Nordic Smart Government

Report on

Business and Application Architecture

v.1.0.3
March 15, 2018

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1 Introduction

This report builds on other deliverables from the project. The Vision Architecture (deliverable 4.1 from WP4) the stakeholder analysis (WP3), the Taltio prototype (WP2) and the business case report (WP1).

2 Scope and deliverables

The report covers some major business processes related to Nordic Smart Government and some application functions needed to make this a reality.

In general for each role it illustrates an architecture vision in an isometric figure and then business function the role performs related to Smart Government is described. Application architecture is described as reference architecture. This means that it is mainly showing high level application functions needed, but not entering into each country's specific interoperability architecture. Hence the use of the phrase reference architecture.

The architecture models are produced using the TOGAF ADM framework by iterations on business and application architecture. The first iteration has been an architectural vision developed by the members of the project as an input to performing stakeholder analysis and business case (deliverable 4.1). The second iteration builds on these reports and the interviews with some stakeholders. This iteration has especially brought more understanding into the business architecture, whereas the application architecture is still in an early phase.

All models are following Open Groups standard notation for architecture, Archimate 3.0.

3 Summary

TBD

4 Business and application architecture

4.1 The roles

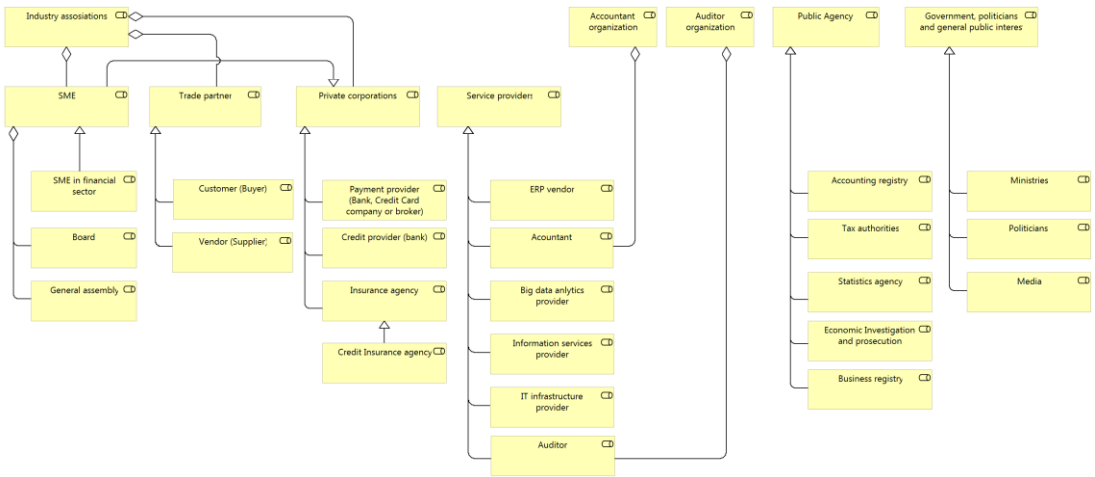


Figure 1 – Roles and their associations

Role	Description
The SME (Small and medium enterprise)	An enterprise where personnel and revenue is beneath a certain level given by EU. NSG limits its focus to SMEs both since it covers the majority of enterprises in the Nordic Region and larger enterprises often have structures that complicate the concept.
The board of the SME	The board plays a role in acceptance of the annual reports.
General Assembly	Approves the Annual Report
Accountant	Provides an accounting service to the SME
Customer (buyer)	The customer buys products and services from the SME.
Vendor (supplier)	The vendor supplies products and services from the SME.
(ERP) software vendor	The ERP software vendor provides software systems related to support processes like accounting.
Payment provider (e.g. bank, credit card company or broker)	Partner of the SME that provide services related to credit and payment.
Big data analytics provider	Provides analysis of financial data from SMEs to generate new data and knowledge. Information may be available to the original SME or to a broader range of actors.
Insurance company	Partner of the SME that provide services related to insuring the assets or intangibles.
Auditor	Appointed by the SME to audit the financial statements.
Accounting registry authority	Governmental agency responsible for the annual accounts.
Tax authority	Governmental agency responsible for tax and vat reporting.
Statistics authority	Governmental agency responsible for generating statistics based on among other sources, financial data from the SME
Economic Investigation and prosecution authority	Governmental agency that supervises the actors in the financial sector, if they are solid and can tolerate shifting economic conditions, and if they have an acceptable risk level.
Ministries	Governmental ministries. Owners of governmental agencies, but does not play an active role in Nordic Smart Government.
Industry associations	Note: In Deloitte's stakeholder analysis have listed "confederation of industries" under

	SMEs and "organizations representing them" under "private corporations", Both of these can be sorted under "industry associations".
Media	Media may have access to aggregated open data coming from the sectors (originating from the SME)
Politicians	Politicians may have access to aggregated open data coming from the sectors (originating from the SME)

4.2 Business functions and processes

An SME generally has an ERP system that supports its business. A typical ERP system covers a large set of functions often grouped into functional areas or modules. How each ERP vendor decides to group the functions varies, but typically the following is included

- Finance and accounting
- Human Resources
- Order processing/Sales/Marketing
- Procurement/Supply chain management
- Customer relationship management
- Manufacturing

In our scope we are <u>not</u> trying to make a full overview of the ERP functions, however we are looking at those functions that play a role in Nordic Smart Government, especially related to the accounting function. Below is a set of functions that are especially considered relevant.

The diagram below shows how these functions are mentioned in the Business Case report.

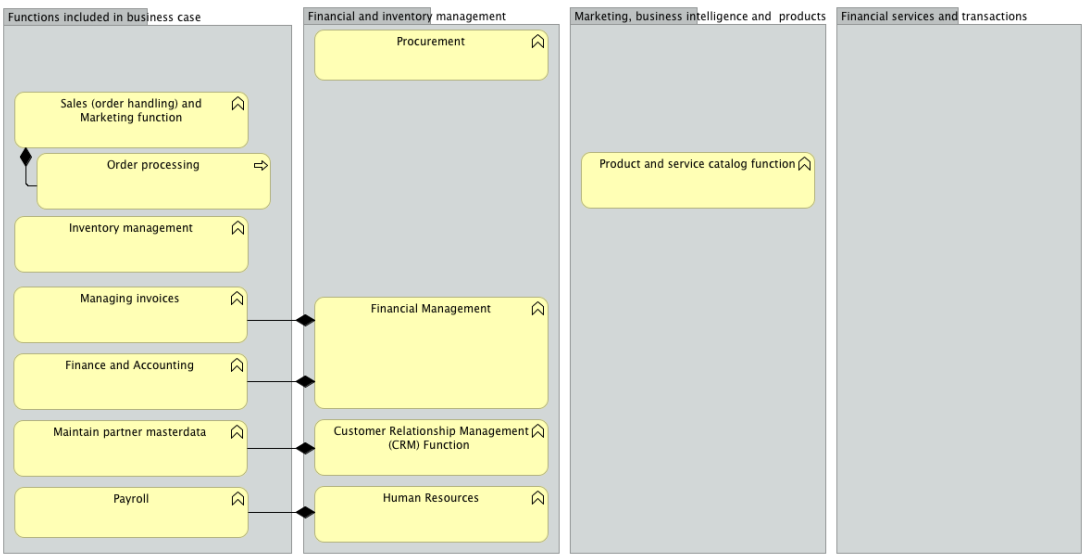


Figure 2 – functions that relates to Nordic Smart Government from the Business Case report.

Below is a list of functional areas included

Functional area	Description
Procurement (tendering and purchasing) function	Source, purchase, fulfill, pay
Sales function	Inquiry handling, Sales order processing, Shipping, Invoicing.
- Order processing	Order processing is a sub process of sales that takes a submitted order and gets it ready to be released to fulfillment. It groups those order line items in an order that are being shipped to the same address, on the same day, by the same carrier, and from the same fulfillment center. Items that have a product attribute of "release separately" will be put into a release by themselves. Before creating releases for an order, the order payment status is checked to verify that the payment authorization has been obtained and is still valid.
Product catalog management function	Product catalog management or product information management (PIM) means managing the information required to market and sell products through distribution channels.
Inventory management function	The Inventory management or warehouse management functional area is used to manage the storage and the movement of inventory.
Financial and accounting function	
- Managing invoices	
- Accounting	
Customer relationship management function	
- Maintain partner master data	
Human resources	
- Payroll function	

Other transactions include selling, inventory management, bank statements, adjustments and salary payment and reimbursement. The transactions are standardized and machine-readable. The content will include product information, VAT etc.

The business processes that of our prime interest for Nordic Smart Government is described into more detail below.

