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Goods Receiving Exception handling process

A development study

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Abstract

Valmet has identified the Services business line's Goods Receiving exception handling process as a bottleneck. The goal of the study was to map the current state and find improvement proposals. The following questions were to be answered by the study:

1. What are the problems / bottlenecks of the current GR exception handling process between the warehouse, logistics and purchasing?
2. What kind of functional requirements are there for the GR exception handling tool?
3. How could the current GR exception handling process between the warehouse, logistics and purchasing be improved?

The topic is important to the company as they state in their vision that they strive to be the best at customer service. The GR exception process is significant especially to the spare parts deliveries as most spare part items are purchased just in time for shipment to customer. A disruption in the goods reception process will quickly affect on-time delivery to customer.

Study methods used were survey study, quantitative data analysis and observation. The results show that employees are not satisfied with the process. The process was found to be only reactive as no performance measures or goals were set. The number of exceptions is static according to data analysis and the same suppliers cause the most exceptions every year. As a result, a list of problem points and improvement proposals, a process map and user stories were created. The results form a basis for a future process development and software tool procurement project.

Keywords/tags (subjects)

Warehouse processes, goods receiving, deviations, exceptions, process improvement

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Tiivistelmä

Valmet on tunnistanut vastaanottopalautteiden käsittelyprosessin olevan yksi pullonkaula Palvelut-liiketoimintayksikön toimitusketjussa. Tutkimuksen tavoitteena oli kartoittaa prosessin nykytila ja löytää kehityskohteita prosessista vastaamalla seuraaviin tutkimuskysymyksiin:

1. Mitä ongelmia ja pullonkauloja prosessissa esiintyy varaston, logistiikkaosaston ja oston välillä?
2. Minkälaisia toiminnallisia vaatimuksia vastaanottopalautteiden käsittelytyökaluun kohdistuu?
3. Kuinka nykyistä vastaanottopalautteiden käsittelyprosessia varaston, logistiikkaosaston ja oston välillä voisi kehittää?

Tutkimuksen aihe on yritykselle tärkeä, sillä se pyrkii olemaan paras asiakkaan palvelemisessa. Vastaanottopalautteiden käsittelyprosessi on erityisen merkittävä varaosatoimituksille, sillä useimmat varaosat hankitaan Just In Time -periaatteella asiakastoimituksia varten. Häiriö vastaanottoprosessissa vaikuttaa toimitusvarmuuteen.

Tutkimusmenetelminä käytettiin kyselytutkimusta, määrällistä analyysia ja havainnointia. Saatujen tulosten perusteella työntekijät eivät ole tyytyväisiä prosessiin. Prosessin todettiin olevan reaktiivinen, sillä suorituskykymittareita ja -tavoitteita ei ollut asetettu. Kvantitatiivisen analyysin perusteella todettiin, että vastaanottopalautteiden määrä on pysynyt samalla tasolla, ja samat toimittajat aiheuttavat vuodesta toiseen suurimman osan palautteista.

Tutkimuksen tuloksena laadittiin listat prosessin ongelmakohdista ja kehitysehdotuksista sekä prosessikartta ja käyttäjätarinat. Tulokset muodostavat pohjan jatkokehitysprojektille ja uuden tietojärjestelmätyökalun hankintaprojektille.

Avainsanat (asiasanat)
Warehouse processes, goods receiving, deviations, exceptions, process improvement

Muut tiedot

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1 Introduction

The competition between companies is becoming fiercer with the emerging of new technologies, globalisation and growing customer demands. One growing trend is customer expectations of faster and faster deliveries. Any issue causing delays with goods being ready for shipping needs to be addressed and handled promptly.

Digitalisation is seen as a must in the competitive world of business. Digital solutions help process data faster, exchange information between stakeholders in real time and give transparency to processes. Digital form of data also opens posibilities for efficient analyzing and monitoring of business prosesess.

Valmet Technologies Oy's vision is to become the global champion in serving their customers (Valmet's Way Forward, 2019.). This includes many factors, but one main factor is delivering the right quality and at the right time. Valmet Technology's Services Business Line's logistics department has identified the Goods Reception exception process to be a bottleneck in their warehouse process at their logistics center. Any delay in processing goods through the logistics center is a problem issue due to the nature of the business. A major part of the goods are spare parts that are ordered Just In Time and need to be dispatched without delay to customer's site. Both the office and warehouse workers have voiced discontent regarding the process flow. Management assumes the main cause of discontent to be the software tool used in the exception handing process.

A GR exception is a disruption in the goods receiving process. In the current process they are logged into a tool created in a Lotus Notes database by the warehouse personnel. There are several causes for a disruption, but the common factor is that the goods cannot be received into the system and processed further.

The goal was to study the current state of the process, find ideas how the process could be improved and what kind of functions would be needed for the tool used. The report is limited to the internal process and not to the root causes of the exceptions. The outcome is a description of the current process, list of development ideas and a preliminary list of the required functions for a new tool.

1.1 Valmet

Valmet produces and develops technology, automation and services for pulp, paper and energy industries. Valmet has 13 000 employees globally and had approximately a 3.3-billion-euro revenue in 2018. Their head office is located in Espoo, Finland and they are listed in Nasdaq Helsinki. Valmet is divided into business lines, that are Services, Automation, Pulp & Energy and Paper. (Our Businesses 2019.)

Figure 1. Map of Valmet Locations

(Our Businesses 2019.)

The Services Business Line has 70 service centres globally and employs 5 000 professionals. The customers are mainly pulp, paper and energy industries. The business line (BL) provides services and solutions for process industries. The services and solutions provided include spare, wear and replacement parts and equipment, paper machine clothing, filter fabrics, paper machine roll services, plant improvements, upgrades and technical modifications and expert services to improve plant efficiency and operational effectiveness, as well as plant maintenance outsourcing. (Services Business Line 2019.)

The Services BL is split into business units. The business units are Rolls, Mill Improvements, Performance Parts, Fabrics and Energy and Environment. The market areas are North America, South America, EMEA, China and Asia-Pacific. The net sales of the Services BL was approximately 1.2 billion euros in 2018 which was 37 % of Valmet's total sales. (Services Business Line 2019.)

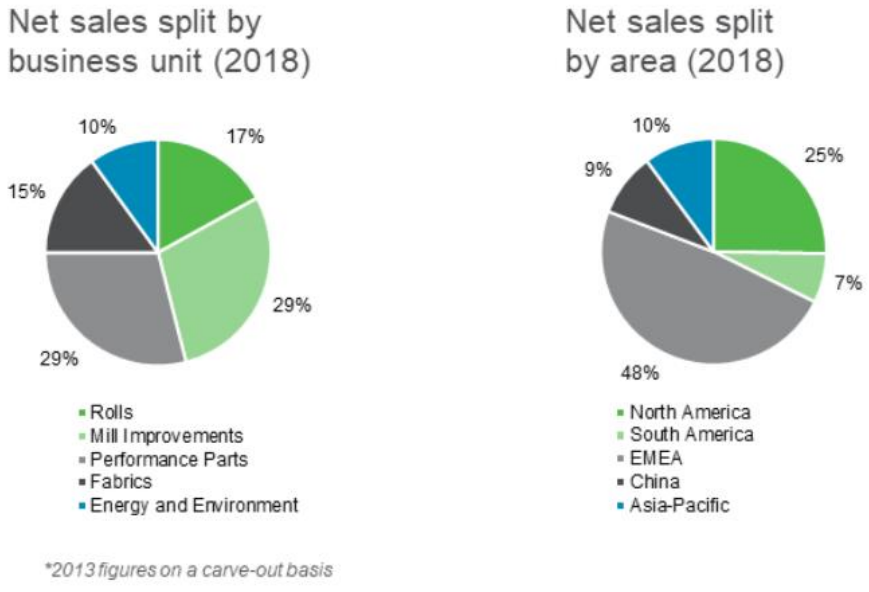

Figure 2. Services Business Line Net Sales 2018
(Services Business Line 2019.)

1.2 Logistics Center Finland

The Finland Logistics Center is operated by a third party, but the managerial control of the activities is done by Valmet Technologies Oy's Services business unit's Logistics department. The center is located in South Finland, only 45 minutes from the Helsinki-Vantaa airport. It can house 6 050 pallets and 1 900 meters of small item shelving. The floor area of the warehouse is 2 194 square meters. (Luhanko 2019.)

