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A Feasibility Study of the Data Transfer Automatization from PIM to GS1 Synkka

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Metropolia

When starting my journey to deepen my knowledge in the management area by enrolling to the Industrial Management programme as a mother of two small children and with a working slash studying better half, I told myself that if I pull this through, life will seem remarkably easier afterwards. And at this point of my studies, returning my finalised thesis, I can say the year was even more arduous than I expected. But now it's time to relax a bit and spend more time with my family. I want to thank first of all my mother, who helped us when spending evenings with the studies, and my husband Toni, for looking after our kids when I retreated to write my thesis for days stretching too long.

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The objective of this study was to provide a feasible solution proposal for automating the data transfer between the case company's PIM system and GS1 Synkka since there currently is no solution for this, but the market potential has been recognized.

The study was conducted by using design research focusing mainly on qualitative research. The study is based on the documentation of the systems at hand and on interviews of system specialists, marketing and customer managers as well as customer workshop and questionnaire. The study was conducted by creating a conceptual framework for the feasibility study and utilizing it in the data collection.

The outcome of the study was a solution proposal of the data transfer automization. It presented the most feasible solution of the alternatives with details of the technical execution and pricing strategy.

The outcome of the thesis will be utilized in the sales cases and the solution is planned to be put into production. It will provide a framework for planning the solution's technical execution and product data model which follows the GDSN standards. This indicates the importance of the different systems' flawless communications when it comes to the company's product data management and a rising importance of global standards.

Keywords	PIM, Synkka, GDSN, integration, feasibility

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Acronyms

API	An application programming interface
BC	Benefit and cost ratio
BSF	Balanced Scorecard Framework
GDSN	Global Data Synchronisation Network
GLN	Information Provider Global Location Number
GTIN	Global Trade Item Number
JSON	JavaScript Object Notation
PIM	Product information management system
REST	Representational state transfer
RND	Product development team
SaaS	Software as a Service
SSCC	Serial Shipping Container Code
ST	Sales Tool
UI	(Web) user interface
XML	Extensible Markup Language
XSD	XML Schema Definition

1 Introduction

Companies are moving towards cloud-based solutions systems that enable accessing resources via web browser. Cloud computing provides three types of services to clients, namely: Software as a Service (SaaS), which is an application provided as a service instead of hardware or software application, Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). (Sarfraz et al. 2011, p286).

The case company offers a Product information management (PIM) system, which is a SaaS service, alongside it a sales tool plugin (ST) which can be implemented to produce a variety of sales materials and Excels with product information for the company using it. Product information management is essential for the daily business of many product selling companies. In order to efficiently provide product information to their customers, companies need a centralized system to store, enrich and distribute this data, and this is what PIM is designed for.

GS1 Synkka (also a SaaS service) is a globally working data bank service provider in Finland, belonging to GS1 network. It enables retailers to access standardized product information, and manufacturers and distributors to share their product data according to global standards. GS1 Synkka product data pool is based on GDSN-standard (Global Data Synchronization Network) which means that Synkka can be used in synchronizing data between different market areas together with other data pools working within the GS1 network.

These different systems need to be integrated so that they communicate flawlessly. This helps companies in performing their daily business without needing to manually ensure that all systems are on the same stage with consistent and up-to-date product data.

1.1 Business Context

The case company is a Finnish software company whose core product is product information management (PIM) software that it provides to its customers. The case company operates currently in Finland, but it has plans for the future to target also elsewhere in Europe.

The case company's customers use Synkka to provide their products for retailers who use Synkka as a source for product data in their daily business.

1.2 Business Challenge, Objective and Outcome

The case company's customers use both PIM and Synkka. The ideal situation would be that a company who is using PIM, does not need to maintain product data elsewhere. This requires integrating PIM system to other services.

Automatic data transfer from PIM to Synkka is currently not possible. Therefore, the objective and outcome of this study is a solution proposal for a feasible solution to integrate these systems so that the automized data transfer between PIM and GS1 Synkka would be possible.

1.3 Thesis Outline

This study was conducted to propose a solution to integrate PIM and Synkka in a feasible way. Section one introduces the topic and both systems shortly. Section two describes the applied research plan. Section three is the conceptual framework which is built by searching for best practices in conducting a feasibility study in the relevant field. This is used to build a feasibility tool to help evaluating the best option in hand. Section four covers detailed analysis of both systems and the relevant data is collected through workshops and interviews of specialists, interface documentations and by studying both systems. Section five covers the comparison of different options by implementing the feasibility measurement tool, which was conducted in section two, and the initial proposal of the solution. Section six consists of feedback received from business lead and product development (RND) departments and possible improvements. Based on improvement suggestions, the final proposal is summarized. Finally, in section seven, future plans for implementing the solution is discussed.

2 Method and Material

This section describes the research approach, data collection and data analysis used in this thesis. In the first section the selected research strategy is described. Next the research design method is set out and thirdly the methods used in collecting and analysing data are shown. In the last part of this section the Quality Plan of this Thesis is reviewed.

2.1 Research Approach

The selected research strategy for this Thesis is Applied research, which consists of methodologies such as case study or action research. This study aims to produce a practical solution for the case company by combining development and research, and thus the selected approach for this study is a Design research. Design research is a combination of development and research, where the process goes through iterative cycles of design and implementation. (Edelson, 2002, p. 106). This thesis could be classified as an Action research, but since the research process should be iterated several times, it is not reasonable due to the nature of the thesis. Also, in the action research, researcher is part of the implementation process as an active actor (Kananen, 2013) which in the scope of this thesis will not happen, as the selection of technologies and the execution of the proposed solution is left to the RND department of the case company.

Methodologies used in the design research come from the qualitive and quantitative research approaches (Kananen, 2013). This thesis is focused mainly on qualitative research as it aims to provide a solution proposal based on interviews with customers, systems' documentations and solution executers' and specialists' interviews. When selecting the best possible solution in the scope of economic feasibility, potential market estimations are utilized alongside with cost calculations.

Table 1: Classification of different research approaches and methods (Kananen, 2013)

Factor	Research Approaches		Researches with Multiple Approaches Researches with Multiple Strategies		
	Qualitative Research	**Quantitative Research**	**Case Research**	**Design Research**	**Action Research**
Relationship between Theory and Practise	Introduction of from practise to theory	Deduction or from theory to practice	Abduction	Abduction	Abduction or interaction between theory and practice
Purpose of Research	Understanding	Generalisation Prediction	Understanding	Change	Intervention Change
Researcher's role	External participant	External observer	External participant	External participant	Active actor
Research Questions	Open questions Theme interview	Structured questions	Mainly open questions	Mainly open questions	Mainly open questions
Responses	Text descriptive	Number quantitative	Open	Open	Open

The scope of the thesis fits to the definition of Design research, as it deals with assessing the feasibility of a unique solution in the case company. It aims to change the usage of the company's product as well as customers ways of working by introducing a new feature. Also, the implementation of the selected solution is left to the product development team in the organization, and the iterations rounds will be out of the scope of the thesis due to time limitations.

2.2 Research Design

The research design of this thesis consists of five parts. The research design is illustrated in Figure 1.

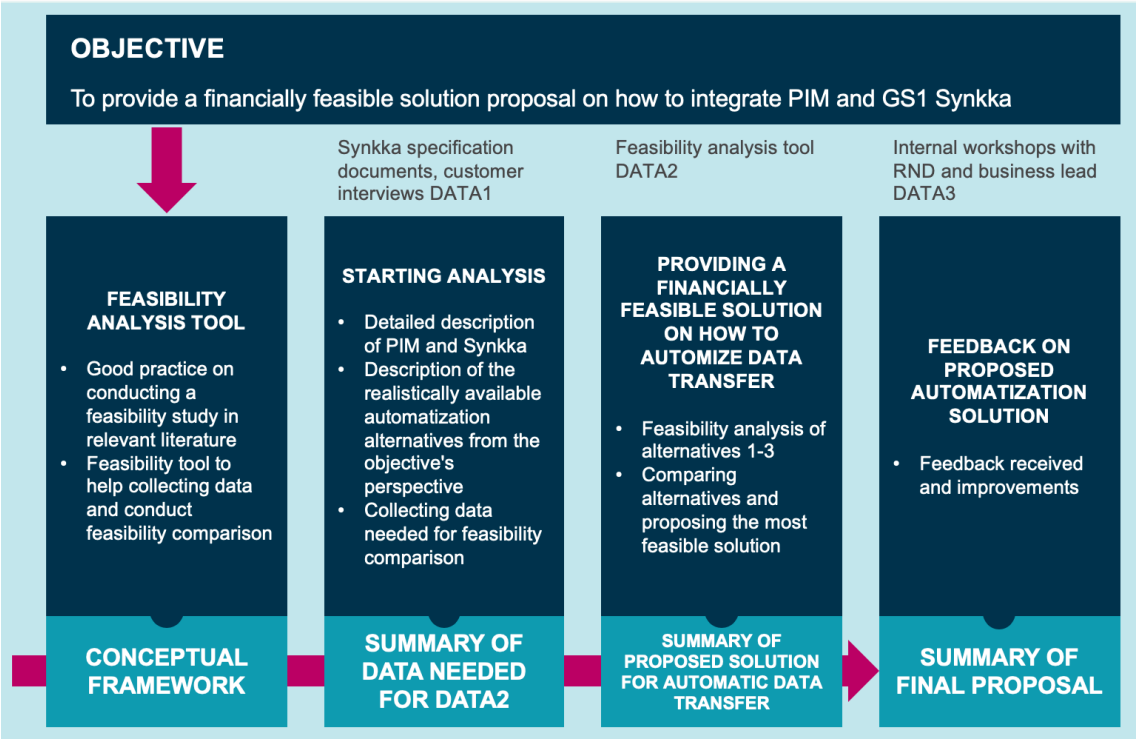


Figure 1: Research design of the study

The first step of the research design was to determine the object of the study. Next the conceptual framework was planned, and a feasibility analysis tool was created based on relevant literature. This tool is used in the fourth step to analyse proposed solution options. The third step is starting analysis, which consists of a description of both systems and collecting the data needed for the feasibility study. It presents three different solution outcome models. The fourth step consists of analysing the feasibility solutions and providing solution proposal for the data transfer. The fifth part consists of the summary of the final proposal based on the feedback received from the previous part.

2.3 Data Collection and Analysis

This thesis draws data from various types of sources. These include documentations of both systems in hand, interviews and workshops with product development (RND) department, project managers, sales and marketing, CEO, business lead and system specialists as well as workshops and questionnaires with customers who are currently using both systems or might be potential new customers needing them both. Also, a webinar arranged by GS1 Finland was used as a source in the thesis. Overview of the data collection can be seen in Table 2 below. Interviews and workshops were held in

the company premises and due to the pandemic caused by SARS-CoV-2 virus, some of the planned meetings were held via Microsoft TEAMS application. Questionnaires were made with Microsoft Forms via email.

Table 2: Data collection plan

	CONTENT	SOURCE	INFORMANT	TIMING	OUTCOME
DATA 1 Starting analysis	- Detailed description of PIM and SYNKKA - Basic description of the realistically available automatization alternatives from the objective's perspective - Collecting data needed for feasibility comparison	- Synkka specification documents - Project manager interview analysis - Customer interview result analysis - Customer questionnaire result analysis - PIM documentation - RND workshop result analysis - Marketing analysis - Company strategy documents	- Synkka integration specialist - Project managers - Pilot customer - (Potential) customers - RND - Marketing manager - CEO	February - March	- Summary of data needed for G5
DATA 2 Providing a feasible solution on how to automatize data transfer	- Feasibility analysis of alternative 1 - Feasibility analysis of alternative 2 - Feasibility analysis of alternative 3 - Comparing alternatives and proposing the most feasible solution	- Feasibility analysis tool	- Marketing manager - Business lead	March-April	- Summary of proposed solution for automatic data transfer
DATA 3 Feedback on proposed automatization solution	- Feedback received and improvements	- Internal workshops	- Business lead - RND	April-May	- Summary of final proposal

Data 1 was collected by examining documentations of both systems. Test user was created for Synkka, and test data was created to provide reliable data for planning the integration. Project managers were interviewed to gain knowledge of customer needs, and a pilot customer was interviewed in order to gain knowledge of customer needs

and current ways of working with Synkka. Other current and potential customers received a questionnaire about their Synkka usage. The RND department CTO was interviewed in the essential questions related to the technical part of the integration execution and PIM interface. The Synkka technical specialist was interviewed together with RND CTO and the project status was followed in meetings and via status updates. The marketing manager and CEO were interviewed to gain insight of the potential markets and project costs. The purpose of this data collection was to define how the two systems could be integrated in a feasible way.

The Data 2 was mostly collected by examining potential solutions with the help of the feasibility analysis tool built in the step one. Marketing department and Business lead were interviewed in order to get current financial data as well as reliable information of the competitors and potential market value and areas.

Data 3 consists of feedback regarding the solution proposal from RND and Business lead with internal workshops. The data collection is presented in more detail in Table 3.

Table 3: Data collection methods

	Data type	Source / Participants	Topic	Date
Data 1				
1	Interview	CTO (RND)	Technical requirements and potential pitfalls	2.3.2020
2	Interview	Project manager	Customer use cases	24.2.2020
3	Interview	Pilot customer	Customer needs survey and current Synkka usage	13.3.2020
4	Questionnaire	Customers	Customer needs and current Synkka usage	Spring 2020
5	Webinar	GS1 Finland webinar	Synkka interface changes in the May 2020 update	26.3.2020
6	Interview and emails	GS1 Synkka specialist	Technical specifications	14.4.2020 (interview date)
Data 2				
7	Interview/workshop	Marketing manager, CEO	Potential market areas, financial analysis	10.3.2020
8	Interview	Business lead	Proposal validation	4.5.2020
Data 3				
9	Interview	Business lead, RND		

The documents for Data 1 consisted mainly of technical documentations of the Synkka interface, and these were used to give structure for internal workshops with RND and in order to gain a better understanding of the possibilities to execute the data transfer from PIM to Synkka. These documents are listed in the following Table 4.

Table 4: Internal documents used in the starting analysis

	Name of the document	Description	Number of pages
A	GS1 attribute information	All Synkka data fields identified by the id number and the Finnish and GDSN standard name.	137
B	GS1 Finland Synkka Data Pool FTPS Connectivity Guide	Specifies the connectivity details of FTPS-specific communication of GS1 Finland system.	11
C	Synkka Data Pool Operations Manual_v04	Specifies and describes the basic functionalities of Synkka data pool.	54
D	BMS GDSN Catalogue Item Sync 25Aug2015	The details design of the catalogue Item synchronization business transaction (schemas) needed to meet the requirements of the referenced Business Requirements Document BRAD(s).	248 + XSD modules
E	GDSN Media Solution Api Documentation	Media items Synkka API description	40
F	GDSN Operations Manual	Using the GS1 Standards in the Global Data Synchronisation Network (GDSN)	52
G	Item information profile	Synkka Finnish product information profile (attributes, codes, validation rules)	Excel spreadsheet
H	GS1 Vocabulary Standard	GS1 specification defining GS1 vocabulary	82
I	Case company strategy for 2020	Strategy and goals for 2020	PPT 17 slides
J	Case company marketing materials	Marketing strategy and PIM description	Various PPT sources
K	BMS GDSN Trade Item Modules Sept2019	GDSN message standards	407
L	Naming products in Synkka data pool	Naming rules for base units and packages	10
M	GDSN validation rules	International GSDN validation rules	Excel spreadsheet

3 Good Practice on Conducting a Feasibility Study in Relevant Literature

This section consists of a literature review looking into best practises for conducting a feasibility study. In the first subsection the general theory of the feasibility studies is covered. In the second subsection, the conceptual framework is constructed and implementing a feasibility study in the product development project is discussed. In the third part, all the relevant data is used to design a feasibility tool which was utilized in step 2 of the data plan.

3.1 A Feasibility Study

A feasibility study is a research which is done before the main study to estimate the important parameters needed when designing the solution (Arain et al. 2010). A feasibility study is conducted at the early stage of project in order to get sufficient information of the solution and whether it can be feasibly implemented before allocating resources to the project (Overton, 2007). The feasibility analysis also includes consideration of alternative solutions (Nicholas et al. 2008).

The primary objective in feasibility study according to Overton (2007) is to assess three types of feasibility as follows:

1. Technical feasibility (TFS)
2. Economic feasibility (EFS)
3. Operational feasibility

Many studies use the acronym TELOS, which refers to the five areas of feasibility, adding two aspects to above: Legal feasibility and Scheduling feasibility (Bause, 2014).

According to Bause (2014), the best-known field of feasibility studies is the economic one (EFS), which is used to assess if the product developed would be viable and profitable for the company, e.g. benefits outweigh the costs while taking note of company resources and know-how. There are several ways to measure economic feasibility, for example cost-benefit analysis, Expected Monetary Value (EMV), decision tree analysis, and sensitivity analysis (Dobson, 2011).

A technical feasibility study (TFS) has been used in various ways and does not have as standardized methods for measuring as an economical one, and descriptions of it seem to vary depending on the context. In many sources it is inspected as a part of the whole feasibility study process. For example, Overton (2007) says that technical feasibility is a part of a feasibility study with an economic one answering to a question whether the solution can be achieved with an existing technology. Majura (2019) states that technical feasibility is something that should be assessed after a market analysis is ready, and the technical feasibility study's main goal is to assess resource and technology availability throughout the project lifespan. Whitten (et al, 2007) describes technical feasibility as a measurement of the practicality of the technical solution and assessment whether there are technical resources and expertise to execute it. One way to look at technical feasibility, is to evaluate it from the perspective of a product's design process. (Bause, 2014).

Operational feasibility studies are for determining whether the solution would work in the organization if implemented. They assess if the company has enough resources for the project and if the end product has use in the company after implementation. According to Gorbitt et al. (1991), implementing a technology has three stages: installation, activation and institutionalization, where the activation stands for getting users to use the system, and institutionalization means creating the new status quo. To assess operational feasibility, these should be noted when a project is in the planning stage instead of in the implementation phase.

Legal feasibility deals with issues like warranties, patents, copyrights and licence issues which should be considered when planning the project to ensure that it is legally doable (Overton, 2007). Schedule feasibility assesses whether the project can be completed within a given deadline. It is a realistic timeframe for the project and high schedule feasibility tells that project has a high probability to be on time (Šerman et al. 2017).

After the feasibility study is conducted, management can decide which, if any, of the proposed solutions is executable.

3.2 Key Feasibility Drivers

The conceptual framework of this thesis is built from relevant literature concerning feasibility studies, customer values, intangible assets and market analysis. According to

Bause (2014), in the context of product development process, both economic and technical feasibility should be assessed. As the project is hosted internally within the executing company, it has a purpose as an improvement of the product offered by the case company. This enables a better perceived efficiency from the customer perspective, which justifies the importance of technical feasibility (Phillips, 2013). In the scope of this thesis, legal, operational and scheduling feasibility were considered to be irrelevant due to the nature of the project and the schedule limitations.

According to Steyn et al. (2008), customer needs in a feasibility analysis process is a logical place to start the process. Problems arise from needs and the solution is to satisfy these needs. To analyse these needs, a research should to be conducted to gather the relevant information. (Steyn et al. 2008).

Intangible benefits cannot be calculated in euros and they are harder to measure. Intangible assets come for example from a company's investments to develop new or existing technologies, knowledge assets, brands, networks and company reputation. Intangible assets have become increasingly important alongside with tangible assets such as equipment or property. (Sandner, 2009).

Based on the findings, the following key feasibility drivers were considered to be important in the project scope:

- Customer needs
- Intangible assets
- Technical feasibility
- Economic feasibility

These are described in more detail in the following chapters.

3.2.1 Analysing Customer Needs

Each customer interaction should be positive in the customer perspective, and to meet or even exceed their needs (Smith, 2003). According to Frame (2003), projects arise from human needs. After the need is recognized, the management can decide whether it is worth fulfilling, which makes needs a driving force behind projects. These needs

have to be clearly articulated in order to achieve the description of the project's functional requirements. After the functional requirements are stated, they can be used to determine project's technical requirements. (Frame, 2003).

Figure 2: Project requirements arise from customer needs (Frame, 2003)

In order for these requirements to work, needs must be clearly stated, or the resulting project will not address the true need. According to Smith (2003), customer needs should be driven by what customers are saying, this requires skills to listen and ask the right questions, as well as analysing the results. Frame (2003) suggests a five-step approach to effectively articulate these needs:

- Step 1: Ask those who have the need to define it as clearly as possible.
- Step 2: Ask a full set of questions about the need.
- Step 3: Carry out whatever research is necessary to enable you to understand the need better.
- Step 4: Formulate the need as best you can in view of insights gained in the first three steps.
- Step 5: Ask the customers to respond to your formulation of the need and revise your formulation accordingly.