4.2.1 The Procurement business function

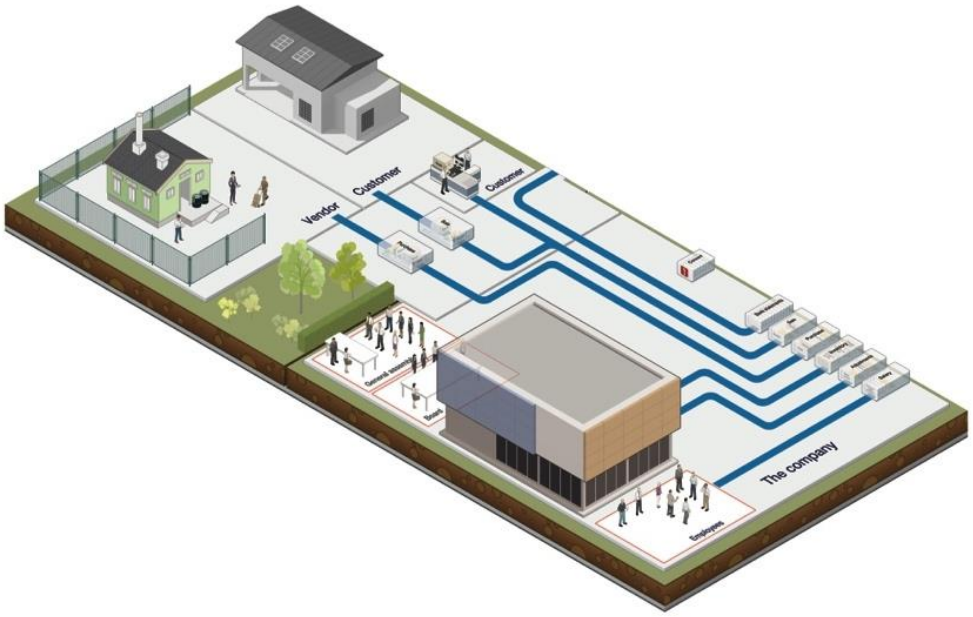


Figure 3 – Procurement is one of the functions performed by an SME.

The SME is buying goods or services from a *Vendor (supplier)*; Sourcing, ordering, receiving invoices, process payment and getting receipt.

The SME is buying from a vendor.

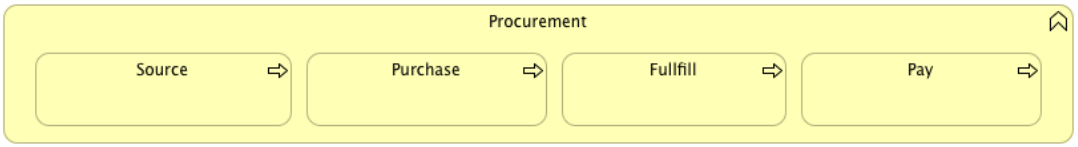


Figure 4 - Procurement function

Functions include:

- Source: request for quote, quotation, compare
- Purhase: Purchase request, Purchase order, approval
- Fullfill: Delivery order, Goods received, Inventory update
- Pay: Invoice, Payment approval, receipt

4.2.1.1 Specialized procurement process: Public procurement (competition)

A specialized procurement process for public procurement is described below. Where the sourcing process is broken down into more steps.

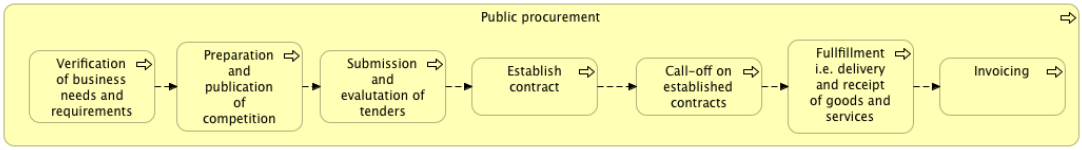


Figure 5 - Public procurement process

Please note that a separate report/deliverable has been made for this particular case, as it is important when it comes to standards for the digital documents.

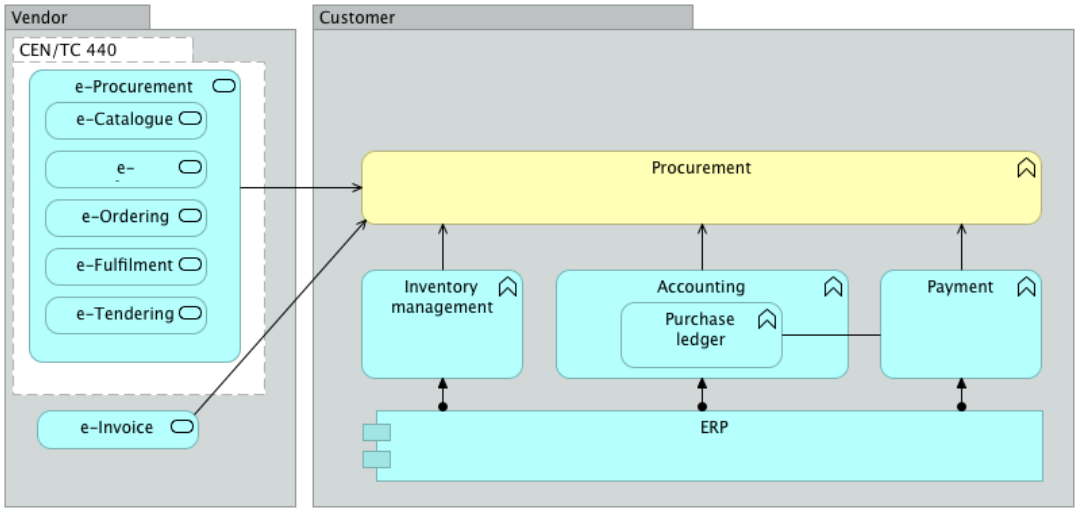


Figure 6 - Procurement function and relevant standards from CEN/TC 440

The (public) procurement-process is currently being defined and described as a set of data formats and protocols under the EU-initiative CEN/TC 440. This is aimed at the government procuring products and services from private companies, but it will probably make sense for private customers as well.

Please note that the view shows this mostly from the customer (procurer) point of view, not the vendor (seller).

4.2.2 The sales business function

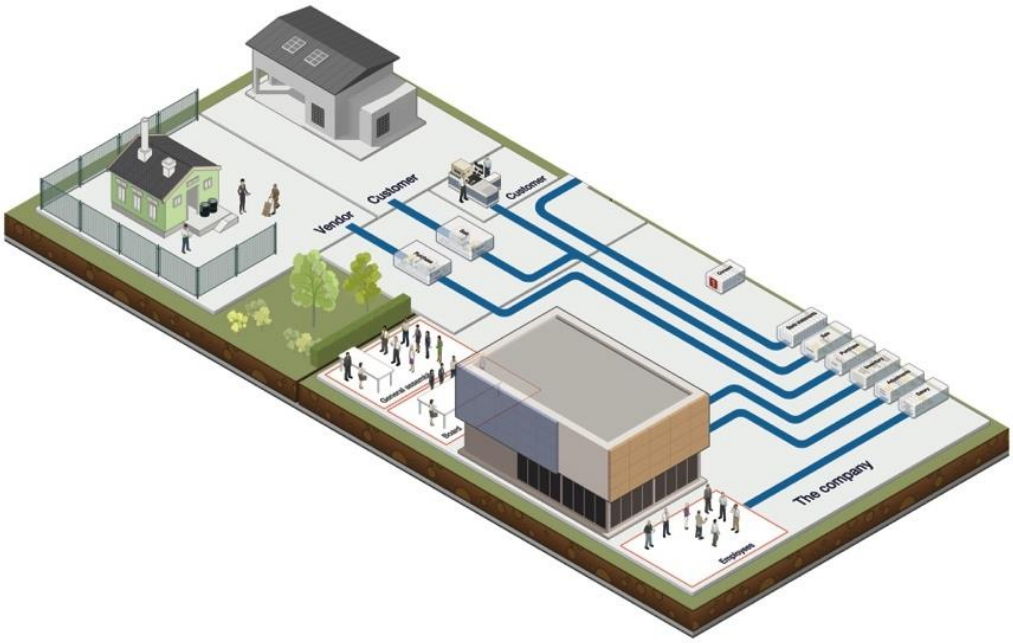


Figure 7 - The sales is one of the business function of an SME

The SME is selling goods or services from a *Customer*; Inquiry handling, Sales order processing, Shipping, Invoicing.

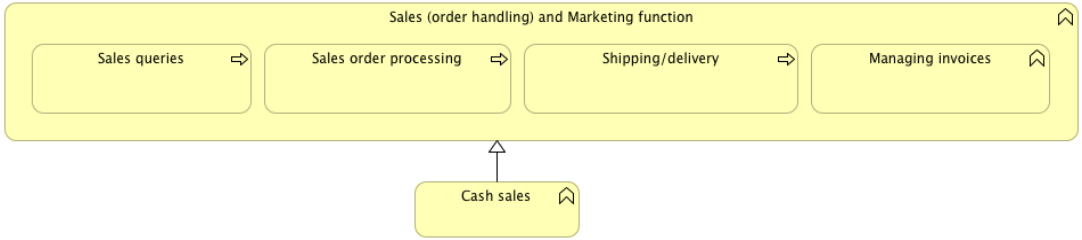


Figure 8 - Sales function, where cash sales is seen as a specialized function.

Functions in sales and marketing include

- Sales queries: Inquiry, quotations
- Sales order processing: Contract, order control
- Shipping/delivery
- Invoicing , receipt

Especially the order and invoice information (transactions) is of prime interest for Nordic Smart Government. Also the cash sales plays a significant role to generate digital journal entries.