The stock value of the logistics warehouse is approx. 13 million Euros, and the number of articles in process is 12 000. Moreover, the number of stocked items from that is 4 500. The service level is 45 percent when considered based on items sold from stock. The number of inbound delivery lines is 180 per day and the number of outbound delivery lines is 300 per day. (Luhanko 2019.)

2 Theoretical Background

2.1 Warehousing

Before the 90's warehousing was often seen as a necessary evil and a costly function. However, as global competition intensified, that view started to change. Warehousing changed into a critical function for the supply chain to facilitate surpassing one's competition in lead-times, customer service and cost-efficiency. Warehouses are designed, often by using automation, to perform with high throughput rate and productivity. More often, warehouses are turned into flow-through warehouses where the aim is that items are shelved for short periods of time only. (Faber, de Kostner & van de Velde 2002, 381-382.)

A warehouse is an essential part of the supply chain, critical in providing high level customer service. As new trends emerge, such as increasing market volatility, product range expansion and ever shortening lead time demands of customers, one's warehouse operations have to be in line with the supply chain requirements as a whole. (Rushton, Croucher & Baker 2017, 291-292.)

Rushton and company (2017, 291-292) give different types of classifications to warehouses :

- By the stage in the supply chain: materials, work-in-progress, finished goods or returned goods
- By geographic: global warehouse, regional warehouse, national warehouse or local warehouse
- By product type: small parts, large assemblies, frozen food, perishables, security items and hazardous goods
- By function: inventory holding or sortation (like a hub for a parcel service)
- By ownership: owned by user or thirdparty logistics company
- By equipment: from a largely manual operation to a highly automated warehouse.

Keeping inventory helps smoothen the variation between supply and demand. There might also be other reasons for stocking inventory, such as purchasing discounts on large quantities, stocking seasonal items in advance and covering production shutdows and breakdowns. (Rushton et al. 2017, 292-293.)

Reasons for keeping a warehouse and holding inventory

- Optimizing logistics performance
- additional services, added value services
- reducing transport costs
- balancing required and delivered quantities
- market position, proximity
- needed process step
- Supply lead-time is greater than demand lead-time
- Manufacturing economies of scale (When manufacturing large quantities at a time and keeping inventory is significantly cheaper than manufacturing on demand due to long setting times in production, perishable raw materials and so on.)

  (Rushton et al. 2017, 292-293.)

A warehouse is often the most costly part of the supply chain due to the facilities, staff and equipment required. Therefore, succesful planning and management are essential in view of costs and services. On average, warehousing is responsible for 20 to 30 percent of logistics costs in addition to the inventory itself, which is about 20 to 25 percent. (Rushton et al. 2017, 298.)

The basic warehousing process consisting of receiving, put away, picking and dispatch seems simple but it quickly becomes complex in practice, because

- goods receiving cannot be planned due to irregular arriving times
- goods measures, weight and temperature demands vary and require different types of facilitation and equipment which have to be available
- throughput of different goods vary and some might fluctuate
- customers order small quantities which have to be consolidated and shipped right away.

  (ten Hompel & Schmidt 2007, 4-5.)

Warehouses can also have different functions, such as an inventory holding point, consolidation, cross-dock, sortation, assembly, trans-shipment and returned items center. Often a warehouse is a mix of a warehouse and distribution center which is often called a logistics center. (Rushton et al. 2017, 293-294.)

A center that is a combination of a warehouse and distribution center may have functions such as shown in the process of Figure 3.

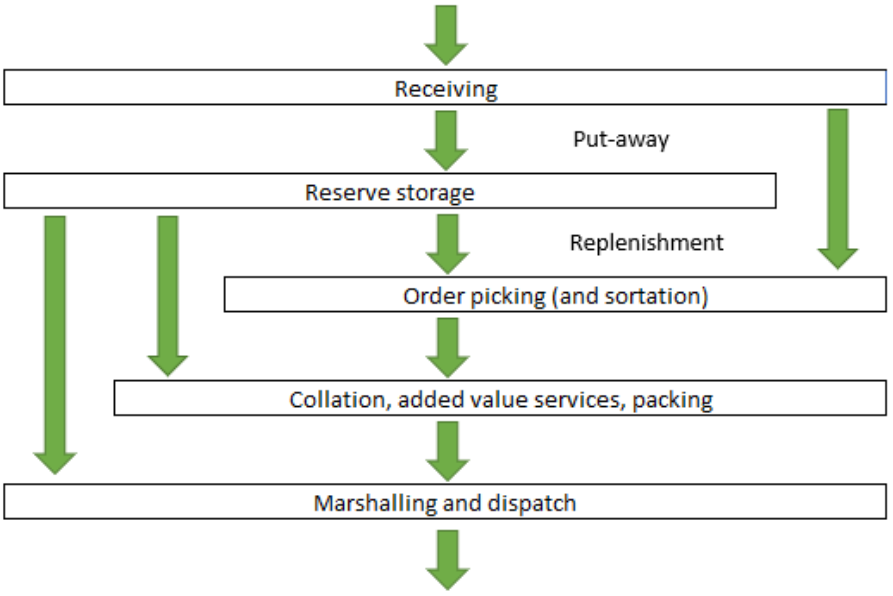

Figure 3. Warehouse process

(Adapted from Rushton et al. 2017, 295.)

2.1.1 Warehouse processes

Even tough warehouses may differ in type, size and location the fundamental prosesses are always the same (Richards 2011, 43). This tends to apply whether a warehouse is fairly manual and basic or highly automated (Rushton et al. 2017, 294). Often in literature the focus is on the picking process but for the purpose of the topic the focus was on the receiving process this time.

Receiving

Receiving usually involves physical unloading of the goods from a carrier, checking the arrived goods against purchase orders and recording the incoming goods into the system. It can also include packing and repacking in to a more convenient size for following the operations. Quality control checks may be carried out at this stage. (Rushton et al. 2017, 295.)

Receiving forms a basis for the success of all the following operations. Making sure that the correct item has been received in the correct quantity and condition is

paramount to the whole warehouse operation. These factors can be termed as supplier compliance. In the book titled Warehouse Management, the author contends that it is already too late at this stage to rectify most receiving issues and that they present pre-receipt steps that need to be taken before the actual receiving. The first step is to make sure that the supplier presents the items to the warehouse in the most appropriate manner. They suggest that the warehouse manager is involved in the agreeing of how items are packed and labelled. (Richards 2011, 44 – 55.)

Often items may arrive in unsuitable packaging, and they are incorretcly or insufficiently labelled. It makes sense to agree already in the supplier ramp up stage to deliver the goods in their transit packaging to ensure compliance. (Richards 2011, 44 – 55.)

A key objective in the receiving process is for the goods to be put away to the required location with minimun delay and the least handling possible. This requires cooperation and coordination with suppliers and agreed terms in procurement agreements. (Rushton et al. 2017, 370.) Factors that need to be agreed internally and externally before ordering goods should include:

- Size and type of cartons
- type of transit packaging (material)
- palletized or non-palletized
- labelling inner and outer carton (product descrition, barcode and quantities)
- carton quantities
- mode of transport, delivery quantity and frequency.

(Richards 2011, 44 – 55.)

To ensure throughput speed and efficient picking it is smart to order delivery in selling quantities. Products delivered in outer cartons need to be sufficiently labelled to ensure that they are easily identifiable. If barcodes are included, they need to be compatible with the warehouse's radio frequency equipment. Simplicity of identification can speed the in-handling process. (Richards 2011, 44 – 55.)

There might also be a need to collect more than standard data on arrivial. Other information can be bacth and lot numbers, serial numbers and expiration dates. (Richards 2011, 44 – 55.)

Put away and storage

Received and checked goods are stored. These days, a WMS (Warehouse Management System) usually pre-allocates storage locations for products and guides the operator on where to store what. Depending on the warehouse operation design, this can be to the dispatch area if cross-docked or to the picking area as a form of replenishment or to a reserve or bulk storage location. The put-away can be combined with retrieval in some warehouse systems. The same operator puts away en route to retrieving as per the system's instructions. The put-away should be planned systematically, and product location ensured accurately and efficiently. (Richards 2011, 57-58.)

Order

Upon receiving an order from a customer, goods need to be retrieved from storage in the correct quantity and in time to meet the required service level. An order often contains several order lines, each requiring a specific quantity of a specific product. If the order line asks for a full unit load it can be retrieved straight from the reserve storage. However, if full unit loads are not required, the goods will usually be retrieved from the picking area. If the warehouse only stores small quantities of a product, the reserve and picking stock may be combined. Order picking is the most costly and labour intense warehouse operation. It is critical in achieving a high level efficiency and order accuracy. (Rushton et al. 2017, 295-296.) This is why many studies and books devote much more focus to it than other warehouse operations.