It is important not to use the customer's view of the need as an actual metrics of the value, as they might not necessarily have the technical competence, or they are too close to the problem itself. To get the understanding of the need, a set of questions is created. These questions can be e.g. to estimate the real need of the problem solving and estimating whether the problem is solvable by the service provider. When the need has been clearly stated, it has to be articulated in order to formulate the functional requirements. In step five, the formulated need is revised with a customer to avoid a common pitfall of having created a need which is not according to a real customer need, leading to an end product underused or not used at all by the customer. (Frame, 2003).

According to Smith (2003), customer bases their decision of purchase on a wide range of needs, but their expectations is what should be met. The level of meeting these expectations defines the rest of the customer relationship. In Figure 3 below, Smith illustrates the causality of customers' expectations and actual experience gained from the product or service received.

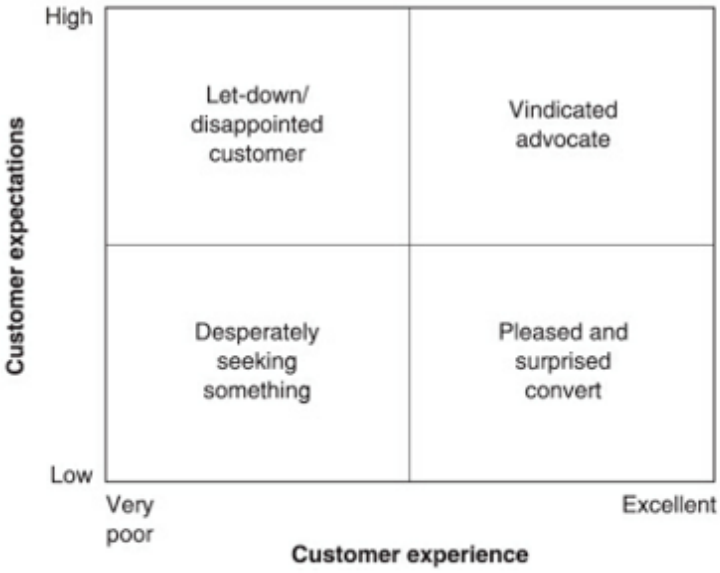


Figure 3: The effects of experience against expectation (Smith, 2003).

Smith (2003) continues that "gaps pointed out by customers are often the ones that are most important. If you do not address their concerns someone else will". By analysing customer needs, company can come up with new ideas for improvements for existing products or services. Customers are usually the richest source of new ideas, improvements and new applications of existing products or services (Smith, 2003).

3.2.2 Measuring Intangible Assets

In order to leverage intangible assets to create value, the organization needs to take note on that intangible assets do not have direct effect on the financial profits since investing to an intangible asset does not hold market value. The effect comes from the cause-and-effect relationships for example by increasing a quality of a process and thus leading to increasing customer satisfaction. With customer satisfaction, an increased customer loyalty can be expected, and this leads to improved sales and long-term customer relationships. (Kaplan, 2003).

Kaplan (2003) categorizes intangible assets as follows (see Figure 4):

- Human capital (e.g. employee skills and knowledge)
- Information capital (e.g. information systems, networks)
- Organization capital (e.g. culture, leadership, knowledge management)

Intangible assets are linked to a customer value creation process. Kaplan (2003) states that "customer value proposition provides the context for intangible assets to create value". For example, if the customer values saving time, then creating systems and processes which produce time savings to a customer are valuable to the company. Both financial and customer perspectives should be used when planning the outcome. To achieve the desired outcome, a company's internal process perspective has some critical processes with a great impact on the company strategy (Kaplan, 2003). For example, R&D investments to re-engineer a company's product development process or choosing to develop new products in joint-venture partnerships. In Figure 4, Kaplans' Balanced Scorecard Framework is used to illustrate company's intangible assets.

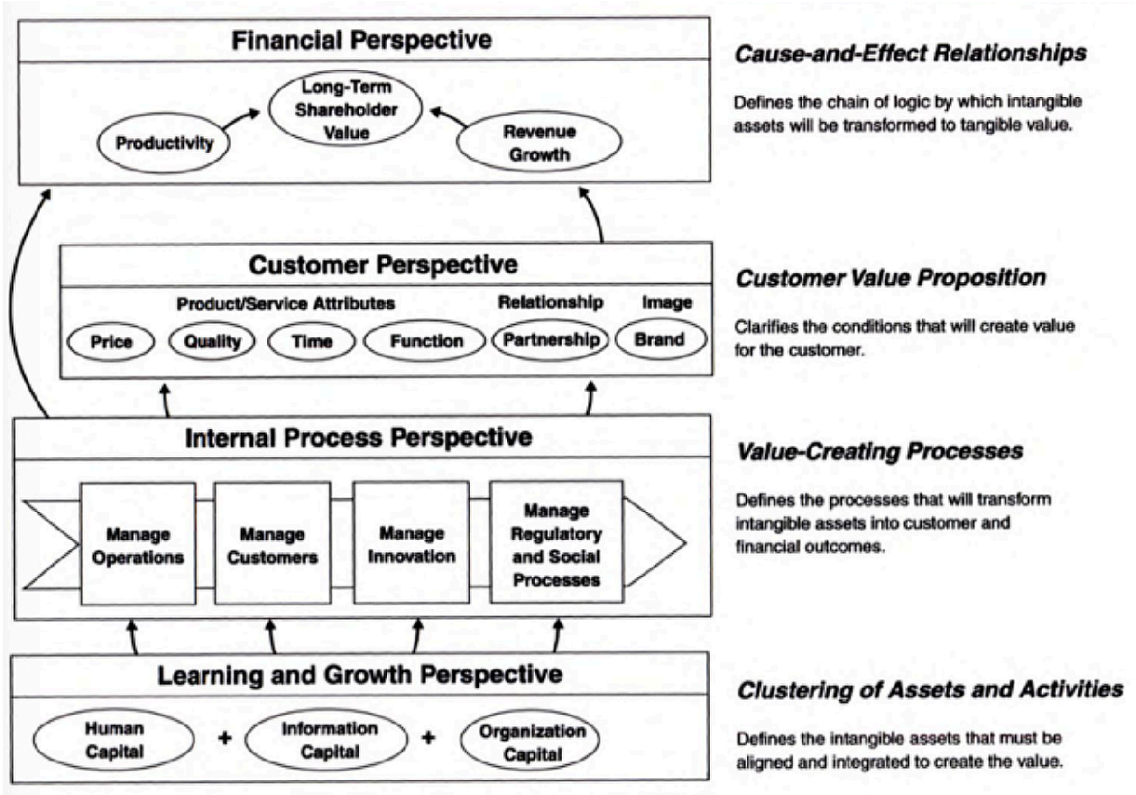


Figure 4: The Balanced Scorecard Framework (Kaplan, 2003 p.31)

As seen in Figure 4, the Balanced Scorecard Framework (BSF) links four perspectives in the cause-effect relationships. It can be used to analyse project steps; its goals, measures, target and initiatives in the purpose to reflect the company's strategic goals to the design process (Cobbold et al. 2002). BSF links company's strategic objectives to its key objectives (financial). Strategy map is read from top to bottom where the top (financial) is considered to be the most important. Financial perspective is describing the tangible outcomes of the process (e.g. making more profitable business or increasing productivity). Customer perspective handles conditions that will create value for the targeted customer. Internal processes describe which processes are expected to have the biggest impact on the company strategy. Intangible assets are the foundation of a strategy by supporting the internal processes. Financial perspectives can be achieved only if customer values are met. (Kaplan, 2003).

According to Sharpe (1997), intangible benefits can be used to supplement the cost/benefit analysis even if they are difficult to quantify. These benefits can be for example improved productivity or customer satisfaction. Transforming the potential value of an intangible asset to tangible requires internal processes, for example design, production, or customer service. Intangible assets cannot be measured by how much investments they require. Instead they should be aligned with the company strategy to create value for the company. (Kaplan, 2003).

3.2.3 Evaluating Technical Feasibility

Bause (2014) summarizes the execution of the technical feasibility study in following three points:

1. Evaluation of the technical task, whether it is solvable and the solution viable under given objective and boundary conditions
2. Is to be conducted at the early phase of product development
3. Is to be conducted before economic feasibility study

In Figure 5, the system development cycle is described showing the feasibility analysis in the conception phase.

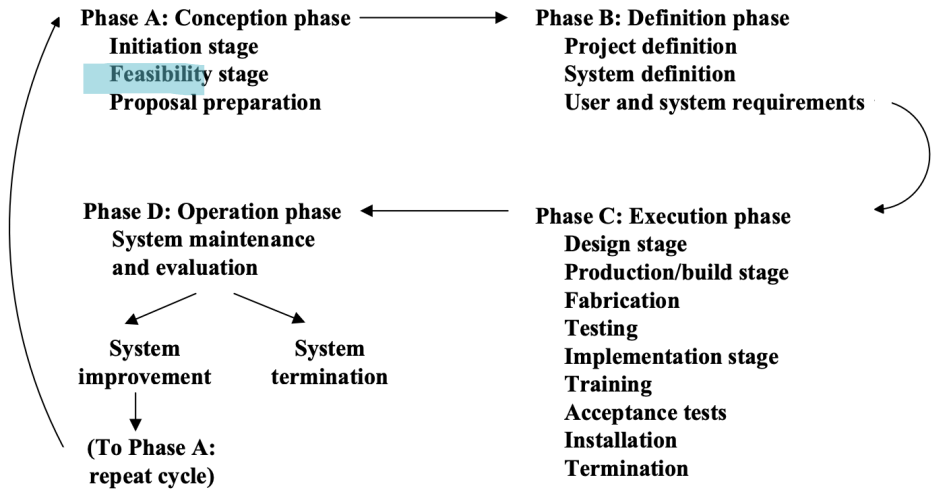


Figure 5: Stages of the system development cycle (Nicholas et al. 2012)

In this thesis, the measuring method of technical feasibility is an evaluation of the product's design process. According to Bause (2014), this is executed by analysing each task of the process with the help of product development activities, followed by an examination of its technical feasibility, as well as system and system environment analysis. These lead to the definition of the requirements and boundary conditions. Similar to EFS, a project objective must be clear.

When evaluating each step of the development process, a system flowchart should be generated showing all the operations carried out by it. It also works as a roadmap for the programmer to understand the logic of the program. (Akidesavan, 2014).

3.2.4 Evaluating Economic Feasibility

Whereas the final funding decision requires a detailed economic evaluation, in the early phase of the project a cost estimation should be executed in the context of the feasibility study. This less detailed evaluation can provide enough information to determine whether to proceed with the project. (Chen, 1998). When evaluating project feasibility from the market perspective, market demand for the new product needs to be evaluated alongside with the competition in the market (Brockman, 2008). This helps estimating the potential financial benefits of the project.

3.2.4.1 Market Analysis

In order to analyse market demand for the new product, it is essential to understand the current market by determining other competitors offering similar products or services in the same market area (Brockman, 2008). According to Majura (2019) A market research should look for answers to the following questions:

1. Customers: Who will be the customer – business, location, product requirements, needs etc.
2. Competitors: Who are the competitors – location, market share, their SWOT, competitive advantages, pricing etc.
3. Market: What is the size of the market – domestic/foreign markets, market segments etc.

Finding answers to these questions can be executed in-house by collecting qualitative and quantitative data. Smith (2002, p 104) states that “Research should be relevant, usable, reliable and cost effective. Research has to inform but if it informs without meeting the first three principles its value will be questionable”. Qualitative data can be collected e.g. by interviews and quantitative data with surveys (questionnaires) and observations. Observations can come from talks with a current or potential customer, industry experts or even competitor employees. Questionnaires are used to create graphical reports. Essential steps for market research are (Majura, 2019):

1. Establish research objectives: determining the need for the product in the market by learning who the customers are and what are competitors’ strategies
2. Identify the secondary data sources for information
3. Collect the secondary data that is relevant to research question
4. Analyse data, if it is missing information, collect data through primary research
5. Select a primary research method, e.g. questionnaire
6. Identify the available sampling frame
7. Determine the method of sampling and the sample size you will use

8. Collect the primary data

9. Process the data and make conclusions

Primary and secondary data types and sources are summarized in Figure 6 below (Smith, 2003).

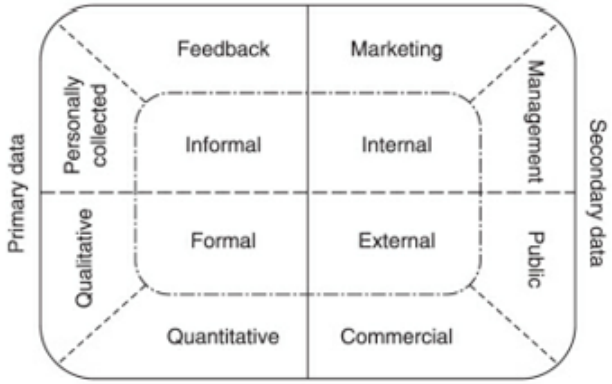


Figure 6: Data types and sources (Smith, 2003)

Primary data sources can be both, formal and informal. Secondary data can come from various source, Smith (2003) divides secondary data sources to internal (e.g. marketing materials) and external which can be from various sources, for example from web. Primary data can be formal (qualitative and quantitative research) and informal (customer and co-worker's conversations, informal feedback sources). (Smith, 2003).

The conclusions can be drawn out to a SWOT analysis. The SWOT analysis evaluates projects' business strengths and weaknesses (internal issues), and market opportunities and potential threats (external issues). The purpose of a SWOT is to identify the key issues that could have positive or negative effect on the success of the project, and thus it can be used to assign actions to either take advantage of these issues or overcome them and thus used as a basis for the marketing strategy. (Majura, 2019).

Majura (2019) introduces six steps for formulating the marketing strategy:

1. Specify the broader market strategy to be opted

2. Create segmentation

3. Target valuable segments

4. Add product differentiation to create unique value to customers

5. Position the product (and the new business) to customers

6. Customize the marketing mix to each target segment

Market segmentation and a broad strategy come from company's market research after customer needs are analysed. Market positions are categorised as follows: leader, challenger, follower and market niche. After company's targeted market position has been decided on, this is utilized to determine the segments company is targeting to. Segmentation is created based on the customer groups analysed in the market research. These segments are evaluated based on for example market potential (using market survey to assess expected sales on the segment for example based on the number of prospective customers in this segment), accessibility and competition. (Majura, 2019).

Product differentiation aims to create unique products or services to differentiate from competitors. Again, the market research should be used to analyze what are the most important differentiative factors for the product or service customers are looking for. Positioning the product or service aims to convince customer that their expectations are best met with company's offering by adding a unique appeal on the product. When positioning a product, a final step should be a deliverable positioning statement which is used when communicating with customers. Each market segment company is targeting should be noted in the marketing strategy. It aims to customize the marketing for the specific segment to gain competitive advantage. This can be for example different pricing strategy or product differentiation per market. (Majura, 2019).

When setting up a marketing strategy for a product, a pricing must be decided. For this it is crucial to have the production costs to calculate the price. A break-even point can be used for example when the product is not a physical one, but for example a SaaS type of a product with e.g. monthly license fee. It requires analysing competitor prices and what customers are ready to pay for the product (Majura, 2019).

3.2.4.2 Cost Benefit Analysis

An economic feasibility study often uses cost/benefit analysis to determine whether the project at hand is feasible. Brockman (2008) states that financial feasibility (project costs and financing) should include best and worst-case scenarios. According to Brockman (2008), economic feasibility is investigated after it is determined that the project is market and technically feasible. Huppert (1998) states that a benefit and cost ratio (BC) calculation allows comparing multiple projects. In the sense of financial feasibility, a project with highest BC is the best alternative. Primary components to measure cost benefit are identification of initial project costs, analysis of initial project costs, identification of total project costs over 5-year, and analysis of life-cycle costs. (Huppert, 1998).

When evaluating the technical feasibility of a software development, measuring the efforts required by programming need to be taken into account. Akidesavan (2014) describes a following methods to estimate these:

1. Based on experience: estimation is done based on past experience
2. Based on program variables methodology
3. Based on function-point methodology: functional decomposition of a program
4. Based on IBASP project time estimation: programming efforts are counted as A hours

Investing in a project requires capital funds and other resources and it is aiming at gaining benefits in the future, in the form of cost savings, profits or social benefits. These future benefits should exceed the investment costs, and this is where economic feasibility evaluation takes place. It deals with measurable, quantified terms and should provide results which help in the decision of the investments cost-effectiveness. (Chen, 1998).

3.2.4.3 Calculating Project's Economic Feasibility

The following cost benefit analysis calculations form was created based on the chapters 3.2.4.1 and 3.2.4.2 and of the workshop with the case company CEO (Data 7). Different scenarios are created by varying the number of new customers per year in the "An estimation of the cost benefit years 1 to 5" table.

Development costs

Investment	Work (h)	Base price	*	Total
Solution Design			*	- €
Programming			*	- €
Product/Project management			*	- €
Productization			*	- €
Total development costs				Xxx €

Operational costs (annual)

Investment	Work (h)	Base price	*	Total
Product/Project management				- €
Programming				- €
Total annual operational costs				Xxx €

Pricing (estimated profit per customer)

	Base price	*	Total
Implementing (one-time fee)			- €
Monthly SaaS fee		12	- €
Total yearly profit			Xxx €

An estimation of the cost benefit years 1 to 5 (profit is based on the estimation of the number of new customers)

Years	1	2	3	4	5
Development costs					
Operational costs					
Benefits (profit)					
Benefit / cost ratio					

3.2.5 Creating a Feasibility Analysis Tool

Based on the conclusions in the chapter 3.2.4, analysing customer needs to gain knowledge of potential customer value, defining intangible assets, alongside with project's economic and technical feasibility, were considered to be the most important aspects in the analysis. Due to the nature of product development process, selected tool for measuring was Feasibility analysis matrix shown in Table 5 below. The cells should

contain feasibility assessment notes for the specific key driver for each of the candidates and they are assigned with a rank or score based on how well they meet the specified criteria. (Whitten et al. 2007).

Table 5: Feasibility analysis matrix (Whitten et al. 2007)

	Weighting %	Solution 1	Solution 2	No feasible solution
Customer value/needs	x%	Score 0-100	Score 0-100	Score 0-100
Intangible assets	x%	Score 0-100	Score 0-100	Score 0-100
Technical feasibility - **Measuring whether the solution is technically executable** - **Determines if solution can be executed at all (yes/no)**	x%	Score 0-100	Score 0-100	Score 0-100
Economic feasibility - **Measuring whether the solution is financially profitable (5-year lifecycle)**	x%	Score 0-100	Score 0-100	Score 0-100
Weighted score / ranking	100%			

As depicted in Table 5, on the last row is a final ranking or score. Some of the feasibility criteria are more important and their importance can be weighted to quantify analysis. This enables selecting essential key drivers for measuring the feasibility and adjusting their weighting according to importance considered. However, if a solution is not feasible based on any key feasibility driver, it should be eliminated.

3.3 Conceptual Framework

The conceptual framework is based on the customer needs, intangible assets and technical and economic feasibility. The first step of the framework analyses customer needs so that the project target can be clearly stated. In the next step, intangible assets are analysed to create a knowledge of the projects' possible benefits which can't be easily quantified. The third part of the framework is a technical feasibility analysis, which focuses on analysing the feasibility of product's design process by evaluating the

flow chart of the implementation process. The next step is analysing economic feasibility, which focuses on market and cost benefit analysis. In order to combine these to create a tool for evaluating solution feasibility, each step of the framework was used to set weights for the feasibility analysis matrix.

The conceptual framework map is illustrated in Figure 7 below.

