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THE IMPACT OF SUPPLIER MASTER DATA ON ACTIVITIES AND DECISIONS OF SUPPLIER MANAGEMENT

A Company Study Case

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ABSTRACT

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A good relationship with key suppliers is a key factor of a sustainable business. Nowadays, supplier data has become an asset, but manipulating the data effectively still is a challenge to business. Managing Supplier Master Data (SMD) – the uniform set of solid and transactional data of supplier – is a way to govern supplier data and enhance the value of supplier relationship, proposing a solution to effective supplier management. Taking this notion, the study aims to determine how Supplier Master Data impacts supplier management decisions and what information of it facilitates decisions.

The thesis surrounded traditional concepts of supplier relationship management (SRM), and Supplier Master Data (SMD). It included SRM decision processes and involvement of SMD with its data attributes. Data Quality concept was briefly mentioned, since it is a crucial matter of decision results. The empirical study had both quantitative to qualitative research in sequence. Not only collecting sources from books, scientific articles to enrich theoretical part, the study also gathered over 4,000 supplier master records from company X and conducted 11 interviews with experienced supply managers in its empirical study.

The findings showed that SMD was a managerial tool for overall control, created a database for both analytics and reference purposes of supplier managers, which indirectly influenced decisions. The impact level of SMD was low to medium in decisions regarding sourcing strategies, risk control and contract management. However, no to low impact on supplier selection, evaluation and relationship classification was observed due to unavailability of data and company procedure. Noticeably, key data for SRM decisions were Name, Address, Identification code, Activity Status, Terms of Payment and Delivery, Currency, Category and Contract Data. Otherwise, Relationship Segmentation, Industry and Classification data were optional. A majority of the data were kept in good quality, fulfilling the need of decisions makers. Yet attributes of Contract data and Category data should be revised to enhance usability in Contract Management and Category Control. The study suggested improving comprehension of the data as well as automation so that SMD could be applied to complex range of data, resulting in higher data quality and user satisfaction.

Keywords	Supplier Relationship Management, Supply Chain, Supplier Master Data, Data Quality, Decisions.

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CONTENTS

APPENDICES

LIST OF FIGURES AND TABLES

LIST OF APPENDICES

APPENDIX 1. Questions to Analyze Dataset

APPENDIX 2. Interview Questions

LIST OF TERMINOLOGY

DQ: Data Quality

MD: Master Data

SMD: Supplier Master Data

SRM: Supplier Relationship Management

1 INTRODUCTION OF THE THESIS

The introduction provides background information and reasons for selecting the topic. This part introduces the research question and objectives together with the structure of the thesis to demonstrate a clear view of the content for readers. Benefits of the study contribute not only academic research, business practice, but also serve parties with interest in the topic.

1.1 Background of The Topic

During the development of technology in the 21st century, the values of data have gradually become noticeable as an intangible asset. With a thorough understanding about the data, companies can obtain valuable information and use them to bolster competitive advantages just as they do with traditional assets for example products, employees or inventory. For international corporations, various information, analytics and evaluation for decisions accumulate significantly. The larger corporations are, the heavier the demand on data burdens business activities. Therefore, managing data quality is a growing concern.

In Supplier Relationship Management (SRM), the attention emerges in managing the data quality, questioning an effective method to control supplier data. If Master Data is well controlled, that means SRM can obtain accurate, up-to-date supplier information for business demands (Jäger 2013; Borek, Parlikad, Webb & Woodall 2013). However, a majority of supplier data in business that exist substantially and sporadically encumber business performance. Furthermore, the data quality – the core meaning of supplier data and business intelligence – is often neglected and regulated unproperly. (Allen & Cervo 2015).

Obstacles in organizing supplier data affect business functions, create low transparency in the supply network and reduce management power of SRM managers. Even though data are considered as a "corporate asset" (Allen & Cervo 2015), people have not understood fully to gain most value from the data. They usually tangle with typical data issues. Duplicates, out of date and wrong data impair analytical

figures in reports, weakens evaluations, regular operation efficiency and strategic decisions accuracy.

1.2 Objective of The Study

To raise a consciousness that supplier master data is fundamental in supplier management, the objective of the thesis aims to define **whether Supplier Master Data can improve decisions of Supplier Relationship Management.** In specific, the thesis seeks answers to:

- How does Supplier Master Data participate in and impact SRM decision activities?
- What information of Supplier Master Data do SRM decisions need?
- What can SMD do to improve SRM decisions?

Business data is an interdisciplinary area between Business and Technology Department, so managing data of an organization is not entirely under IT technicians' responsibility, but also involves business users (Allen & Cervo 2015, 23). This paper focuses on Supplier Relationship Management whilst it briefly discusses the technical aspects.

1.3 Benefits of The Study

Firstly, the thesis is written to enrich academic source in the field of Business, Supplier Relationship Management. During the progress of thesis research, availability of the materials supporting Supplier Master Data, Data Quality in SRM perspective overall were not as tailored and popular as the one of Customer Data. Secondly, since the thesis involves supplier data topic, one of the leading trends of the 21st century, it can propose an idea to enhance effectiveness in SRM practices. Lastly, the thesis serves any party who is interested in the topic and attentive to development either supply chain or supplier management.

1.4 Structure of The Thesis

The thesis contains five parts: Introduction, Theoretical Framework, Empirical Study, Interpretation of Findings, Discussion and Conclusion. A list of Reference with links and citations to used materials and a list of Appendices with empirical questions are given in the end.

Part 1 – Introduction: The introduction presents an overview of thesis's content, structure, origin of the research idea and beneficial parties. Along introducing research questions and focus area, it gives a general background of the field knowledge and the objective of the study.

Part 2 – Theoretical Review: Key concepts are Supplier Relationship Management, Supplier Master Data and the relation of Data Quality to SRM's decision making. This part depicts those aspects holistically to give the scientific-proven answers to research questions, then suggests a framework to implement the empirical study.

Part 3 – Empirical Study: Empirical part includes the design, research method, data collection and data analysis. The data was gathered to reveal the practical side of theoretical framework. The collected data are analyzed to depict the result pattern and compare it to the theoretical framework.

Part 4 – Results Interpretation: Continuing the part 3, the fourth part explains the findings and give critique on the results from both theoretical and empirical aspects. It reflects and defines final answers to the research questions which were set in objectives.

Part 5 – Discussion and Conclusion: The last part summarizes salient content, evaluation of reliability and validity of the whole research, as well as review of thesis' objectives and the findings. It ends by clarifying limitations and suggests ideas for future studies.

2   THEORETICAL FRAMEWORK

The literature reviews and depicts key concepts of Supply Chain Management, Supplier Relationship Management by showing SRM decisions and processes, which leads to the need of managing supplier data. Later, the theory of Supplier Master Data defines what information is needed in Supplier Relationship Management decisions, while Data Quality concept explains definition of high data quality. This section is based on selected materials, which are previous researches in published books, scientific papers and journals. Compiling, cross-referencing, and comparing opinions of different researchers on the same subject were done. Key words like "Master Data", "Supplier Data", "Strategic Decisions in Supplier Management", and "Supplier Management Process" were looked up the most.

2.1   SUPPLIER RELATIONSHIP MANAGEMENT

This section explains roles of a supplier to a manufacturing firm's supply chain, then leads to key knowledge of Supplier Relationship Management and its activities. It opens the concern about refining and managing supplier data.

2.1.1   Supplier Definition and Supplier Roles in Supply Chain

The economy today is connected by multiple transactions and exchange activities happening every time among businesses, cities, and countries. The power of global supply chain is proven by the density of trading activities around the world, which affirms no company can survive alone without alliances. Business needs relationships with partners – vendor, customer and investor – and that relation finally links all parties together under a chain of supply. The greater number of collaborations and purchasing activities occur, the more demand to govern relationships between buyer and seller.

Cambridge dictionary defines "*supplier*" as a person or an organization that provides raw materials, services, products to a firm in a long time ("Supplier", n.d). The usage of "*supplier*" term usually mingles with "*vendor*", "*seller*" or "*provider*", since the difference between those terms only emerges from contextual scenarios.

In this paper, a supplier is a person or an organization that involves frequently in purchasing transactions with a firm by selling goods or services in exchange for monetary profits. Emphasizing the length of relationship, "*supplier*" is a suitable term to use under this circumstance.

Given a traditional view, Drake (2011) and Cambridge dictionary define that suppliers that has a direct connection to which they send the item to, are sorted as **Tier 1 supplier.** Also, any business that supplies to the Tier 1 suppliers is **Tier 2 supplier** (Drake 2011; "first-tier supplier" & "second-tier supplier" n.d).

Flow Of Purchase Orders, Money

Supplier   Manufacturer   Wholesaler   Retailer   Customer

Flow Of Goods And Information
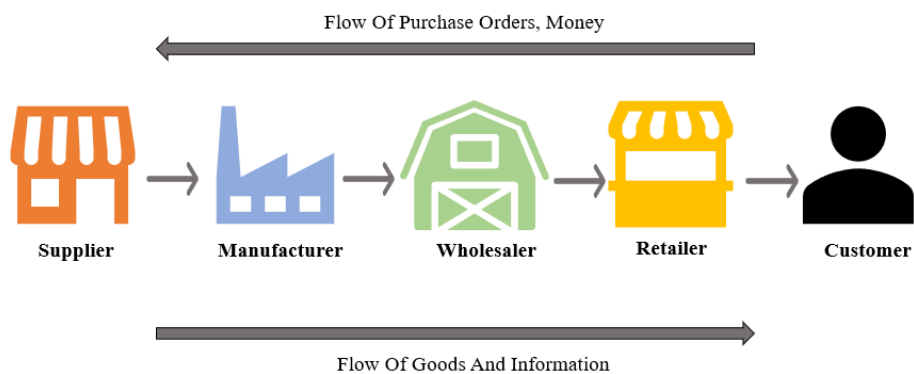
Figure 1. Linear Supply Chain Model.