Collation, added value services and packing

After picking, the goods need to be collated into complete customer orders for dispatch. If the goods are not picked directly into dispatch containers, they need go

through packing where they are packed into a carton and/or stretch- or shrink-wrapped on to a pallet to be ready for transport. This process can include value adding activities such as final production postponement, kitting, labelling, repacking etc. In addition, it can also include returns processing. (Rushton et al. 2017, 295-296.)

Dispatch

Goods are marshalled together for example according to forwarder and destination country or whole vechile loads in the dispatch area to await collection. From there the goods are loaded into vehicles for onward transport to the next point in the supply chain. Dispatch can be conventional or automated. (Rushton et al. 2017, 295-296.)

2.1.2 Receiving checks, deviations and supply errors

Once goods have been offloaded, decisions need to be made whether they need to be checked. Ideally, inbound goods are moved straight from the loading bay to storage or dispatch if cross docked. However, unless there is 100 percent certainty about the supplier's accuracy and quality, some form of checking is needed. It can be a random check for some items or just a total count of the pallets. (Richards 2011, 44 – 55.)

Benwell (1996) says that stock control begins with suppliers. Supply errors result in goods receiving delays, large volumes of goods waiting for attention in goods receiving area or even affect stock accuracy which may lead to returns from customer if not noticed during picking or packing phase. To avoind supply erros Benwell advocates a five-point plan to be negotiated with suppliers. The five point are

1. Quality assurance
2. Quantity assurance
3. Identity assurance

4. Conformity assurance
5. Chronology assurance.

   (Benwell 1996.)

The plan needs to be agreed in writing with suppliers and detailed for each component. Supplier conformance to the agreed points must be monitored. It should be made clear to suppliers that infringements will be noted and may affect future business decisions. If conformance is achieved receipts should be possible to process quickly and precisely. (Benwell 1996.)

One factor to consider is the pareto principle that roughly 80 percent of effects are from 20 percent of the causes. Usually 20 percent of the suppliers of a company deliver 80 percent of its stock. It is likely that also 20 percent of the suppliers cause 80 percent of the goods receipt problems. However, it is worth noting that it is likely that these are not the same 20 percent of the suppliers. Supplier performance should also be measured in this light in order to indentify poor performance. It is reasonable to assume that suppliers are not causing problems on purpose. They are probably not aware of the problems and the warehouse's needs. The company should work together with the suppliers and suggest improvements. (Richards 2011, 44 – 55.) In addition to performance monitoring penalties for non -conformance can be introduced to insure compliance (Rushton et al. 2017, 370).

In retail, GFR (good faith receiving) is often used. This means that items are accepted without checking on arrival. Randoms checks are done and exeptions are charged from the supplier on a pro rata basis. (Richards 2011, 44 – 55.)

If GFR is not in use, the regularity and thoroughness of inbound goods checks can be decided by measuring supplier performance. The rate of checking is determined by the accuracy of recent deliveries. When dealing with new suppliers, it may be prudent to check whole consignments until the company is confident about the compliance of the supplier. This means making a trade-off between the time used on checking and the number of discrepencies found and the time it takes to handle them. (Richards 2011, 44 – 55.)

One needs to decide if checks are done against delivery notes or by blind counts. In a blind count, an operator is not aware of the quantities expected until the count is completed. (Richards 2011, 44 – 55.)

Barcode scanning or RFID will notably speed up the process and improve accuracy. Products can be scanned and compared in real-time (if wireless enabled). Once scanned, the items can be moved directly to quality control, picking phase or storage. (Richards 2011, 44 – 55.)

It has been reported by the Aberdeeb Group (2009) that 70 percent of the best-in-class companies are more likely to receive goods without paper documents than all other companies. They have transferred to barcodes, RFID and voice technology. (Richards 2011, 44 – 55.)

Certain items require additional quality checking upon receipt. This category includes for example high-value items, hazardous goods, temperature sensitive items, food and new suppliers. There should be a separate area close to the receiving area for spot-checking these items. To avoid delays in the process and minimize the area needed, these checks should be conducted as promptly and efficiently as possible. If issues are found, the items should be moved to a quarantine area to await decision or testing. Most WMS are able to block access to quarantine items, making them unavailable for picking. A physical sign is a good fail safe. (Richards 2011, 44 – 55.)

Recording and reporting deviations both internally and externally is essential for a continuously improving process (Richards 2011, 44-55). Deviations often translate to delays. Usually some handling buffer has been calculated into the total item order-to- delivery process lead time to cover warehouse inbound operations. For example, two working days are often added. This buffer is quickly depleted if the labelling, packaging or documentation is insufficient or the item is damaged or incorrect. Even if the documentation and labelling are as agreed, the identification of goods when checking may be challenging especially when dealing with non-consumer goods, such as machined items and customer specific designs. Warehouse operators need to be given enough guidelines on how comprehensive the checking and identification needs to be. For instance, the operators need to know whether they are allowed to trust supplier labels or whether they need to open the package to verify whether the

item matches the description on the label. The operators might not be able to identify an item that is an assembly.

2.2 Process Improvement

Improvements in services or processes should address the needs of the system as a whole in order to be effective. To be successful an organization must balance functional needs with a clear business vision and strategy. The ultimate objective being to satisfy the customer, because customer retention leads to more profit. (Foster 2010, 316.)

Improvement comes from simplifying processes and procedures according to Tom Peters. Different parts of the company's whole process need to be aligned and work optimally together to improve efficiency and reduce cost. (Richards 2011, 43.)

Process thinking is based on the notion that value for the customer is created in a chain of events, which can be called a process. This chain of events needs to be indentified and modelled. After this, goals must be set for monitoring and development, this is referred to as process management. (Laamanen & Tinnilä, 2009.) Tom Peters has said that "What you cannot measure, you cannot control." This could also be said of process improving, if one does not have clear goals and KPIs (Key Performance Indicator) they cannot control the development.

Every process has a customer, internal or external. Feedback and information from customers is needed for development of the process. Change is good only when the process is then carried out in a new way that produces better results, whether it be in terms of profit, efficiency, quality or customer satisfaction.

Laamanen and Tinnilä provide a process maturity model in their book titled Terms and concepts in business process management, this model is illustrated in Figure 4.

Maturity Level	Indicators
Disorder	- Customers and requirements are not defined. - Crises start improvement - No alingment, Random Kaizen - Personalized
Repeatable	- Customer and requirements are defined and feedback system installed. - Nonconformities and problems start improvement - Some process oriented measurement - Some co-operation over functional borders and roles defined
Responsive	- Feedback and measurements systems linked to corrective action systems - Trends and forecasting start improvement - Process oriented measurements and target setting - Process supporting teams established and clear roles deployed
Proactive	- Integration and strategy deployment focus, IT-systems help analysis - Correlation and understanding of success factoes starts improvements - Well balanced efficiency and effectivess measurements (internal and external) - Internal networks to maximize learning and knoledge share
Innovative	- Innovation as a key strategy, systems and tools - External information and oppurtunities start improvement - Heavy use of external information - External networking to maximise learning, knowledge share and use of oppurtunities

Figure 4. Process Maturity Model

(Adapted from Laamanen & Tinnilä 2009, 92.)

Using modelling helps to create a road map and choose an effective strategy for improvement. One should also use modelling to assess the capability of the organization. Human competence and information are key factors in moving a process to the next level. Employees need to posess the required skills and information to achieve that level. (Laamanen & Tinnilä 2009, 91-92.)

People, employees are the engine of innovation. Technology is good for performing tasks, but it cannot itself innovate. Thus how people are managed is the key to unlock potential. Those who believe in continous improvement think that the system should be improved forever. The system includes the people. This requires tools to free hidden human potential for change and improvement. Ishikawa's seven tools for quality are one option. They include the following tools: (Foster 2010, 316 - 317.)

- Process Maps
- Check Sheets

- Histagrams
- Scatter plots
- Control Charts
- Cause and Effect diagrams
- Pareto Analysis

One approach to improvement is Lean. Its core idea is also to simplify your processes making them "lean". Lean was developed by american scientists by studying the Japanese automotive company Toyota's production methods and processes. The idea is to eliminate waste from your processes. As a part of Toyota Production System Shigeo Shingo identified seven types of waste. Those were over production, Defects, Unnessesary Inventory, Inappropriate processing, Excessive transportation, Waiting and Unnecessary motion. Goods receiption exceptions like supply errors can be classified as waste type defects. Basicly all activities that do not create value from customer perspective is considered waste. Actions should be made to create value flow without interruption and through continous improvement remove successive layers of waste as they are identified. (Hines & Taylor 2000.)