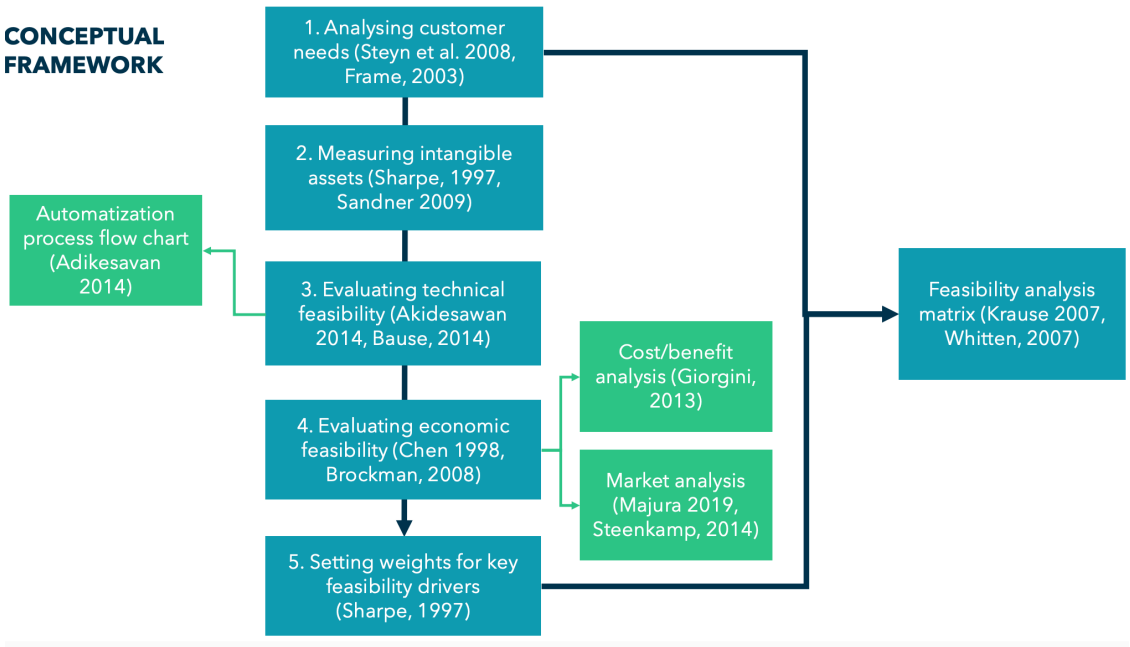


Figure 7: Conceptual framework for conducting a feasibility analysis for the data transfer automization

The conceptual framework is utilized in the data collection phase in chapter 4.4, where the key feasibility drivers are evaluated in the scope of the thesis. Next chapter describes the solution proposal alternatives and the systems involved before the data collection phase.

4 Analysis of the Solution Proposal Alternatives

This part of the study consists of detailed descriptions of each possible solution proposal. At first the current situation is briefly described. Then each system at hand is described in more detail, mainly focusing on Synkka as the case company has the know-how of other systems at hand and all of the solution alternatives are presented. Data for the next part of the study concerning conducting the feasibility comparison of the solution alternatives, is collected.

4.1 Overview of This Data Stage

In this section all the systems involved in the possible execution of the data transfer automization are described. In the second part the big picture of the systems at hand is described and PIM and Sales Tool are introduced in a general level. Following section focuses on Synkka and aims to provide a detailed technical and functional description of its usage. After the system introduction part, the possible solution alternatives for the data transfer are presented in section three. Each solution is described, and their technical requirements are analysed. Fourth part of the analysis stage concentrates on collecting the data based on the conceptual framework. Final section summarizes this data collection providing the information needed for the Data 2 stage of the study consisting of analysing and comparing the feasibility of each alternative.

4.2 Detailed Description of PIM, Synkka and Sales Tool

In the context of this thesis, PIM user is a manufacturer who is distributing product data to GS1 Synkka to be available for a merchant as shown in Figure 8. Synkka is GS1 Finland's data storage system which interacts with other GS1 data pools in the GS1 network (GDSN). Currently the biggest user group of GDSN is the food and beverage sector, but new sectors are emerging. Synkka is used to share standardized product information, it is used by many retailers to get access to standardized product information with uniquely identified products.

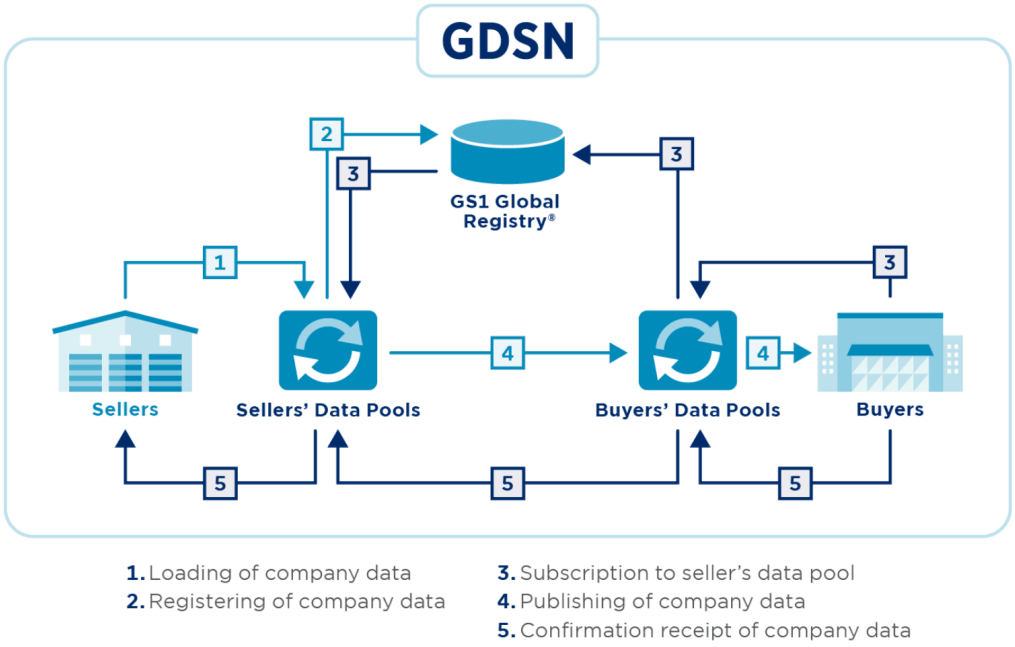


Figure 8: Different Data Pools interact in GS1 GDSN (source gs1.org)

Currently customers maintain their product data in Synkka manually. This is done either by populating Synkka Excel or using Synkka web user interface (see Figure 9) to input the product data.

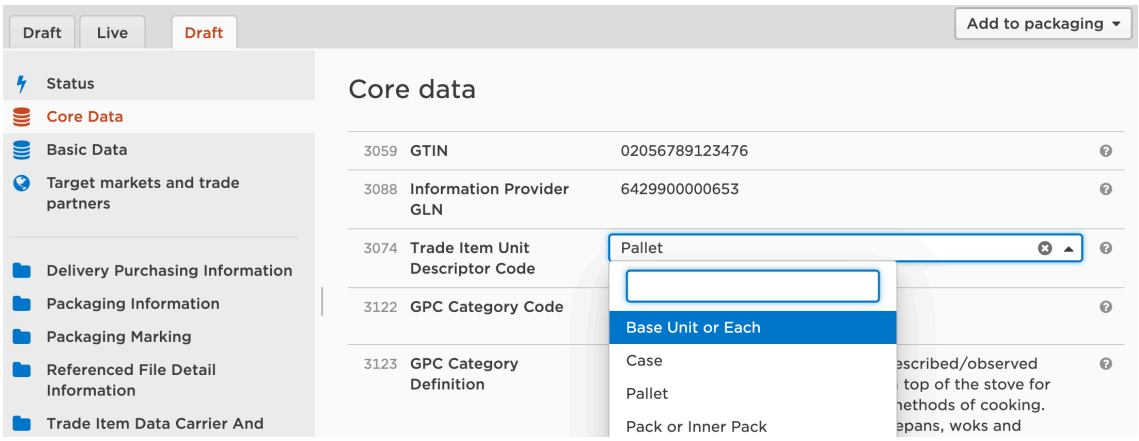


Figure 9: Synkka web user interface of the product Core Data input

PIM is a product information management system where a customer stores product information which is vital for marketing purposes. Usually PIM is integrated to a customer's ERP (Enterprise Resource Planning) system, which provides PIM with e.g. product codes and technical data. ERP usually takes care of the customer's inventory, order management, customer registry and customer specific pricing etc which are not

relevant from the marketing perspective. Product data in PIM is also maintained via web user interface shown in Figure 9 or by Excel data import.

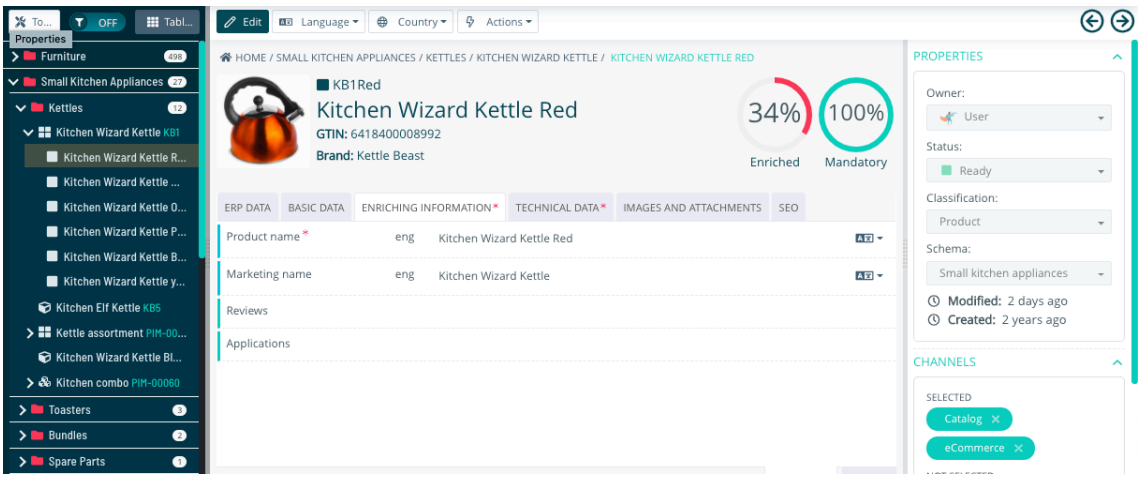


Figure 10: PIM web user interface

PIM is a product information management system which customers are using to enrich and distribute their products. PIM can be integrated to multiple different softwares, databases and other sources of data. PIM provides a REST interface to allow access to a real time product information from PIM. This REST API can be utilized to fetch the products and product data to other systems, for example, customers' web shop. A customizable PIM plugin Sales Tool also utilizes this API when it generates sales materials and other product information containing documents from the PIM data. A simplified data flow chart is shown in Figure 11 below.

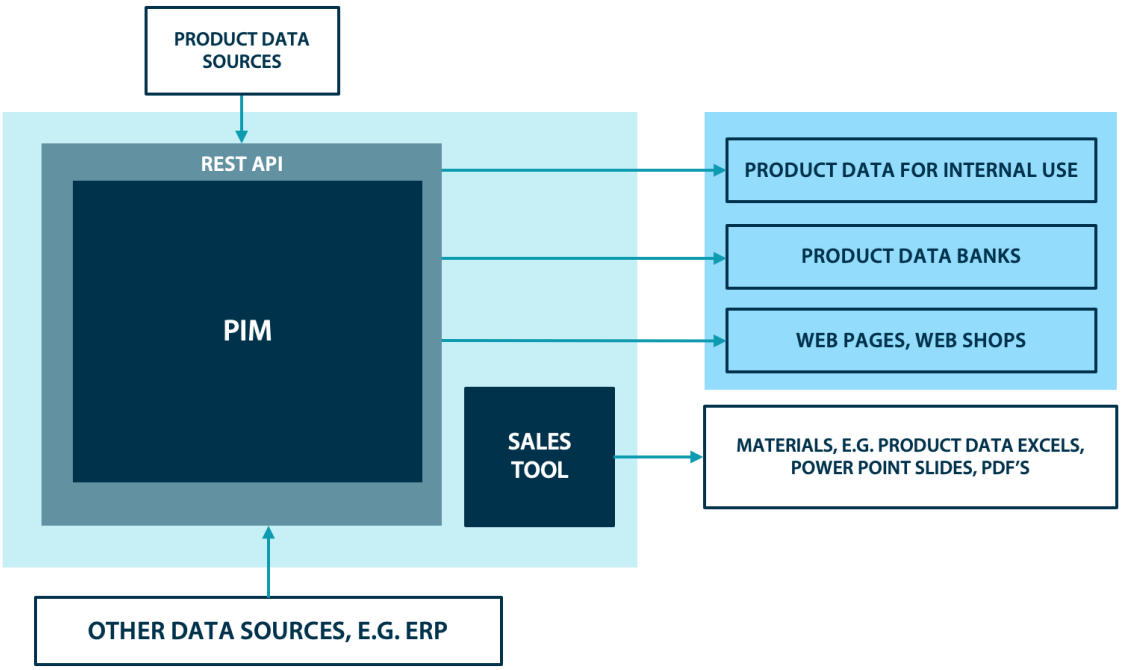


Figure 11: A data flow chart of PIM system: PIM can fetch data from multiple sources and distribute it via REST API or Sales Tool (Document J)

Sales Tool (ST) can be used to automatically generate e.g. product cards, price list, retail excels and so on from the PIM products. ST creates these on the fly with up-to-date product information, and it can interact with other systems, for example ERP in order to fetch customer specific prices for the products. Each ST is a customer specific project, they utilize the same core project and modules but can have different versions of those. ST has a simple user interface customized for the customers brand and a selection of customer specific publications.

4.2.1 Synkka

GDSN® is a GS1 Global Data Synchronisation Network® which consists of interoperable data pools including Synkka. In 2020 there are 42 certified data pools globally and number is growing (source: gs1.org). All of these data pools are GS1 certified and their master data is based on GS1 standards to enable collaboration and data sharing. All of the data pools in the network have real time access to all data and it enables product information to be consistent and up to date for retailers and suppliers using this data.

(source: gs1.org). In Figure 12 below, the amount and growth percentage of GDSN users (GLN) and products (GTIN) can be seen per year (statistics from 14 July 2019) globally and in Europe.

GS1 GLOBAL REGISTRY			
	Total	Monthly Growth	Yearly Growth
GTIN	31,139,359		13%
GLN	55,268		12%
% Active GLN's	82		3%
Subscriptions	2,807,755		19%
Matches	2,079,650		14%
Match by Item	88,415,767		20%
Europe	Total	Monthly Growth	Yearly Growth
GTIN	8,822,503		19%
GLN	17,402		11%

Figure 12: Number of users and products in the GDSN (source: gs1.org)

When product has item and location numbers (GTINs and GLNs), its data such as dimensions, country of origin, allergens, nutritional info, can be managed and shared with trading partners via GDSN. GTINs and Serial Shipping Container Codes (SSCC) which are encoded into bar codes or EPC/RFID tags, are used to identify packages (pallets) and enable tracking of product shipment. 78% of all global retailers' and manufacturers' logistic locations have a GLN code which enables uniquely identified locations and thus increasing product traceability. (Source: gs1.org).

Each product needs to have unique Global Trade Item Number, GTIN code (known as EAN before) before it can be added to Synkka. GS1 is the only official provider of GTINs. GS1 GTIN definition is "a uniquely identified trade items of a company, where trade items are products or services that are priced, ordered or invoiced at any point in the supply chain". GS1 standards lie at the heart of "just in time" (JIT) systems, as it enables product tracking based on GTIN for retailers at every stage of the supply chain (source: gs1.org). For the company to get the GTIN-13 for their products, they need to be registered to GS1 to purchase the GS1 company prefix, this is a 9-digit number used to identify a company. Then 3 digits are added by the company, and finally a check digit which makes sure that the GTIN is correctly composed. This digit can be calculated with GS1 Check digit calculator. There are other formats of GTIN (GTIN-8, GTIN-12 and GTIN-14) which have similar methods in creating the code, but GTIN-13 is the most common in Finland (source: gs1.fi).

GS1 has pre-defined standards that each product must fulfil before they can be added as products to Synkka. In addition to GTIN, each product must have a hierarchy level (packaging hierarchy), target market (country), GPC Brick code and Information Provider Global Location Number (GLN) which is a company's location identifier, for example a store or a warehouse (Document F). In addition to these, product name fields are in three languages (fi, en, se).

Each of the Synkka product modules (schemas) have certain attributes that are mandatory for this module, these are based on the Global Product Classification (GPC) segments. For example, Allergen Information Module is mandatory for products having a brick code belonging to Food, beverages and tobacco segment (Document D). The GPC standard is used to group the products same way in a global aspect. For example, Healthcare, Communications, or Food, beverages and tobacco, are GPC segments. GS1 offers an online tool to categorize products: https://www.gs1.org/services/gpc-browser. Each product has a category known as a brick in GPC. In Figures 13 and 14 GPC classification system is illustrated. (Source: gs1.org).

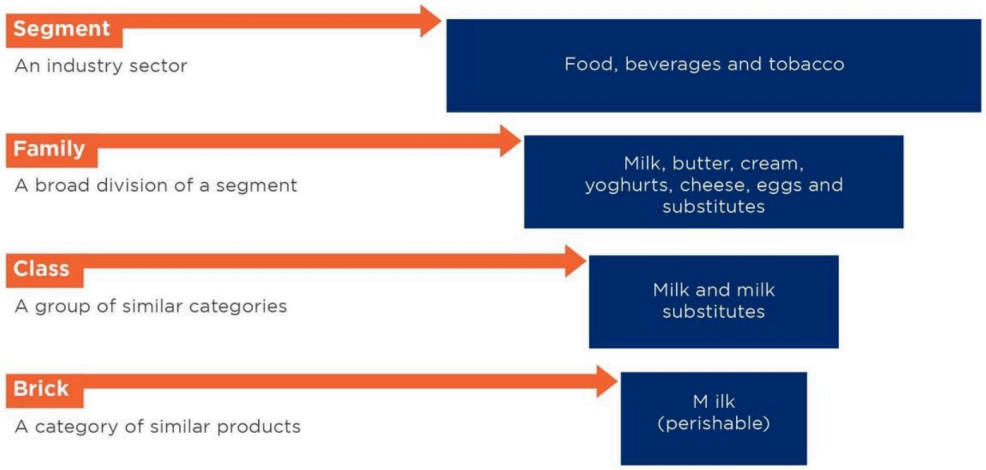


Figure 13: GPC classification Segment and Brick (Source: gs1.org)

Each Brick can have many attributes which describe the product. The GS1 database identifies the GPC segment using the Brick code and based on the segment it can have mandatory attributes. To identify the correct brick code for the product, GPC category definition offers a description for the category. Below is an example of GPC brick XML and its' definition (source: Documents A and D):

<brick code="10000116" text="Tea – Bags/Loose" definition="Includes any products that can be described/observed as loose tea that is derived from the dried leaves of the tea plant, Camellia

Sinensis. Specifically includes tea contained in tea bags. Excludes products such as Ready-to-Drink Teas, Instant Teas and Herbal Infusions.”>

These bricks have attributes which are defined in the XML, for example:

<attType code=”20000239” text=”If Flavoured” definition=”Indicates, with reference to the product branding, labelling or packaging, the descriptive term that is used by the product manufacturer to identify whether or not the product is flavoured.”>

Each attribute can have multiple values of which product can have one or many values, e.g.:

<attValue code=”30002960” text=”NO” definition=””/>
<attValue code=”30002518” text=”UNIDENTIFIED” definition=”This term is used to describe those product attributes that are unidentifiable given existing or available product information.”/>
<attValue code=”30002654” text=”YES” definition=””/>

These are illustrated in Figure 14 below:

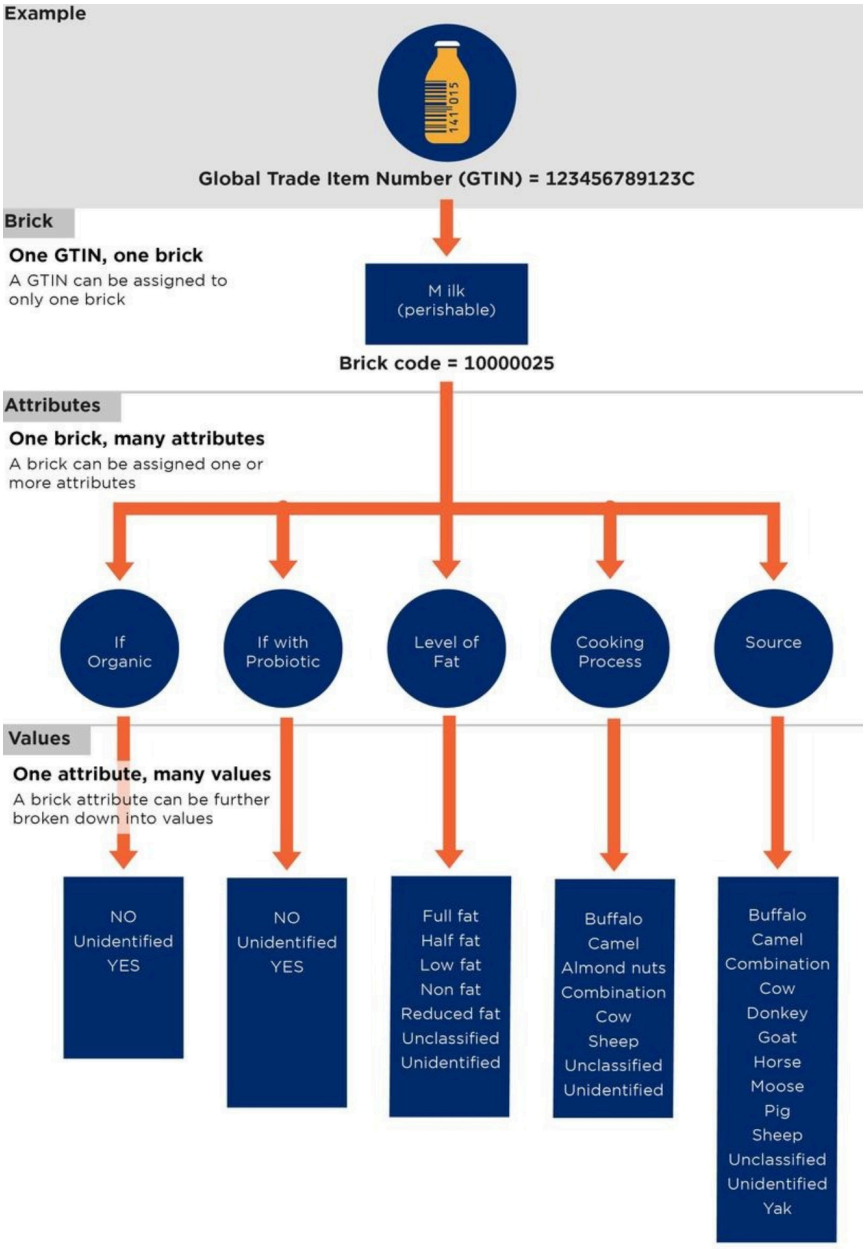
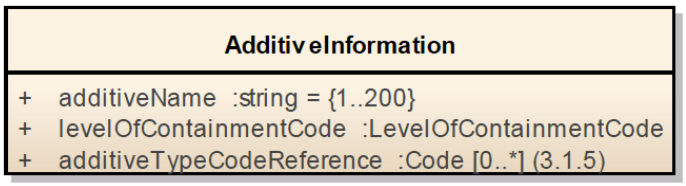


Figure 14: Structure of a product Brick class attributes and their values (Source: gs1.org)

As seen in Figure 14 above, Synkka attributes can have multiple predefined values. For example, “If Organic” attribute type can have one of the values NO, Unidentified or YES. An attribute can also have multiple values which can be predefined. Attributes which indicate measurements have information of the unit (Document A). The units can be predefined, or they can be selected from a few options (e.g. mm/cm/m for attribute measuring width or length). These units are expressed as codes in the GDSN system.