"The interaction between buyers and sellers" was affirmed as one of the core principles in supply chain to gain customers' satisfaction (Drake 2011, 3). In practice, the linear model of supply chain (Figure 1) is further expanded with countless branches. Typically, there are more suppliers in the chain instead of a single player, thereby the actual view of supply network is the extended vertically and horizontally (Figure 2) and combines both Tier 1 supplier, Tier 2 suppliers (Drake 2011).
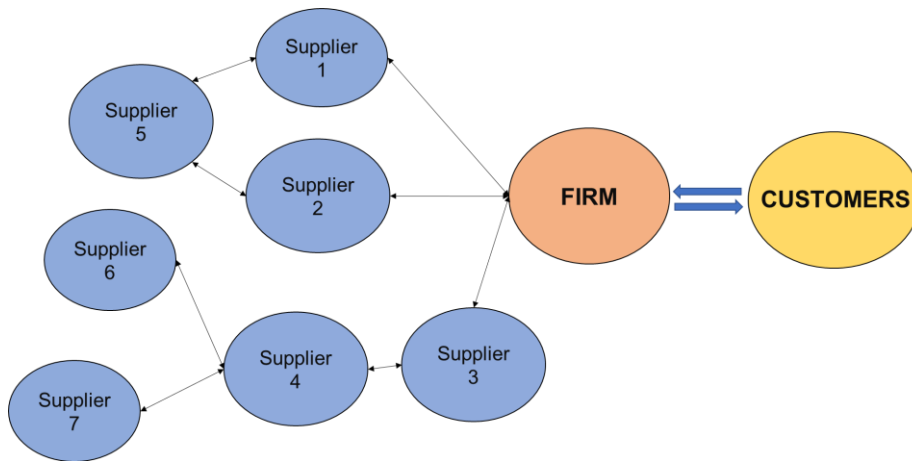
Figure 2. Supplier Network of a Firm

Supplier participates in the value stream, offering essentials materials and services for the firm's production and regular operation, so that the firm can fulfil end-consumers' demand and receive profits. To maximize value on each product sold to customers, product development asks for investment and innovation, which is achieved by exploring new materials, upgrading technology and collaborating with suppliers. As a result, procurement team initiates sourcing for materials, goods, and services that meet quality and conditions to produce items which customers are willing to pay. O'Brien (2014) described the "end to end flow of a value system", inferring that the larger quantity and complexity of players the chain was, the higher value end-product was (Figure 3) (O'Brien 2014, 299-301).
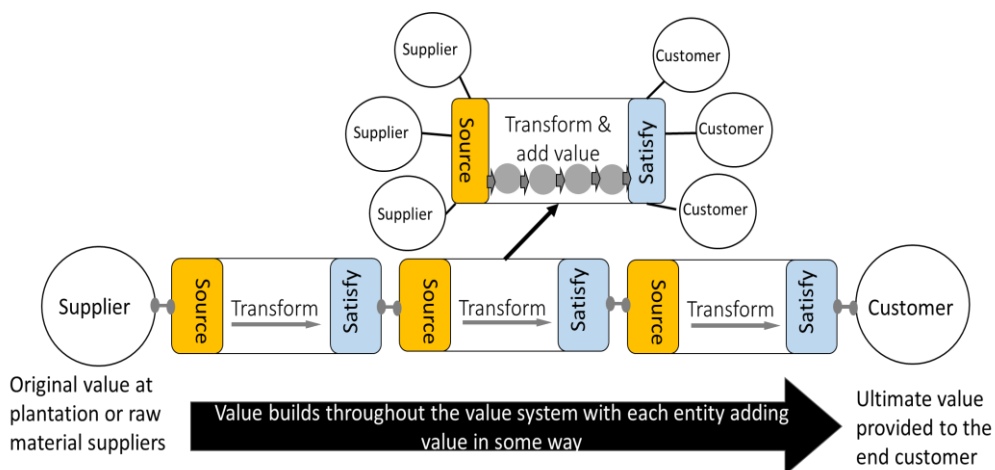
Figure 3. The Value System (O'Brien 2014)

Due to the matter of resources scarcity and production efficiency, a manufacturing firm works with different types of suppliers in versatile purposes. Practically, suppliers can enter any point along the chain, from initial planning to after-sales activities. For instance, at planning stage when the firm makes strategies and defines roadmap, it outsources a supplier for consultancy because the supplier gives expertise, new ideas and technologies to save cost and time. Likewise, the firm works with suppliers in critical processes such as Maintenance and Repair Operations (MRO), Human Resources, or Finance (O'Brien 2014, 299-301). In general, the role of supplier is irreplaceable.

A company can have multiple suppliers for its products and obtains load of supplier data in history of purchase transactions. In order to manage suppliers effectively, a **transparent and structural view of what each supplier provides is essential, which tells how much the company spent and what kind of the relationship the supplier has with the company**. Moreover, the company concerns the information about quality, specific measurement of products/service as well as terms of contract to begin and implement a successful purchase. Especially, sustainability of business in long term depends on the resilience of relationship with supplier. Managing the relationship between the company and partners (including suppliers, intermediaries, third party service providers) is a core activity for an organization (Drake 2011; Mentzer, Stank & Myers 2008).

2.1.2 Definition and Goal of Supplier Relationship Management

An enterprise engages more suppliers along the history of operation, its supplier relationship grows not only in number but also in complexity. Instead of a simple purchasing activity between buyer and seller, the matter of inventory, quality in materials, design, and product development have caused more concerns to firm owners. Difficulties in dealing such matters with suppliers and keeping balance in relationship with them require a new approach. Since 1990s, Supplier Relationship Management (SRM) became a key concept, a managerial approach for business to regulate, coordinate and maintain partnership with suppliers (Hardy 2017**;** Lambert & Schwieterman 2012, 337-352). It subsumes under the coverage of supply chain

management, ensuring the effectiveness in operation of the whole supply activities (Figure 4) (Lambert *et al* 1998, 1-20). Delloite reported SRM strategies were beneficial when company concentrated on first-tier suppliers and key partners that it had harvested the most values (Delloite 2014).
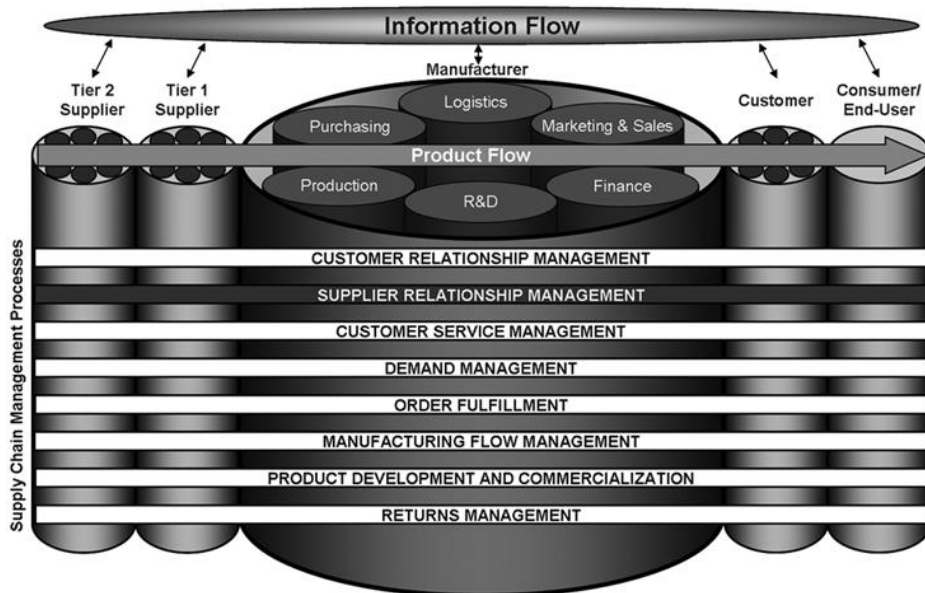
Figure 4. Supplier Relationship Management in relation to Supply Chain (Lambert et al. 1998).

SRM activities govern the relationship lifecycle of new and existing suppliers. That includes planning, partnership evaluation, calculating risks, cost spending, and implementing interaction strategies to maintain and develop the top beneficial relationships with suppliers. The target of SRM is aligned to the goal of the whole supply chain, which is effectiveness in cost, cashflow, quality, inventory, and delivery (Hardy 2017, 60–62; Wisner, Tan & Leong 2009).

2.1.3   Activities of Supplier Relationship Management

Macro–SRM is a large process having sub-processes highly integrated and aligned with Procurement. Activities of SRM (Figure 5) construct the linkages among (Lambert & Schwieterman 2012, 337–352) a firm's processes and between a firm with external stakeholders.

SRM Process is divided into the Strategic (or Relative) process and the Operational (or Transactional) process. The Strategic Process involves relationship enhancement and management, planning, setting metrics and guidelines for the Operational Process to escalate the value of relationship in long run. Meanwhile, the Operational Process, which mostly intertwined with Procurement, initiates sourcing opportunities, performs purchase transactions, measures performance and supports the Strategic Process to enhance supply base's efficiency (Lambert & Schwieterman 2012).
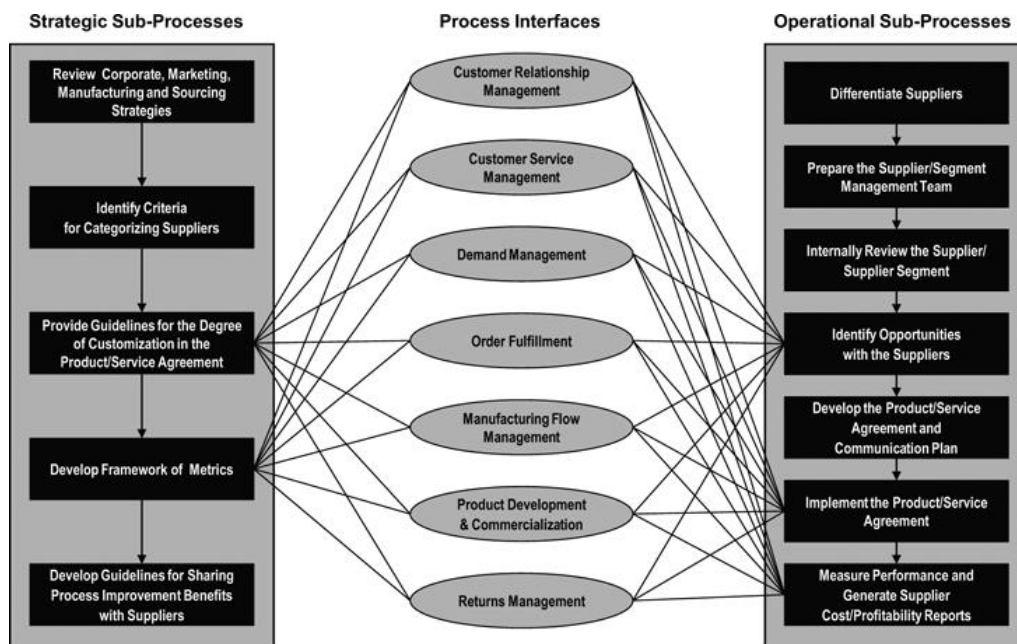
Figure 5. Supplier Relationship Management Processes (Lambert & Schwieterman 2012).

The Strategic part and the Operational part of SRM are not separated but influence mutually. On one end, purchase activities initiate market engagement and establish connection with a supplier, then strategies are made to improve that relationship. On the other end, SRM strategic decisions affect purchasing activities by setting the supplier's contractual terms and conditions (Park, Shin & Chang 2010; Klemettinen 2018).