2.2.1 Measuring - A tool for Performance Management

Perfomance measuring is a vital instrument of performance management. It provides information relevant for making decisions. An often quoted Lord Kelvin phrase is "If you cannot measure it, you cannot improve it". (Pavlov & Bourne 2011, 101-102.) One should measure an organization's performance and productivity to ensure customer satisfaction and a culture of continuous improvement. Measuring performance helps to identify possible problem areas and to train employees in the right area. (Richards 2011, 230.) Measuring an organization's performance helps to compare its competitiveness to competitors and to check performance against the organization's own goals. Performance measurement's key roles are to comply, check and challenge. (De Toni & Tonchia 2001, 58-59.)

Research in Performance Management shows four common performance dimensions

- Cost / Productivity
- Time
- Flexibility
- Quality.

The first is cost related and the rest non-cost ie. physical dimensions. Both cost and non-cost measures should always be utilized in order to have a comprehensive understanding of a processes performance. (De Toni & Tonchia 2001, 64-65.)

Measures should be not only aligned with company strategy but also with customer expectations. (Richards 2011, 230.) The recent trend has been that customers expect ever shortening lead times both in industry and retail. If performance is not measured against customer expectation, improvement cannot be continous and the risk of losing customers is increased.

Strategic goals do not usually hint to only one performance measure, but to many and they are not always clearly defined. For example product quality can be measured in many ways. However, relation between strategic goals and performance measures is fundamental. The purpose of measurement is managing organizational performance. Measures accessable to employees challenge them to improve their own way of working without direct management input. (Beamon 1999, 279-281.)

Measuring can have many roles such as feedback, feedforward and guidance. The effectiveness of measuring is dependant on how the organization is managed. Especially, to what degree it is managed through measures. For example, is there a measure based compensation systems in place and softer aspects such as culture and management competence. (Pavlov & Bourne 2011, 103-104.)

Performance management often delivers benefit indirectly by encouriging behaviour consistent with strategy and encouraging debate about how organizational performance is determined. When creating objective measures for resources and

processes, which are dificult to convert into numbers, one needs to uncover subjective assumptions about them. This way assumptions about organization performance will become worded and possible to challenge. (Pavlov & Bourne 2011, 103-104.)

Pavlov and Bourne say their research on studies showed an inconsistency on performance measuring's power to affect performance. The effect can be unpredictable and the mechanism vague. In my view this would be due to the variation on how well an organization understands what they are measuring and how. Management affects measuring but measuring also affects management. "You get, what you measure." It has been noted in accounting literature that the process of measuring performance affects performance by intensifying the cycle of reflection and altering behaviours (Pavlov & Bourne 2011, 113-115).

2.2.2 Tools for process improvement

Current State Analysis

Understanding the current state is often regarded as a prerequisite for improvement. Before planning improvements, one must have a good understanding of the current state of the process that is to be improved. A thorough analysis of the current state helps the people studying the process to avoid the pitfall of assuming there is a problem in a specific process phase and that the said problem is caused by an assumed reason, without verifying the problem's existence. (Kliem 2016, 60-62.)

The current state analysis can be based on various sources of information such as, but not limited to, quantitative collected data, empirical observations and user experiences. However, just having information concerning the process is often not enough. The information must be presented in a way that helps to understand the entire process flow along all the process phases. Due to the narrow scope and specialty of different work positions in an organization, people often lack such understanding and they tend to focus on just the process phase that is familiar to them. This hinders their possibility to detect potential bottlenecks or problems. Visualizing the process by using a map and a standard set of symbols, backed with

information, people can overcome these limitations and provide valuable insights into developing the process. (Kliem 2016, 60-62.)

Process Maps

Creating a process map of the process in its current state is the first step in many improvement projects. It is a useful step, because we need to know the process to be able to improve it. Process maps and their language can vary from simple to complex. Different figures can be used to represent different types of steps. For example, a diamond figure can represent a decision. The symbols can be used to chart the process from beginning to end. Arcs leave and enter a symbol to represent the progression from one step to the next. Figure 5 presents an example of a map and symbols. (Foster 2010, 318-320.)

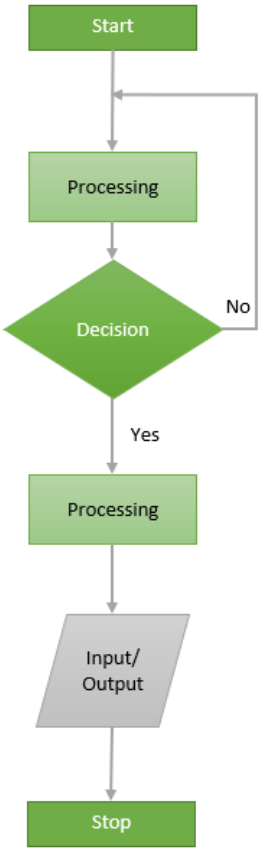

Figure 5. Example of a process map and symbols
(Adapted from Foster 2010, 318.)

At first, one should create a general map and then fill it out with details or sub flow charts to each of the elements. Interviewing those who do will help to walk through the process. After creation one can determine which steps bring value and which do not. However, before simplifying or improving, one should determine does the work really need to be done. In Table 1 illustrates the steps to creating a process map. (Foster 2010, 318-320.)

Table 1. Steps to process mapping

Step	Description
1.	Settle on the standard set of process mapping symbols to be used.
2.	Clearly communicate the purpose of the process ap to all involved in the exercise.
3.	Observe the work being performed by shadowing the employees performing the work.
4.	Develop a map of the process.
5.	Review the process map with the employees to make needed changes and adjustments to the map.

(Adapted from Foster 2010, 320.)

Root Cause Analysis

With the emergence of lean management practices, pioneered by the Japanese automotive industry, several root cause analysis (RCA) techniques used in lean management have gained popularity among practitioners of process development. The guiding principle of RCA is that even though one could pinpoint the direct reason for a particular problem, that reason might not and usually is not the original, the real "root" cause of the problem. In addition, only by eliminating the root cause(s) can one prevent the problem from reoccurring. (Ohno 1998, 17-18, Liker 2004, 252-254.)

One of the most well-known Root cause analysis techniques for process development is the "5 Whys" –method, originally developed by Toyota. Five Whys is

a deceptively simple method in which the developer, after detecting an issue asks, “Why has the issue occurred”, usually leading to the direct cause. An example of this kind of analysis can be seen in Figure 6. Instead of stopping there, the question “Why?” is asked several times to find out what the actual root cause is. The question “Why?” needs to be repeated again and again, until the actual root cause of the issue is found. (Ohno 1988, 17-18.) In most cases five times is enough, although some situation requires less and some more of Whys.

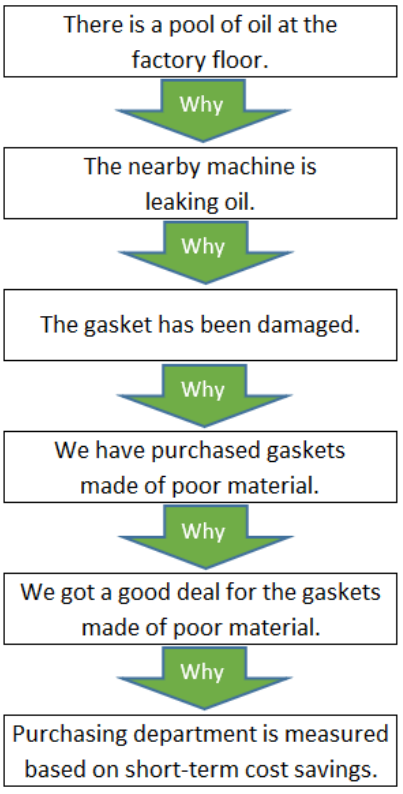

Figure 6. Example of The Five Whys method

Even though the Five Whys method is very simple and easy to understand on a conceptual level, many companies are struggling when it comes to implementing it as a part of daily activities. Five Whys challenges the user by requiring systematic,

detail-oriented thinking and personal discipline. This is something that is often difficult to maintain in a fast-paced work environment. (Liker 2004, 252-254.)