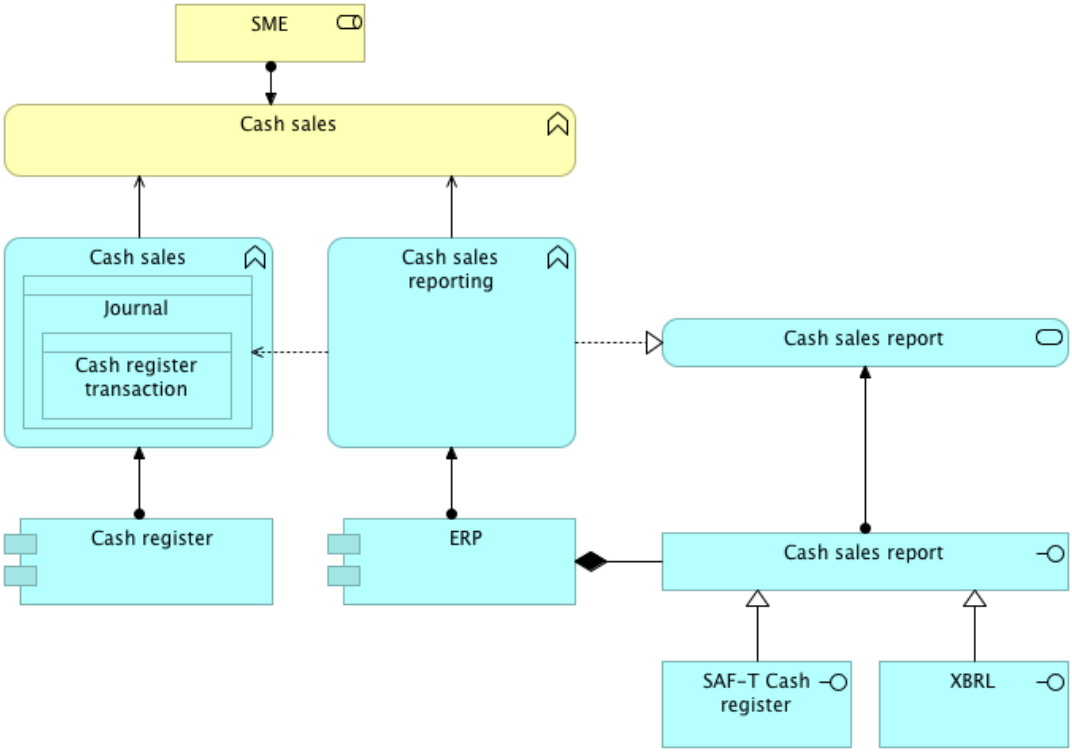


Figure 9 - Cash sales

Cash sales is a specialization of the sales function. It is assumed that the ERP-system needs to keep track of each cash register transaction and does so by accessing, storing and aggregating the journal from each register. This information can further be provided through the "cash sales report"-service.

The format of the journal of actual register transactions from a single cash register can be represented as "SAF-T Cash register" or "XBRL". At least in case of SAF- T CR, the requirement is that the journal is created in the cash register itself (entries needs to be digitally signed by a key known to the register).

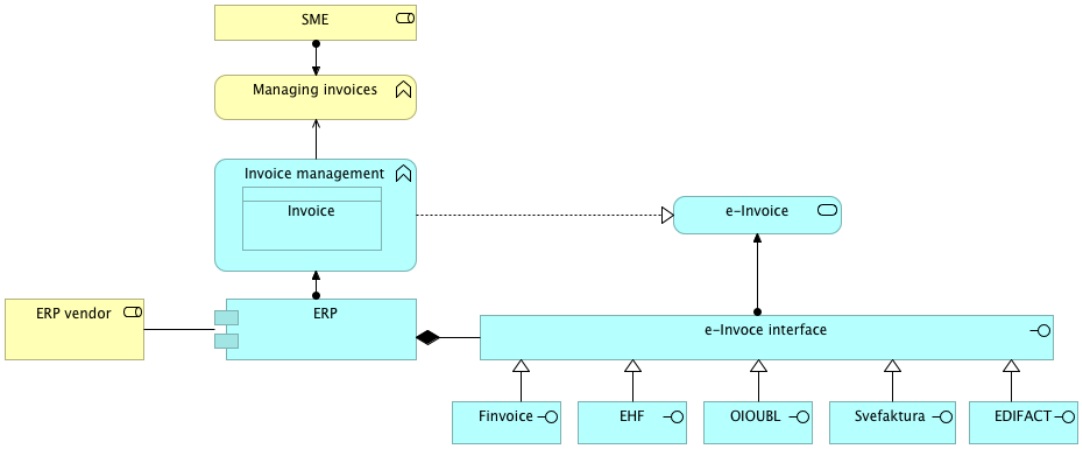


Figure 10 - Outgoing invoice management

The infrastructure for electronic invoicing is already well established. However, each country has its own standards and infrastructure, as indicated in the view above.

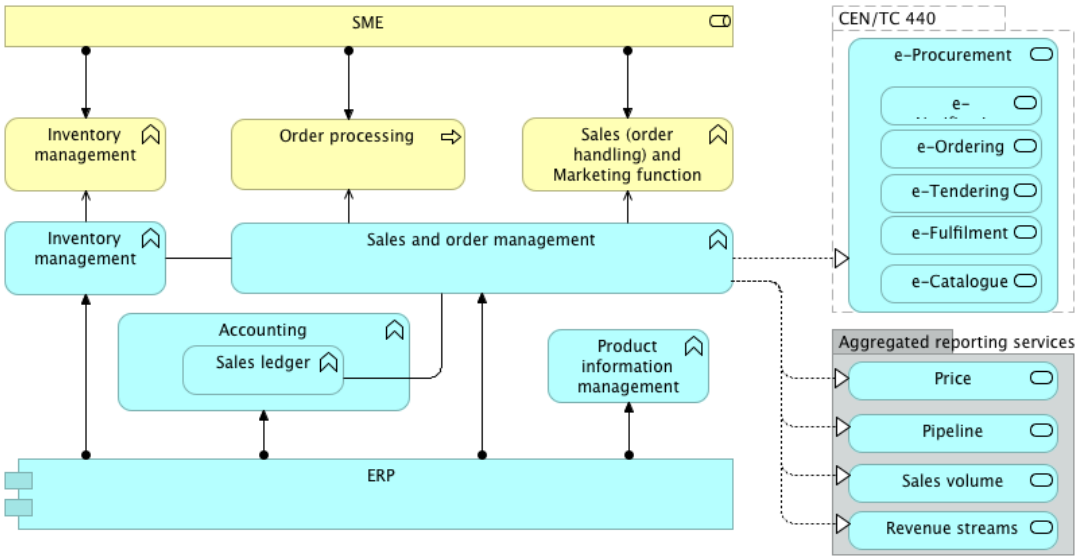


Figure 11 - Sales and order management

The view above shows the sales processes from the buyers' point of view. Note that the realization with CEN/TC 440 standards is most relevant for public sector procurement.

Note that also inventory management and product information management is described in the model above.

4.2.3 Product catalog management function

Product catalog management or product information management (PIM) means managing the information required to market and sell products through distribution channels. A PIM function facilitates maintenance of consistent and quality product data and information.

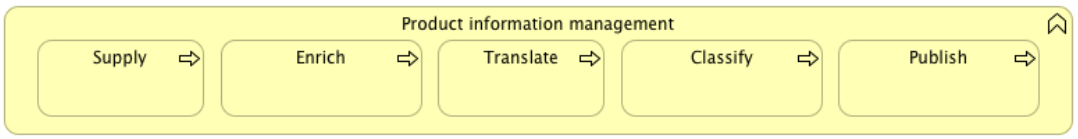


Figure 12 - Product information management function

The role of product information management in Nordic Smart Government is to make sure each transaction carries a unique identifier to products so that queries can include elements from the product information record. Categorization is of special interest, e.g. "how many products classified as energy drinks was sold last month?"

4.2.4 Inventory management function

The Inventory management or warehouse management functional area is used to manage the storage and the movement of inventory. The functional area is responsible for tracking the movement of every stock item such the item received, picked, packed and shipped. It relates to product catalog management that handles the description of the items. Main function is Inventory control/stock management.

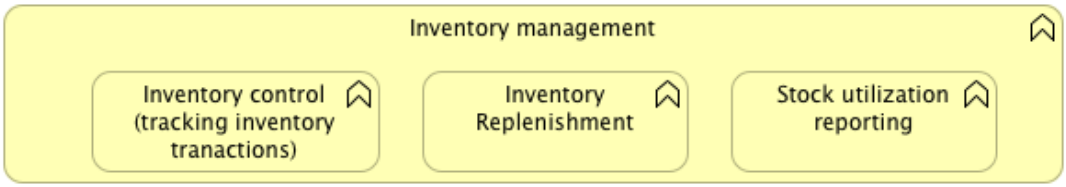


Figure 13 - Inventory management function

The role of inventory management related to Nordic Smart Government is related to inventory control, especially to keep track of your inventory from a physical and an accounting perspective.

4.2.5 Financial and accounting function

A financial and accounting management function includes the following functions:

- Account payables
- Account receivables
- General Ledger
- Billing – managing invoices to client/customers
- Stock/inventory
- Purchase order
- Sales order
- Bookkeeping – recording payment

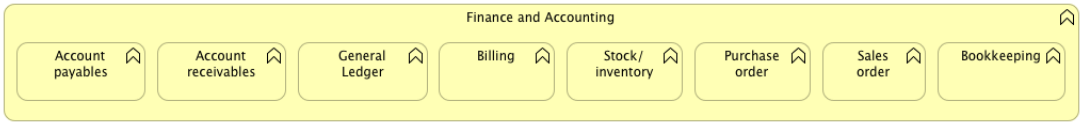


Figure 14 - Finance and Accounting function

The general ledger contains all the accounts for recording transactions relating to a company's assets liabilities, owners' equity, revenue and expenses. In ERPs the general ledger works as a central repository for accounting data where data is transferred from other modules.

The role of the financial and accounting functional area is especially related to the automation of the general ledger, and digitalization of the other functions mentioned above.

From the experience of the Taltio project (WP2), key to the success of the Nordic Smart Government project is both the access to ledger details, but also that the repository not only contain transaction details only relevant to the general ledger, but to other products as well. Further investigation must go into ERP vendors ability to deliver this.