Park and her colleagues (2010) explained the integrative process of SRM in five continuous stages (Figure 6), starting with preparation and ending with purchase

evaluation stage. Later, the similar approach was justly shared in a research of PwC in 2013 (Pwc 2013; Park et al. 2010).
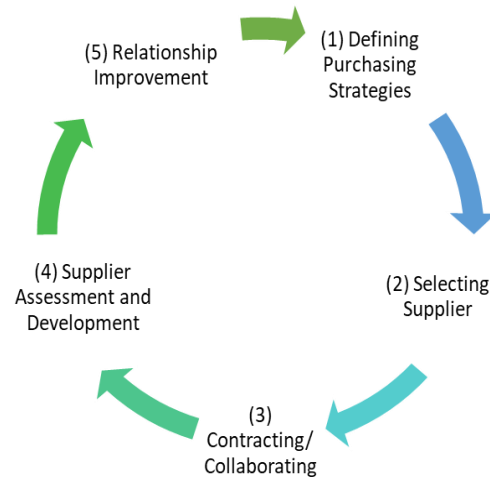
Figure 6. Integration process in SRM (Park et al. 2010)

(1) **Shaping Purchasing Strategies:** Goals are defined initially by calculating costs, risks and seeking promotion of value, innovation and optimization for the supply network. By reviewing and accessing the supplier performance scorecard, managers can set criteria for the supplier selection process as well as refine terms and conditions for long-term and daily transactions (Park et al. 2010).

(2) **Supplier Selection:** Procurement team is responsible to find a supplier that is suitable to sourcing criteria. Data for supplier selection come either from the existing internal database or from market engagement (Fox & Vaidyanathan 2017). The following points are typically evaluated in a selection process (Hardy 2017; Easton, Hales, Schuh, Strohmer, Triplat & Kearney 2014):

- **Supplier's Portfolio**: defining the segmentation, industrial capability, level of return of investment (ROI), and competency of executing procurement.
- **Potential of Relationship Governance:** duties of contractual parties, contact person, level of trust, extent of alignment to company's code of conduct.
- **Risk Management and Supplier Performance**: review scorecard; combine measurement of delivery, cost, capital security, order completion, goods quality, and correspondent actions.

- **Development Ability and Supplier Certification**: rate the supplier's propriety and capacity in term of the company's benefits.

(3) **Collaboration/Contracting:** The contract execution is the result of "top down strategic decision and bottom up [evaluation results]" (Easton et al. 2014). The proposal for purchasing is solicited after each party agrees on negotiation about conditions and terms (Walter & Yusen 2014). Procurement team also establishes a record of supplier's profile in the system to document and monitor transactions.

(4) **Supplier Assessment and Development:** A supplier is evaluated in three stages: before, during, and after the transaction by encompassing profits, delivery, product quality, the effectiveness of collaboration, and other measurements formed by the need of individual firms (Walter & Yusen 2014). For relative assessment, companies often compare the supplier's value and performance to their business's requirements. Supplier classification models are, for example, ABC classification (Pareto analysis) that combines purchase volume in terms of quality, finance, and technology with strategic importance or Segmentation relationship (Figure 7.) that measures the extent of strategic level and the supplier's influence power (Hoffmann, Beck & Füger 2012, 109–119).
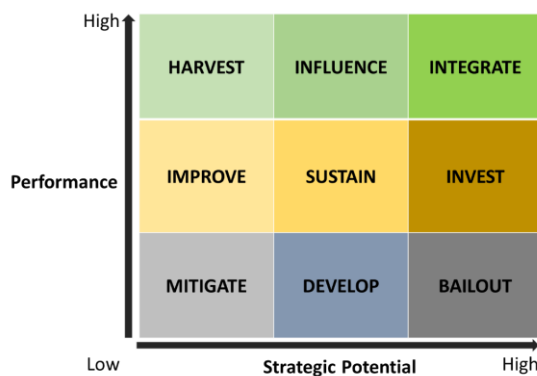

Figure 7. SRM Relationship Framework.

Alternatively, scholars discussed Portfolio approach as an alternative, in which the segmentation framework above is clustered into 4 types of relationship development: Strategic, Critical, Arm's length and Routine Development (Hoffmann et al. 2012, 109-119). The purpose of classifying is to determine suppliers, who generate

competitive advantages for the company, to maintain the closeness partnership – strategic or tactical approach. When the key suppliers are defined, managers arrange activities towards continuous improvement with appropriate tactics.

(5) **Continuous Improvement:** After the evaluation, SRM coordinates across functions and departments, employs measures to alleviate drawbacks. Besides, carrying interaction (meetings, feedbacks, negotiations) with suppliers is essential to improve the performance, benefits, as well as relationship.

Supplier data are like the currency running under activities of SRM, from decisions, evaluation to execution. SRM cannot lack a database/ system to contain and present information. Regardless of evaluation methods, the accuracy in supplier data is indisputably vital. Thus, the demand for supplier data management and a system supporting SRM activities exist, especially in corporations where SRM managers make supplier evaluation and decisions on a large scale. Jäger suggested that SRM should govern master data as the base of management system to remove manual work, monitor, maintain and control accuracy in analytics and decisions (Jäger 2013).

2.2 SUPPLIER MASTER DATA AS A MANAGEMENT TOOL

This part introduces the concept and characteristics of supplier master data. Nevertheless, it investigates the challenges of SRM regarding supplier data and how managing master data supports SRM.

2.2.1 Supplier Master Data (SMD)

Supplier Master Data (SMD), so-called Vendor Master Data, is "a set of identifiers and attributes" representing critical and consistent information of suppliers. Master data are used across functions and systems of an organization (Dreibelbis, Hechler & Milman 2008; Allen & Cervo 2015; Gartner Glossary). It allows users to obtain an overview of supplier information, to generate performance report, analytical results and work as a trusted source (Jäger 2013; Dubov & Berson 2007).

The data of supplier are the core of an enterprise system, typically compose two parts: Master Data and Transactional Data. Transactional Data has values changing

in every transaction like type of product, price and delivery location. More consistent than transactional data, Master Data is rarely influenced by transactions and can determine the Transactional Data (Kappauf et al. 2011). Master data is not modified without a thoughtful consideration (Borek et al. 2013). The term "Supplier Master Data" used in this paper refers to such consistent data. The goal of master data management is to ensure a high level of accuracy, timeliness, consistency, and transparency of data in the system (Dreibelbis et al. 2008). That responsibility is shared between data owners like SRM specialists or procurement staff, who give input value, use and evaluate the information, and data steward like IT engineers or technicians, who control the process and maintain the data stream in the system (Dubov & Berson 2007).

According to Kappauf, a supplier master record has three data types, namely General Data, Company code data, Purchasing Data (Kappauf et al. 2011,43). Later, Jäger shared the same view, also described how Purchasing Team should act to keep the data correct (Jäger 2013). Easton denoted the meaning of Supplier Master Data to SRM would be incomplete without Classification Data, because SRM requires structuring the level of relationship with a supplier in order to delegate resources and focus on suppliers bringing the most competitive advantages to the company. The fourth type of data allows suppliers to be classified by strategic relevance and informs the status of relationship (Easton, S. et al. 2014; SAP Documentation). Moreover, contract data is also kept in Classification Data (SAP Documentation, Oracle).
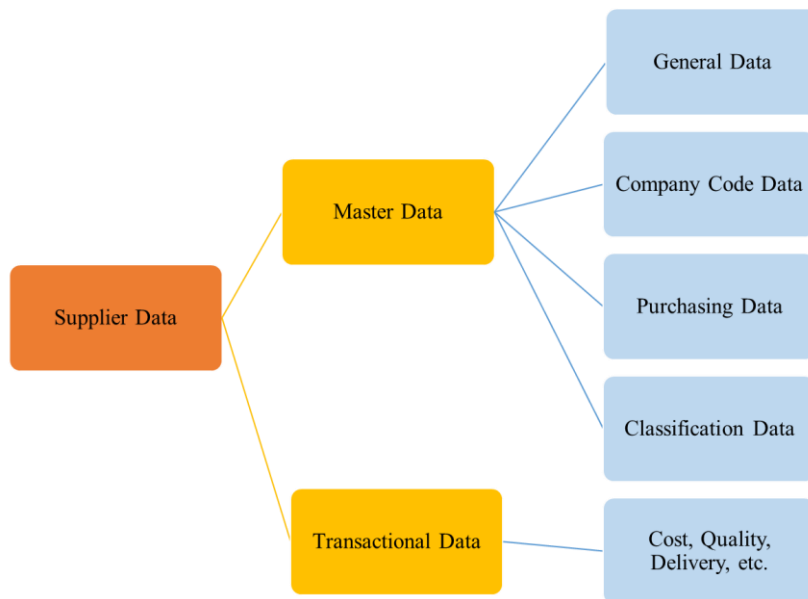
Figure 8. Structure in Master Data of Supplier.

- **General data**: supplier name, address, language, contact method, identification numbers.
- **Company code data:** payment methods, local accounting data.
- **Purchasing data:** Payment terms, products/service information, delivery terms, currency, purchasing group, partners, plant/ storage location data.
- **Classification data:** ABC Classification, Qualification Level, Relationship Segmentation, Agreements/Contracts, Certifications.

Technically, a unique code presents a supplier's master data record. This code is used in different departments like Supplier Relationship Management, Inventory Management, Logistics, or Accounting & Finance under an enterprise system. Particularly in SRM processes, having the code created for suppliers, users can see the supplier's information, utilize the data to perform tasks, and store business documents. (Kappauf et al. 2011, 74; Duteil 2017; Dubov & Berson 2007).

2.2.2 Challenges of SRM in Managing Supplier Data

Although issues of non-regulated data do not impact the main business immediately, they impede and interrupt workflow of business, reduce the effectiveness and

waste resources on correcting errors. In SRM and Procurement practices, several challenges related to supplier data are shown in Table 1.

Table 1 Challenges related to supplier data in SRM.

Challenges	Explanation	Results
Silo Effects (Fragmented data points)	Each different function owns a separate copy of suppliers' data, which are not in sync, not structured or systemized.	Incorrect, inconsistence of output data across processes.
Redundant & duplicate data	A supplier has more than one record in the system.	Unable to define the correct data; conflicts in using data.
Confusion in communication	Misunderstanding "who is talking to which supplier about what?"	Confusion in internal communication and message to suppliers.
Lacking transparency	SRM managers have no or little intuition of the total supply network (e.g. number of suppliers, type of products, and operational history).	Underestimate risks; weaken relationships and control in purchasing activities.

(Olson 200; PwC 2013; Magal & Word 2012; Easton et al. 2014; Drake 2011; Taylor 2018).

Even though users understand fundamentally the guideline of SRM and know what content they are seeking in the database, they still demand on controlling preciseness and consistency of supplier data. In order that users comprehend and communicate in a same way, the data must be unified and synced; then it enables reports, analytics and transactional activities (Easton et al. 2014, 28). Hardy described three main requirements of SRM on supplier master data. First, maintain a unique record for each supplier, then link the corresponded information in the supplier master record with different purchasing processes. Second, keep the information current, comprehensive and showing linkages between parties, which allow searching and assessing suppliers. Third, associate the data to key performance indicators. This enables insight analyses, which recommend interaction mode base on statisti-

cal and analytical figures. He also advocated SMD to follow guidelines and procedures from SRM to gain transparency, reliability and prevalence in reported data (Hardy 2017).