2.3 Procurement of a software tool

Acquiring an information system is an arduous task, where many technical, legal, organizational and human factors must be considered. Researchers have developed many methods to help improve the outcome of projects and to minimize the risks. However, almost all companies have their own practices and methods. This makes even the task of comparing quotations to each other challenging. Procuring an information system is always an investment and requires good planning and assessing. The process of changing a tool should always accompany a functional change in the process. Usually, the benefits of a software project are only realized when the way of working is changed as well. An ETLA report on productivity claims that an IT-investment will most likely be unprofitable if a corresponding process development is not carried out. (Forselius 2013.)

An information system usually is seen to include both the software and the needed hardware. In his book about successfully acquiring a software Forselius (2013, 9-13) divides a software procurement project into four main stages which are

6. Preparation
7. Solution and Supplier Selection
8. Monitoring
9. Finishing / Close out.

2.3.1 Procurement preparation

The owner, users and software supplier need to have a common understanding of what the system should entail, and the quality required. This understanding can be built by defining the required functionalities, technical framework and quality requirements. Whether it be a small or large, out of the box or tailored software the fundamental requirements need to be defined on a detailed level in order to reliably evaluate the prerequisites for fulfillment. (Forselius 2013, 29.)

Requirements are needed attributes for an item that are defined before beginning to develop a design for the item. Requirements analysis is the transformation between the need and the design concept. Basically, a process to unravel what the system must do to satisfy customer/user need. The need is a fundamental requirement from which all other requirements and the design stem. (Grady 2006, 7-8.)

The requirements can then be used to assess the scale of the project; workhour estimate, cost estimate, preliminary schedule and so on. It can also be utilized in planning, change management, progress follow up during the project and in the test & approval process at the end. (Forselius 2013, 29.)

Defining the requirements can be the most laborious task of the procurement preparation process. Employing several business experts, future users and process and architecture specialists to participate in the process should be considered. Forselius (2013, 29) claims that many successful software acquisitions have a common factor, the same amount of work was put into defining the requirements as was put into the projects tendered out using them. (Forselius 2013, 29.) Most projects tumble due to non-technical complexity, meaning due to human factors not technological. (Tate 2015, 22-25.)

It is worth the effort to define the requirements in detail. It will help to ensure the system will meet user needs. There is no supplier who can understand and fulfill user needs efficiently with poorly given requirements. When the business processes and using circumstances are depicted comprehensively a common vision is easy to communicate. (Forselius 2013, 29.) Even if an out-of-the-box solution is selected, one cannot abandon the process of thinking about what this specific organization wants

and needs. To stay in control of the project a good view of what constitutes a good feature for the organization in question is required. (Tate 2015, 22-25.)

If, in addition, a preliminary data model and needed interfaces to other systems is depicted the estimating of the project should be reliable. The level of the requirements assessment predicts the projects outcome, because it is the basis of the whole operation. (Forselius 2013.)

However, creating requirements on a sufficient level is a balancing act. One's options should not be limited by defining the requirements too precisely. It may be a good idea to use an impartial consultant in the preparation. Impartial, because an uneven setting among potential suppliers is not in the interest of the procuring party. (Forselius 2013, 30.) When defining requirements for the process of selection a partner and software, one should focus on the what rather than the how. For example, it is not useful to draw any screen or reports layouts at this point. (Tate 2015, 57.)

The software development process consists of defining requirements, technical implementation work and quality control. The process begins with a proposed idea in the procuring organization. When the target of the procurement process is set, a short description of who and what will be using the new software is required. Users should be divided into groups based on, for example using method, use frequency, authority and environment. This will help to define and plan needed requirements right from the beginning. There is no need to go to a very detailed level. As long as the groups character and distinction from the other groups is made clear. The different groups number of users and using habit details are useful to describe on a rough level. (Forselius 2013, 30-32.)

When the groups have been defined, user stories are a good way to describe their needs. User stories need to have a few rules such as

- Persons in the stories should be given names.
- The Story tells how the user does their typical task with the help of the software.

- The story is always told from user perspective without explaining what the software does and how.
- The stories should be short, but they should tie the software use to real named user function need.
- The stories can form a continuing story but should be kept as separate per user group and only refer to the previous or following use and user group.

(Adapted from Forselius 2013, 32.)

User stories help open a dialogue with users about different working methods and help unify the way of working. They also help potential suppliers to understand what business will use the software for. User stories will also help in future training of users. (Forselius 2013, 32-33.)

When user stories have been written they will help to start gathering terminology of the target processes. It is recommended to gather an alphabetical list of terms and give them short descriptions and translations to other languages. It is better for the development, user instructions and all product description the more unified and consistent the use of terms is. (Forselius 2013, 33.)

If the software is meant to be used for saving data into the system's database and to manage the stored data, all data groups and their relationships need to be defined and described. A model named Entity Relationship Model has been proven to be the best for this job. The model doesn't need to be perfect or complete at this stage but the earlier the entities are identified and their relationships regarding management and searches depicted the more fluent the requirements defining will be in future. The basic idea of the model is to

1. Gather the entities you want to store data about.
2. Identify the relationships between the entities.
3. Complete the entities by adding related attributes.
4. Draw a conceptual schema so that there are as few relationships describing lines as possible.

5. Produce a directory of entities where describing attributes are listed with ever entity.

   (Adapted from Forselius 2013, 33-35.)

The entity relationship model is the most important source in the database defining. It needs to gather the most important needs of data storing and use needs of the users. Even when procuring an out-of-the-box software creating one's own model will help in comparing available products. (Forselius 2013, 33-35.)

Requirements are needed attributes for an item that are defined before beginning to develop a design for the item. Requirements analysis is the transformation between the need and the design concept. Basically, it is a process to unravel what the system must do to satisfy customer/user need. The need is a fundamental requirement from which all other requirements and the design stem. (Grady 2006, 7-8.)

The first way to start illustrating the needed functional requirements is process maps. With the help of these maps all business processes where users will use the new software should be described. It is important to limit the description only to processes where the new software is involved to ensure a successful procurement. The information gathered from process maps can be increased by adding worded descriptions of the process as well. A good thing to also do is add a list of use cases and integrations involved in the process. A use case is a point in the map where information is going from the user towards the software or vice versa. Often information flow can be two way, but it can also be the user only entering data for storing into the system. User can also mean another software that is integrated to the new software. (Forselius 2013, 35-37.)

Building the list of requirements starts with gathering all the functions in the use cases. In addition, all instances in the process flow where the software needs to integrate with other software needs to be described. In addition to all functions found in the use cases and process map, reports and statistics are needed and batch handling algorithms for cleaning old information from the database. In most cases the data in the database needs to also be transferred to a separate Data Warehouse or Business Intelligence in addition to operative reporting. (Forselius 2013, 37-39.)

When a project team is in place for the procurement planning and tendering functional requirements need to be described one by one in detail as outlined above. At least the following will need to be defined

- Type of function
- name of the function
- worded description of the function
- list of needed data elements
- references to use cases and processes where the function is needed.

(Adapted from Forselius 2013, 39-41.)

3 Study questions and methods

The goal of the study was to understand the state of the GR exception handling process and how it could be improved. The result of the study should be a description of the current state, list of problems points, improvement proposals and a preliminary list of functions needed for the handling tool.

At present, the GR exceptions are logged into a Lotus Notes -database created for this purpose. The warehouse staff logs the exception, and all information that they have on the issue and send it to be investigated by the logistics coordinators or purchasers. The process is seen as inefficient by the management, and they wish to improve the process and the tool. However, no real analysis has been done, the assumption is based on random employee feedback.

Handling the product for the least amount of time possible will lead to reduced labour hours. Labour costs can be from 48 to 60 percent of the total warehouse cost. They are also difficult costs to control. Thus, any means of reducing them is worth exploring. (Richards 2011, 43.)

Some assumptions about the topic were voiced at the initial discussion with Valmet representatives. The assumptions were:

- the tool is obsolete
- users are unhappy with the tool
- supplier claims are being issued based on the exceptions
- the process needs improvement
- the number of exceptions is not declining.

Three study questions were set to guide the study. The study questions are listed below:

1. What are the problems / bottlenecks of the current GR exception handling process between the warehouse, logistics and purchasing?
2. What kind of functional requirements are there for the GR exception handling tool?
3. How could the current GR exception handling process between the warehouse, logistics and purchasing be improved?

This was a case study. A case study is a study of a particular case related to its environment. The goal is to understand this exact case. One may refer to other cases but only to highlight the distinctiveness of the case at hand. The case can be a process, a system, a person or some other distinct entity, as long as the study focuses on its singularity and uniqueness. (Simons 2009.) The methods chosen for this study were a questionnaire survey, quantitative analysis and observation.