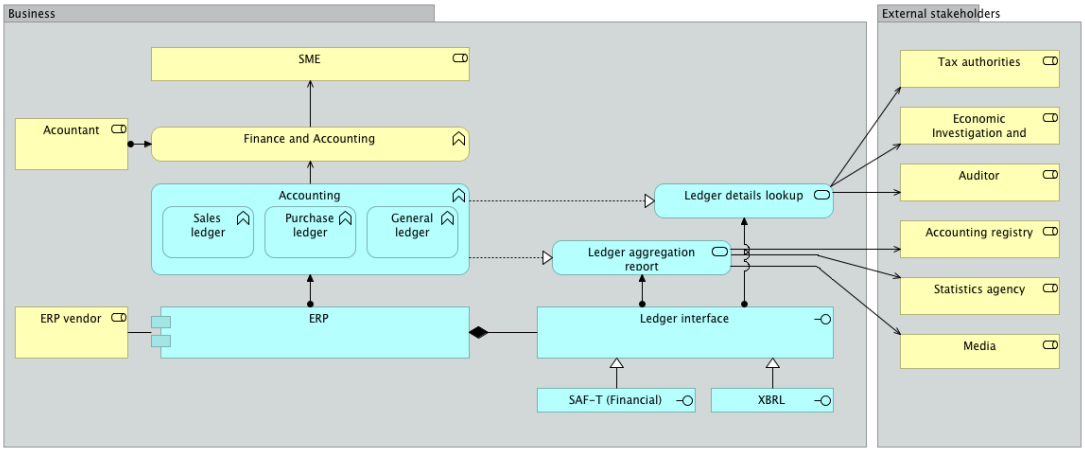


Figure 15 - Accounting and general ledger

Central to the idea of the Nordic Smart Government is real-time access to detailed ledger transactions or aggregated ledger reports.

The diagram shows an accountant role providing an accounting-service to the SME through the accounting application function of an ERP-system. With increased integration of structured data across the entire value chain, the need for an accountant role might vanish completely, the accountant becoming more an advisor, i.e. an external service provider.

The need for external audit will also change. With increased integration and automation, it might be replaced by automatic audits by government agencies. The Auditor will become more of an advisor.

Other external stakeholders are consumers with information need from the business. There is a distinction between the services "ledger details" (or rather financial data details) and "ledger aggregation" (financial reports) to be able to show which stakeholders would have access to which level of detail. The connections shown here is a preliminary one, further dialog with the stakeholders is needed.

The business itself will be able to control which stakeholders have access to detailed information where legal basis for access is not given to the authority. A typical example would be that media would probably like to have access to all

details, while the business only want to show aggregated reports. Hence a user's consent function is needed (see chapter on trust architecture).

The financial details might reveal business secrets or personally identifiable information, especially when correlated with other sources. So the privacy and business secret implications of these services needs to be considered carefully and appropriate access control needs to be implemented.

Note also the standards involved here. There are national differences. XBRL is especially used in general ledger reporting – a requirement for Financial sector SMEs. National standards are used in some Nordic countries.

Standard Audit File – Tax (SAF-T) is an OECD standard for transfer of accounting data from companies to tax authorities or external auditors. Implementation of this in Nordic countries varies.

Nordic Smart Government will benefit from all countries using the same standards.

4.2.6 Customer relationship management function

The CRM function is about managing all your company's relationships and interactions with customers and potential customers. The goal is simple: Improve business relationships. Functions include

- Account and Contact management
- Lead and Opportunity management
- Forecasting and analytics
- Marketing
- Sales Force management

Figure 16 - CRM function

For Nordic Smart Government the most important function here is the account and contact management that relates to the (public sector) master data and a (annual) account from public sector or directly from the customers ERP vendor. With Smart Government you should be able to know if your potential customer is solid.

4.2.7 Human resources function

Human resources (HR) is used to describe both the people who work for a company or organization and the department responsible for managing resources related to employees.

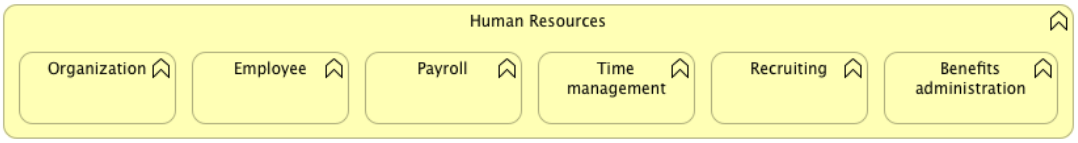


Figure 17 - Human Resources function

For Nordic Smart Government the payroll function is of highest interest as it relates to transaction level data and input to accounting.

4.3 Information need from the public sector incl. reporting

Government Administrations requires information from the SMEs. In the following we are briefly describing some of the most important actors and their needs. The actors are: Tax Administration, Statistics, Annual accounting register, and Agency for economic investigation and prosecution. Note that the name of these organizations varies in each country, but exists as functions in each country. Other authorities may request information which could be aggregated from the ledger, under certain circumstances, inspections etc.

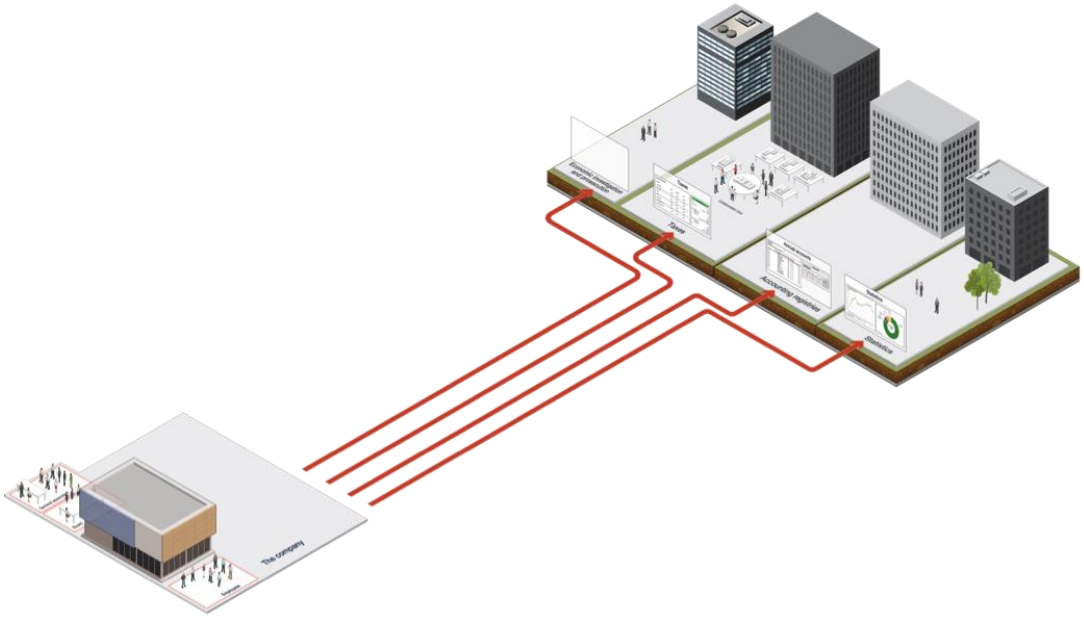


Figure 18 – Information flowing from the SME to the public sector

4.3.1 Annual accounts

The SMEs annual account is reported to the accounting registries.

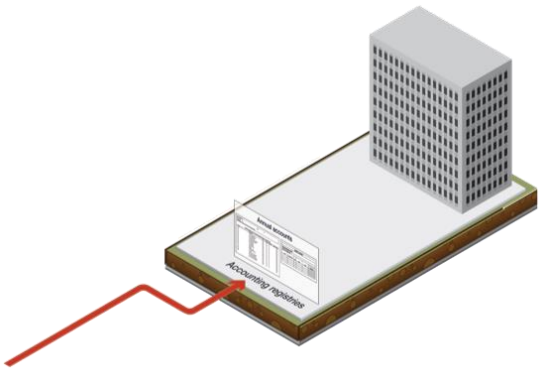


Figure 19 – Annual account reporting to accounting registries

The details in law and regulations related to deadlines, the involvement, and what type of control is done by the accounting registry varies across the countries, but generally they all follow the accounting directive from EU, Directive 2013/34.

Figure 20 – Annual reporting function

Smart Government aims to turn the reporting into the accounting registry (or a party with the legal rights) rather ask/query and generate the annual report.

4.3.2 VAT reporting and Tax declaration

The SME reports VAT and annual tax declaration to Tax administration.

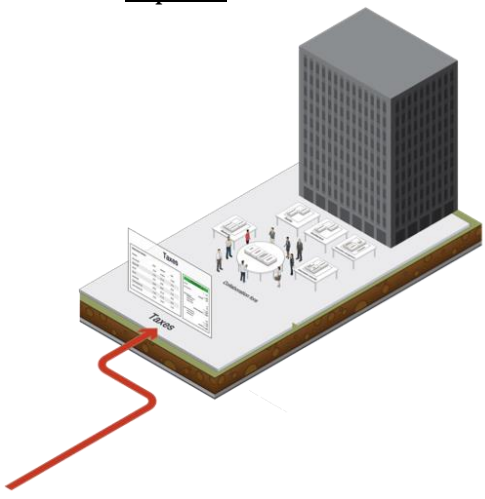


Figure 21 – VAT reporting to Tax administration

The law in each country varies when it comes to for instance the date and number of reporting periods.