2.2.3 Supplier Master Data to Counter Challenges in SRM

Master Data allows supplier data to be referenced across enterprise's functions, enables sourcing and collaboration activities between the organization and its trading partners. By this property, managing supplier master data is not only helpful to remove problems of silo-effect in supplier chain operation but also to integrate information, to reduce duplicates and wrong records (Borek et al. 2013; Kappauf et al. 2011). As a result, managerial practices reduce manual work to obtain supplier information. For governance purpose, when supplier data are monitored in one place, the control power and transparent visibility of supply chain rise. This is offered by SMD via maintaining status, documents, and supplier data in master records (Borek et al. 2013; PwC 2013). Risk migration also receives benefits if key indicators are tracked (Nikoi & Boateng 2013).

With the development of technology, currently enterprise programmes are the solutions to supplier data issues. These programmes offer SRM managers a tool for managing business information. The tool reflects the situation of suppliers by fetching and compiling data from different business functions with analytical parameters. From there, costs and risks are measured with visibility to maximize value of each dollar spent, relationship's benefits and product quality (Hardy 2017). The tool cannot operate without the input from Master Data, thus well-conformed master data attributes value to result of SRM decisions (Jäger 2013; Dreibelbis et al. 2008).

Especially, in the Era of Big Data and Business Intelligence, managing master data becomes prominent to build an intelligent system not only for SRM but also for the supply chain. If SMD contributes a rich and trustful data source, decision-makers will have reliable and responsive insights on supplier performance, which facilitates strategy design and drives business proliferation (Dubov & Berson 2007; Easton et al. 2014; Rytilahti 2019).

2.3 SUPPLIER MASTER DATA AND DECISIONS OF SRM

Nikoi and Boateng defined three types of decisions in business, which are routine, tactical and strategic decisions, with power and resources intensified respectively (Nikoi & Boateng 2013). SRM has two typical decision types: operational decision and strategic decision. In this paper, the strategic decision is one group, whereas the operational type combines the routine and tactical decisions. The operational decision exists in regular purchasing activities while the strategic decision work further to govern relative aspects and set operational principles.

SMD can help decision makers of SRM in both aspects of operation and relative management. It seems to play behind SRM processes, like an information carrier that is aligned to the whole SRM principles and subsumed in the flow between two SRM processes (Figure 9) (Kappauf et al. 2011; Nikoi & Boateng 2013).
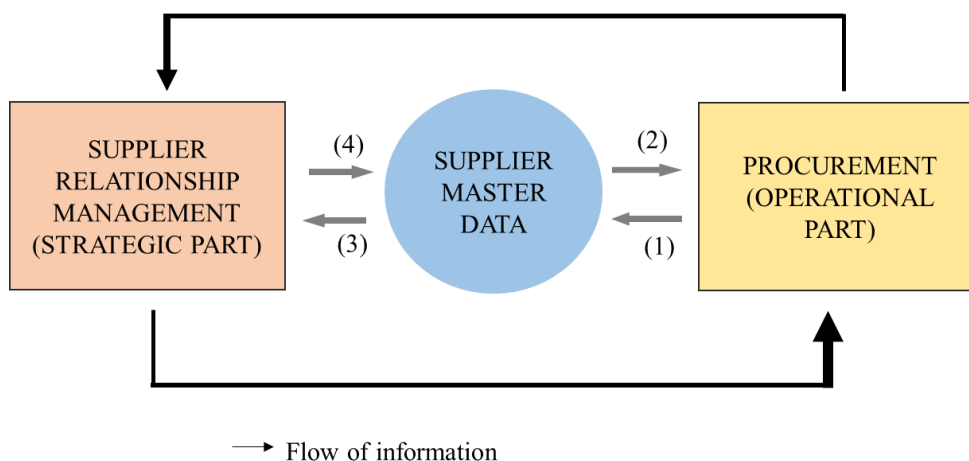
Figure 9. Relation between SMD and SRM processes.

When a new supplier is introduced during regular purchasing activities, its data is stored for monitoring transaction and future use then reported to managers. (1) With SMD, the supplier data is recorded in the database and, simultaneously, presented to SRM managers. (2) In case the company choose a supplier having data already maintained, the selection stage is shortened with supplier's history, status and other information provided by SMD, so that purchasers and managers can quickly check and update. While the operational process fetch information from SMD to perform

24

purchasing activities, it also adds new data into the master record by interacting with suppliers.

(3) In strategic side, SMD facilitates review and assess supply network as well as supplier relationships. Likely, a comprehensive reporting figures need to assemble other different sources to present the entire picture of suppliers' performance. As master data is basically consistent, so it may not be adaptive by situations to give all data users need. (4) Afterwards, managers use SMD to declare to display the decision outcomes, for instant, new payment terms or restriction on unqualified suppliers. Thereby, operational practices will refer as indicators.

2.3.1 SMD in Strategic Decisions

Through integration with master data, strategic planners can focus their attention on key suppliers to promote actions (Figure 10). Since not every data point in SMD contributes meaningful values to the scope of SRM, professionals need to contemplate and refine important data fields. For instance, payment methods and banking details is important to accountants but excluded in SRM's tasks (Fleckenstein & Fellows 2019).

Figure 10. Report to Strategic Decisions.

On the Strategic Decisions, mostly SRM specialists concentrate on improvement group's profits and performance. To decide a key partner, the practice involves reviewing a supplier in different aspects: corporation, marketing prospect, alternatives source and quality of procurement. Also, decisions are made on category
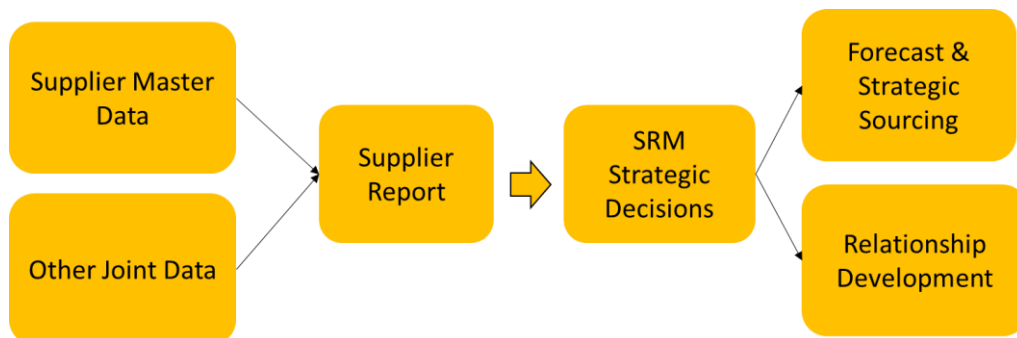
spend, the terms of product/service agreements, compliance metrics and indicators, and strategies to develop supply base (Easton et al. 2014).

Keeping essential information of supplier and purchasing terms, SMD impacts on decisions of Strategic Sourcing and Forecast and Relationship Evaluation and Development (Sehgal 2009; Kappauf et al. 2011). **Strategic Sourcing and Forecast** is about calculating risks and costs, setting guideline for purchases, and managing contracts (Kasliwal 2018; Kappauf et al. 2011). This is the initial stage of procurement, internally informs what products to be sourced, conditions in contractual terms and other requirements. Long terms contracts are reviewed either for better pricing or for delivery terms (Walter & Yusen 2014, Kappauf et al. 2011, 64–74). On the other hand, **Relationship Development** goes beyond internal evaluation, concentrates on adding value into the strategic partnership. Base on analytical report, SRM determines the suitable suppliers to enhance strategic bound and to promote collaboration for mutual development. Focusing on the key suppliers helps the firm in reaching market demand rapidly and flexibly, handling innovations, minimizing product life cycle and cost (Kappauf et al. 2011, 64–74). Since influential suppliers are important to the business, their data is subject to governance.

2.3.2 SMD in Operational Decisions

SMD is a database where supplier information is stored; hence, when purchasers initiate purchase, they access SMD to obtain supplier general information and prompt to investigate its history. It is a quicker and more reliable method than locating arbitrarily in the market. This practice results quicker response, reduces manual tasks and time lead in sourcing (Duteil 2017). Also, SMD involves in On-boarding/Off-boarding activities, registering new suppliers into the system and supporting supplier selection. For an enterprise system, having supplier master record is a prerequisite to generate documents (e.g purchaser orders or request for quotation), and to manage a contract (Kappauf et al. 2011; Jäger 2013). Supplier master records must match contractual terms, which allows post-purchase activities (invoice booking, evaluation, payment, reimbursing) to execute properly (Jäger 2013, Kasliwal 2018). For instance, the payment term information in SMD tells when to pay suppliers. If supplier is paid on time, supply chain activities as well as the relationship

is not impaired. Lastly, SMD performs risk–mitigating actions by indicating supplier's status, which prevents people mistakenly using the supplier who fails to perform commitments, violates policies or any legal circumstances. (Kappauf et al. 2011).

2.3.3 Data Attributes and Supplier Relationship Management

Although types of the data contained in SMD depend on the system's capability and its design, they answers the typical questions of SRM: who the supplier is, what products that the company buys, what purchasing terms are, what relationship the company holds with the supplier, and what current situation is (Easton et al. 2014; IBM; Ivanov, Tsipoulanidis & Schönberger 2013, 114). The essential data attributes of SMD to SRM decisions are selected and compiled in Table 2.

Table 2 Suggestion for Essential Data Attributes.

Attributes	Meaning and Purpose of Use
1.Supplier Name	Supplier name tells who is selling to the company.
2.Address	Address data inform where the supplier locates. Often, it tells location the product is bought.
3. Business Size & Industrial Type	It gives insights for Supplier's Portfolio: operation size, type of business, potential expanding market.
4. Identification Code	It is a unique code (Vat, Tax or DUNNS), used to validate the supplier from legal and financial aspects.
5. Active Status	Status data indicates the situation of supplier.
6. Purchasing Category	Suppliers are grouped by purchased items. Managers uses category data to make analyses on Spend and Purchasing pattern.
7. Payment Terms	It tells the due of payment. The longer term, the better cashflow for company.

8. Currency	It informs the currency for payment, also affect company's capital flow and purchasing patterns.
9. Delivery Terms	It tells incoterm terms, delivery location, mode of transportation and duty of each party. Mostly, it is used in purchase of tangible items.
10. ABC Classification	It defines the importance level of the supplier, based on the total spend over a period.
11. Supplier Relationship Segmentation	It ranks performance and strategic roles of the suppliers to help managers focus on key suppliers.
12. Contract/ Agreement Data	It links the contract's content and the supplier's data to monitor the scope of contract/ agreement.

Firstly, the attributes of General Data (Trade Name, Location, Identity, Business Size & Industrial Type, and Active Status) present basic information about the supplier, used in both Strategic and Operational activities. The Business Size & Industrial data serves Strategic Decision to conduct a Supplier Industry Analysis, which looks for market share, financial strengths, and supplier's position in global supply chain. This helps to plan partnerships with large corporations (Ivanov et al. 2003, 114). The Identification Code not only verifies the supplier, but also provides the official business registration for legislative documents (Easton et al. 2014; Nikoi & Boateng 2013). The Active Status can tell the situation of supplier and its history. It promotes checking spending and activities with the firm in the past. On top of that, operational side acquires the status to determine to use an inactive supplier or to find alternatives.