For example, when adding information of an additive, it contains information of three different attributes, these are additiveName, additiveTypeCodeReference and levelOfContainmentCode. As seen in Figure 15 below, additive name is a string, but level of containment and containment code are shown as pre-defined codes. These codes are described in the Item information profile (Document G). An example of a code list can be seen in Figure 22 (page 42).



Content	Attribute / Role	Datatype /Secondary class	Multiplicity	Definition
AdditiveInformation				Information on presence or absence of additives or genetic modifications contained in the trade item.
Attribute	additiveName	string	1..1	The name of any additive or genetic modification contained or not contained in the trade item.
Attribute	additiveTypeCodeReference	code	0..*	A code that specifies an additive type for example an EU E-number.
Attribute	levelOfContainmentCode	LevelOfContainmentCode	1..1	Code indicating the level of presence of the additive.

Figure 15: Additive information related attributes (Document K)

The packaging hierarchy of products is also maintained in Synkka. It describes each packaging type where the product belongs to. In Figure 16, an example of a simple packaging hierarchy is illustrated. Each package needs to have a unique GTIN code, and each package also has the knowledge of the containing product amount and GTIN.

Figure 16: Example of different packaging types for a product. Each package type in the packaging hierarchy needs its own GTIN code

When packaging hierarchy has only one level, it is a base unit (BASE_UNIT_OR_EACH), this can be for example a sack of potatoes. This is also always the lowest level of the hierarchy since every packaging hierarchy has to have a base unit as its trade item unit descriptor (F7158), because without it the recipient cannot process the hierarchy and product cannot have any features without a base unit. A package can also include product variations, for example different lipstick colours or a package of flashlight and its batteries. In this case the package is called display shipper.

Package hierarchies can be quite complex, as a base unit can belong to multiple different hierarchy branches. A complex example would be a beer can, which can be sold as a base unit and in multipacks (cases of 6-pack, 24-pack). This type of packaging hierarchy is illustrated in Figure 17. The Case of 3 pcs contains three multipacks of 8 base units. Dolly is a pallet package containing 20 and pallet contains 99 pcs multipacks of 24 base units. Multipacks of 8 and 24 base units are sold to customer as well as the base unit. (Source: asiakas.gs1.fi)

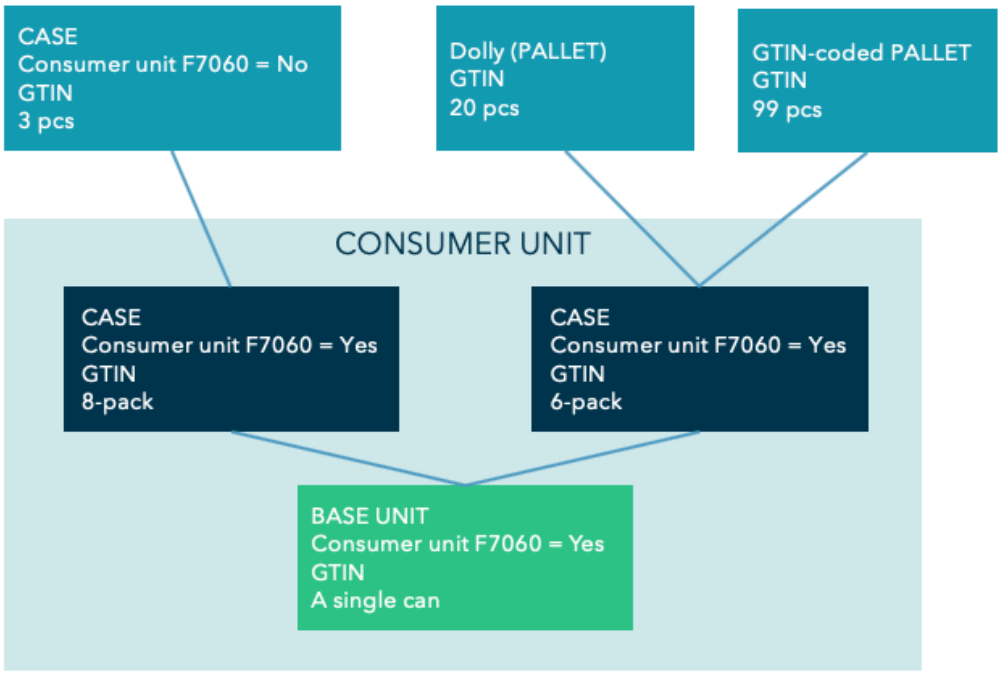


Figure 17: Example of a complex packaging hierarchy (a beer can). Source: asiakas.gs1.fi

Each package type needs to have information of its measures (dimensions, weight) and packaging materials (material type, which can be for example glass, plastic, wooden or fiber). Packaging material are announced as codes, which can be found from the Item information profile (Document G). Each packaging material needs to have information of its weight. The web site Rinki (https://rinkiin.fi/yrityksille) provides some common package material measures.

Naming products in Synkka requires specific attributes which together form products "Synkka name". Name must be given to base unit and case. Mandatory fields for naming base unit are *brand name, description short, trade item description and regulated product name* (for food sector only). *Sub brand, variant description, functional name* and *descriptive size* are optional fields. For the case unit and pallet the name is copied from the base unit with a few additions. Description short and trade item description should include information of the quantity of base units (or cases if product described is a pallet) contained (Document L). In Figure 18, an example of product base unit naming is illustrated.

Fresh Feel-good 0,5l lime sparkling water

Brand name: Fresh
Sub brand: Feel-good
Trade item description: Fresh Feel-good carbonated lime sparkling water
Description short: Sparkling water 0,5l
Functional name: Sparkling water
Variant name: lime

Figure 18: Naming example of a base unit

Different countries have some specific validation rules or required attributes. Each country's own item information profile offers information of their attributes and validation rules. When distributor is targeting abroad, they need to make a note of these rules as well, which might require adding additional data for a product. (Source: Data 6). In Figure 19 below, current connections from GS1 Finlands Synkka to other data pools are shown.

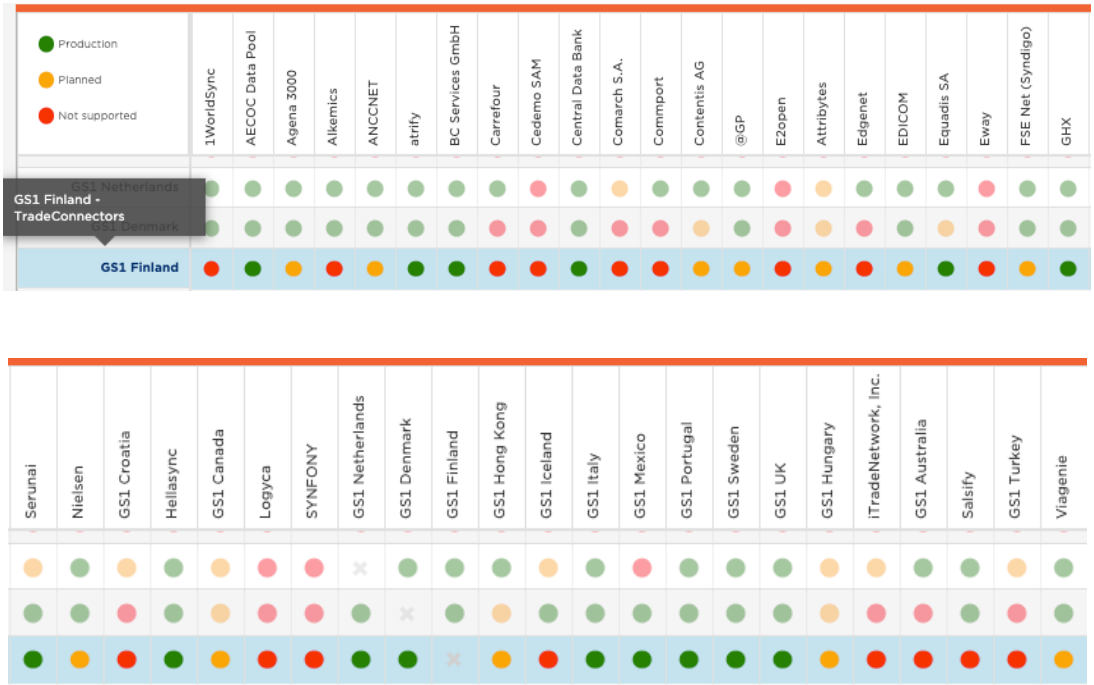


Figure 19: GS1 Finland's (Synkka) current and planned data pool connections (source: gs1.org)

Synkka provides a possibility to add media for the products, for example product images and documents. This GDSN Media Solution API is a RESTful service using JSON

messages. Purpose of the API is to be able to upload and modify company's media items and attach and remove them from products (Document E). Since media items cannot be added via Synkka XML message or Excel, adding media items would require a separate integration solution.

Synkka also provides a Swagger REST API for retrieving data from Synkka, this is accessible only for specific customers' product data. This can be utilized when determining if automatized integration should check whether the product at hand is a new product (create) or if it is an update to existing product data (Data 6).

4.3 Description of the Realistically Available Automatization Alternatives from the Objective's Perspective

All of the possible solution alternatives are related to the development of the PIM product. There are three possibilities when it comes to executing data transfer between PIM and Synkka. These solution alternatives are:

1. Solution proposal 1: Integration from PIM to Synkka (fully automated solution)
2. Solution proposal 2: Using Sales Tool to generate Synkka Excel from PIM data for the user to manually upload to Synkka
3. Solution proposal 3: No feasible solution proposal

4.3.1 Integrating PIM to Synkka

Integration from PIM to Synkka would work as a fully automized solution to transfer products and product data from the customers' PIM system to Synkka. The customers' only responsibility would be maintaining the required data in PIM and selecting the desired Synkka products in PIM (can be executed with Excel import or in PIM UI). Each product customer who wants to add to Synkka should have a "Synkka" publishing channel set, and since PIM supports publishing channels for attributes as well, it can be utilized when selecting which product attributes are exported from PIM to Synkka. The integration consists of generating the XML file containing all the product data and of the process of transferring generated XML to Synkka. It is vital for the customer to

maintain a standardized data model in their PIM system in order to implement Synkka data transfer automatization or the integration would become too complex.

A simplified image of the XML data transfer process is shown in Figure 8 (page 27). The data Source in the thesis context is PIM and the Seller's Data Pool is Synkka. Synkka is also serving as the Buyers data pool in the case where Data Recipient (merchant) is located in Finland. A target of the thesis is to automate the step "Loading of company data" (Document B). The Synkka interface is updated on a regular basis, usually four times a year of which one or two updates are considered a major one. This would require updates to the integration logic. The next planned interface upgrade is scheduled for May 2020 (maintenance release 3.1.12), which will bring some changes to the attributes, e.g. some new attribute types, deleted attribute types and new attribute value code lists (Data 5).

In order for PIM to communicate with Synkka, it requires FTPS connection. First an XML message of the product data is created, then FTPS connection is established and the message is uploaded to Synkka data pool. Synkka gets the message in the Outbox folder and processes it. When the processing is finished, the outcome file and the response are placed in the processed folder, where it can be accessed by the integration. The processing time before result message is in the processed folder is dependent on the current queue of the processable files. Inbox holds the CIC messages which are used when targeting to foreign markets as some of the validation rules differ from the GS1 Finland's model. In Figure below, integration and its processes are shown (Data 6 and Document C):

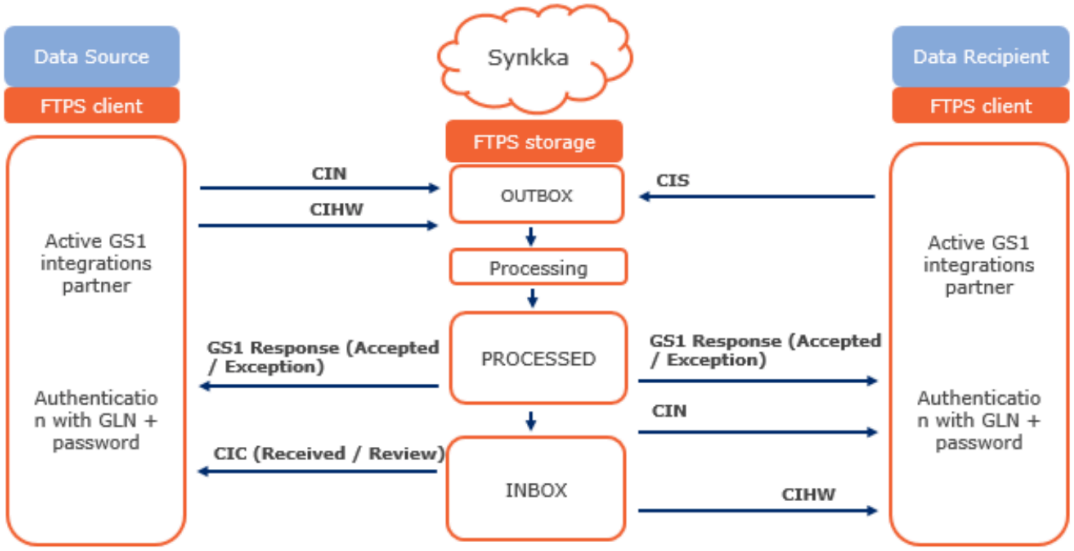


Figure 20: FTPS communication process between parties in the network (Document C)

Explanation of the processes in Figure 20:

- CIN: Catalogue Item Notification
- GS1 Response ACCEPTED and GS1 Response EXCEPTION
- CIC: Catalogue Item Confirmation
- CIS: Catalogue Item Subscription
- CIS: Catalogue Item Subscription DELETE
- RFCIN: Request for Catalogue Item Notification
- CIHW: Catalogue Item Hierarchical Withdrawal

When products are added (catalogue item sent), the message should include information about the catalogue item notification type. Different types are: *create, update, correct* and *delete*. Create is used when a new product is registered. Update and correct make changes to existing products. Delete is for removing product. In order to define the correct notification type, integration should first fetch the data from the customers' Synkka products using API described at the end of chapter 4.2.1. If product already exists, create will not be used. However, determining whether using update or correct can be difficult. Correct is used in case of missing information or spelling errors in product data, changes in product availability date, cancelling product launch and re-

activating deleted product, and in other cases when information is vital from the retailer's perspective. (Document D). Validation rules for all attributes are described in GDSN validation rules (Document M) but since rules are rather complex, implementing them in use is most likely time consuming.

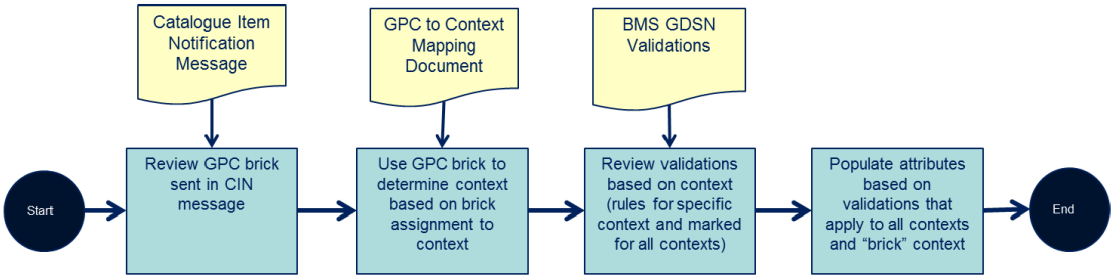


Figure 21: GS1 validation uses brick to determine the attributes that need to be sent for a product and thus the modules needed to be sent (Document F)

Synkka XML consists of predefined schemas, which are described in GS1 as XSD files (each schema has an XSD standard description), these are called modules (Document D). Most of the validation rules for attribute definitions and message restrictions that can be represented using XML syntax are encoded in these schemas (Document F), the process of selecting attributes for validation is shown in Figure 21. GS1 schemas consist of various numbers of attributes and codes which are used to standardize the information. These codes are according to a GDSN standard and they are listed in the Synkka Item information profile (Document G). Each code belongs to a code list, and these code lists are categorized to follow the schemas. Thus, a code list identified as "AllergenTypeCodeList" can be attached to AllergenInformationModule.xsd schema description. An example of a code list is shown in Figure 22, on the left column are the codes and on the right column are English equivalents for each of them. Each data pool provider can locally translate these so that they can be utilized in the domestic market.

ABF	AllergenTypeCodeList	Barnacle and its Derivatives
ABG	AllergenTypeCodeList	Crab and its Derivatives
ABH	AllergenTypeCodeList	Crawfish and its Derivatives
ABI	AllergenTypeCodeList	Krill and its Derivatives
ABJ	AllergenTypeCodeList	Lobster and its Derivatives
ABK	AllergenTypeCodeList	Prawns and their Derivatives
ABL	AllergenTypeCodeList	Shrimp and its Derivatives

Figure 22: Allergen type code list (Document G)

As seen in Figure 23, product attributes need to be mapped with Synkka attributes. To utilize GS1 schemas, each PIM attribute should have the knowledge of its GS1 schema. This could be accomplished with for example PIM schema or attribute type tag -feature which enable classification of attributes. GS1 units are identified with codes, so for the integration to work, measurement attribute units in PIM need to be mapped with corresponding codes. If units used in PIM differ (for example Synkka uses cm and PIM attribute mm), also the conversion to correct measurement should be done in the integration. GS1 attributes have specific data types, for example text (string) which can have validation rule in its length and language (Document H). PIM supports language versioning and has several different datatypes, these and GS1 data types can be mapped in the following way:

	GS1 Synkka	**PIM**
	GS1 codelists	
	String	String
	Attr-value pair	Choice
	Number	Number
	Ingredients list	Table
	DateTime	Date

Table 6: Attribute data type mapping of GS1 and PIM

Each Synkka schema has some mandatory attributes. PIM offers a possibility to define mandatory fields per schema. This could be utilized when measuring whether the products is ready to be published in Synkka (is all mandatory data filled for a product).