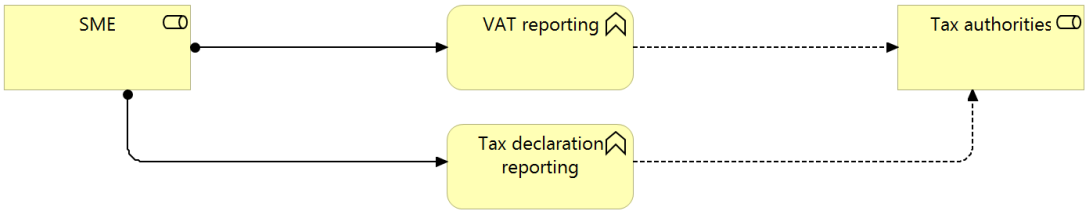


Figure 22 – VAT and tax declaration functions to Tax authorities

Smart Government aims to enable continuous reporting from the accounting system to Tax administration.

4.3.3 Statistics

The SME reports to the governmental agency for Statistics.

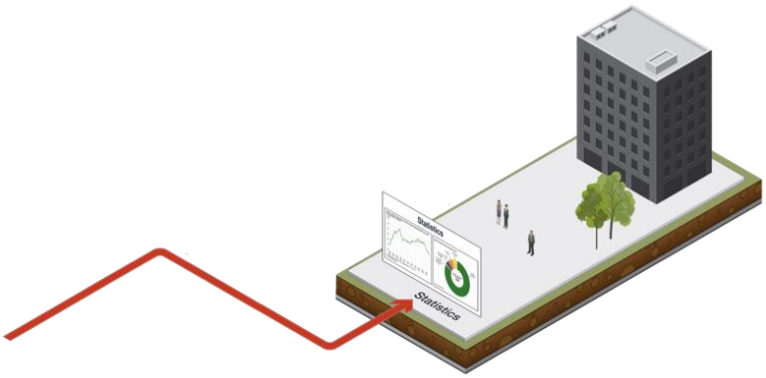


Figure 23 - Statistics reporting and information capture

Statistic agencies often collects financial information the SME has provided to other agencies, e.g. Tax, rather than asking directly from the SME. However, Statistics also, for various reasons, collect information directly from the SME as well. Information flow varies from country to country.

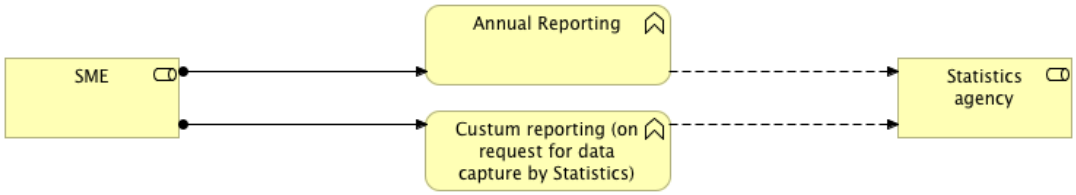


Figure 24 - Reporting and information capture function for statistics

For Nordic Smart Government the aim is that SSB should be able to access more detailed information from the SME accounting data query-based, and able to aggregate over other dimensions (e.g. product codes, trading country etc.).

4.3.4 Agency for economic investigation and prosecution

A subset of SMEs report to this agency. The agency for economic investigation and prosecution supervises the actors in the financial sector, if they are solid and can tolerate shifting economical conditions, and if they have an acceptable risk level.

Hence, reporting to this agency is only relevant for SMEs in the financial sector, e.g. real estate brokers, banks, insurance companies etc.

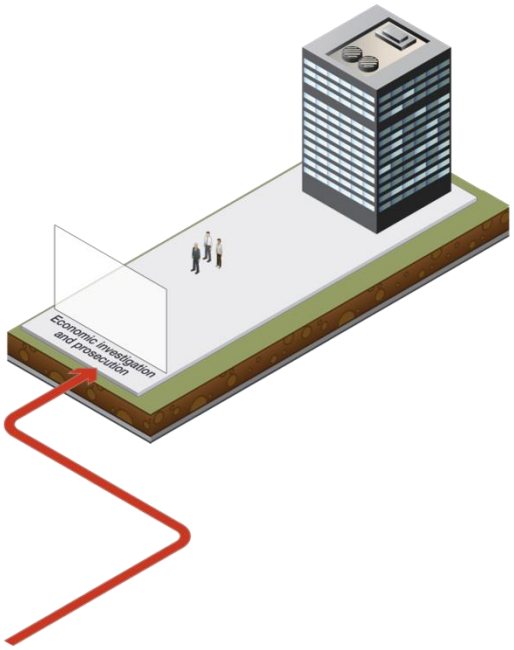


Figure 25 –SME in financial sector reporting to agency for economic investigation and prosecution

A relevant SME must report an annual financial report to the agency. Other specialized reports also exist.

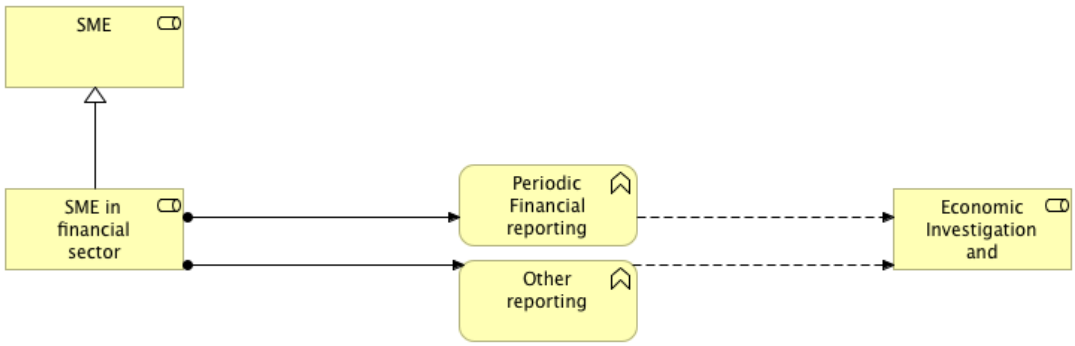


Figure 26 –Periodic financial reporting and other reporting functions from SMEs in the financial sector to agency for economic investigation and protection.

For Nordic Smart Government all or some of the reports may be produced on demand by queries to the SME.

4.4 Information need from the private sector

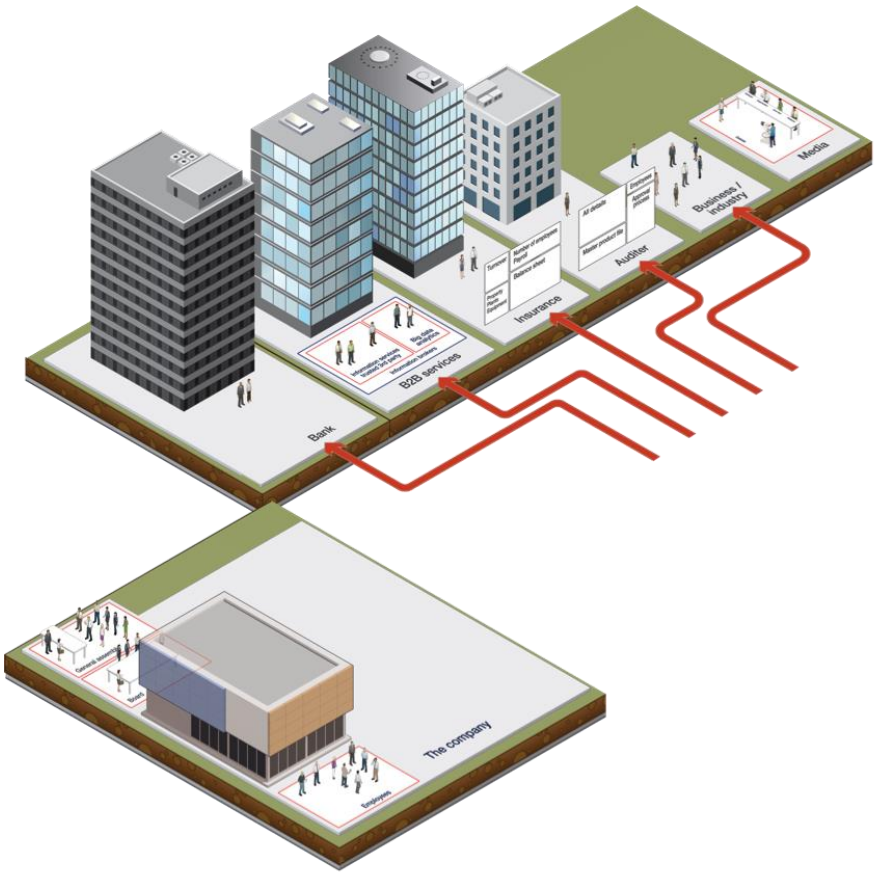


Figure 27 – Information need to the private sector arising from financial data in the SME or aggregations from several SMEs.

4.4.1 Banks

Banks have need for risk assessment of an SME when granting credit.

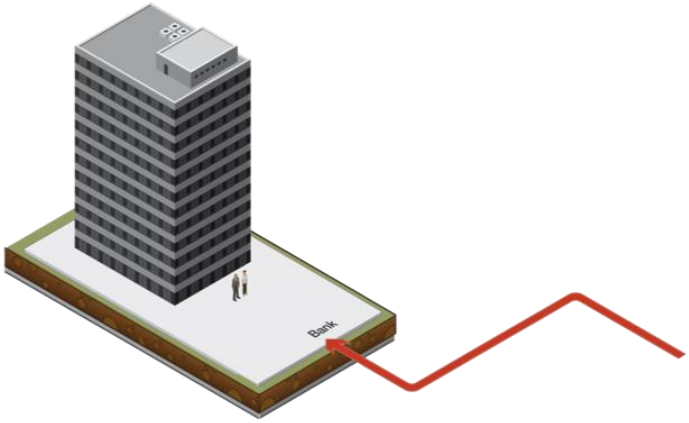


Figure 28 - Bank information need

Utilizing the accessible data may provide new loans and hence liquidity for the SME.