3.1 Questionnaire survey

A questionnaire survey is one of the basic study methods. The advantage of a questionnaire survey is the possibility to obtain a large quantity of data. One can acquire a large number of participants and ask several questions. It is an efficient method that saves time. If the questionnaire is carefully designed, it can be quickly

analyzed with computer assistance. However, interpreting the results may be problematic. The common assessment is that the data is superficial. The following are the drawbacks of questionnaire surveys:

- No way to know how serious and honest the participants were when answering.
- Not clear how suitable the answer options were from the participants' point of view. Misunderstandings are difficult to control.
- No way to know how well the participants are acquainted with the subject in question.
- A good questionnaire takes time and knowledge to create.
- The lack of answers can be great in some cases.

  (Hirsjärvi, Remes & Sajavaara 2018, 195.)

The chosen method in this study was a web survey. It was chosen for its efficacy and ease of analysis due to the ready digital format of the data.

A major drawback can be a lack of answers. The common answer rate for web surveys sent to the general public is 30 – 40- percent. In this case the rate was expected to be higher because the survey was sent to a specified group. (Hirsjärvi et al.,2018, 196.) This group consists of employees who work with GR exceptions handling regularly.

In this study Survey Monkey's online survey tool was used to conduct the survey and analyze the results. Two versions of the survey were created: one for the warehouse and logistics workers who log GR exception cases and another one for logistics coordinators and purchaser who handle the cases. The questions were the same for both groups, but the questions relating to supplier collaboration were excluded from the first survey. The purpose of the survey was to form an understanding of the user experience and satisfaction related to both the tool and the process. The users were also asked to give their own development proposals. The survey consisted of both open questions and quantitative multiple choice questions.

The warehouse version of the survey was sent to all employees who had created a GR exception in 2019, seven in total and the purchasing version to 30 employees noted as handlers with the most exception cases. The survey was conducted in Finnish, because all the employees to whom it was sent to were Finnish speaking. This was done to make it easier to participate. A questionnaire survey is a good way to gather qualitative data from a large group and when it is answered anonymously people feel free to be honest.

3.2 Quantitative data analysis

A quantitative analysis was done on the GR exception database in order to understand the frequency, classification and numbers of suppliers and employees involved in the process. A report of the GR exceptions was exported from the database to Excel and pivots and charts were created to sort and visualize the information. Numeric information was used to search for patterns, such as the pareto principle. Due to the large quantity of data quantitative analysis is the only way to manage and process it.

3.3 Observation

Observation is a common and necessary basic method of sciences. Many fields of science have their own observation methods. Observation is a laborious method compared to a questionnare survey or interview. It is not about just looking but about monitoring and surveillance. (Hirsjärvi et al. 2018, 212-213.)

One of observation's perks is that it is possible to obtain immediate and direct data about an individual's, group's or organization's operations and behaviour. It is a way to gain access to the natural environment. One could call it 'real world' research. It is best suited for qualitative research. (Hirsjärvi et al. 2018, 212-213.)

The method is mostly criticized for the risk of the observer disrupting the situation and thus altering its course. It may also be difficult to record data instantly and the

researcher may have to rely on memory and record observations at a later time. (Hirsjärvi et al. 2018, 213.)

The observation approach can be systematic or participatory. Systematic observation is susually performed in a laboratory environment with the researcher in an outside orserver role. In participatory observation the researcher participates in the activities and adapts to the natural course of events. (Hirsjärvi et al. 2018, 214-217.)

Observation was used to understand the process and the way of operation at present. It was a good way to gain a deeper understanding of the process and its current state. Disruption to the activities was not significant because of an already existing familiarity between the observed employees and observer. In addition to simply observing both in the purchasing department and warehouse, I also participated by creating test cases in order to see the tool function.

The current process was observed by following process at warehouse and office. In addition to participating in the actual handling I also read the existing instructions about GR Exception handling. This was done to get an understanding of how the process works and of user behavior. Observations were recorded as hand-written notes while in office and warehouse.

4 Results

The objective of the study was to find answers to the questions listed below:

1. What are the problems / bottlenecks of the current GR exception handling process between the warehouse, logistics and purchasing?
2. What kind of functional requirements are there for the GR exception handling tool?
3. How could the current GR exception handling process between the warehouse, logistics and purchasing be improved?

4.1 Observing the current state

Instructions or other material did not include a process map to illustrate the flow of the process. Moreover, no Key Performance Indicators had been established for GR Handling process which made understanding the performance level and state of the process difficult.

For facilitating understanding of the process and for the future process and tool development purposes, user stories were created based on observations. The user stories below are about three common phases of the GR exception handling.

1. User Story: Creation

Peter works in Goods Receiving and starts to work on a shipment that has arrived today. He notices that there is no packing slip for the pallet in question and that there is no labelling on the items themselves. He checks the waybill to find that it does not list the items or have a purchase reference. Peter realizes he has no way of identifying the items or the related purchase order. Peter moves the pallet to the quarantine area and marks the pallet and waybill "Needs identification" and hands them of to Mike.

Mike's primary job is creating and handling GR Exceptions at the warehouse end. Mike checks the pallet over and takes photos of both the shipment and the waybill. He then goes to his computer and opens the GR Exception database and starts to log in this new exception case and logs all information that he has about the shipment into it. From the waybill Mike can see the supplier who has sent the pallet, but because he has no purchase reference, he does not know which purchaser to send the case to. He must send it to a logistics coordinator first and he assigns it to Tony. He describes the situation and attaches the photos taken earlier. When the case is sent to a handler, Mike can now only wait for a reply.

2. User Story: Handling and Investigating

Tony receives a notification email about a new GR Exception assigned to him by Mike. Tony clicks the link to open the case, reads the description and realizes that he must determine which purchaser it should be sent to. Based on the supplier in question he checks the responsible purchaser from another system and assigns the case to Emma.

Emma receives a notification email that a GR Exception case regarding supplier X has been assigned to her. She notes that there is no purchase order reference. She opens the case using the link in the notification. From the description she understands the issue. After looking over the case she finds that she needs information from the sender. She checks the contact person for the noted supplier from another system and sends an email inquiry for which she has downloaded the attachments from the exception case. She requests the supplier to send a packing slip or at the least give a purchase order reference and a list of items and quantities that the pallet should contain. She comments the action she has taken to the exception case.

When Emma receives the reply with a packing slip attached, she returns to the exception case. She checks that the packing slip matches the pallet and purchase order. Emma logs in the purchase order reference and attaches the received packing slip to the case and writes a comment. After she has noted all information about the case, she saves it and sends it back to the creator, in this case Mike, for further processing.

3. User Story: Closing the case

Mike receives a notification email that a GR Exception case has been returned to him. He opens the case via the link in the email and checks the actions comments and attachments added. He estimates whether a Goods Receipt can be done with the new given information. After he has concluded that the needed information has been given, he prints the packing slip, comments on the case that it is finished and closes the case. He attaches the waybill and packing slip onto the pallet and returns it to the goods receiving area from the quarantine area to be processed through the normal goods receiving process steps.

Observation revealed that one person worked on the GR exception creating and handling full time at the warehouse. Other goods reception workers bring exception goods to him to the quarantine area for investigation. He then takes pictures and collects all information available on the goods and creates a case in the handling tool. After he has received enough information, he returns the goods to the goods reception for processing into the system and put away. It was decided that one person should be dedicated to handling the process, because it is often complicated and there are so many cases, averaging seven cases per workday last year. The reasons preventing goods receipt vary greatly and investigation is laborious.

The warehouse workers are not familiar with paper machine technology and they do not usually have a technical degree which makes identifying high-technology or made-to-order machined parts very difficult. The packing list maybe included in the package but identifying the items if not labelled is difficult and sometimes impossible. The packing list's codes and descriptions may also vary from those in the purchase order / warehouse order printed from the ERP system which makes verifying that the correct goods have been received difficult or impossible. Most of the pallets and packages in the quarantine area are there because of missing papers and markings.

Both office workers from logistics and purchasing and the warehouse worker express a great deal of frustration while handling the GR exception cases. They also often complained about each other's quality of work and lack of sufficient and timely information. However, none of them seemed to know exactly what was expected of them.

The instructions found within the tool did not give me a good understanding of how the process worked and what needs to be done. They simply described the tool's features. To be able to handle a case I needed to have another person guide me and explain what was needed from me.