Secondly, SRM specialists are more attentive to the Purchasing Data and the Classification Data than to the General Data. The Purchasing Data (Purchasing Category, Payment Terms, Currency, and Delivery Terms) are highly requested for both Spend Analysis and regular operative processes. In detail, the Purchasing Category attribute represents a cluster of products having relative characteristics. It aggregates suppliers by their offerings, allows managers to see suppliers by the spectrum of products. From a strategic point, the Purchasing Category attribute leverages control power in consolidating spend volume, visualizing purchase's tendency, and

defining strategies for the whole category (Pandit & Marmanis 2008, Nollet & Beaulieu 2005). From an operation point, when suppliers are organized by the category, it optimizes actions in locating existing suppliers before souring a new candidate. Theo other attributes (Payment and Delivery data) are sensitive fields because they could risk the flow of capital and inventory. Specialists care about the fluctuation in these values with a scrutiny to obtain most optimum terms (Kasliwal 2018; Walter & Yusen 2014).

Thirdly, the Classification Data (ABC Classification, Supplier Relationship Segmentation, and Contract Data) are noticeable in SRM because they mark differences in importance among key suppliers and the rest. The Classification data primarily serve reports, not widely shared in SRM practices because they emerge from certain needs (SAP Documents). Each supplier should be segmented, even before purchase activities, to monitor closely its performance, to promote development proactively, and to leverage competition in the relevant interaction mode. Because of that notion, the attributes of ABC classification and Supplier Relationship Segmentation are put into account for the Strategic Decision. Likewise, maintaining the Contract/Agreement data, SMD can enable control on the contract's validity and coverage, as well as the supplier's compliance (Easton et al. 2014; Jäger 2013).

2.4 DATA QUALITY OF MASTER DATA AND SRM DECISIONS

According to Cooke, "when data is poorly governed and inconsistent, supply chain [is] less competitive and [time is wasted] between the system and trading partners", he denotes that data quality is not only a technical measurement, it also bears economic value (Cooke 2014, 20). Data quality of SMD is the top concern of SRM since the base of decisions relies significantly on the quality of data. In an enterprise setting, the quality of data is described by "fitness for use" – the ability to satisfy users' requirements for certain purposes (Otto & Ebner 2010). High data quality in business means that the data are "fitting the intended purpose in operation, decision making, and planning" (Fleckenstein & Fellow 2019).

A "good shape" of supplier master data means that the data have minimum duplicates and high accurate, timely, complete information (Lawrence & Shen 2019).

The framework includes six dimensions – Accuracy, Completeness, Consistency, Timeliness, Relevancy, and Accessibility – is one of the metrics measuring data quality (Otto & Ebner 2015; Olson 2003).

Table 3 Six Dimensions of Data Quality.

Dimensions	Meaning and measurements
Accuracy	Correctness level of the information to present the real object.
Completeness	Comprehension level of information that data conveys.
Consistency	The integration level of the data across different functions/ application systems.
Timeliness	The compatibility level of the data in correlation with real world object at a given time.
Relevancy	The usability level of the data to users.
Accessibility	The availability level of the data.

(Otto & Ebner 2015; Olson 2003)

Accurate and timely information in SMD not only benefits analytics and evaluations of SRM but also profits the whole company. An interview of PwC with SRM experts reported that correct supplier data was a hidden factor, which was critical to business success (PwC 2013). A sustainable and effective operation requires data to be integrative, real-time, correct, accessible, and transparent (Dubov & Berson, 2007). Data quality concerns both technician and business users because poor data quality in SMD is the root of hindrances in operation system, which is costly to fix, causes delays in supply (Allen & Cervo 2015; Klaus & Dominic 2017, 259–266; Olson 2003). Also, "no organization can report high-quality financial data if the source data used to produce the financial numbers is of poor quality" (Dubov & Berson 2007).

Improving the data quality asks efforts from both business users and data engineers. Users in upstream stages are responsible for obtaining the input from a variety of

sources while data engineers handle the data from upstream business before they are entered the system (Dubov & Berson 2007). Since users who are feeding the information to the system should have the knowledge of correct information to be stored in the system, a clear instruction and training are essential to enhance data quality awareness as well as work culture to employees (Tee, Bowen, Doyle & Rohde 2005). On technical aspects, calibrating parameters of value in attribute helps to decrease wrong data occurrences. Setting data indicators is also an effective solution. On top of that, increasing data quality needs communication between users and engineers to initiate further development. It is determined that a significant improvement in quality can result from regulating properly master data (Dubov & Berson 2007).

3 EMPIRICAL STUDY

Empirical study confirms, refuses and supplements the concepts or phenomenon presented in theoretical study. By applying the framework of theoretical concepts, the results can answer the research objectives with supportive evidences and realistic observation (Habib, Pathik & Maryam 2014).

3.1 Research Plan

The theoretical part proposed that Suppliers Master Data could influences several decision processes in SRM by its information and functionalities. Twelve data attributes in master data were suggested, together with six aspects to evaluate data quality. The empirical study expects to confirm the influence of SMD, the essential data attributes used in SRM decisions, and the concern issues of data quality.

The empirical study has a sequential design, takes company X as its study case. It begins with a quantitative approach to study the situation of supplier data in company X, then uses the qualitative approach to seek answers to the impact level of SMD on SRM decisions as well as the concern of decision-makers for data quality. Data were collected and processed through coding, pattern, and information analysis. Finally, the empirical study finishes with data interpretation and findings (Hesse-Biber 2010).

3.2 Research Methodology and Method Design

Quantitative and Qualitative methods are the two main approaches to conduct empirical research. Each type differentiates in result meaning, the structure of implementation, and serves different targeted objects. Quantitative research studies a phenomenon by focusing on numerical data, statistical parameters to give quantified answers. It proves hypothetical arguments, correlation, or application of certain frameworks (Given 2008). The result is objective, unbiased, logical, and investigative. Information are collected via structural questions in online/ email surveys, polls, or questionnaires. Answers choices are also scripted in advance. Later, the

quantitative data is inserted into a computable program to proceed with calculation and analysis (Hesse-Biber 2010, Hair, Page & Brunsveld 2019, 174).

Qualitative research prefers opinions and observations that are in non-numerical data form. It takes descriptive format like verbal conversations or images to explain the subject phenomena (Babbie 2014, 303–304; Hair et al. 2019, 306–309). Different from the Quantitative type, the Qualitative approach gathers complex data like subconscious feelings, reasons, and in-depth explanation via interviewing individuals or groups of people having experience and understanding thoroughly the subject, using unstructured or semi-structured questions (Harindran & Chandra 2017). The knowledge of the researcher is important to translate properly the meaning of answers given by interviewees.

The empirical study conducts both Quantitative and Qualitative methods in a sequential design, in which the Quantitative method initiates and generates the input to the Qualitative method (Hesse-Biber 2010, 100). Quantitative is applied to Company X's supplier master records to present its current situation, phenomena, statistical findings. Then interviews follow afterward to find explanations to the phenomenon in the Quantitative part (Patrick 2018, 59; Hesse-Biber 2010, 65).

3.3 Data Collection

The data collection can come from primary source, secondary source or both. Researchers defines what type of information is required to answer the research question. Method of gathering data is decided researcher preference and by external factors such as time, cost, location, conditions and. (Naval 2017, 179).

3.3.1 Study Case: Company X

A case study for the empirical research is company X. The company has headquarters in Finland and operates in over 80 countries. It performs in mechanics and energy industry. Company X has a large supply network which expands globally. The company follows category management structure. For supplier management, the

company targets to build sustainable and reliable partnerships with partner by sharing knowledge, collaborating in product development and creating mutual values beside financial benefits.

3.3.2 Data Collection Method and Sampling

In this research, data collection used primary data which were supplier master records from company X's database and answers of interviewees. Sampling is selecting a number of elements from the population as representatives (Patrick 2018). The sampling process starts with the target population, follows with determining sampling method and sample size, and finishes with implementation. Using sequential design, the thesis also has two different sampling methods.

The method of quantitative sampling includes between probability and non-probability. In probability sampling, data is collected randomly with minimal bias. It takes almost exact the miniature of the population to generalize the principle (Hair et al. 2019, 190). In non-probability type, although sampling elements are decided by the research, they are sufficient to reason rationally for the whole population (Hair et al. 2019, 187–188). The study applied stratified random sample, choosing randomly the sample size from clustered population, because the case population (supplier master data records) are separated by branch locations, then the researcher chose randomly one entity to conduct the sampling (Hesse-Biber 2010, 50). All the available supplier records within company X in Finland are taken for quantitative sampling. The sample was taken on 8th of August 2020.

The rule of probability is not strictly applied in Qualitative sampling. Thus, data is selected by the researcher's choice and subjective understanding of respondents (Hesse-Biber 2010, 49–50). Qualitative sampling in the sequential design, takes the data so that it can integrate with quantitative data and give insights to the phenomenon in the quantitative part. Practically, the chosen approach is interview which expects to have 10 respondents who interact with SMD, have more than two year experience in SRM activities and decisions.

3.4   Implementation of Empirical Study

As quantitative research, the thesis employed a set of questions to study the dataset. In the quantitative method, questions are designed to computerize a large a number of inputs. Quantitative data was from extracted supplier master records of company X, then converted to numerical form. Question set (Appendix 1) aims to reflect the current composition of supplier network and to figure whether there is action to managing SMD, what attributes SMD has and how many records containing values among twelve proposed attributes.

As qualitative method, the thesis implemented interviews to gather information. Each interview session took approximately 30 to 45 minutes per person. The questions were semi-structured to open thinking initially and later address specific topics. Question wording was understandable, non-bias, and unambiguous. The interview questions (Appendix 2) comprises of general questions, questions about SMD and SRM decisions, and questions about SMD data attributes and data quality.

3.4.1   Data Coding

Quantitative data was generated in an excel file from company X's database, filtered, cleared irrelevant data, removed credential information of company X and proceeded coding. Total 5,160 records were kept in the system (data extracted on 8th of August 2020), but 639 records were faulty and marked for clean-up. Odd records were eliminated, the remaining 4,521 records were considered as valid samples for analytics. For qualitative data, answers of each question were summarized, coded, grouped by similarities, then analyzed to detect underlying patterns. From the samples, generalization and descriptive words demonstrate the findings. In implementation, the target of 10 interviews were satisfied with 11 interview sessions conducted between 12th of August 2020 and 26th of August 2020. The interviewees have worked in the supplier management and sourcing field with professional experience varied from 2 years to 20 years. All interviewees have been aware of master data management and interacted with SMD frequently.