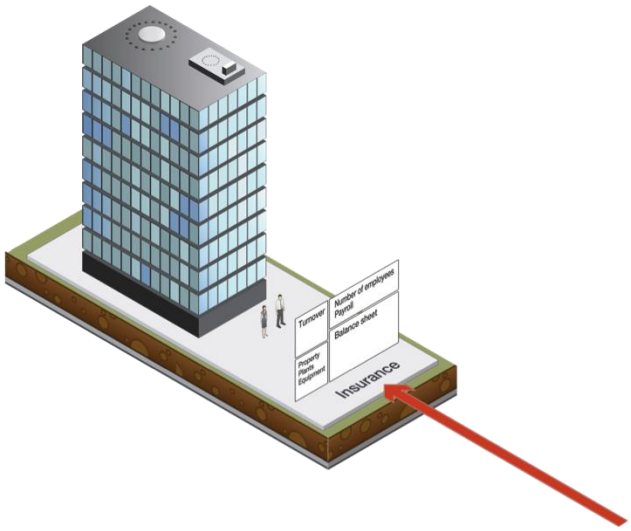
For banks access to various details may also increase the possibility of new business opportunities, including marketing.

Figure 29 - Credit lending evaluation function and other business opportunities may arise from the financial information.

The credit provider (bank) interest in Nordic Smart Government lies in its responsibility for risk assessment when granting credit that eventually serves the SME. Other business opportunities also arise from the information accessible for the banks.

4.4.2 Insurance

Insurance have the need of accessing detailed information about what they are insuring



Various types of trade credit insurances e.g. export insurance is a product offered by private insurance companies to business entities wishing to protect their account receivables (unpaid invoices) from loss due to credit risks such as insolvency or bankruptcy.

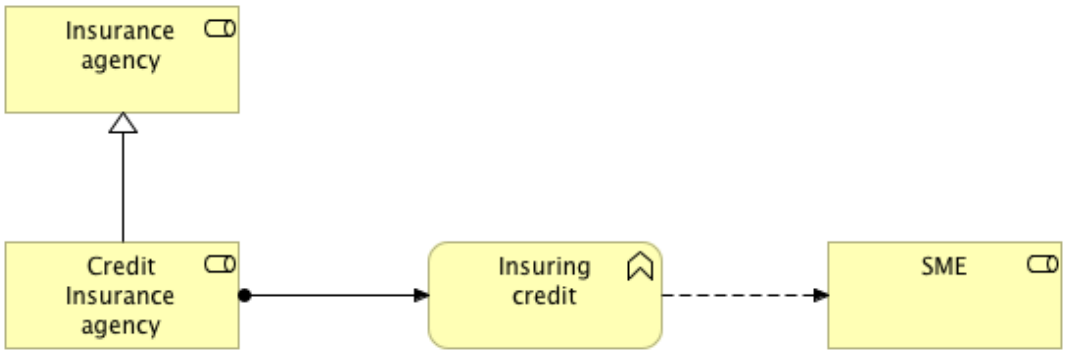


Figure 30 - Insuring credit function

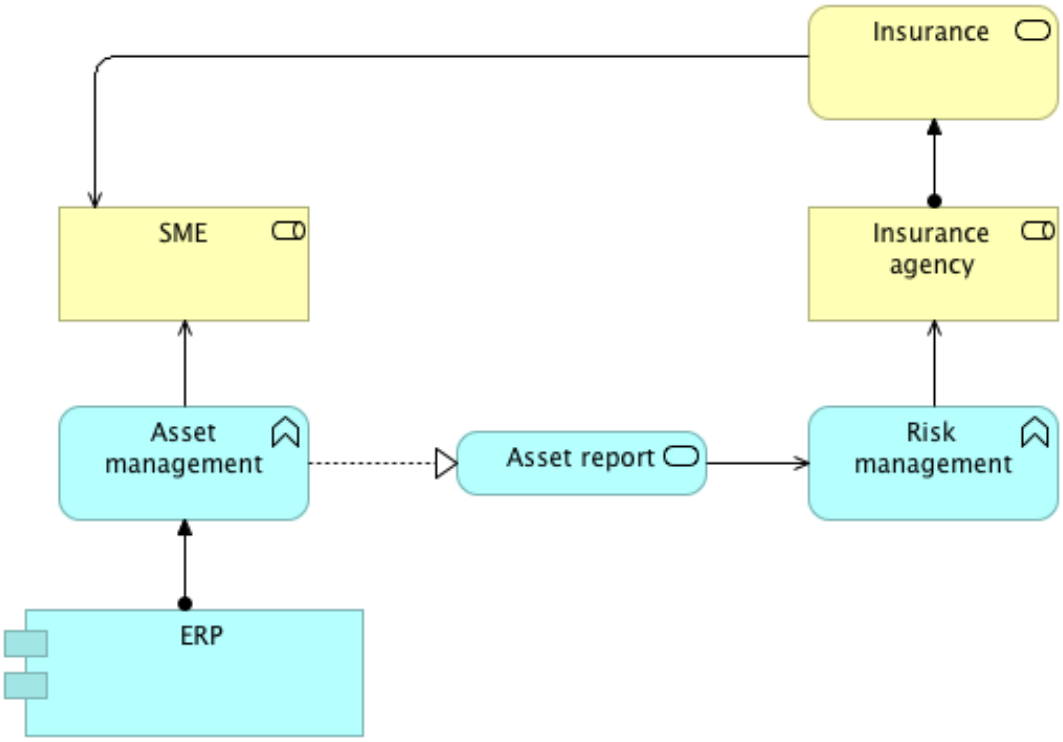


Figure 31 - Insurance of assets

An insurance company might get the inventory of assets to insure directly from the asset management application function at the client-SME.

Other insurance processes not shown here include credit insurance; which would be a part of the "credit lending" processes. Yet another process will be insurance covering people (health, pensions, life etc.), which ties into the HR-module, which will handle personal identifiable information and hence will represent challenges not described here. However, all these are still relevant for Smart Government.

4.4.3 Auditors

An auditor is appointed by the SME to audit the financial statements.

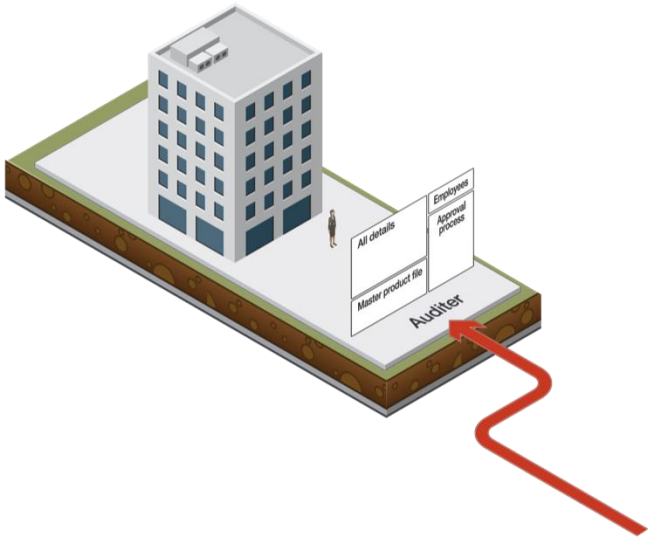


Figure 32 – Auditor performing a audit on the financial statements, in the future a more advisory role is expected.

Figure 33 - Auditors to offer financial services to the SMEs.

For Nordic Smart Government the auditor will be changed as the financial statements report can be automatically generated. The auditor will be transformed to a more advisory role.

4.4.4 Business and industry associations

The business and industry associations represent the businesses interest.

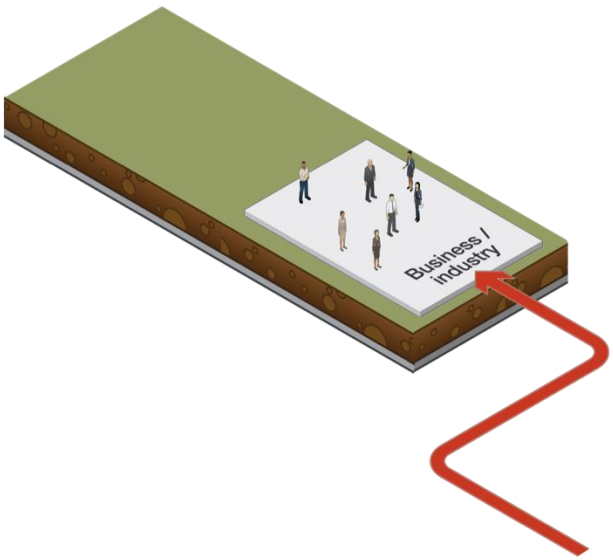


Figure 34 - Business or industry association gathering information for statistical purposes

Figure 35 – Business or industry association performs political influence on aggregations of financial information.

For Nordic Smart Government they would generally be interested in statistics of the industry.

4.4.5 B2B services/information brokers

The business to business service actors include brokers of information. These actors include (big) data analyses and credit analysis services.