Since there was no existing illustration of the process, I created a process map based on my observations. The process map in Figure 7 is a simple one that shows the task flow from one responsible person to another.

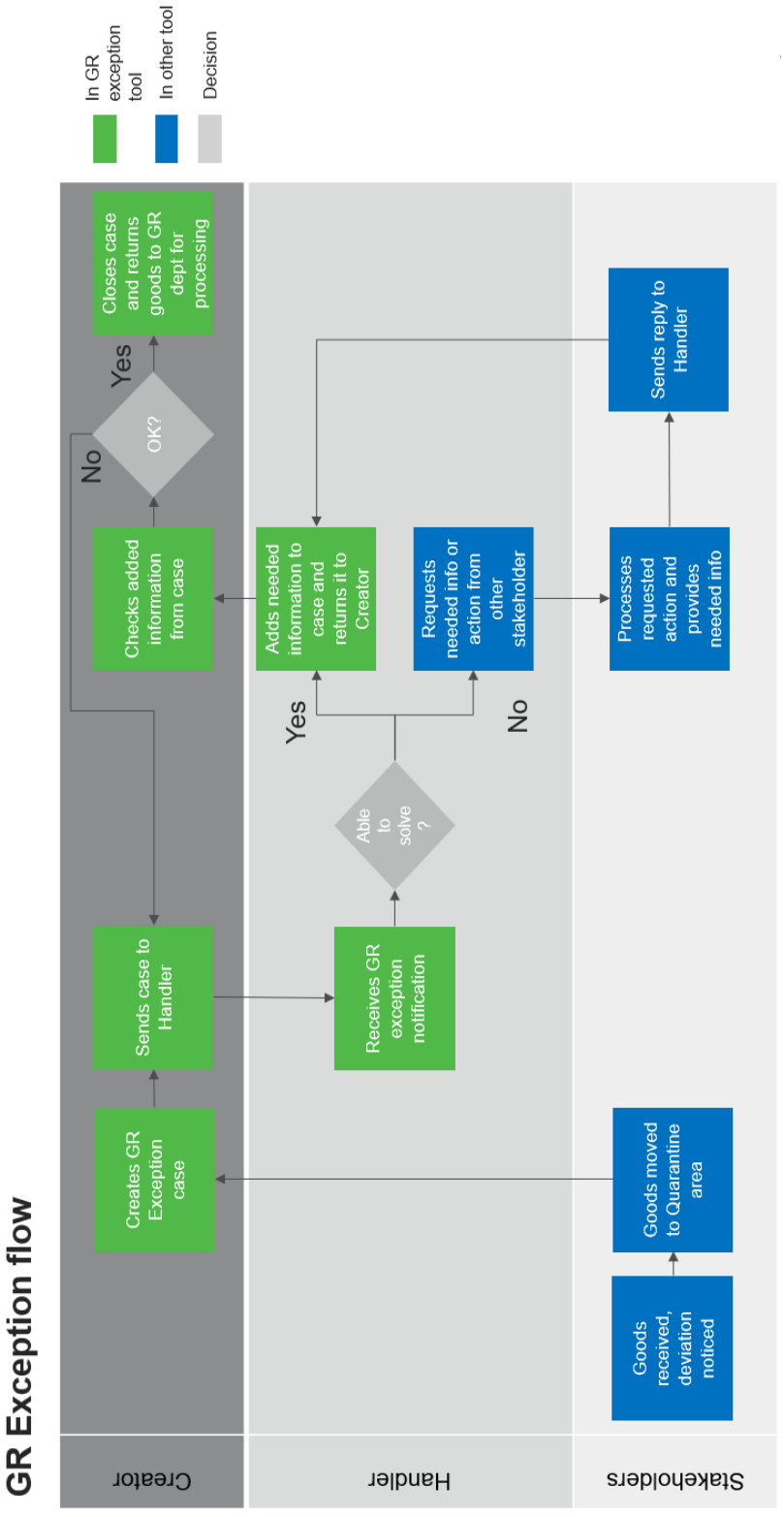

Figure 7. GR Exception process flow

4.2 Quantitative data analysis

A study of the logged GR exceptions showed that the number of exceptions had stayed between 800 and 1 500 exceptions per year from 2012. The exception per year statistics can be seen in Figure 8. The number of inbound deliveries at the Finland logistics center is approx. 180 lines per day. In this light the approximately three and a half percent of inbound lines cause a GR exception case. The percentage is not great, but when looking at it from the angle of the number of cases per day, it can be seen that there are on avarage of six exceptions per working day. Moreover, there is a dedicated person at the warehouse who handles the exceptions as his main duty.

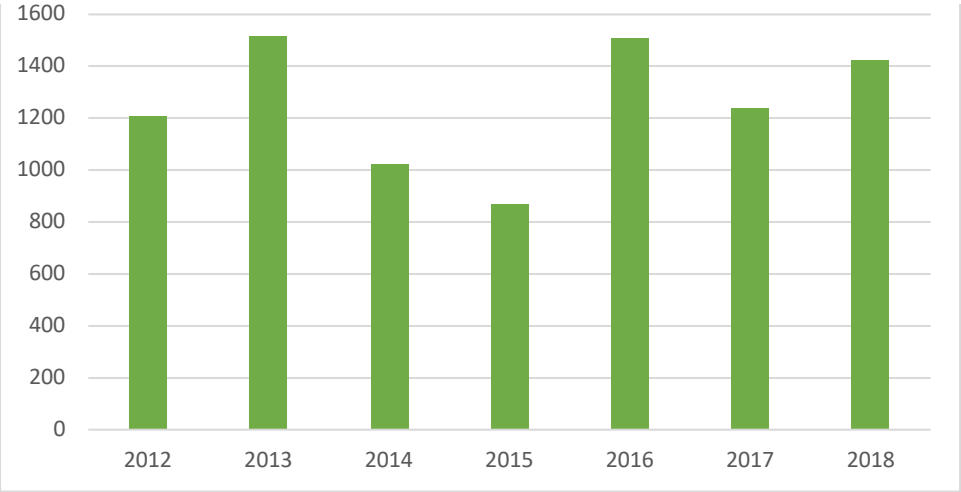

Figure 8. GR Exceptions per year

The report that can be taken out from the GR exception case database is very limited in terms of information. It consists of data fields listed in Table 2.

Table 2. GR Exception Report Headers

Report Column Headers FIN	Report Column Headers EN
Status	Status
Laatija	Creator
Pvm	Date (Creation)
Ostaja	Purchaser (Handler)
Tilausnro	Order number
Tilauspvm	Order Date
Toimituspvm	Delivery Date
Toimittaja	Supplier
Viitenro	Reference
Toimitustapa	Delivery method
Rahtikirjanro	Waybill number
Rahtikirjavirheet	Waybill errors
Pakkauslistavirheet	Packing Slip errors
Kollin virheet	Package errors
Luokittelu	Classification

It is possible to check the Edit History of the case by opening the case. However, only the last 10 edits are shown and the report does not specify what was changed, it mentions only the user and date of edit. This means that it is not possible to obtain reliable quantitative data about GR exception handling times without using excessive amounts of time. When thinking about ways to improve the process, a better possibility of measuring handling is a must. As noted before in chapter 2.2.1 about measuring, "if you cannot measure it, you cannot improve it".

Analysing the data from the named supplier perspective shows that there is a large number of suppliers involved in the exceptions cases. In the years 2016 – 2018 there were 1436 suppliers listed. This number does include duplicates due to different ways of noting the same supplier's name. For example, Etra Oy can be found, but also just Etra has been used. This is due to the free text field where the supplier name is noted. There is no integration to a Supplier Relationship Management system or a supplier contact information database.

While analysing no clear pattern could be found, such as a pareto where 20 percent of suppliers were responsible for 80 percent of cases. However, while listing the top ten suppliers per year, it could be seen that some suppliers were always or often on the list. In the tables below the top ten suppliers for the years 2016, 2017 and 2018 can be seen.