3.4.2 Integrative Analysis

After coding, data from both methods were integrated for analysis. Results of each side supplement the other or reveal conflicts in findings. Supplier management in company X concentrates on maximizing the value of supplier relationship regarding Quality, Cost and Delivery. Key to achieve the goal is having trusted partners in long run as well as understanding the strategic role of each supplier.
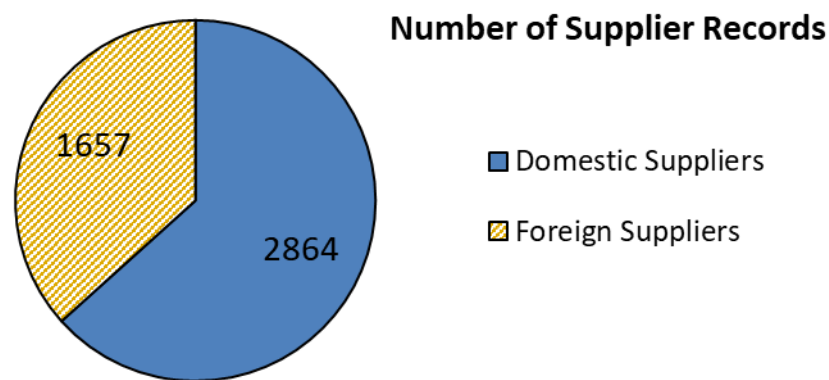

Figure 11. Numbers of Supplier Records.

In practice, Company X employs the supplier master data concept and has a team dedicating to manage master data. Company X has collected and stored supplier data in a global database by using an enterprise system. From the database given on 8th of August 2020, there were 4,521 available supplier records. In details, domestic suppliers took 63% while 37% of supplier records were foreign entities (Figure 11). The number of supplier's records in the company was large and came from more than 70 countries. Each supplier master record had a unique ID representing a supplier entity. The ID was used and shared among departments, allows users to access and extract information from the system to perform different tasks. For example, in the case of SRM, information in SMD transferred directly to purchasing department, enabling buying activities and generating purchase orders. The entire SRM system was built with SMD as the basement, which ameliorated visibility and silo-effect.

SMD was an inseparable part of supplier management process at company X. Supply managers agreed that the magnitude of supplier master data was vast both as a

source of information and as a management tool. SMD involved in majority activities and decisions of SRM with different impact level. In company X, SMD participated in supplier registration, category control, contract management, analytics & forecast of supply planning. Primarily, SMD performed in onboarding activities of a new supplier, supplier information check, and control supplier status as a safety practice.
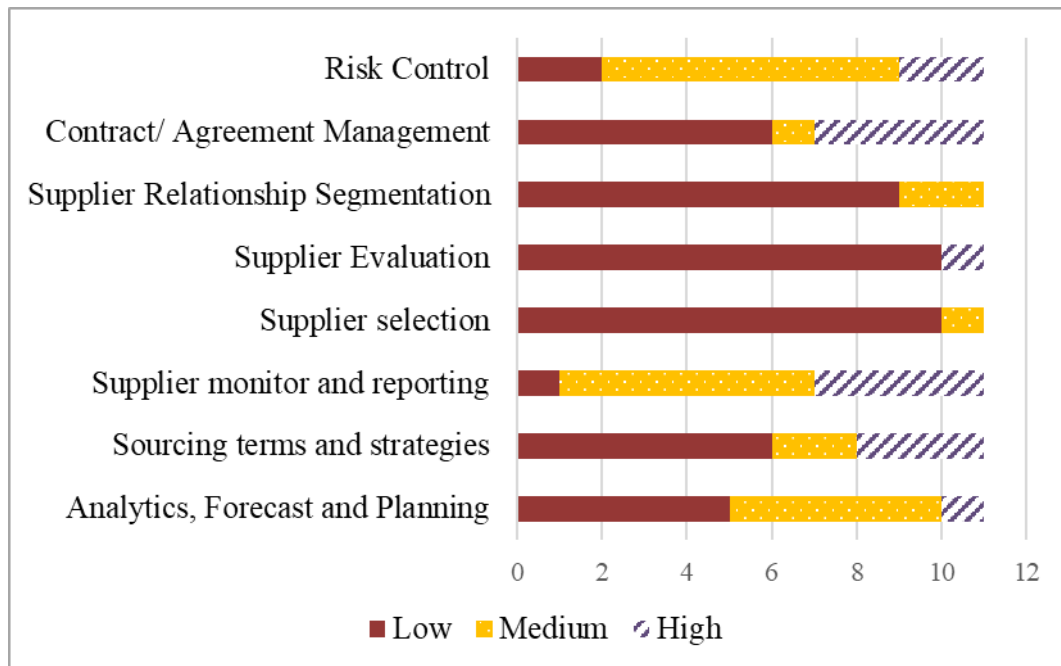
Figure 12. Opinions on Impact Level of SMD To SRM Processes.

The interview's results inferred that decision makers did not rely directly on information of SMD for strategic decisions. Instead, they thought of SMD as a database linking master data and relevant data in other processes, then resulting a compiled report for Sourcing Analytics, Forecast and Planning. The interviewees believed SMD was the foundation to conform and reconcile others supplier data. Additionally, they used several information from master records such as name, identification, payment term, and delivery term were mandatory for the assessment.

The interviewees said that SMD currently carried limited information about the supplier, category of products, and payment terms. Yet, purchasers prioritized other information missing from SMD like available contract coverage and price list. On top of that, they did not perform the work related to SMD if the records were not

established earlier. Furthermore, the need to have SMD was peripheral in case the suppliers had been known by people who handled the task. Particularly, 10 out of 11 persons perceived no to very low SMD impact in supplier selection. Majority of interviewees agreed that selection process was completely or nearly independent from SMD due to the working process. In case the company continued working with current suppliers, SMD was not needed. When SMD was used to look for the potential players, the search function merely showed how many suppliers were available by category. The existing information in SMD informed purchasers the proximity of terms to negotiate but did not decide the final actions. Nevertheless, it was possible to engage suppliers in sourcing decisions without SMD interaction, so the impact level was perceived as low to medium in defining buying terms. Similarly, the impact of SMD was not seen in the after-purchase evaluation since the information for evaluation round came from transactional data (spend, quality, delivery) instead of master data, proved by answers of more than nine people.

On the other hand, medium effect was dominantly agreed in risk control. In practice, information in SMD allowed updating news related to activities of supplier outside scope of the contract to access risk level as well as to mitigate risks. Two opinions emphasized the impact on risk control of SMD in the legal and financial situation suppliers. For managing contract & agreement, low impact was the prevalent answers with reasons that contracts and agreements were separately managed from SMD. The content of the contract and agreement were often decided through executive meetings and performance figures of supplier. This process did not involve master data but may gain benefit from unifying the two.

About supplier relationship classification, two persons defined a medium impact, but all others chose low to no impact from SMD. Like the evaluation stage, the classification stage was said to obtain transactional data instead of master data to make decisions. Also, the need for supplier segmentation was low and simple at that moment, thus existing segmentation data in SMD was not developed. About supply monitoring, six opinions agreed the medium impact of SMD while four persons preferred an upper medium to high effect. In common, they believed that SMD

was used in a reporting system, allowing them to monitor daily and take actions on time.

Quantitative data showed that twelve suggested data attributes were available, but not every supplier record had all attributes in use. The data attributes of Name, Address, Identification Code, Purchasing Category, Payment Terms, Delivery Terms, Activities Status, Currency and Contract/ Agreement were confirmed to be critical data due to the nature and uniqueness of the information. Those data were utilized heavily in operational decisions and risk management. On the other hand, most respondents said that ABC Classification, Segmentation data and Business & Industrial Type were the optional input for both operation and strategies.
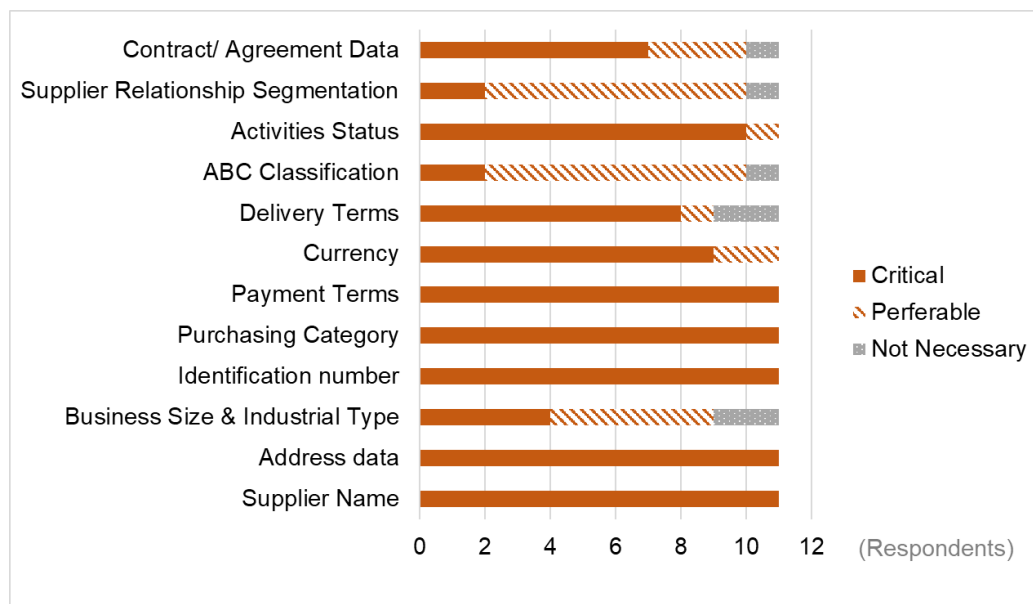
Figure 13. Demand of Data for Decisions.

Comparing to the needs, most critical data attributes were maintained well. Although the Identification Data was missing from a few records, 92% of supplier records having this data was considered as high. The Identification code was agreed as a crucial element, enables verification not only on legal aspects but also financial situation of supplier. The completeness of key purchasing information such as Payment Terms, Currency, Delivery Term were high as well (Figure 14). However, a few noticing opinions were received regarding the important of Delivery data and Currency data. The Delivery Term data was perceived by two interviewees as an

39

unnecessary data or merely an optional data, because they worked with service and intangible goods and did not require this type of information on decision level. Currency data was said to be a critical field for operation but not required for decisions.