The packaging hierarchy information management for a product is not currently supported in PIM. This could be accomplished by adding information of its parent packaging types for a product, e.g. their GTIN, quantity of base units contained, packaging material information and so on. However, this could lead to a rather complex product

data and problems in constructing the packaging hierarchy, since each attribute should have the information of its packaging hierarchy level, and each package and material information should possess the knowledge to which package type they belong to. A simplified example of the package hierarchy XML structure when hierarchy has two variations is shown below. Catalogue Item is a display shipper package type, it contains two child trade items which are base unit types (consumer units) and each of these (package and variations) have their own unique GTIN (Data 6):

```
<catalogueItem>
  <tradeItem>
    <gtin>000123456789</gtin>
<tradeItemUnitDescriptorCode>DISPLAY_SHIPPER</tradeItemUnitDescriptorCode>
  </tradeItem>
</catalogueItem>
<nextLowerLevelTradeItemInformation>
  <quantityOfChildren>2</quantityOfChildren>
<totalQuantityOfNextLowerLevelTradeItem>72</totalQuantityOfNextLowerLevelTradeItem>
  <childTradeItem>
    <gtin>000012345678</gtin>
<quantityOfNextLowerLevelTradeItem>36</quantityOfNextLowerLevelTradeItem>
  </childTradeItem>
  <childTradeItem>
    <gtin>000001234567</gtin>
    <quantityOfNextLowerLevelTradeItem>36</quantityOfNextLowerLevelTradeItem>
  </childTradeItem>
</nextLowerLevelTradeItemInformation>
```

Media integration API uses JSON messages instead of XML. When media item (MediaItem) is created, it is not attached to any product. Media items are added to products, and if product gets cancelled, discontinued or withdrawn, media items are removed from the product automatically and they become archived and eventually deleted (in approximately 180 days). REST API uses a .ASPXAUTH cookie authentication for logging into the API, user logs with their email and password, using company GLN if they possess more than one account. The simplest JSON message for creating a MediaItem requires just two properties, OriginalFileName and BinaryData, where BinaryData holds information of media items properties, for example image properties such as width, height, aspect ratio, resolution and so on. (source: pp-synkka.gs1.fi):

```
{
“OriginalFileName”: “filename.png”,
“BinaryData”: “…“
}
```

Since media items cannot be added via Synkka XML message or Excel, adding media items would require a separate integration solution.

Based on the information needed to map PIM product to Synkka products for creating the XML structure, a simplified integration flow chart was drawn in Figure 23. This flow chart is however missing information of the package hierarchy due to limitations PIM currently has in handling the hierarchy, and of the media integration.

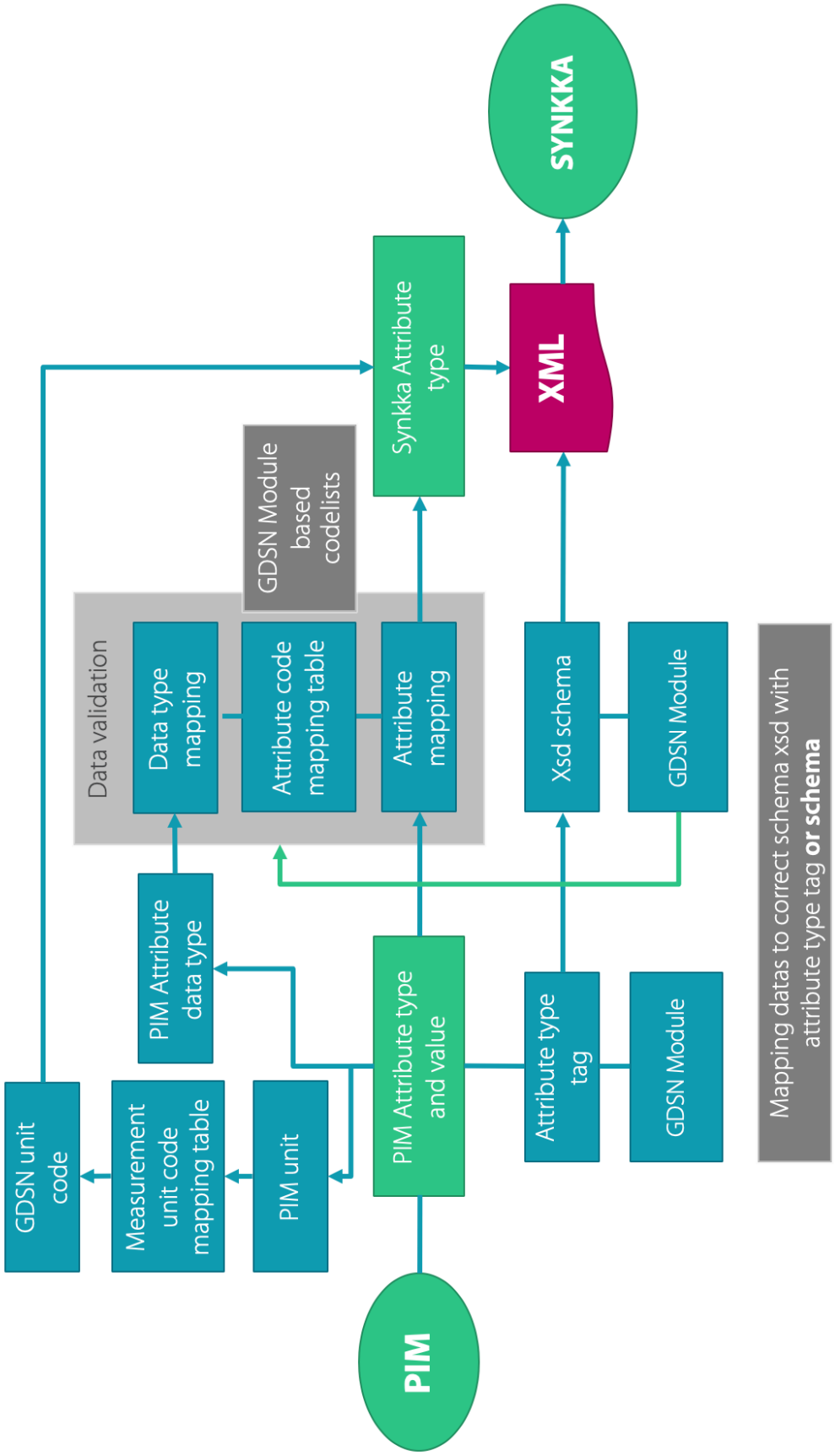


Figure 23: Integration flow chart of solution proposal 1, integrating PIM to Synkka

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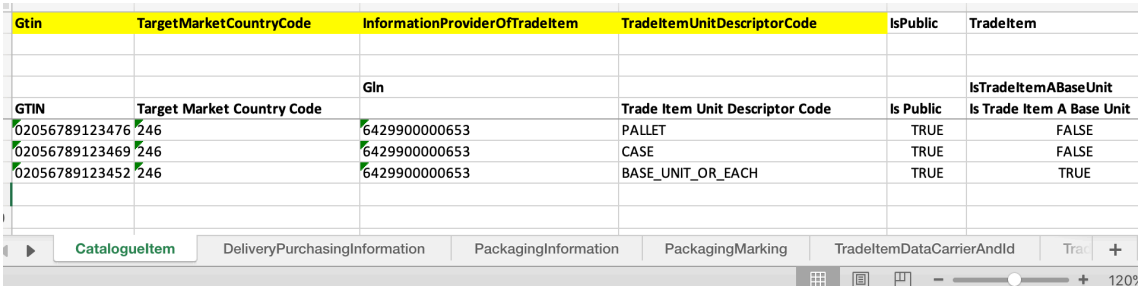
4.3.2 Using Sales Tool to generate Excel for Customer to Import PIM Product Data to Synkka

In addition to web user interface, Synkka offers possibility to add and modify products with Excel upload, and the customer can export their products from Synkka to Excel. Updating data this way is more beneficial when adding multiple products when they contain similar or partly the same data since copying data rows is rather simple. The Sales Tool (ST) could be utilized in the automated data transfer process by creating Synkka Excels from PIM product data.

Synkka Excels follow strict standards. In Figure 24, some mandatory data which recurs in every sheet for all products is highlighted and part of the GS1 schemas (modules) can be seen as Excel sheet titles. Each schema is represented in its own Excel sheet. In order to utilize ST in the data transfer process, ST should be able to create the Excel which follows these standards.



Gtin	TargetMarketCountryCode	InformationProviderOfTradeItem	TradeItemUnitDescriptorCode	IsPublic	TradeItem
		Gln			IsTradeItemABaseUnit
GTIN	Target Market Country Code		Trade Item Unit Descriptor Code	Is Public	Is Trade Item A Base Unit
02056789123476	246	6429900000653	PALLET	TRUE	FALSE
02056789123469	246	6429900000653	CASE	TRUE	FALSE
02056789123452	246	6429900000653	BASE_UNIT_OR_EACH	TRUE	TRUE

CatalogueItem | DeliveryPurchasingInformation | PackagingInformation | PackagingMarking | TradeItemDataCarrierAndId

Figure 24: Example of Synkka Excel (Data 3)

Sheet title is a name of the module, e.g. PackagingInformation has the data for Packaging Information Module schema. It contains Packaging class which is used as a title for all the attributes class contains. Next title row defines the sub class if it exists, it is followed by attribute name and if needed, information if the data is value, a code list type or a measurement unit code. Last title row has the attribute name (e.g. Target Market Country Code). In Figure 25, packaging class attributes are listed. Sub class PackagingMaterial contains attributes which are listed in the same figure, these are used to express what materials packaging contains, and since each package can contain more than just one material (e.g. glass jar with a metal cap), each material followed with information of e.g. material weight is listed in its own column. Excel uses same code lists as Synkka XML for attribute values and units. An example of presenting products package material in Synkka Excel is shown in Figure 26.

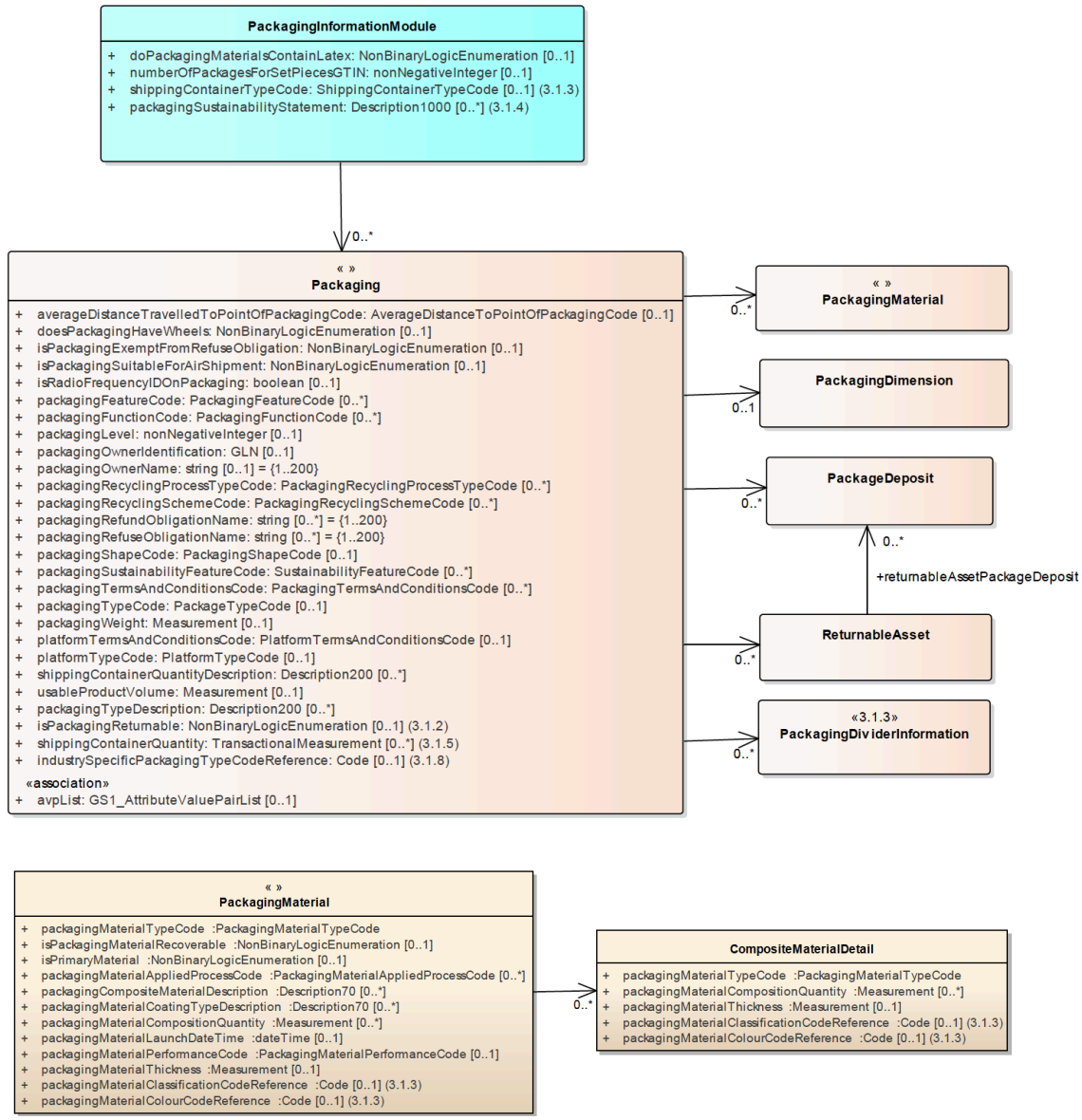


Figure 25: Packaging Information Module with Packaging class and PackagingMaterial sub class (Document K)

Packaging[0]	Packaging[0]	Packaging[0]	Packaging[0]	Packaging[0]	Packaging[0]
			PackagingMaterial[0]	PackagingMaterial[0]	PackagingMaterial[0]
PackagingTypeCode	PlatformTermsAndConditionsC	PlatformType	PackagingMaterialTypeCode	PackagingMaterialCompositionQuantity[0]	PackagingMaterialCompositionQuantity[0]
Value	Value	Value	Value	MeasurementUnitCode	Value
BG	7	11	POLYMER_PP	GRM	5
NE					
PX	7	11	WOOD_OTHER	GRM	25000
CS			CORRUGATED_BOARD_OTHER	GRM	553
PX	7	11	WOOD_OTHER	GRM	25000

Figure 26: Synkka Excel Packaging Information Module

Similar to solution proposal 1, since PIM does not fully support some of the Synkka features required, part of the Excel including package hierarchy information should be manually filled by the customer or made in a configuration file where each PIM attribute data regarding packaging information would be mapped to correct Synkka field.

In ST user interface customer can select the products to Excel, they can also decide whether product at hand is new (create), modified (update, correct) or if it needs to be removed. Since removal can be done as product cancellation or discontinuing (date), this information can also be managed from PIM. New products in Excel are created to Synkka and existing ones are updated.

The data transfer flow chart is shown in Figure 27. Most of the data validation should be executed within the ST plugin. A standardized data model is essential in this solution perspective similar to solution proposal 1 but not playing as crucial part since ST is a customer specific solution and could have more custom logic. However, this might cause extra work when updating the solutions in the case of Synkka interface updates.

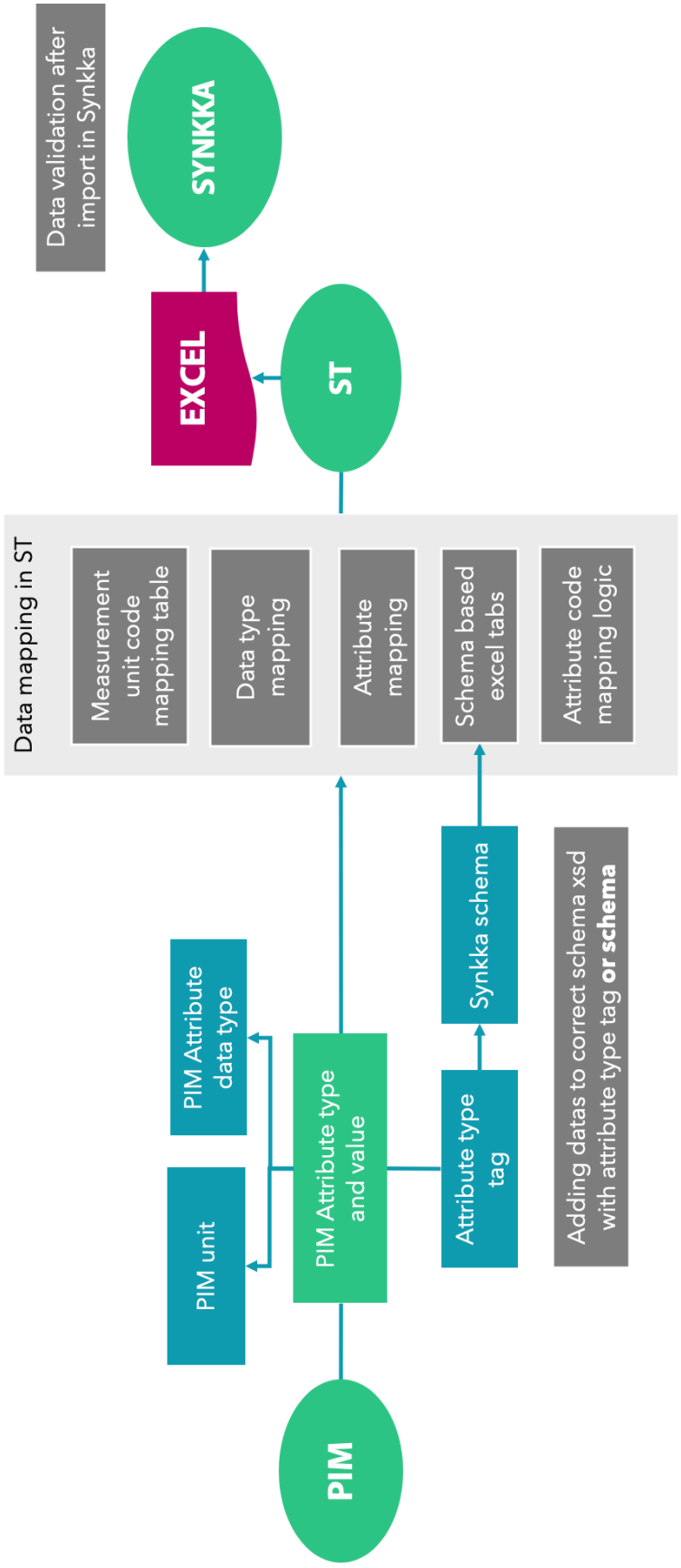


Figure 27: Solution proposal 2: Flow chart of using ST to generate Synkka Excel

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4.4 Collecting Data for Measuring Feasibility

Due to possible technical limitations the project's technical feasibility was assessed first. In order to gain more insight for the customer workshops and questionnaires, the project manager interview was also held at the beginning of data collection. After these the customer workshops, questionnaires and interviews were held. Technical and financial feasibility were redefined after more insight was gained through customer interaction. A Synkka specialist was interviewed via TEAMS meeting and more information was gathered via emails. As some of the intangible assets were emerging from other data collections, for example market analysis, these were also redefined during the collection process. The results were analysed and are presented in the following chapters in the order they were originally laid out in the conceptual framework.

4.4.1 Analysing Customer Needs

Customer needs were analysed by having a workshop, interviews/email and questionnaires. In order to identify the points which current customers considered being problems in the current situation, and what value the automatization could bring to their processes, as well as what improvements customers considered to be essential compared to the current situation. Questionnaire summary can be found in Appendix 6 along with the customer workshop notes in Appendix 5.

Customer needs based on the findings are the following (Data 4):

- Time saving
- Less manual work / need to remove duplicate work when adding product data
- Ease of use (Synkka user interface was considered difficult to use)
- Getting rid of irrelevant sources to maintain product data (e.g. packaging information handled manually in Excel because it is lacking a proper maintaining system)

Figure 28: Time used in adding or updating products in Synkka per month based on 4 replies (Data 4)

Following analysis was made from the data: customers are facing two major issues in the current situation. Firstly, there is no single centralized system to store their product data so that it would be available in every channel. This was an issue for both PIM users and customers not yet having PIM solution. Secondly, it takes company resources and time to add and maintain product data in Synkka. Based on the analysis, customer needs were articulated as follows:

1. Having one, centralized and user-friendly place to maintain product information
2. Saving time and resources

Benefits of the data transfer automatization were listed as follows: saving time, ease of use, possibility to add more products to Synkka (gained from time savings and ease of use) and thus better chance to serve retailers with a bigger product portfolio. Other benefits the automatization would accomplish were error reduction in data (validation) and consistency in the product information, faster cycle to get the product to the market and on the other hand maintaining the portfolio to remove old products from the selection, and possibility to target markets outside Finland via Synkka.

The customer needs were summarized to functional requirements, which were the following: ease of use and automated product data flow from PIM to Synkka, in order to utilize these when designing the project's technical requirements.

4.4.2 Measuring Intangible Assets

Most of the benefits project implementation would bring are not immediately tangible and cannot be seen before the solution has been implemented. However, during the execution of this thesis, the knowledge and possible solution was already used in the sales cases, and it was noted that there were several customers who valued the possibility for the data transfer automatization highly, in one case it was even considered a crucial aspect for purchasing the PIM solution from the case company.

The customer analysis was utilized alongside with the company strategy (Document I) to draw out an integrated Balanced Scorecard with Strategy Map based on Kaplan's framework seen in Figure 29. Some of the data from figure has been moved to Appendix 11.