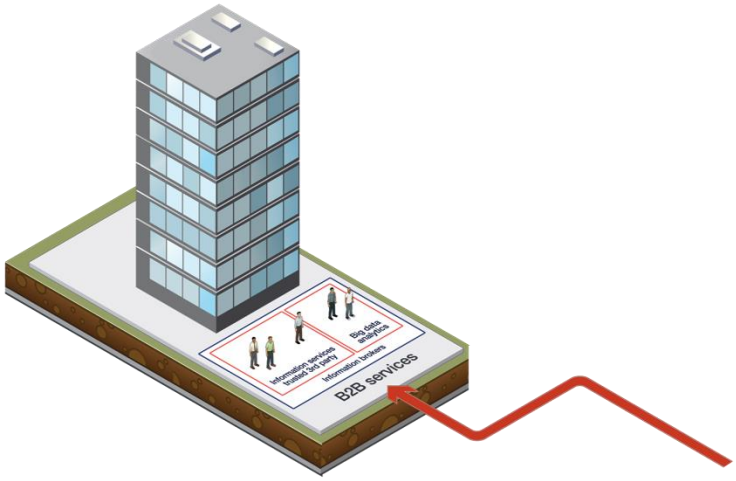


Figure 36 - Business to business service providers may perform a number of services

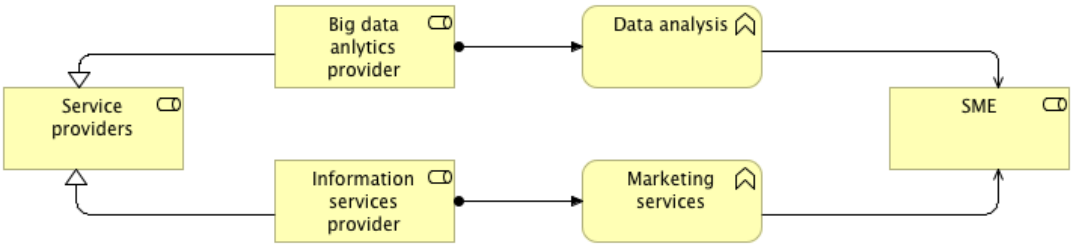


Figure 37 – Service providers perform functions which analyze or enrich data and serves the SME

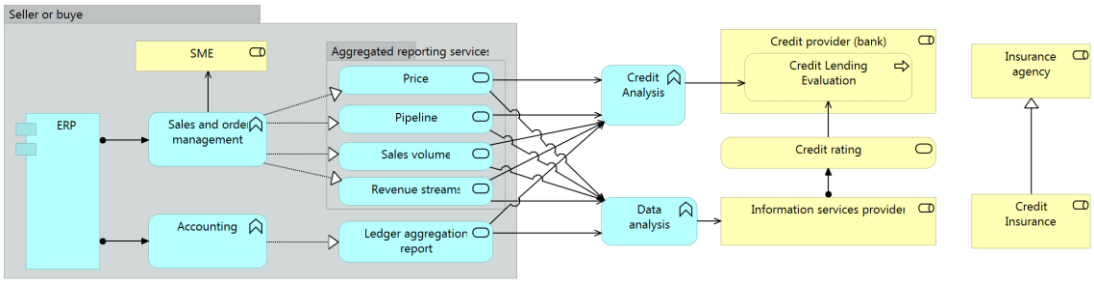


Figure 38 – Information service provider application architecture.

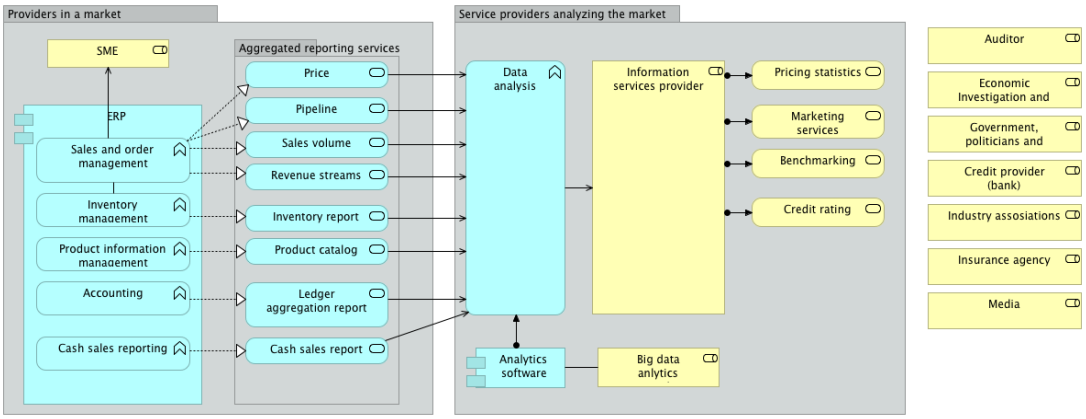


Figure 39 – Detailing of the data analysis.

4.4.6 Media

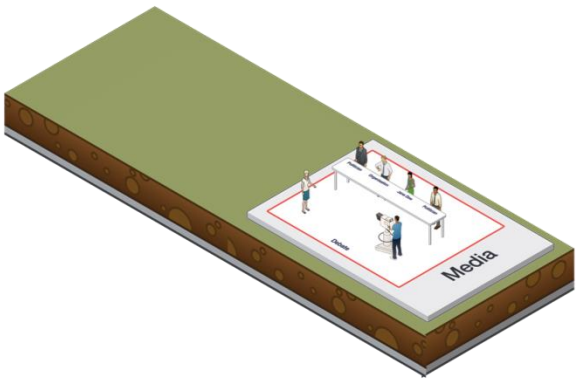


Figure 40 – Media consists of data journalists that perform much the same tasks as an information service provider, but on a more ad-hoc level.

4.5 Databank

A databank is the term used for the storage of company's detailed financial transactions.

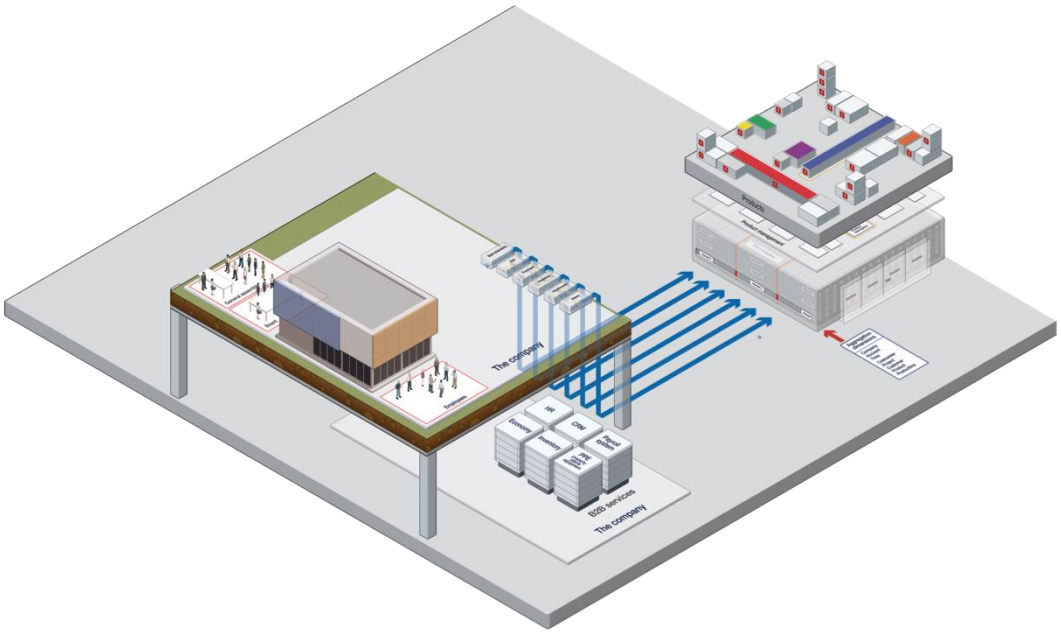


Figure 41 - Databank

The databank should be implemented in the ERP systems rather than be a separate extraction or governmental cloud. The databank will therefore be a distributed one.

An ERP vendor can provide cloud storage meeting necessary security requirements, for its SME customers.

The databank will have to provide APIs for extraction of data including aggregations like General Ledger (e.g. XBRL), detailed transaction data (e.g. SAF-T), and other products.

An important feature of the databank is ability to aggregate over various dimensions (not only account and time which is common for General Ledger Repositories). The databank needs to for instance aggregate over other dimensions, e.g. company, account, time, cost center, project, customer, product, line of product.

Some products will be shared with specific partners through legal basis, whereas others will be open data, high aggregation level e.g. annual account, and third parties through users consent.

The API of (standardized) products must be described in an API-catalog (see below). Each ERP vendor will provide an addressing component mapping the organizational number/CVR-number to the respective API.

4.6 Trust architecture

4.6.1 Access to base registries

Governmental agencies must provide the authoritative data (master data) needed from base registries for the ERP systems (data bank) to provide high quality data themselves. This includes the catalogs for finding, evaluating and using the authoritative data.

Though this is not part of Nordic Smart Government project itself it is a prerequisite for the success of the concept.

