycle at the SIA that concerns the technical and financial aspects of the stages an application goes through from the day of the first idea to the development phase, through the maintenance phase until it enters end of life.

![Figure 3: The proprietary application lifecycle at the SIA in a technical and financial perspective.](image-url)
Figure 3 is read counter clockwise and starts at the development phase displaying the first events of the application lifecycle. The model made for the application lifecycle at the SIA includes the requirement specification phase, the development phase, the testing phase and deployment. Leaving the maintenance phase, the application can enter two ways in the lifecycle, either end of life, where it will be phased out and or the application restarts the lifecycle with new development of the existing application. The application can circle the lifecycle-model until it is no longer needed and goes to the end of life. The differences of this lifecycle from the lifecycle in chapter 4.2 Application Lifecycle Management in Figure 2 is that the lifecycle in Figure 5 is adapted to the responsible units at the SIA. In the Development phase the responsible unit is the Development plan and the ITA is responsible for the Maintenance phase.

8.2 Development and maintenance

Figure 4 shows how the development phase and the maintenance phase are visualized from two different perspectives; a financial perspective and a technical perspective, according to chapter 7.3 Unfinished projects.

<table>
<thead>
<tr>
<th>Development phase</th>
<th>Beginning of Maintenance phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial perspective</td>
<td></td>
</tr>
<tr>
<td>Technical perspective</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 4:* Presents two different angles of the transfer of the project from both a financial and a technical perspective.

Figure 4 shows two different angles of the transfer of the project from both a financial and a technical perspective, creating difficulties in maintaining a uniform perspective of the application lifecycle since it is seen differently from different departments and perspectives.

A problem with this view of the application lifecycle is the creation of a technical debt when transferring costs to a department without enough funding. This also creates an obstruction in the management accounting, since the transfer of costs to the maintenance phase prevents the SIA from handling the end of the development phase as an asset, and instead forces it to become a direct cost.
8.3 Lifecycle and bookkeeping

Figure 5 and Figure 6 displays how two applications can be booked in several projects at the same time, and several projects can contain applications from different parts of their respective lifecycle.

The inner circle of the Development phase, in Figure 5 and Figure 6, represent the start of the lifecycle for an application. The application leaves the Development phase and enters the Maintenance phase and from this stage the application can either go to end of life or to a new Development phase, which is an equivalent cycle to the inner lifecycle, only representing new development of the existing application rather than the creation of the application (which is the inner cycle).

Figure 5: Describes how application 1 is linked to a project and how the projects are related to the bookkeeping.

Figure 5 illustrates how an application can be booked in two projects during its lifecycle, although an application can also be booked in more than two projects at the same time. The first Development phase of Application 1 is represented in Project 1 and the second development phase is represented in Project 2. The maintenance is not booked in any project, but is represented in the income statement, see also chapter 7.2 Bookkeeping of proprietary governmental applications from a lifecycle perspective.
Figure 6: Describes how application 2 is linked to a project and how the projects are related to the bookkeeping.

Figure 6 presents an extent to this; showing that Project 2 may contain development of Application 2 and at the same time contains new development of Application 1. The new development of Application 2 is booked in Project 3.

8.4 Bookkeeping of tangible and intangible assets

Intangible assets are financed with loans at the SIA, this due to the way in which SIA has chosen to interpret the laws from the ESV of intangible assets. The problem with this approach arises when the budget, financed with loans, runs out of funds before the application development is completed. When this occurs the ITA division cannot use grants to fund the remaining development since laws prohibits the use of grants as a source of finance for intangible assets. To circumvent this dilemma, management accounting summarizes the remaining development to an action list and moves the application from the development phase to the next step in the lifecycle, i.e. maintenance. Since maintenance can be seen as a direct cost and consequently can be financed with grants, this solves the immediate problem.

This in turns creates a distorted view of the size of the application, since the accounted development phase only partly describes the actual development cost and thus presenting the applications to be smaller than it is. In addition, the actual steps in an application lifecycle are
almost impossible to trace, which in turn greatly increases the difficulty of budgeting for future application development and maintenance based on previous projects financial history. However, it is debatable whether this way of funding is a financial problem, since the organization is non-profitable and the main concern at the SIA is not to gain financial surplus or deficits. Making the bookkeeping transparent also removes the possibility to finance maintenance and technical debt with loans, which can either result in forcing the SIA to provide the ITA enough funding for the maintenance and technical debt or the funding fails, since it is not considered adequate and in line with the organizational goals.