For categorization, approximately 79% of the records had the Category Data. This result displays an underperformance for such a critical data that links directly to figures of strategic planning. If this information is missing, the category spending report might be erroneous and lead to unreliable results.
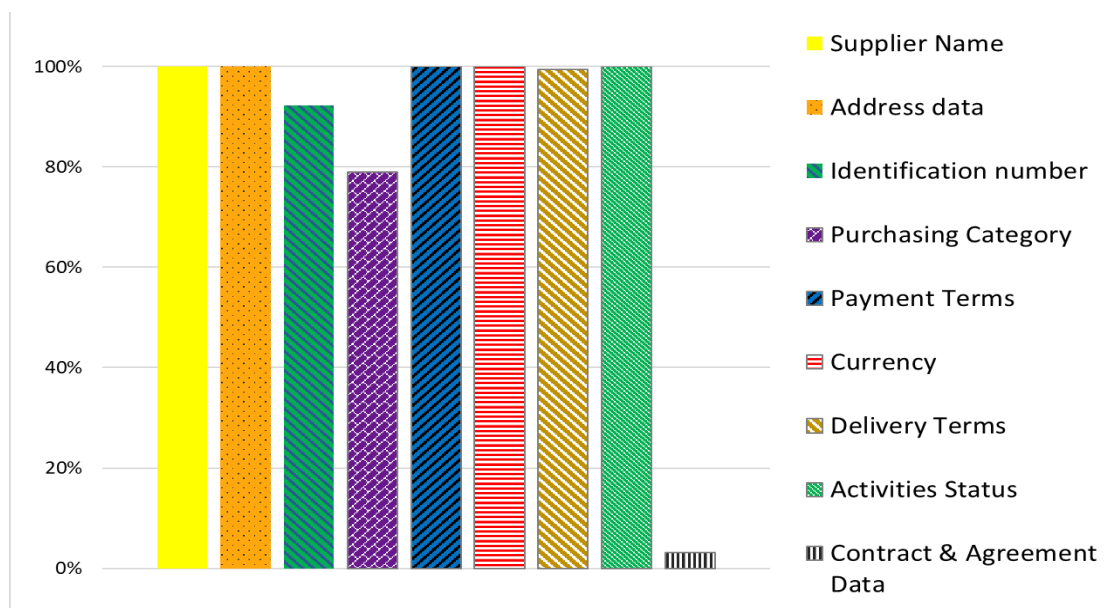
Figure 14. Data Availability of Critical Attributes.

3% supplier records having contract data were possibly caused by a weakness in maintenance or a not-in-use attribute. The percentage corresponded with low impact of data in SMD on contract management. The evidence from interview showed that company X was performing a separate procedure in contract management, which reasoned why contract data attribute had not been utilized. Although five persons supposed that supplier master records always had contract data as critical attribute for the governance purpose, currently such data in SMD was less reliable and needed manual transfer from a contract management system.

The remaining of suggested data attributes are grouped into Preferable information, namely Business Type & Industrial Type, ABC Classification, and Relationship

Segmentation data because they either were not urgent need in business or easily found on the Internet. Only a few supplier records had values in the attributes of ABC classification (34%) and Relationship Segmentation (1%). These figures were also compatible with low demand and non-frequent data governance actions.
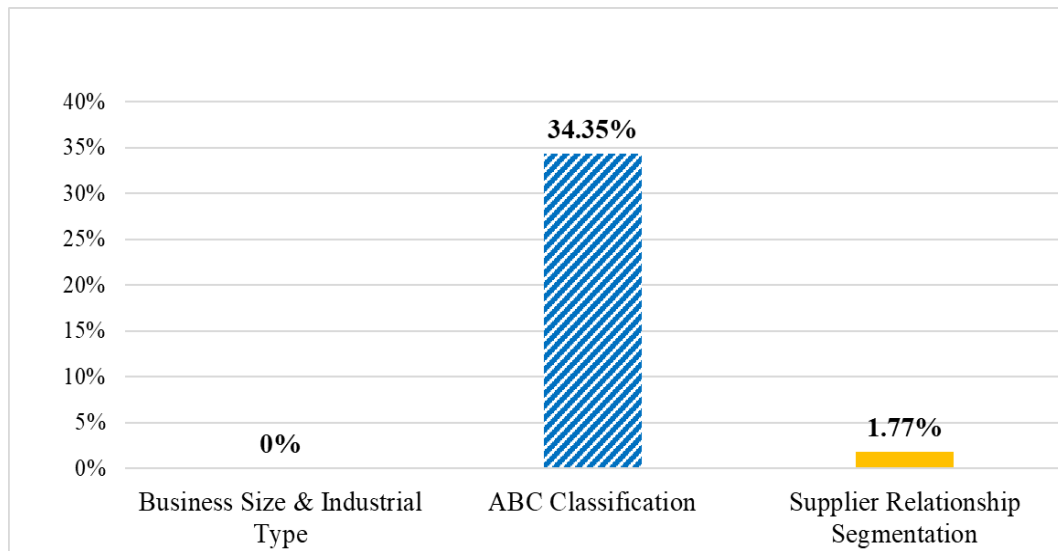
Figure 15. Data Availability of Preferable Attributes.

Business Size & Industrial Type was considered perferable option with 7 out of 11 voters. Respondents agreed it added insights to the report and removed manual browsing, but it is was still unnecessary. They reasoned that it was easier to search on the Internet and did not generate decisive values. About the Classification data, only two persons thought ABC Classification was critical data for decision making. One person said no added value was seen even though the rest thought that this attribute was good to have. Additionally, the Relationship Segmentation data was chosen as an optional value as users currently were unfamiliar with it. In another word, the demand for deep segmenting or classifying modes of relationship was insignificant, so that the company did not use these attributes neither in operation nor decision making. On top of that, if the information with low necessity was put into the system, it would burden the data quality with faulty and out–dated data.

All respondent agreed that the data quality was the core to build a reliable report and strengthen the validity of decisions. They also confirmed the workflow would be impacted negatively if the data quality had issues. One person said that the data

quality of master data affected on firm's operation more than on decision making. Although master data acts as the basement, it could not generate much values to decisions. Still, it was crucial to maintain high data quality. People working with SMD also understood the need to maintain high data quality, so they had tried to ensure that all information was correctly inserted and updated to avoid duplicates and errors in the system, so that workflow processed properly.

Overall, user' feedbacks showed satisfactory to the data quality. Although the majority thought that improvements were still needed, but they had not encountered hindrances with the data's accuracy constantly. A few issues were noticed, mainly related to the angle of accuracy, completeness and timeliness, so corrective actions were required. About completeness, one manager said the biggest concern was that master data could not reflect fullest supplier information. For instance, only data of supplier's headquaters was stored, but in practice the purchasing activities occured with multiples offices of suppliers. This issue has made the data unreliable and low usability. Otherwise, no issue was raised on the dimensions of Consistency, Relevancy and Accessibility. All interviewees shared a demand of up-to-date data in SMD. They also brought ideas to improve the data quality via serveral ways such as training, automation, and communication between users and developer or data keepers.

4 INTEPRETATION OF FINDINGS

The chapter compiles and presents the results from integrative analytical data in contrast with the theoretical framework. It also includes findings and explanations to three main aspects of the thesis: Impact of SMD on SRM decisions, the essential data attributes of SRM in SMD, and practices done in SMD to improve decisions.

4.1 Impact of Supplier Master Data on Decisions of SRM

From the theory, SMD is suggested to participate and influence both Strategic and Operational decisions of SRM. The study case confirms existence of the impact on both parts of SRM but notices that SMD does not influence directly decisions. Instead, it is the referencing basement for decisions making. Meanwhile, the impact level of SMD on management decisions depends on type of information in SMD, capability of current system, and the procedure of the company. Insufficient level of reliability and proactiveness also lower the impact and usability of SMD.

Strategic decisions centers on controlling the whole supply network, focuses on the top valuable suppliers to sustains the relationships and maximize benefits. The decisions at strategic level, based on analytics and forecast for sourcing plan and supply development, requires information from multiple places to be collected and measured. SMD can provide the basic information about the supplier but not the most demanded one for strategies – spending data. Additionally, those purchasing terms in SMD, often serving controlling and revision purposes, are modified by the decisions rather than impacts the decisions. On the other side, SMD set a foundation for other data and enables linkages in analytics. No report data is usable for analytics if the information in SMD is wrong, thus strategic decisions are still affected by SMD. In the case study, the medium impact of SMD is received in strategic level, but it is possibly higher if SMD contains more crucial data and develops intensive integration.

On the operational decision including determining products and terms, supplier selection, supplier assessment and defining supplier relationship, it is noticeable that the impact level of SMD changes by situations, particularly, the way of working

and the limitation of the system. The main value of SMD in operation part is checking information and references, although SMD theoretically means to provide control power in management. This results a low impact on sourcing decisions, supplier selection, and supplier evaluation.

Considerably, if the supplier selection round is done inwardly – purchasers have chosen a supplier and set the contract before using SMD to make a record or update information – SMD is not needed and does not create value. Otherwise, when the process is done "inside-out" (looking for an existing supplier, review its history, re-accessing bad records, then proceeding the selection and contracting), the use of SMD is visible, but still weak. In both cases, SMD does not directly define the supplier to be chosen and the contractual terms. Purchasers usually seek for information not maintained in SMD, so the impact of SMD is limited. The same pattern is observed in the performance evaluation stage and the relationship segmentation stage. The information from master data does not generate enough values to evaluate the performance of the supplier. SMD only provides a supplier ID to integrate the documents, links assessment's result to the equivalent record.

The potential developments are agreed on contract management, risk control, and analytics. In case those processes are enhanced, SMD has a larger impact. Although SMD cannot define the condition and negotiable terms in the contract, its data is essential base for making decisions thank to building reports and KPIs. Specifically, there is a possibility of using contract/ agreement data to unify the system and enable users to see whether a supplier is holding a valid contract. In the future, when the demand for supplier segmentation grows, it is possible to use SMD for a clear view, helping managers focus on key suppliers. Also, if risk elements are prevented by SMD's participation, it is beneficial for business to mitigate risk systematically and proactive by using the data. Manages are alert to risky players such as blacklist supplier or disqualified suppliers once the core information of supplier is transparent.

4.2 Important Data Attributes in Supplier Master Data

Supplier Master Data (SMD) participates strongest in management and reporting aspect, in which it indirectly influences the decisions under SRM. Thereby, it is important to define the core information of SMD to focus governance and keep such data high quality. With SMD purchasers are able to know who the supplier is, its type of product or service, basic purchasing contractual terms and current status of the supplier. The demand of business defines the popularity of value in data attributes and reversely, data attributes reflects the demand of business. That means if the information is critical, the supplier master records must have such data maintained. However, the data exist sporadically if the information is preferable. In company X, users need SMD when they check the information like address, contact person, payment terms, status, and history of the supplier. Yet in the aspect of the relationship, SMD has not been utilized to reflect how important the supplier is to the company.

Despite various types of data in SMD, the data for decisions that SMD can provide are basic and limited. Several critical data are about the suppliers' identity (Name, Address, Identification code), the purchasing data (Payment Terms, Delivery Terms, Currency), the Category and the Contract/Agreement data. Among these critical attributes, almost all data are maintained in high completeness. An improvement is necessary for the Purchasing Category, Contract/ Agreement data since they are critical information. Beside the internal factors, there are external factors hindering the completeness of data such as no access to trusted sources and lacking local contacts of the company.

On another hand, the ABC Classification, Segmentation data as well as Business & Industry data are seen as preferable information. That means users do not reject helpfulness property, but they do not receive significant added values from those data. Practically, the preferable attributes reflect low percentage of data availability because no check or maintenance is done. While the theory suggests the segmentation data (either ABC or Supplier Segmentation) should subject to critical group, the empirical result tells that it is not necessary to have such data if the company

already knows its key suppliers. This striking contrast denotes the classification data is merely one way to analyze suppliers, so it can be ruled out if the value perceived is low.