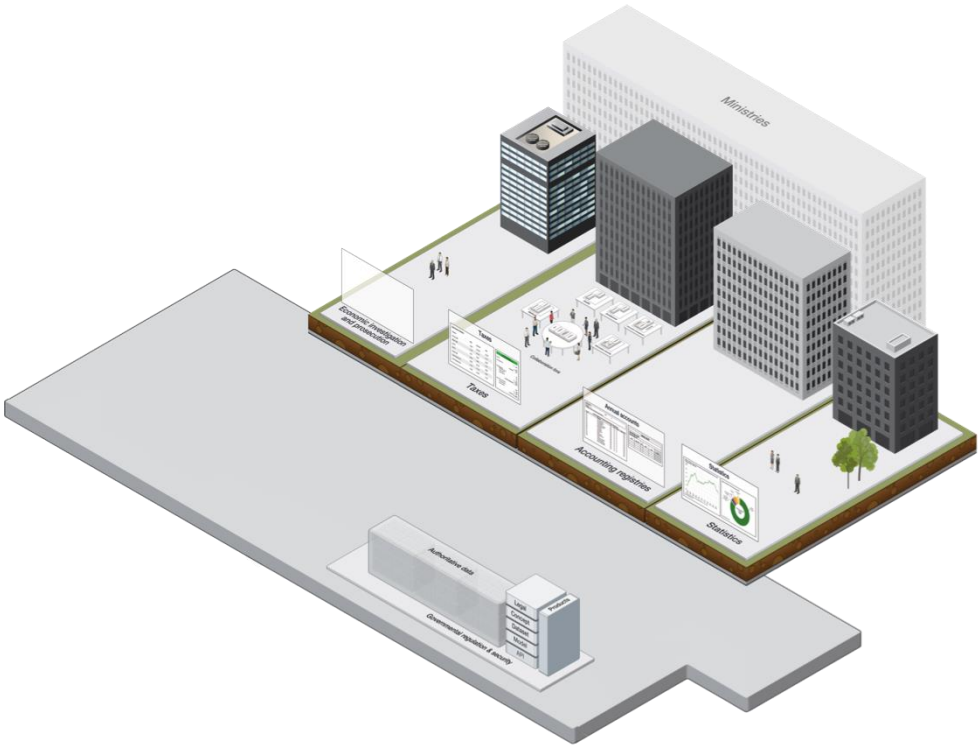


Figure 42 - Access to government base registries is a prerequisite for Smart Government

4.6.2 Users' consent

Access to financial data from government is generally being done through legal basis by accounting registries, tax administration, statistics and so forth. However, the business case of Smart Government is showing substantial effects in the business-to-business segment.

Sharing between private actors would require that the SME remain in control of the SME. A mechanism to ensure this is the implementation of a robust users' consent.

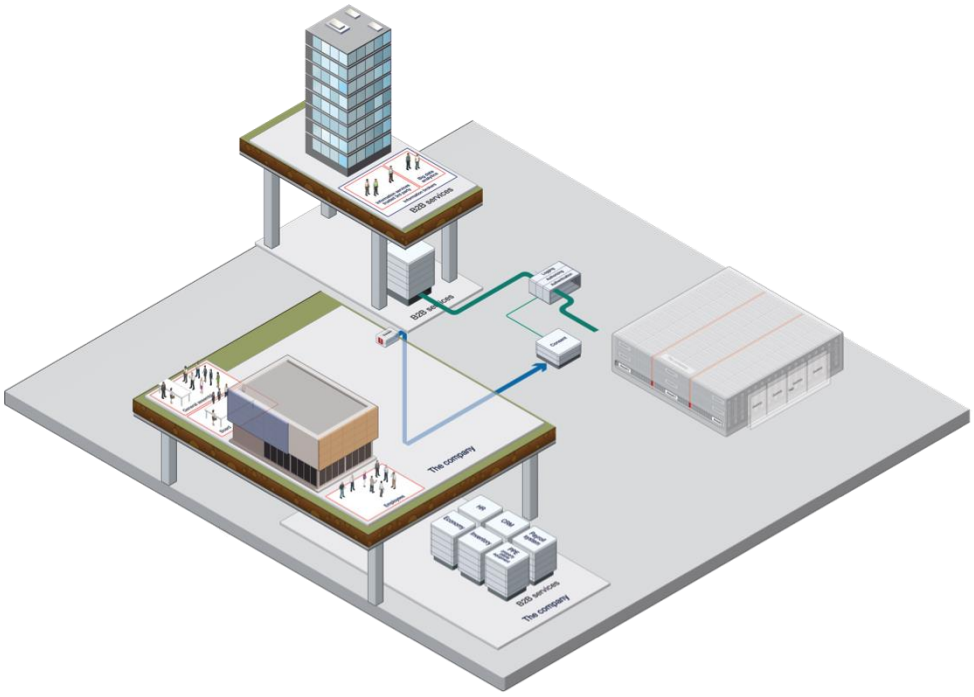
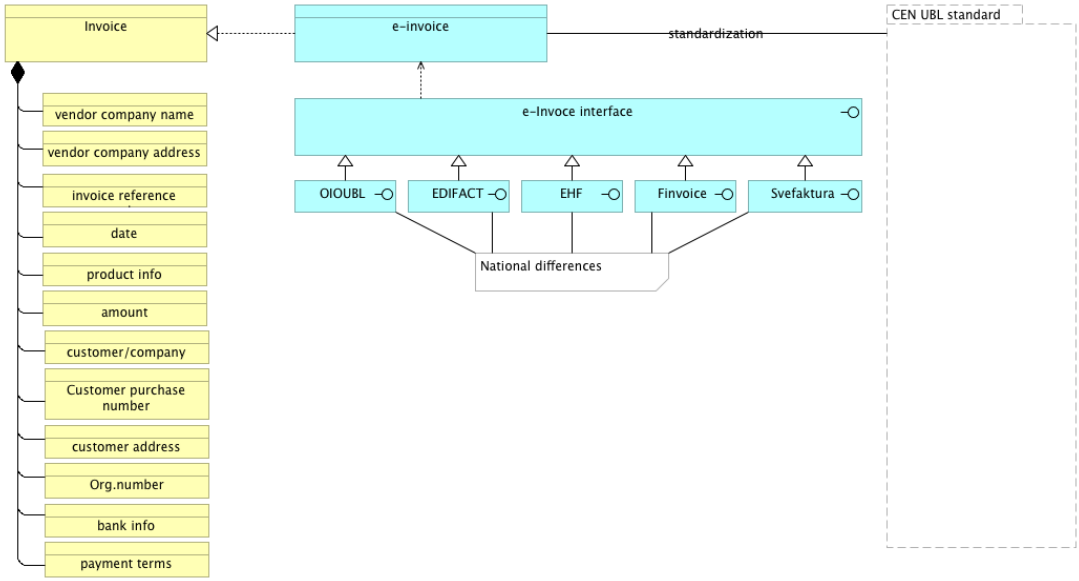


Figure 43 - User's consent in sharing data from the databank with third party (exemplified by B2B service provider)

4.7 Information architecture

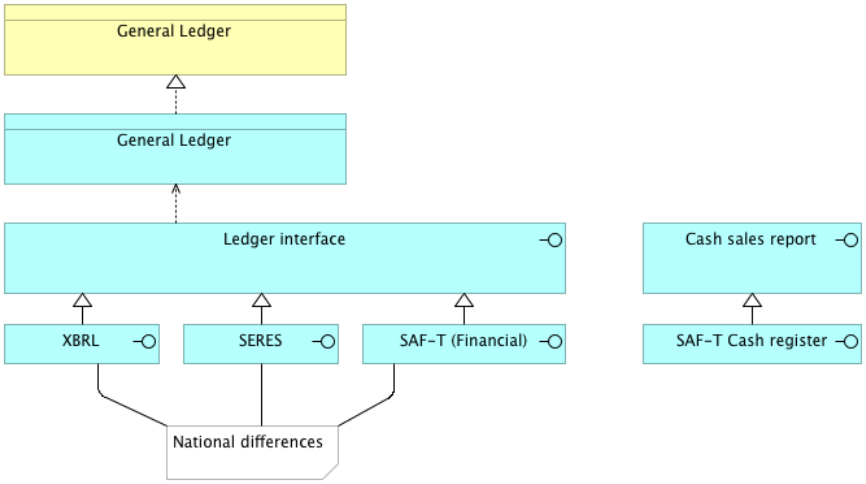
4.7.1 Transaction formats

4.7.1.1 Invoice



4.7.2 Reporting formats

4.7.2.1 General ledger



5 Recommendations for further architectural work

The following are some recommendations for further architectural work

- **Stakeholders believe the concept to be feasible**. All countries have a range of projects relating to Smart Government, and obstacles are generally non-technical.

- Of the technical aspects, pre-requisites are **alignment with on-going standardisation** especially with the e-procurement. National standards must be mapped to international standards especially e-procurement standards (e.g. UBL) and reporting standards (e.g. XBRL). Further work is also needed here e.g. to make sure the order lines are mapped to product catalogs.

- **Alignment with on-going national projects and building blocks and align with EU-interoperability framework and architecture (EIF and EIRA).** National administrations have on-going initiatives related to Smart Government, e.g. the Taltio project in Finland and SAF-T project in Tax administration in Norway. Furthermore each country has on-going work in their interoperability infrastructure where functions like authentication, authorisation, signing, access to base registries, and data and service catalogs must be used as building blocks in accordance with the EU interoperability framework

- **Privacy by design - principle (GDPR concept) must be extended to "Business Secrets by design" principle.** This implies that the business must be in full control of the sharing of their own detailed data to ensure trust. The building block to enable this feature is a register over reporting

requirement obligation (business to government) and a user consent component.

- Generally, the storage of data needs to be close to the business, hence it is believed that the **ERP-vendors store the transaction data**.

- The previous point implies that the **ERP-vendors must support a range of APIs** ranging from extracting detailed transaction data, extracting aggregated reports (e.g. financial report for the last 30 days), to statistics and analytics across companies and products. Pilot work with EPR-vendors are needed here to understand the possibilities and constraints.

- **Availability of transaction data will enable redesign reporting processes** (e.g. annual accounts registry may be considered obsolete), and radically improve other processes e.g. the classification of a particular business' sector or line of business (e.g. NACE classification). These to-be scenarios must be further explored.

- **Authoritative data from business registries and related registries must be made available** to the data store/ERP-vendor to ensure high-quality in the analysis and extractions.

- **The government(s) must take a role in certifying ERP-vendors** to enable vendors to be compliant with smart government.

- **The process for designing new products** - when, who and how - and who can use them, must be further explored.

- **All countries must explore their legal constraints and the need for amendments** to support the process of sharing the business transaction data in an automatic business reporting (and other use of the by-products of the transaction data).