8.5 Financial versus ethical aspects

Another finding worth considering is that the Development plan often in advance, before the development starts, knows that the budgeted resources will not suffice. Despite this, the development of the application commences. Although, as described in chapter 7.6 Governmental Management, “ethical factors” needs to be considered as a possible valid argument to oversee the financial problems this results in. That is, the ethical aspects can override the importance of the financial.

8.6 Reopening projects

One possible solution is to reopen the projects after deployment or not close them at all. Then the software can be manage as intangible assets (and partially direct costs) and financed with loans from the Swedish National Financial Management Authority, although this would only solve some of the financial difficulties for the ITA division but not create a solution for the lack of transparency towards the project portfolio or a holistic view of the applications lifecycles. This does not solve the funding problem, if the Development plan is not granted enough funds to finance the entire applications or projects; this would not be a solution or a reasonable option.

8.7 Technical debt

If a technical debt is not handled in time, this can lead to effects that can be both expensive and problematic to fix. One example is the need to upgrade applications written in legacy programming language to a newer and more modern language. Even though this is considered
expensive, if not done it might in time create problems due to the fact that fewer developers will master it, thus making development and maintenance very expensive.

In addition this survey has revealed that the ITA division reallocates funds targeted for maintenance to fix technical debt produced by other divisions in earlier stages of the development cycle.

Furthermore, chapter 7.2 Bookkeeping of proprietary governmental applications from a lifecycle perspective shows that one of the main causes for the lack of funds, in the later stages of the application lifecycle, is that the ITA division is budgeting for a development/maintenance cost-ratio of a 80/20 rule while earlier studies has shown rather the opposite, i.e. the majority of the available funds is consumed by maintenance. This produces unfinanced technical debt that will further limit the ITA division and the financial boundaries it faces.

### 8.8 Applications traceability from a lifecycle perspective

The applications are frequently booked, in different stages of their lifecycle, in multiple projects simultaneously and the information is stored in excel-files, which makes the information problematic to collect. This creates problems in traceability of the applications and problems with having a lifecycle management perspective. A possible solution to this is to book the applications separately in i.e. the sub-module of Agresso used for tangible assets, although there is resistance against this proposal since it is not in line with the traditions of management accounting at the SIA.
9 Conclusions

The study shows that the SIA have inadequate handling of their proprietary applications and that each application is financially linked to one or more projects simultaneously, hampering traceability and prevents an active ALM.

The analysis presents a customized model, Figure 5, of an ALM that takes into account the technical perspective and the financial perspective. The model facilitates the understanding of the distribution of costs amongst the Maintenance phase and Development phase where the theoretical and actual cost allocations differ significantly. Theoretically, the Maintenance phase allocates approximately 90% of the total costs for IT-projects and 10% are distributed to the Development phase. The case study showed that, at the SIA, only 20% of the funding for IT-projects goes to maintenance and 80% is allocated to new development. A consequence is, instead of quality improvement and adaption of applications, an increased technical debt. The technical debt at Swedish Authorities is at present funded with loans from the Swedish National Debt Office, which contradicts the fact that the funding lent from the Swedish National Debt Office has to be invested in assets and cannot contribute to payments of costs.

A conclusion that can be made is that the results can also be found in other Swedish government agencies. A generalization can therefore be made of the research from the case study since the SIA consists of a major part of Sweden's GDP. The generalization is also supported by results from the Swedish Audit Office alongside with the results and analysis from this research. The SIA exceed budgets without asking for increased funding, meaning that the SIA must handle the financial complications internally by moving funds amongst different departments and projects and also spending money meant for development on maintenance. The Swedish Audit Office found that one third of the Swedish authorities are also exceeding their budgets.
9.1 Future work

The study has shown that a Swedish governmental agency has the potential to implement ALM in their business, which allows for further research in this area. One area that is of interest and requires further research is the investigation of how these two perspectives can be implemented in a safe and efficient manner in a government, how to implement it and how the operations are conducted.

Another area that may be of interest for further research is to make a comparison between government agencies and private companies to show differences and similarities in utilization of ALM and thereby find inspiration of how ALM better can be adapted to Swedish authorities.
10 Bibliography


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36
Application management from a lifecycle perspective - A case study at the Social Insurance Agency
Melenie Lindh
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