Looking at the critical attributes of SMD, it is seen that the meaning of the information in SMD to activities in SRM is quite basic. It simply informs the registration of the supplier together with a brief information about the products/ service and purchasing terms. This also refers that SMD is less able to generate great decisive values for SRM. Under the circumstances of service offering, the element like delivery terms is even not necessary. Furthermore, if the people working with supplier constantly, they may not need the data attributes to perform their tasks. However, people who are not familiar with suppliers and want to look up, gain more benefits from SMD.

4.3   Data Quality and Improvement Practices for SMD

SMD is an essential part of the supply chain thus managers put high attention to data quality, which is accountable to the accuracy of report and decision outcome. Reflecting six dimensions of data quality from the theoretical section, the quality of supplier master data in company X's is maintained on a good level perceptibly. The company uses a set of enterprise applications to manage supplier records, monitor suppliers' performances and supply chain activities. An integrated system built with master data as the foundation ensures accessibility and visibility across the whole company regardless of location, facilitates information flow, and diminished the silo-effect. Thereby, the good consistency and accessibility dimensions are ensured.

With proactive practices and feedbacks from users, the accuracy and timeliness dimensions are at a decent level. Minor data issues still occur irregularly, though fixable quickly, they still demand more sustainable and long-term solutions. However, these are not big concerns because the demand is agreeing with the capability. The relevancy dimension is similar to timeliness dimension. As the current SMD is user-oriented, so users' demand is fulfilled to a satisfactory extent. The completeness is the dimension to improve if the company starts investing more in the value creation

aspect of the data, for instance, by adding business partners and creditworthiness identifiers. SMD data quality of company X is on a decent scale for users, but there is room for improvement.

Commonly, users' demand for the data quality is to have up-to-date data, which requires a lot of efforts from both users and technicians. Suggestions to resolve the data quality issues comes from different approaches. Initially, the data should be checked and verified by algorithms, third-party resources, or trusted contacts. It is always necessary to consider the number of suppliers needed checking and their associated matters such as time and financial budget. Also, automation is one of the elements that creates a turning point, reduces manual work, and enlarges value generation ability of the data. Besides, training and communication are irreplaceable for the company's employees. It is important that users are aware of the data quality in order to give the correct input, actively collaborate with data stewards, and report whenever errors are detected.

5   DISCUSSION AND CONCLUSION

The conclusion chapter summaries the main content of the thesis as well as evaluates connectivity between theoretical framework and outcomes, the performance of the study, validity, and reliability. Additionally, this part discusses the limitations of the research and suggestions for further studies.

5.1   Summary of The Thesis

The thesis aims to define **whether Supplier Master Data can improve decisions of Supplier Relationship Management** by looking for the impact of SMD on SRM activities and decisions, essentials data types for decisions, and the meaning of quality in SMD to SRM. The study confirms that SMD is important to the decision and activities of supplier management. Thorough governance master data benefits both decision–making and management practices.

How does Supplier Master Data participate and impact SRM decision activities? Supplier master data, as a function and as information source, is essential to SRM. Proven by the findings, SMD in the company X participates and influences strongly multiple processes of SRM, ranging from registering suppliers, maintaining information to controlling and reporting. Supplier Master Data functions like a ledger, in which sub-sequential processes are linked to, having the goal to provide correct and reliable information to users. In managerial activities, SMD facilitates control power, so managers can see a big picture of the supply base to concentrate on the key suppliers. It also improves the visibility and value creation with reliable reported statistics. The weights of SMD in Strategic and Operational processes are varied in extent. Although SMD indirectly impacts the supplier management decisions, it improves decisions eventually.

In both SRM strategic and operational decisions, SMD has an influential role in reporting and analytics, but the value of information that SMD provides mainly serves as a reference source. Regarding the information, the impact of SMD scores the average in Analytics, Forecast & Planning, Risk Control, meaning the information has a certain effect on outcomes. In contrast with the theory, the Supplier

Selection, Evaluation, and Contract Management activities employ little SMD. The main reasons for the low impact stem from the capability and advance of the current system, the comprehension of information, and the way of using data. The observation on data availability also explains why the impact of SMD is around low to medium score. Developments are potentially done the ground of analytics, contract management, and risk control in the company case.

What information of Supplier Master Data do SRM decisions need? Among the twelve suggested data attributes, the critical data include Name, Address, Identification, Payment Terms, Status, Delivery Terms, Currency, Purchasing Category, and Contract/Agreement data. The preferable attributes are ABC Classification, Supplier Segmentation, and Business & Industry data. Since the critical data are used heavily in supplier reports and assessments, the completeness of those data needs to be significantly high in SMD. However, the availability of the Purchasing Category data and the Contract/Agreement data were falling behind the others, raising a caution. Currently, the preferable data have low business demand, resulting in scattered and missing values. If the business demand for these attributes grows, maintenance actions and enhancement will raise the completeness.

What can SMD do to improve SRM decisions? High quality of the data is the key to improve the values and decision outcomes of SRM. High data quality needs techniques, algorithms, and advanced tools in order to upgrade competence in controlling and measuring indicators. Regardless of tools and techniques, the initial drive comes from users' awareness. If the data users understand the influence of data quality over the supplier and supply chain management, they will act responsibly and notice data issues. Besides, business users should closely collaborate with data steward to define the demand, visualize way of working, and unify the standards for the whole supplier data as well as the supply chain operation.

In the study case, even though SMD has not proved significant effectiveness to decision-makers, it is undeniably useful and potential for future development of the company. SMD needs investment from internal resources (capital, planning & execution, facilities, and procedures), and external technology to deploy its capability.

If supplier data is well structured and has high data quality, both strategic decisions and regular operation are warranted by correct statistics and reliable figures. These benefits are not only meaningful to the supply chain managers, but to the company as well.

5.2 Reliability and Validity of The Research

A research's reliability tells how consistent the results are if the study is reproduced in the same approach. The validity of a research asks for feasibility of the selected methods to measure the research question or the phenomenon (Johnson & Christensen 2012, 138–150). Both the reliability and validity reflect the entire thesis and give critiques on its achievements.

The theory framework explained the basics of Supply chain, the need to manage supplier data, activities in SRM, and decisions under SRM. It also clarifies how SMD benefits SRM with the specified type of data, and the relation between data quality and SRM decisions. All important aspects of the theory part are channeled to the empirical research and reflected in the discussion part. In the emprical, the theoretical framework is tested. Later, the discussion displays the level of impact, the way master data can improve SRM decisions with its attributes and data quality.

By answering research questions fully together with detailed explanations to the phenomenon, the thesis's validity is accomplished. The aim of the thesis is satisfied by the outcomes. The study chose an appropriate methodology and approach, which is not only suitable for the practical conditions but also relevant to answer the research's inquiries. The quantitative method gives a factful and statistical reflection of the master data while the qualitative method provides explanations and practical insights from data users' perspectives. The study design holds a strong connection from theory framework, empirical study, question set to the findings. Adequate sampling with large amount of primary data from the real company and from information-rich answers of experts prove the validity and quality of the study. The result, having in–depth reasoning, can depicts generalization. The analysis is contemplated carefully, reveals profound findings, and ensures the thesis' high validity in the scope of the sample and study context.

The reliability of the thesis is between adequate to high. There are external factors that the author is unable to control, such as objectivity changes in answers, the procedure of company X as well as the movement of technological trends. Those elements may alter the results of the study. Nonetheless, the thesis is highly consistent for the moment unless such factors occur radically.

5.3 Limitation and Suggestion for Further Research

The first limitation is the difference in the company's demand. In the findings, the empirical data took company X that has a basic demand on supplier master data, keeping the supplier data in place to review and control, mainly does updates on the supplier data manually and passively, so the level of impact results low to medium. The findings of this study most correlate with companies that have similar tools, demand, and ways of working. If the use of master data is expanded and upgraded, the result could become different. The impact of SMD does not exist in companies that do not maintain SMD, but for companies with more advanced master data usage, more diversifying type of information in master data, the impact possibly yields. Since this paper is written from the view of a business researcher, the technical side of data quality is a shortfall. If the sampling had collected secondary data, the findings would have been strengthened. Due to limitations on conditions and resources, this was a limitation.

The findings raise a point that SRM decisions rely on the transactional data heavily. Thereby, there are a few suggestions for future researches. The first suggestion is to conduct a study on SMD's impact across several companies with differences in company's size, development of the systems, and the advance of master data in supply chain activities. The second suggestion is to combine the transactional data with the master data to define key parameters for SRM decisions. The third option is to explore the technology side, asking the method to construct the master data so that it adds more value to supplier relationship management.

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APPRENDIX 1

Quantitative: Questions to Analyse Dataset

1. How many supplier's records are kept currently?

   - Input number

2. Choose the correct description about the suppliers?

   - Mostly domestics suppliers.

   - Mostly international suppliers.

   - Both domestics and international suppliers

3. Is master data of suppliers governed?

4. Are these following attributes available?

   How many records have value in these following attributes?

   - Supplier Name

   - Address (incl. Country postal code, region, city)

   - Business size & Industrial Type

   - DUNS/ VAT/ Tax or other identification code

   - Purchasing Category

   - Payment terms

   - Currency

   - Delivery terms (Incoterms and location, mode)

   - ABC Classification

   - Activity Status

   - Supplier Relationship Segmentation

   - Contract data

APPENDIX 2

Questionnaire Interview

Part A: General Information

1. How long have you worked in supplier management profession?

2. What are your goals for supplier relationship management?

3. What do you do to manage supplier's relationship?

Part B: SMD in Supplier management and decisions:

4. How do you think about the usage of SMD on these processes?

   - Provide overview and maintain supplier information

   - Analyse and forecast supply base

   - Supplier selection and evaluation

   - Supplier onboarding/ offboarding

   - Monitor and Reporting

   - Risk control

   - Documenting and Communication

   - Maintain information of Contract and Agreement

   - Issue documents in operational purchasing

5. What decisions in SRM do you need information from supplier master data? On those SRM activities and decisions, how is the level of impact from SMD?

6. Can these issues be solved by having master data maintained?

   - Silo Effects (Fragmented data across functions)

   - Redundant & duplicate data

   - Confusion in communication

   - Lacking transparency

Part C: Data attributes and Data Quality Issue

7. How do you think about impact of SMD on those decisions?

8. What information of SMD is important in decision making? And why do you think so?

   - Supplier name

- Address

- Business size & Industrial Type

- DUNS/ VAT/ Tax or other identification code

- Purchasing Category

- Payment terms

- Currency

- Delivery terms (Incoterms, location, mode of transportation)

- ABC Classification

- Activity Status

- Supplier Relationship Segmentation

- Contract and Agreement Data.

9. Can high data quality improve decisions in decisions of SRM?
10. What do you think about the current data quality in term of Accuracy/ Completeness/ Consistency / Timeliness / Relevancy / Accessibility?
11. What practices can be done to maintain high data quality?