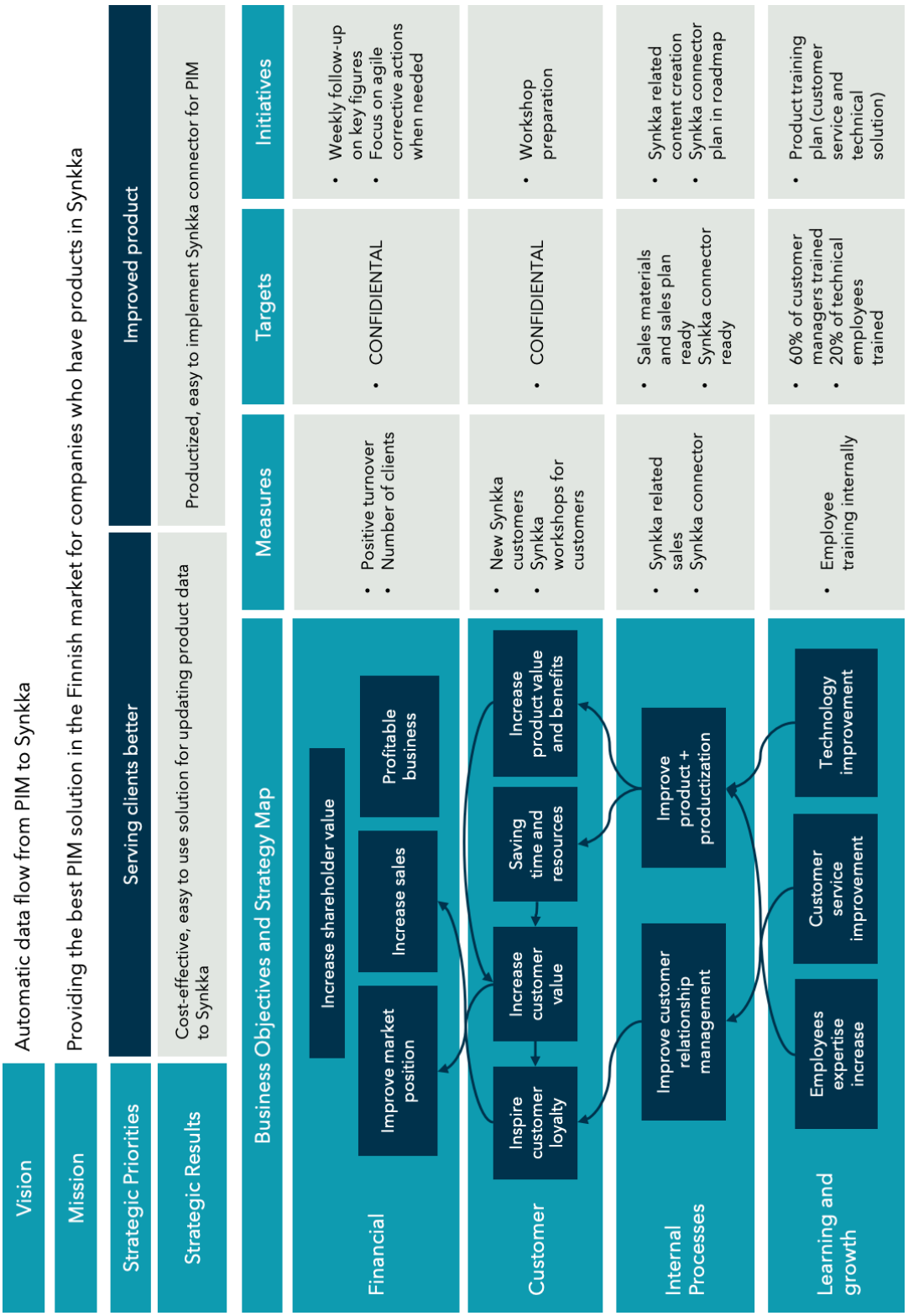

Figure 29: Company strategy and intangible assets implemented in Kaplan's Balanced Scorecard with Strategy Map

The vision was based on the project goal, being “Automatic data flow from PIM to Synkka”. The mission was set based on the company strategy of being the best PIM solution provider: “Providing the best PIM solution in the Finnish markets for companies who have products in Synkka”. The project’s strategic results were set to “Serving clients better” and having an “Improved product”. The business objectives in the projects scope were implemented in the strategy map. The methods for measuring were set alongside with targets for the following year, these are seen in the figure. As Figure 29 illustrated, some initiatives are needed for each step, for example workshop preparations in order to gain new Synkka customers, and internal training plan to achieve improvement in technical and customer service expertise.

Based on the findings, the following intangible benefits were recognized:

- Customer:
    - Saving time and resources
    - Increased product value and benefits
- Learning:
    - Employees’ expertise increases
    - Customer service improvements
    - Improved technology
- Processes:
    - Product improvement
    - Improvement in customer relationship management

When successfully implementing the project, these will lead to product improvement and thus better product portfolio. The customer will get more value from the product, this will increase the existing and new customers’ value and loyalty, and finally, financial strategies can be achieved as these enable improving the market position, sales and meeting the target of making profitable business.

4.4.3 Evaluating Technical Feasibility

The technical feasibility of the project was measured by analysing the system descriptions, technical documentation and each automation alternative descriptions. An integration flow chart was drawn of the potential solutions and used to evaluate whether they are executable. In Figure 23 on page 45, an integration flow chart is shown for the solution proposal 1: Integrating PIM to Synkka, and Figure 27 on page 49 shows the flow chart of solution proposal 2: Using ST to create Synkka Excel.

Based on the interview with RND (Data 1) and detailed descriptions in chapter 4.2.1 of Synkka alongside with the chapter 4.3. describing each alternative solution, following technical limitations were found:

- Current PIM solution does not fully support all Synkka specific product data types
- Package hierarchy management is not fully supported in PIM
- Synkka media integration uses different interface
- Synkka updates on regular basis

None of the solutions had any major technical feasibility issues, but current PIM and ST services would have usability issues since Synkka data model is rather complex and strictly standardized. Code lists, units, GPC codes and other data mappings and validation rules should be implemented in the solution. Package hierarchy is not currently fully supported in PIM. According to Business Lead (Data 8) and Project Manager (Data 2) some of the current customers are already using PIM as a package management system. Their solutions vary from using product assortments as package hierarchy management tool and using attributes to add packaging info, these options could be inspected when implementing the solution since they might offer an almost ready solution. Synkka updates would also require updates in the solution and possibly to the customers' data.

4.4.4 Evaluating Economic Feasibility

In the scope of the project, pursued cost benefits are more related to new potential customers and growing market share as PIM would have more value to customers using Synkka. This makes the cost benefit more difficult to evaluate. Market analysis was conducted first and based on this and the cost estimations an evaluation of the required pricing was constructed.

4.4.4.1 Market analysis

A market analysis was conducted in order to gain insight of the potential usage of the new solution as well as market segments and competition. Data was collected from primary sources, such as customer questionnaires (Data 4) an informal interviews which were considered to be qualitative data, Synkka specialist (Data 6) and web sources (quantitative data), and from secondary sources such as web sources and company strategy (Data I). Following results were gained from the data collection analysis:

Competitors: Based on the research, there are no domestic PIM solutions offering data transfer automatization to Synkka. Competition in the domestic market comes from companies who utilize foreign PIM solutions. One competitor offering the solution was identified, this competitor is located in France and is operating globally. It seems that the competitor does not possess the solution but offers it via different partners who operate on the target market country. This can be seen as a weakness as solution is vulnerable to changes in the partner relationship.

Business and customer: According to Synkka, they currently have approximately 103 000 products in the system. 40% of these belong to the food and beverages category. This is affected by the amount of packaging's each product has. The biggest non-food group in Synkka is cosmetics (18 000 pcs), which can partly be explained by the fact that for example each lipstick colour is stored there as a product. The next biggest groups are Home and décor and batteries (6 700 pcs), cleaning and hygiene (3 800 pcs) and books and magazines (3 300 pcs). Synkka is used by more than 650 suppliers and 50 retailers, including Finland's leading retailer chains Kesko and SOK. Customers have on average 145 products in Synkka, most have less than that. Approximately 30 distributors have from 500 to 1 000 products, and 14 have more than 1 000

products (Data 6). Based on the questionnaire, similar results were achieved (see Figure 30), thought one of the customers noted that there are also some old products since reviewing and removing them is not too simple.

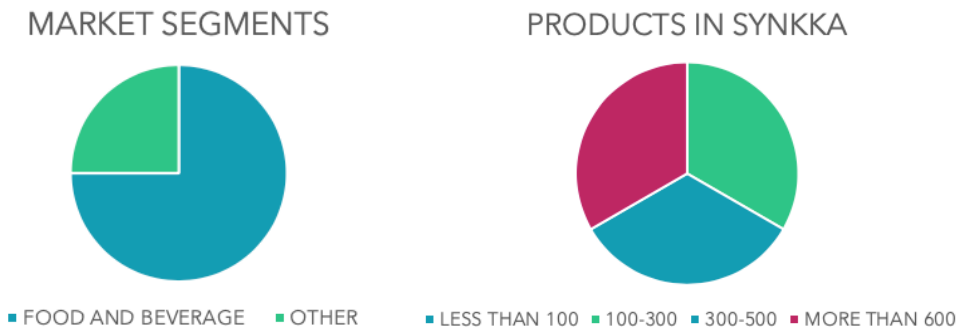

Figure 30: Biggest market segment is food and beverage; most customers have approx. 145 products in Synkka (Data 4)

Market: The market segment for the companies using Synkka is mainly the food and beverage industry. This enables targeting a specific market area and decreasing the complexity of the solution at the first stage and simultaneously enabling testing and possible improvements for the solution with these customers, before expanding to other market segments.

The following SWOT analysis of the prospective business was conducted based on the findings:

Table 7: SWOT analysis of the solution alternatives based on the findings in the market analysis

Strengths	**Actions to take advantage of this strength**
Product differentiation	Marketing strategy of being the only (domestic) PIM provider with automated data transfer solution
Superior product quality	Increasing market share
Expertise in product information management and product data model	Gaining leverage of the expertise in customers field
Weaknesses	**Actions to overcome this weakness**
Currently no solution for the data transfer	Targeting first on specific market area to gain knowledge of products' strengths and weaknesses for more agile product development
Some features not fully supported by the current PIM verion (e.g. package hierarchy management)	Product development
Missing PIM product data quality validation	Product improvements
Opportunities	**Actions to capitalize on this opportunity**
Projects' pilot customer operating in food industry	Gaining first-hand knowledge of the needs of the solution
Potential new customers looking for a solution	Selling future solution
A cutting-edge technology	Quality improvement
Biggest retailers are using Synkka which encourages distributors to add their products there	Flexible pricing model for enabling all sized companies to utilize the solution
Gaining more customers	Ready solution for Synkka model
Customers need to move from manual work to automized solution	Enabling adding enriched product information to Synkka and thus competitive benefits for customer
Threats	**Actions to overcome this threat**
Competitors	Implementing solution in-house, being the only domestic provider (local know-how), collaboration with GS1

As seen in the table above, strength which should also be the drivers of product development, are superior product quality and product differentiation. Weaknesses in the

product can be tackled using strengths of the case company. Project would bring many opportunities to the case company, e.g. new customers. The biggest thread was considered to be the competition. Only one company with ready similar solution was recognized and since the case company is working closely with GS1, this was seen as a benefit and by being the only domestic provider and using in-house solution, the product differentiation could be achieved.

4.4.4.2 Cost benefit analysis

The financial aspect was reviewed with the case company CEO. The costs of the project were easier to estimate, and these were calculated mostly on the basis of work time estimations. As there are two different solution alternatives (as the third option is no solution there will be no additional costs), costs for both of them were estimated. The types of costs in the project were defined based on interviews with RND (Data 1), Business Lead (Data 8) and CEO and Marketing (Data 7). Costs were listed as following:

- Development costs
    - Personnel
        - Solution design
        - Programming
        - Project management
        - Productization
- Operational (on-going) costs
    - Personnel
        - Programming: maintenance
        - Project management (customer support)

These were implemented in the B/C calculation tool created in the chapter 3.2.4.3 (see calculated costs in Appendix 1). To measure economic feasibility, a cost and benefit analysis was made. Project costs consist of product development, which can be divided into solution design, programming, project management and productization. Annual operational costs consist mostly of programming and project management when Synkka interface is updated (approximately four times a year), including changes in the solution and customer environments and of communication with the customer. It was noted that the number of customers might affect on the costs of project management operational costs annually by increasing it as the number of customers increase. This

was not taken into calculations, as at least some part of the management work is invoiceable. Programming costs were estimated together with RND based on the technical feasibility analysis and the detailed description of Synkka by decomposing the process into smaller sections and using past experience. Productization estimation consists of commercial cost estimations e.g. sales- and marketing materials, and of project management materials such as creating the specification materials and project workflow planning. Sales and marketing materials could be constructed in-house and thus costs could be kept relatively low.

Future benefits can't be measured as easily, to gain an estimation of the potential income, project feature pricing and potential new market areas and customers were discussed and analysed based on the market research. As a result, some of the costs were added to the basic PIM project ramp-up as the customer data model definition needs to be considered more thoroughly. Feature implementation was added as a one-time fee and based on the market analysis a monthly fee was calculated. Since the number of products customers have varies, it was used as a basis of the monthly payment amount (customers with more products in Synkka will have a higher monthly fee).

The time spent creating or updating products in Synkka varied significantly amongst customers who participated in the questionnaire (see Figure 28 in the page 51). The time span was from a few hours to 12 days a month. This made it difficult to estimate how much a customer would be eager to invest in the solution. On the other hand, some customers only maintained mandatory products and product data in Synkka since it was considered difficult to use or updates were outsourced. In conclusion, Synkka would most likely be utilized in more potential if data integration would be possible. Customer data was used to estimate how much they might be willing to invest in the data transfer automatization solution per month, this is discussed in the following paragraph.

When estimating the costs, a solution partners fee was used to calculate the cost estimation. This cost estimation did not include collecting the data for the partner (product data, packaging and packaging measures and material data etc.). Based on the cost estimation per hour and the results gathered from workshops and questionnaires, the monthly costs for a customer can vary from just few hundred euros to up to thousands. This estimation does not take into consideration possible cost savings for the customer as workers' time is freed to other more essential tasks in the company. In the cost benefit analysis, only one monthly fee was used in the calculations. This fee was based on

the average amount of products Synkka users have (147) and thus being the smallest fee. A smaller fee would likely attract more users to the system, to calculate the best- and worst-case scenarios, number of customers was used as a variable in the cost benefit calculations.

4.5 Summary of the Data Needed for Providing the Most Feasible Solution Proposal

As a summary of the data collection, some key features were recognized in each of the feasibility drivers. Customer needs focused on ease of use, time and cost savings. Intangible assets were recognized in the company level as well as related to the customer needs with improved skills and product. These can be utilized in achieving the financial targets. Market analysis revealed demand especially on the food and beverage sector and together with the economic feasibility evaluation a pricing model was planned. Main points of each feasibility driver were collected, and they are utilised in the Feasibility criteria table in the chapter 5.5 when analysing which of the solution proposals best fulfils these criteria.

5 Providing the Most Feasible Solution on How to Automate Data Flow from PIM to Synkka

This part of the study consists of the utilization of the data collected in the previous phase, in order to provide the most feasible solution proposal for the data transfer automization.

5.1 Overview of This Data Stage

In this section, data collected in the previous chapter is analysed in more detail per each solution proposal, to come up with the most feasible solution. In the next three sections each solution proposals' feasibility is analysed based on the data. Feasibility is analysed using the conceptual framework so that each step of the framework is graded on a scale of 0 to 100. Each feasibility issue is assigned with a weighted percentage, which has been defined based on the importance of the feasibility driver. For example, the economic feasibility score has been evaluated high due to its importance from the company perspective (if the project is not economically feasible, it should not be executed) and thus is assigned a weighted percentage of 50%. These weighting percentages are shown in the feasibility analysis matrix on page 75. In the section 5 of this data stage, each of the alternatives are compared using the feasibility analysis matrix as a measurement tool. Based on the findings, the most feasible solution is proposed and finally summarised in the last chapter.

Cost benefit analysis for each solution proposal was conducted by using the form created in the conceptual framework (page 22). It was altered a bit based on the review with the case company CEO to include the cumulative costs of the project development. Each solution proposal calculation is presented in Appendix 1.

5.2 Feasibility Analysis of Alternative 1

Solution alternative 1 is an integration from PIM to Synkka (fully automated solution). In this section each key feasibility issue is analysed based on the findings in Data Collection and the solution is compared based on how it fills the requirements of each.

5.2.1 Customer needs

Based on the data collection, time saving, less manual work, ease of use and having no irrelevant data sources were the essential ones. This solution would enable time saving by automatizing the integration process and a customer would only need to select product imported to Synkka and making sure they would have all the data needed for Synkka. This would also decrease manual work since product data would be in one place leading to a centralized system (PIM) and no data administration would be needed in other systems for storing and managing product information, thus enabling time and cost savings for the customer.

Data transfer would be automized as selected products would update to Synkka in each integration run enabling data flow daily or even more often. To successfully implement integration, it would however require standardized data model in PIM. But this can be seen also as a benefit, since the popularity of GDSN is increasing (see Figure 12 in page 30) and standards are becoming more widely used and they might have some benefits for the customer in some other scenarios as well. Strengths and weaknesses of this solution are shown in Table 8 below, it also includes the possible weaknesses that were collected from RND and project manager interview analysis.

Table 8: Strengths and weaknesses of the customer needs analysis in solution proposal 1

	Strengths	Weaknesses
Solution proposal 1: Integration from PIM to Synkka	- Ease of adding products to Synkka due to automization - Only manual work is done in PIM - One centralized system for product data management and distribution - In case of errors in data validation, customer can correct the data to PIM and integration runs again according to schedule (e.g. once a day)	- Customer needs to have a standardized product data model in PIM for Synkka data - Customer needs to maintain many product attributes that may not be essential from their own perspective

5.2.2 Intangible assets

Based on the data collected in chapter 4.4, automized solution alternative has attracted customer interest. Project vision of “Automatic data flow from PIM to Synkka” would be met with the solution, and it would enable targeting the mission of “Providing the best PIM solution in the Finnish markets for companies who have products in Synkka”. The steps (human, information and organization capital) and targets illustrated in the Balanced Scorecard and Strategy Map Figure 29 (p. 53) could be met with successful implementation.

Based on the data collection and solution description, it would lead to customer value increase by fulfilling customer needs analysed in the previous chapter and enabling increased product value and benefits. Implementing the solution would increase employee expertise when programming a new feature and knowledge of customers’ business with expertise in Synkka product model. This would lead to better customer service. Process development would lead to product improvement with new Synkka supporting plugin, which could also handle for example packaging hierarchy and package material management. These improvements in the internal and customer processes would lead to improved sales, market position and helping to reach the target of making profitable business.

5.2.3 Technical feasibility

Integrating to Synkka via FTPS and generating XML from product data requires a rather complex integration solution. It also needs some features which are not supported by the current PIM solution thus requiring a plugin implementation for full support for customers’ Synkka product data management.

The problems that arouse from the technical feasibility data collection are that a proper validation and having all the correct data types is not currently supported in the PIM system. Also, the packaging hierarchy cannot be fully handled in the current system. Thus, this solution would work best if it would be an add-on to the PIM (a plugin) system. It would also enable using PIM for the purpose it is designed for and not adding extra features which would be irrelevant for non Synkka users. In this case the datatypes currently not fully supported, e.g. packaging hierarchy or GPC codes could

be supported. A careful specification beforehand is also crucial to maintain some consistency in the customers' data models and avoiding extra work when implementing the integration. In the case of Synkka media integration, which uses a different interface, a proper data model in PIM enables generating a binary code of the images and documents utilizing document binary data and Synkka specific document attributes. This can be run in a separate integration which utilizes the product's publishing channels when selecting data to be exported to Synkka (publishing channel can be both product and attribute specific).

Table 9: Strengths and weaknesses of the technical feasibility analysis in solution proposal 1

	Strengths	Weaknesses

Solution proposal 1: Integration from PIM to Synkka	- Can utilize GDSN schemas (modules)
	- Enables executing media integration in separate integration solution
	- Validation messages received
	- Data mapping in integration configuration
	- Can read customers Synkka REST API to receive information about existing products
	- Using publishing channel for selecting attributes to be exported to Synkka
		- Synkka data model complexity:
		  ○ E.g. GPC codes implementation is difficult to execute
		  ○ Unit mapping and possible conversions
		  ○ Package hierarchy not fully supported by current PIM version
		- Synkka media integration uses different interface
		- Synkka updates require changes in the integration
		- Item notification determination when message is update or correct

Technical feasibility strengths and weaknesses are composed in Table 9 above. The solution can be implemented with proper data validation and a possibility to access the customers' Synkka products. Synkka data model complexity which comes from GDSN standards, however, causes issues when planning the solution execution.

5.2.4 Economic feasibility

In order to evaluate the solutions' economic feasibility, a benefit / cost ratio was calculated. The data collected in chapter 4.4.4.1 was implemented in the B/C calculation tool of which the figures are shown in Appendix 1. In this model, all the development work costs are applied in the year zero and cumulatively deprecated in the following years

by splitting the total development costs in the five-year time span. Also, the customer is expected to invest to the project starting from year one. Benefit / cost (B/C) ratio for the solution alternative 1 is presented in Table 9 below:

Table 9: Solution proposal 1 B/C ratio

Years	1	2	3	4	5
B / C ratio (1 new customer/year)	1,00	1,49	1,98	2,47	2,96
B / C ratio (2 new customers/year)	2,00	2,98	3,96	4,94	5,92
B / C ratio (1 new customer/year) *	0,82	1,12	1,43	2,04	2,35
B / C ratio (2 new customers/year) *	1,63	2,24	2,86	3,47	4,08

* Diverting from the original plan, monthly SaaS fee was also altered a bit, to gain some insight on how big effect it has on the B/C. This calculation was conducted with a monthly fee being approximately 60% of the original (see Appendix 1 for detailed calculations).

Calculations revealed that positive result would be achieved already in the year two and year one would be the break-even point with 1 customer per year with a higher SaaS fee. With a significantly smaller monthly fee, the positive result would be achieved on the second year with a one customer per year, or already in the first year with a two customers per year.

5.3 Feasibility Analysis of Alternative 2

Solution alternative 2 is using Sales Tool to generate Synkka Excel from PIM data for the user to manually upload to Synkka.

5.3.1 Customer needs

Customer needs defined as ease of use and automatized product data flow from PIM to Synkka are somewhat met since it would enable maintaining product data in PIM as in the solution proposal 1, and time savings since the manual work would only require selecting products in ST UI and uploading it to Synkka. Data flow automatization would not meet the expectations in this solution. Also, there are some technical limitations which have an effect on the customer experience, these are described in more detailed

later in this chapter. This alternative would also force the customer to purchase a ST plugin, since it's not implemented in the PIM solution.

Table 10: Strengths and weaknesses of the customer needs analysis in solution proposal 2

	Strengths	Weaknesses
Solution proposal 2: Using ST to generate Synkka Excel	- Customer can validate errors when importing products to Synkka and correct them, instead of getting integration error - One centralized system for product data management and distribution	- Similar to solution proposal 1 - Customer needs to create the excel in ST - Selecting correct product to excel needs some additional logic (e.g. selected products that are created/changed during past 10 days) - Customer needs to manually upload excel to Synkka - In case of error, customer needs to validate data in PIM and start over

5.3.2 Intangible assets

Similar to solution proposal 1, an automated solution is a necessity to some of the customers. It would somewhat meet the project vision, but the mission of "Providing the best PIM solution in the Finnish markets for companies who have products in Synkka" would not be met since the solution would be implemented mostly in the ST plugin. Since this solution would not fully automize the data flow, the customers' expectation would not be completely met. Also, the Synkka data model is not fully supported. However, this solution would be a significant improvement to the current situation and thus it would most likely lead to customer value increase.

Solution implementation would have a smaller effect on the employee expertise. If it is executed as a part of the ST, no new technologies are likely needed to be learnt. For customer management the solution would provide more expertise and knowledge enabling improved customer service. With improved customer experience, customer value would increase, and this would lead to improved sales figures and enabling meeting the target of making profitable business as the solution proposal 1. As a summary, the solution would enable reaching some of the intangible assets described in the Balanced Scorecard (Figure 29, p. 53) but lacking some of the essentials making it harder to achieve the vision set.

5.3.3 Technical feasibility

As discussed in the feasibility analysis of alternative 1, PIM currently does not fully support all the data types and for example packaging hierarchy. This would require either a PIM plugin communicating between PIM and Synkka, which does not exactly serve the purpose since it would require two plugins (ST) to make the solution work, or customer to add missing features manually to Synkka Excel or in the Synkka UI. ST itself cannot be utilized in the data model management since it is a publishing tool and does not support product data management.

Table 11: Strengths and weaknesses of customer needs analysis in solution proposal 2

	Strengths	Weaknesses
Solution proposal 2: Using ST to generate Synkka Excel	- Customer can select item notification type for the product	- Similar to solution proposal 1 concerning Synkka data model and media interface - Changes required to ST plugin when Synkka interface changes - Data mapping in ST plugin - Has few benefits to be used in media integration - Validation messages received only by customer

In the solution proposal 2 (see flow chart in page 49), validation and data mapping take mostly place in ST. This is likely to cause issues when The Synkka interface changes, as all the customer ST's should be updated accordingly. Since ST is a customer specific implementation and often has some customer specific logic, this can cause different issues in each project. In the case of the media integration, ST Excel is not a suitable solution, and this should be executed separately in a similar manner as in the solution proposal 1. In case of errors in the data, the customer gets the information when uploading Excel to Synkka. It is possible to fix errors at this stage, but if they are not corrected in PIM, the same error is likely to happen again in the next uploading process.

5.3.4 Economic feasibility

When using ST plugin to generate Excel, the customer needs to purchase the plugin. Purchasing it is a one-time fee, the installation without any functionality (basic installation) is calculated in Appendix 1 as well as an estimation of implementing the Synkka Excel. ST has a monthly SaaS fee, so a separate SaaS fee was not added to this solution. While the cost benefit ratio (Table 12) is looking good for the solution, it is most likely too expensive for a customer who does not need ST for other purposes. Also due to higher annual costs, and since many potential Synkka integration users already possess the ST solution, the actual implementing fee would be left out. Since ST is used for many other purposes, many customers would still require it even if they would have a separate integration solution, which would add the value for solution proposal 1. This has not been taken into consideration when making the calculations and they might be too optimistic.

Table 12: Benefit/cost (B/C) ratio for the solution alternative 2

Years	**1**	**2**	**3**	**4**	**5**
B / C ratio (1 new customers/year)	1,16	1,59	2,03	2,46	2,90
B / C ratio (2 new customers/year)	2,32	3,19	4,06	4,93	5,80

Since the solution proposal economic evaluation has some uncertainties described above and some of the implementation fees will not be received from existing customers, the economic feasibility score was lowered by 20 points in the scoring table (page 71).

5.4 Feasibility Analysis of Alternative 3

Solution proposal 3 was no feasible solution for data transfer automatization. This solution would not bring any direct costs to the case company, but the possible benefits would not be gained. In the scope of the project, meeting the customer needs would not happen since the need is not met in any way. Intangible assets are not generated. The technical execution would be possible since it does not require implementation. It is possible that this might cause some indirect losses in the form of lost sales cases. However, these are not calculated when evaluating the economic feasibility, so the B/C

ratio was considered to remain as zero (no costs, no benefits). The customer needs were analysed, and the result is shown in Table 13 below:

Table 13: Strengths and weaknesses of the customer needs analysis in solution proposal 3

	Strengths	Weaknesses
Solution proposal 3: no feasible solution	- No extra attributes for products to maintain in PIM	- Synkka user interface was considered difficult to use - Need to maintain product data in PIM and Synkka separately - No time or cost savings in product management

Since there are no costs in the solution proposal 3 execution, B/C ratio was considered to be zero. The lack of a proper solution would likely cause customer sales cases to be lost, causing expenses in the sales front and losses in the project sales. Since the actual cost would be difficult to evaluate, these were ignored in the results.

Table 14: Benefit/cost (B/C) ratio for the solution alternative 3

Years	**1**	**2**	**3**	**4**	**5**
B / C ratio	0	0	0	0	0

5.5 Comparing Alternatives and Proving the Most Feasible Solution Proposal

As described earlier, a feasibility criteria table shown below was created based on the findings in the chapter 4.4. Each feasibility issue was added to this table and they were given criteria to fulfil. For example, customer needs were divided to six sections based on the findings in data collection and maximum points were assigned to each. These were weighted based on the estimation of the importance of the feature. Scores for each solution proposal were assigned based on how each alternative matches the criteria.

Table 15: Criteria for the key feasibility issues

Customer needs	Intangible assets	Technical feasibility	Economic feasibility
Time saving (max 25 pt.)	Increased product value and benefits for customer (max 20 pt.)	Technically executable (max 50 pt.)	Market potential (max 50 pt.)
Ease of use (max 15 pt.)	Employee expertise increase (max 15 pt.)	Solution complexity (where less complex solution gains more points) (max 50 pt.)	Benefit/cost ratio (max 50 pt.)
One centralized system to maintain product data (less manual work) (max 30 pt.)	Customer service improvements (max 15 pt.)		
Consistency in product data (max 10 pt.)	Better customer relationships (max 15 pt.)		
Faster to market product cycle (max 10 pt.)	Improved technology (max 5 pt.)		
Foreign market possibilities (max 10 pt.)	Product improvement (max 20 pt.)		
	Boosting sales (max 10 pt.)		

Each solution proposal was scored using the feasibility criteria table and total points were assigned to the feasibility matrix in Table 19. The scoring of all alternatives is shown in Tables 16-18.

Table 16: Scoring of Solution Proposal 1

	Customer needs	Intangible assets	Technical feasibility	Economic feasibility
Solution proposal 1: Integrating PIM to Synkka	Time saving 25/25 pt.	Increased product value and benefits for customer 20/20 pt.	Technically executable 50/50 pt.	Market potential 50/50 pt.
	Ease of use: customer needs only to select products 15/15 pt.	Employee expertise increase: programming new features, gaining expertise in Synkka platform 15/15 pt.	Solution complexity (where less complex solution gains more points): requires a plugin for PIM since it does not support all features required 20/50 pt.	Benefit/cost ratio: Break-even point is soon achieved with correct pricing 40/50 pt.
	One centralized system to maintain product data: all data is in PIM system 30/30 pt.	Customer service improvements 15/15 pt.		
	Consistency in product data: with detailed and structured data model 10/10 pt.	Better customer relationships: serving customers with better product offering 15/15 pt.		
	Faster to market product cycle: as soon as product is in PIM, it can be enriched and sent to Synkka 10/10 pt.	Improved technology 5/5 pt.		
	Foreign market possibilities: by adding country specific Synkka data products are ready to be published abroad 10/10 pt.	Product improvement: new in-house executed PIM plugin 20/20 pt.		
		Boosting sales: solution has raised interest in potential customers 10/10 pt.		
Total	**100**	**100**	**70**	**90**

The solution proposal 1 gained maximum points in customer needs and intangible assets feasibility drivers. The technical feasibility was considered less since the solution would require a plugin implementation. Economic feasibility was rather high, since the project could be financially beneficial already in the year one (when year zero is considered the product development year) with high enough SaaS fee or with two or more customers implementing the solution.

Table 17: Scoring of Solution Proposal 2

	Customer needs	Intangible assets	Technical feasibility	Economic feasibility
Solution proposal 2: Using Sales Tool to generate Synkka Excel	Time saving: Requires some manual work 15/25 pt.	Increased product value and benefits for customer: eases the process 15/20 pt.	Technically executable: full support more difficult to gain, since would require complexity in PIM data model or a separate PIM plugin for Synkka data 30/50 pt.	Market potential: requires purchasing ST and not fully automized 30/50 pt.
	Ease of use: customer needs to select products in ST and upload Excel to Synkka 10/15 pt.	Employee expertise increase: programming complexity in ST, gaining expertise in Synkka platform 10/15 pt.	Solution complexity (where less complex solution gains more points): 10/50 pt.	Benefit/cost ratio: B/C ratio is positive from the first year implemented 50/50 pt.
	One centralized system to maintain product data: all data is in PIM system 30/30 pt.	Customer service improvements: only for ST users 5/15 pt.		
	Consistency in product data: with detailed and structured data model 10/10 pt.	Better customer relationships: serving customers with better ST features 10/15 pt.		
	Faster to market product cycle: as soon as product is in PIM, it can be enriched, and ST can access data from REST 8/10 pt.	Improved technology 0/5 pt.		
	Foreign market possibilities: by adding country specific Synkka data products are ready to be published abroad 10/10 pt.	Product improvement: 5/20 pt.		
	Because solution requires customer to purchase ST plugin, it was considered a minus and thus diminishing 20 pt. from total result	Boosting sales: 5/10 pt.		Because the solution economic uncertainties described in the chapter x, 20 pt. was diminished from the final score.
Total	**63**	**50**	**40**	**60**

The solution proposal 2 gained rather good points in customer needs and economic feasibility. Intangible assets were only halfway met since the solution does not bring product improvements, but on the other hand it would increase the knowledge of Synkka model and enable better customer service. Economic feasibility had the best B/C

ratio, but since the calculations were considered rather optimistic, 20 pt. was diminished from the final score.

Table 18: Scoring of Solution Proposal 3

	Customer needs	Intangible assets	Technical feasibility	Economic feasibility
Solution proposal 3: No potential solution proposal	Does not offer any solution for the customer need in the scope of the project.	Does not offer any intangible assets in the scope of the project.	Does not require any technical solution.	No direct costs for the case company, no potential benefits in the future.
Total	**N/A**	**N/A**	**N/A**	**N/A**

The solution proposal 3 was not scored since it does not offer any solution to the problem presented. In customer needs and intangible assets since it would bring no customer value nor intangible assets in the company. Technically it requires no solution. Economic feasibility is more difficult to assess, as there are no costs but also no gains in the future. If other solution proposals would turn out to be economically non feasible, this solution would be the best option.

The scores calculated in previous key feasibility criteria tables were added to the feasibility analysis matrix in Table 19 and the weighted results were calculated.

Table 19: A weighted feasibility analysis matrix of the solution alternatives

	Weighting %	Solution proposal 1: Integrating PIM to Synkka	Solution proposal 2: Using Sales Tool to generate Synkka Excel	Solution proposal 3: No potential solution proposal
Customer needs	15%	100	63	N/A
Intangible assets	15%	100	50	N/A
Technical feasibility (yes/no)	20%	Requires a plugin for feasible implementation, but whit this could fully support the solution. 70 / yes	Cannot fully support all features but is still executable. 20 / yes	N/A / yes
Economic feasibility	50%	90	80	N/A
Weighted score / ranking	100%	89	60,95	N/A

As a summary, each of the solutions were analyzed feasible since none of them failed in economic or technical feasibility. The best weighted score was gained by the solution proposal 1: Integrating PIM to Synkka and thus it was selected for the proposed solution.

5.6 Summary of Proposed Solution for Automatic Data Transfer

The proposed solution for data transfer automization is the solution proposal 1: Integrating PIM to Synkka. This solution would meet the customer needs by fulfilling the requirements stated in chapter 4.4.1. It would also most likely meet the target in creating intangible assets, as market potential was discovered, and the solution would have the perequisites to become a market leader. Some of the differentiative marketing benefits are for example a domestic solution provider and an in-house built solution which is not dependent on any partner's operations. The solution would also improve the product, increase employees' expertise and thus customer service and relationships, enabling reaching the financial target set for the project. Technically the solution is feasible, but it would require some features not fully supported by the current PIM solution to make it more user friendly. These suggestions are described later in this chapter. Economic feasibility met the targets set, but it is also redefined later in this solution proposal.

In order to fulfil all the customer needs and preventing unnecessary feature implementation in the core PIM product, the solution is suggested to be built as a separate PIM plugin. The features that should be added to functionality are following:

Adding package hierarchy for a product: could be executed as a feature where the user can add new package types for the product. The package should have information of the hierarchy level (there can be more than one package type in the same level), it should also have the following data: package GTIN, sub products GTIN, number of products it contains. Each package needs to have a feature to add multiple packaging materials, and each packaging material has information of its attributes. Different package and material type codes could be handled as key value pairs (choice), where key is GS1 code and value is a plain language versioned text. When adding for example a new material type, it would always have necessary attributes which the user can fill, e.g. packaging material weight or recycling. A simplified example of how package data adding should be executed for a product is illustrated in Figure 31.

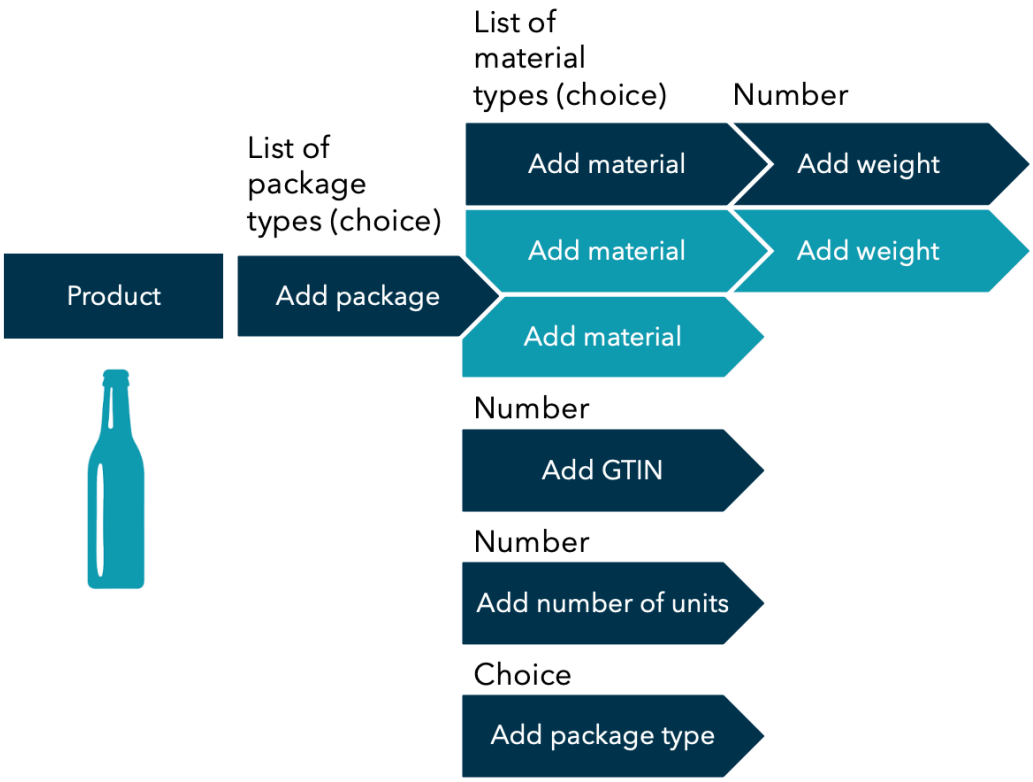

Figure 31: Example process chart of adding package to a product base unit

GPC: Since GPC codes (global product classification) are described in the XML format, this could be utilized when implementing a feature to support nested GPC codes with a suggestive search feature. A process flow chart of the feature is shown in Figure 32.

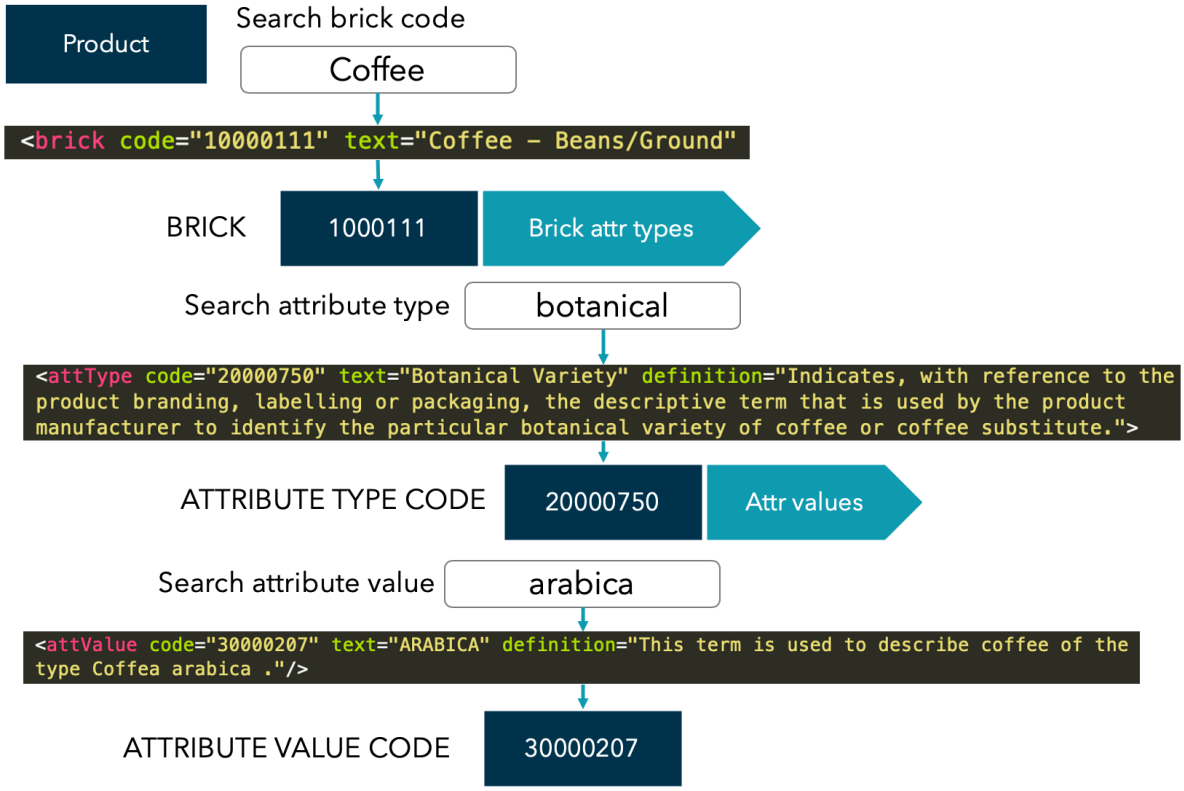

Figure 32: Example of a process for adding GPC codes to a product

To tackle the issues found in the solution, an updated flow chart was created including the plugin, validation Excel (Document G) and media integration. In this solution, the plugin would take care of converting the document data to binary format for the media integration, since it would be a rather simple solution as described in chapter 4.3.1. It would also handle the package hierarchy as suggested above by enabling user to add packages to a product. As a result, this data is generated into the standard package hierarchy XML format. GPC codes (and possibly other codes like UNSPC) could be added to the product data model as suggested above. Some of the code standards used by GDSN might have access via an interface and it should be investigated before deciding how to implement the solution. The PIM attribute types and units would be mapped to corresponding of the GDSN standard, this should be done into the configuration to prevent the customer from changing these as it might cause problems in the integration. In the case of a new customer, the data mapping process will be a standardized process as attributes required for Synkka can be predefined. In the case of an

existing customer, more data mapping is required, and possibly new attributes need to be created. By default, the required Synkka attributes should be added into the customer data model. Additional and enriching data will be mapped in the plugin configuration. A data validation Excel maps the attributes and units to correct codes in Synkka and checks if everything is valid. As a result, each of the product attributes have the correct data model to be appended into the XML.

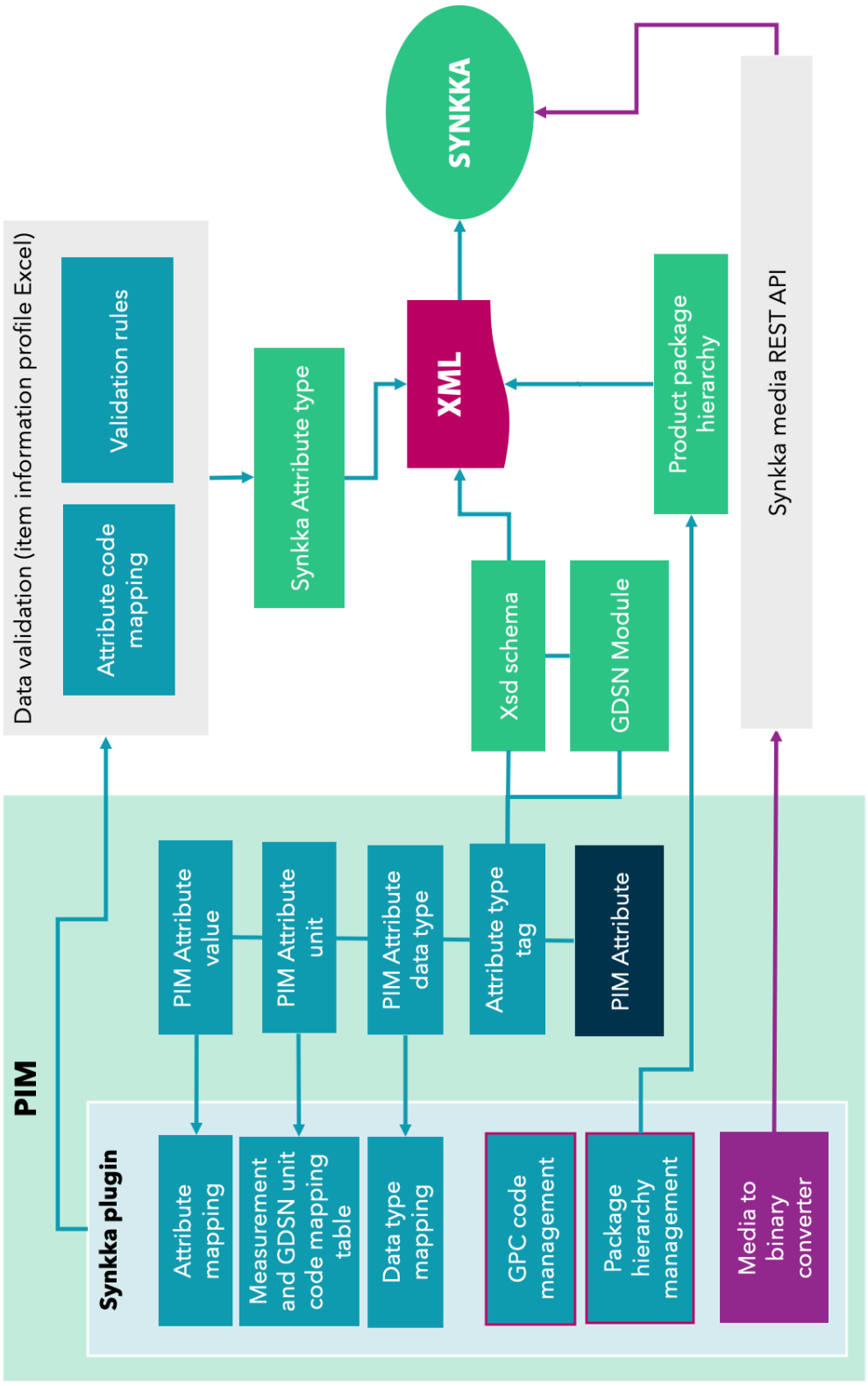

Figure 33: An adjusted flow chart of the solution proposal

Based on the findings in economic feasibility evaluation, a suitable pricing model was adjusted. The implementation fee was to remain in order to diminish the company risks. Calculations were made with different monthly SaaS fees, and also the product volumes were considered. Since in the chapter 4.4.4.1 an average amount of products in Synkka was defined slightly under 150 but most have less, there are 650 suppliers of which 4,7% have 500 to 1000 products, and 2,16% more than 1000 products in Synkka. Since companies with only very few Synkka products are not potential customers for the integration solution, it was estimated that approx. 50% of suppliers have such small volumes that it would not be beneficial to invest in the automation. Detailed calculations are found in Appendix 10, the volume-based pricing model is shown in the table below:

Table 20: Pricing model of the monthly SaaS fee

Product volume in Synkka	% of customers	SaaS fee
Less than 150	86,28	S
Over 150 but less than 1000	9,4	M
Over 1000	4,32	L

Based on these, a pricing model was planned so that the break-even could be accomplished in the early stage of the process. Year zero is not shown in the table below since it is considered to be reserved for the development of the solution only. Detailed calculations are found in Appendix 10. The benefit / cost calculations for this model are shown in Table 21 below.

Table 21: A monthly fee SaaS models B/C ratios

Years	**1**	**2**	**3**	**4**	**5**
B / C ratio (1 new customers/year)	1,01	1,52	2,02	2,52	3,03
B / C ratio (2 new customers/year)	2,03	3,03	4,04	5,05	6,06

After this summary, the proposed solution is evaluated with the company key stakeholders in the next chapter.

6 Feedback on Proposed Integration Solution

Due to the nature of the thesis, the solution proposals were evaluated along the way with the case company key stakeholders and thus the improvement suggestions were appended mostly in the proposal stage. Some improvements to the solution proposal were made based on these suggestions. In this part of the thesis, the final proposal of the selected solution is presented to the stakeholders of the case company. After receiving feedback, and the solution proposal is adjusted accordingly.

6.1 Overview

The company key stakeholders are Business Lead (responsible for current customers and business planning), company CEO (financial targets and sales), CTO (RND lead, responsible for product development and programming), and Marketing Manager (responsible for sales and marketing). The thesis with the solution proposal was presented and discussed with each and some adjustments were made to the solution proposal. On the whole the feedback for the solution proposal and the thesis itself was good, and the marketing manager commented that the thesis is "*An excellent piece of work! There is very good material for the sales cases in hand.*" The Business Lead considered that there is a "*good balance between the technical execution and business analysis*".

6.2 Feedback Received and Improvements

The proposal received some improvement and correction suggestions. These are described below and to finish off this chapter, the final proposal is presented.

The original cost estimations were corrected based on the feedback received from the solution proposal. PIM upgrades were not considered in the original solution proposal, and since these might have an effect on the selected solution proposal the operational costs might be bigger than estimated. The new estimation raised the operational costs of the project for approximately 10% per year. The proposed solution of a PIM plugin was also estimated more arduous, and thus the development costs would be higher. The programming part of the solution would have an approximately57% raise. Also, the

implementation fee was considered to be less profitable since part of the fee would automatically go to work costs of the technical implementation. The actual benefit of the implementation was considered to be approximately half of the original estimation. Based on these, the new benefit / cost ratios were calculated (Appendix 12) and the B/C results are shown in Table 22 in the chapter 7. The costs calculated for the customer in the current situation are not likely to be as high as originally estimated, since the work is usually done in-house. This was however argued, since the original calculation mentioned that the customer will also have savings when the employees' time is freed to other essential work.

When the technical solution was discussed, it was thought that it should be considered thoroughly whether the integration solution would be possible without the plugin implementation. However, an estimation of the programming costs was revised on the basis of the proposed solution. As for the technical execution, the media to binary converting can be executed in the integration solution and it does not need to be implemented in the plugin. Based on this an updated flow chart was drawn and it is presented in chapter 6.3. Based on the feedback, the following changes were made to the final proposal:

- Updated B/C ratio and a new evaluation of the number of new customers needed to make the solution beneficial
- Updated technical flow chart

The summary of the final proposal is presented below.

6.3 Summary of Final Proposal

The solution proposal presented in chapter 5.6. was revised based on the feedback. The changes suggested are mostly minor, the biggest change is in the development costs of the product. When the updated figures were used calculating the benefit cost ratio of the solution, the situation did not however change remarkably. An updated B/C ratio is shown in the table below:

Table 22: Benefit/cost (B/C) ratio of the solution proposal after proposed adjustments

Years	1	2	3	4	5
B / C ratio (1 new customers/year)	0,63	1,05	1,47	1,88	2,30
B / C ratio (2 new customers/year)	1,26	2,10	2,93	3,77	4,61

As seen in the table above, the B/C ratio of the solution will be positive from year two if there is an average of one new customer per year. The ratio would be positive already at year one if two new customers purchase the solution. This does not significantly change the economic feasibility of the project as it is still considered feasible. The monthly SaaS fee was already adjusted in chapter 5.6 and used in the updated calculations. Since the biggest income is most likely coming from companies with a smallest number of Synkka products, the fee should not be too big and thus it was not raised in the final proposal.

Based on the feedback from the technical solution, the integration flow chart was slightly modified to match the final proposed solution and the media to binary conversion has been moved away from the PIM plugin. The flow chart is shown in Figure 34 below.

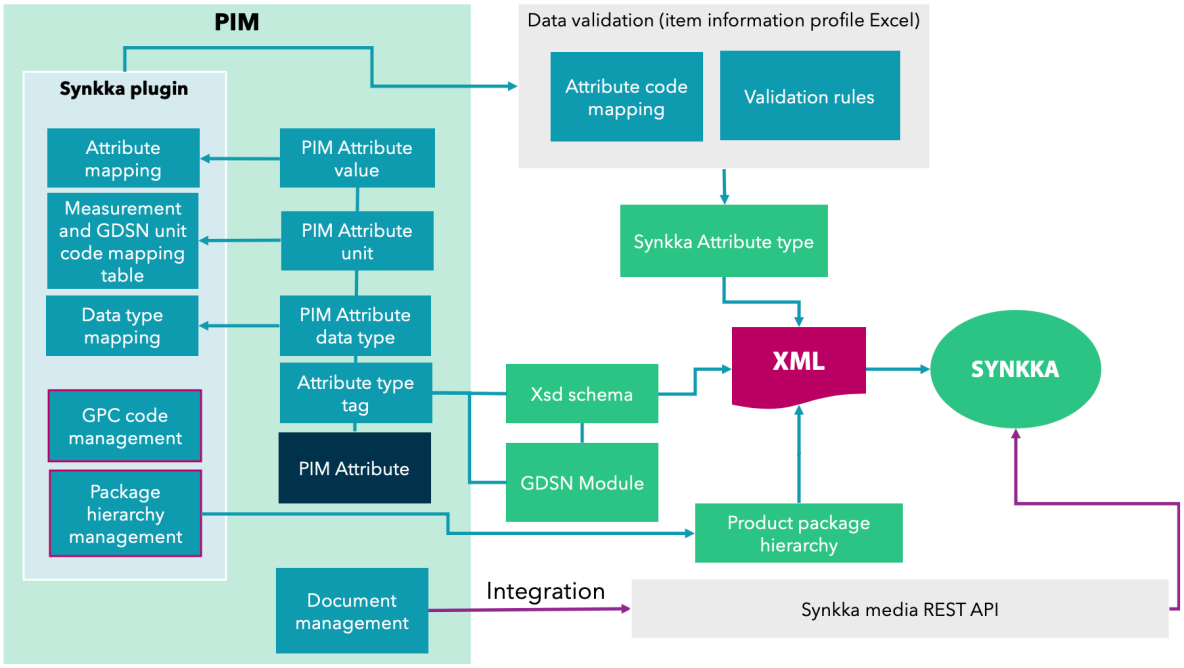

Figure 34: An updated flow chart of the final proposal

As a conclusion, the final proposal did not bring many changes in the proposed solution. But there was still an option left open that the plugin might not be needed if the PIM system could be adjusted to serve the Synkka users better. This analysis is however excluded from this thesis and needs to be considered before the implementation phase. It would most likely cut down the costs, but as said before, it might bring features to PIM that are not essential for non Synkka users and thus make the usage more complex for them. In the next chapter the thesis is summarized, and next steps are planned, followed by an evaluation and closing words.

The final chapter of the thesis consists of an executive summary of the thesis by presenting the result in the scope of the research challenge and business objective. This is followed by a description of the necessary steps to start the implementation of the proposed solution in the case company. In the last chapter, the thesis is evaluated, and its trustworthiness is discussed.

6.4 Executive Summary

Product information management is becoming increasingly important since the number of sales channels is increasing along with globalization and internet. The case company offers a modern PIM solution to its customers which enables enriching the product data much further than for example An ERP system could do. One of these sales channels is GS1 Synkka, which provides product data to retailers in a global GDSN standardized format. Since the number of channels is growing, also the connectivity between these various systems is becoming increasingly important.

The business problem emerged since there is currently no method for transferring the product data from PIM so Synkka. The objective and the outcome of this thesis was to provide a solution proposal for a feasible solution to integrate these systems in a way that would enable the data transfer automation process. The study was conducted using design research and thus aiming to provide a practical solution for the implementation.

At the beginning of the study, there were two potential solutions to consider. A third option of not having a feasible solution, was also added to the comparison. First the conceptual framework was created to collect the data needed to conduct a feasibility study in the area of software development. The conceptual framework consisted of four key feasibility drivers, namely customer needs, intangible assets, technical feasibility and economic feasibility. Each of the feasibility drivers was assigned a method to measure and finally a feasibility matrix tool was created for the final comparison of the proposed solutions.

In order to gain a deep understanding of the possible solution, especially Synkka was studied thoroughly. This part of the thesis consisted mostly of the vast documentation

of the GS1, GDSN standards and Synkka. This knowledge was utilized when presenting the possible solutions to the data transfer automation. Next the data needed for the feasibility comparison was collected by utilizing the tools and methods created in the conceptual framework. Each of the solutions was then compared against the analysed data on each key feasibility driver. Finally, the results were summarized, and the solution of the data transfer was presented as a solution proposal 1: Integrating PIM to Synkka which would provide a fully automized solution.

Finally, the solution proposal was validated by the case company Business Lead, and feedback was collected from each stakeholder. Based on the comments received, the final proposal summary was made.

6.5 Next Steps Towards Implementation

The study aims to provide enough technical details to evaluate the project's technical feasibility and setting the frames needed in planning the solution. The aim has been to identify the most visible challenges the execution would most likely face with suggestions to overcome those. However, since the objective of the thesis was not to create an integration specification, selecting the technologies and the final implementation model is left in the hands of the RND department. The vast documentation collected on the GDSN standards, Synkka interface, xsd schemas and other essential data will be shared with this thesis to deepen the knowledge of the employees and people participating in planning and developing the actual solution.

From the company perspective, it is essential to create a product data model which follows GDSN standards. This will be the backbone for the future customer installations using Synkka as well as a document for the RND to specify how PIM and Synkka data will be mapped in the solution. This data model should contain information of the mandatory attributes, their schema, types and units. Also, a data model design for the food and beverage sector should be created since it is a major user group and the pilot customer is operating in that sector. This can be done in co-operation with the case customer since they possess the knowledge of the sector which contains a large amount of legally regulated data.

Based on the findings of the intangible asset analysis in chapter 4.2.2, a project plan and KPI's should be set to meet the business objective and strategy presented in the Balanced Scorecard with Strategy Map.

6.6 Evaluation and Project Trustworthiness

According to Kananen (2013), “a thesis should be correct, reliable and credible”. To ensure the credibility of this thesis, the documentation of the systems at hand has been carefully examined when applying it in the solution proposals. Also, a solid foundation was built with the conceptual framework to have a reliable and especially essential theory base for the study at hand. The credibility measuring is difficult when using the qualitative design research methods (Kananen, 2013). In this thesis, credibility has been taken into consideration by documenting the data collection methods and justifying the selected tools for measuring. The key stakeholders have evaluated the thesis and it was validated by the business lead. The aim has been to justify and document each decision in a proper way to be able to offer a proper evaluation base for the thesis. Kananen (2013) states that a design research faces a problem when it comes to reliability validation, as it aims for a change. The method to measure the validity of the thesis is by measuring how well the results can be generalized. In the context of this thesis, the solution is a proposal of the feasibility of a new software feature, which makes the evaluation more difficult since there is no existing solution to the problem presented and since the solution proposal is made for a specific environment it cannot be used as a general guideline.

As a personal evaluation of the project, there are some steps that could have been done better. The questionnaire response rate was perhaps too small to draw reliable results, partly because of the current economic situation as many companies had layoffs during the questionnaire phase. This was partly covered by collecting data from statistics received of the Synkka usage. But providing a bit more time for the data collection in a different economic situation, a better result might have been achieved. Also, more detailed data of the customer’s current Synkka usage would have been beneficial when evaluating the cost benefits of the automation, so the questionnaire could have been more detailed.

6.7 Closing Words

The process of the thesis execution was divided into three quite different sections. Theory for the conceptual framework was followed by an excessive amount of technical documentation, global standards, integration documentation and validation rules which helped to draw out a picture of what the solution could eventually be in order to have a

validity for the technical execution. Finally, the conceptual framework was utilized in the process of data collection and a feasibility comparison. As a whole, the thesis process has helped to gain plenty of knowledge on how to conduct a feasibility study, which can differ significantly based on the target at which it is aimed. The model of GDSN has been something interesting to learn. Despite the feeling of complexity, it eventually enables data communication in multiple channels globally while adding the traceability of a product in the form of a GTIN. I am convinced that the standards will play a growing role in the global world and that sharing information quickly and in a consistent way is a necessity. These standards apply also to products for example in medical care, and in these uncertain days it plays a vital role when healthcare is in a need of supplies and medicine.

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Appendix 1: Cost benefit calculations of solution alternatives (Confidential)

[for evaluator view only]

Appendix 2

Data 2

Field notes – Interview, Project Manager – *Confidential*

[for evaluator view only]

Appendix 3

Data 1

Field notes – Workshop RND – *Confidential*

[for evaluator view only]

Appendix 4

Data 7

Field notes – Workshop, CEO, Marketing Manager – *Confidential*

[for evaluator view only]

Appendix 5

Data 3

Field notes – Workshop, customer– *Confidential*

[for evaluator view only]

Appendix 6

Data 4

Questionnaire – *Confidential*

[for evaluator view only]

Appendix 7

Data 6

Field notes – Interview, GS1 – *Confidential*

[for evaluator view only]

Appendix 8

Data 8

Field notes – Feedback and validation of the solution proposal – *Confidential*

[for evaluator view only]

Appendix 9

Data 9

Field notes – Feedback of the solution proposal – *Confidential*

[for evaluator view only]

Appendix 10

SaaS monthly fee calculations – *Confidential*

[for evaluator view only]

Appendix 11

Kaplans Balanced Scorecard with Strategy Map – *Confidential*

[for evaluator view only]

Appendix 12

Updated cost benefit calculations – *Confidential*

[for evaluator view only]