Table 3. Uncorrected Supplier data from GR exception database

Year	2016		2017		2018	
Rank	Supplier	Exceptions	Supplier	Exceptions	Supplier	Exceptions
1.	Supplier A	36	Supplier A	93	Supplier N	55
2.	Supplier B	31	Supplier B	29	Supplier A	52
3.	Supplier D	26	Supplier C	25	Supplier O	24
4.	Supplier E	25	Supplier K	18	Supplier M	23
5.	Supplier C	18	Supplier H	18	Supplier P	21
6.	Supplier F	17	Supplier L	17	Supplier I	14
7.	Supplier G	13	Supplier M	15	Supplier Q	13
8.	Supplier H	13	Supplier N	13	Supplier B	13
9.	Supplier I	13	Supplier E	12	Supplier R	13
10.	Supplier J	12	Supplier N	11	Supplier C	11

In Table 3, some suppliers appear twice in the top ten due to different versions of the supplier's name. This is one issue with the current tool that the lack of integration to ERP or a supplier information database means that supplier information is entered manually by the creator and is subject to their interpretation and typos. In Table 4, the rows meaning same supplier have been combined to give a more accurate view of the top ten. The data suggests that four suppliers are in the top ten of suppliers with most GR exceptions every year within the studied period.

Table 4. Corrected Supplier data of Top ten Suppliers

Year	2016		2017		2018	
Rank	Supplier	Exceptions	Supplier	Exceptions	Supplier	Exceptions
1.	Supplier AO	36	Supplier AO	93	Supplier BN	68
2.	Supplier BN	31	Supplier BN	42	Supplier AO	76
3.	Supplier CD	44	Supplier CD	25	Supplier M	23
4.	Supplier E	25	Supplier K	18	Supplier FP	21
5.	Supplier FP	17	Supplier H	18	Supplier I	14
6.	Supplier G	13	Supplier LQ	17	Supplier LQ	13
7.	Supplier H	13	Supplier M	15	Supplier R	13
8.	Supplier I	13	Supplier E	12	Supplier C	11
9.	Supplier J	12	Supplier N	11	Supplier S	11
10.	Supplier S	12	Supplier S	11	Supplier T	11

The top ten is approximately eight percent of the suppliers, but they are responsible for 18 percent of the exceptions in the last three years. What is noteworthy is that some suppliers are in the top ten every year.

Another perspective used in analyzing was the classification of the GR Exceptions. There are four classification types available; Insufficient Markings, Wrong Quantity, Wrong Item, Faulty Item and Unrecognizable item. The amounts per Classification type during 2016 – 2018 can be seen in table 6.

Table 5. Amount of Cases per Classification Type

Amout per Class	Year			
Classification type	2016	2017	2018	Total
(Blank)	393	520	493	1406
Tu 1 - Insufficient markings	628	124	204	956
Tu 5 - wrong Quantity	239	338	340	917
Tu 3 - Wrong Item	127	145	100	372
Tu 2 - Faulty Item	84	80	101	265
Tu 4 - Unrecognizable item	36	31	186	253
Total	**1507**	**1238**	**1424**	**4169**

GR Exception cases with Classification type left blank are the most notable group. Blank cases represent almost 34 percent of case total. The second most common is the Classification type 'Insufficient Markings' with 956 in total which is 23 percent of all cases in the three year period. It can be seen that there was a clear drop in those cases from year 2016 to 2017. However, the total of cases was also higher in 2016 than it was in 2017 or 2018. Data analysis does not give a clear reason for the high number of cases in 2016. The third most common name Classification type is 'Wrong Quantity'. It is almost as large a group in total as the previous with 917 cases which is 22 percent of all cases in the three year period.

When looking at the division of cases between purchasers a pareto could be seen. In the years 2016 – 2018 there were 138 different purchasers named in the cases, 33 of those purchasers where named as handler in 81 % (3362) of the cases. This is a clear 20/80 ratio.

4.3 Questionnaire survey results

The result was that a total of 17 employees answered the survey, five warehouse and logistics employees and twelve purchasing employees. They reported their roles in the process to be creators, handlers and process owners. Process owners both create cases and act as handlers in others. In the following the survey results have been grouped into four categories; tool features, process, improvement and supplier related. The total participation rate was 46 percent.

4.3.1 Tool Features

Out of the total of 17 participants only one answered "No" to question about needing attachments in the tool. Thirteen out of 17 feel that the use of attachments is easy but only one found it very easy. Two found it to be somewhat difficult to use

attachments in the tool. Apart from one all found finding needed information in the tool easy or very easy.

Logistics and warehouse employees all find the email notifications about GR exceptions very useful. Purchasers' answers varied more. Seven found them very useful, three useful and one somewhat useful.

The classification of GR exceptions seems to be unfamiliar to many participants. Eight found them to be useful and the rest were not sure what the question was referring to. Quotes from open answers can be found below.

> *"It is unclear how the GR exceptions are classified."*
>
> *"I don't know what classification this question is referring to."*
>
> *"Classification? Is such a thing in use?"*
>
> *"Yes, exceptions are classified, but it doesn't affect the handling process in any way."*

No feature of the tool was thought to be unnecessary. Most of the participants commented that the tool is very simple and bare and had nothing extra.

In total, a clear majority of 12 were satisfied or very satisfied with the current tool. Only one participant was not at all satisfied with the tool. A graph of the answers can be seen in Figure 9.

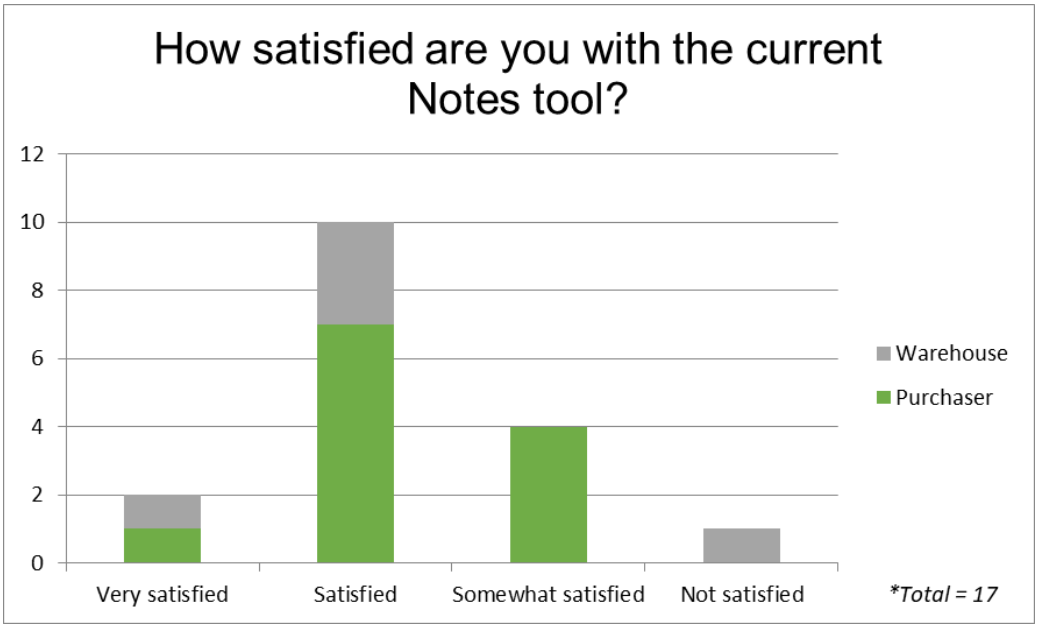

Figure 9. Comparison Graph of Question 18 answers

4.3.2 Process

When asked about the most laborious phase of the GR exception handing, the most common answer for creators was the prework to gather needed information to be able to create a case in the tool. For the same question handlers noted the investigation of what has happened and who can solve the issue. Below some quotes from open answers from survey.

> *"Comparing information, understanding the whole picture (what should have arrived)."*
>
> *"Confirming what exactly has arrived and what was ordered."*
>
> *"Gathering information and writing instructions on what to do to solve the issue."*

According to the survey 10 tools are regularly used by handlers in the process in addition to the GR Exception handling tool itself. Those tools are listed in below Table 7.

Table 6. Additional tool used in handling

Tool	How many use
Infor LN (ERP)	83 %
Email	100 %
Phone	75 %
PDM	83 %
Baan (Legacy ERP)	58 %
Sovelia	42 %
VST (Qlickview report)	8 %
Skype	17 %
Basware IA	8 %
Supply Chain Master (Supplier collaboration tool)	8 %

When asked about the amount of time used per week on GR exception case handling the answers varied significantly. The estimates varied from 15 minutes to six hours. The avarage answer to how much active work time does a case usually take was 29 minutes and the medium 19 minutes. Most common answers were 10 minutes and 30.

Fifteen out of 17 participants answered that they did not need instructions when working on GR Exception cases. Surprisingly, 10 answered that they could not find the instructions if needed. However, almost all (15/17) felt that they get support for use if needed. Free comments show that mostly the support comes from colleagues. Graph of answers to Question 9 'Can you find the instructions, if needed?' can be seen in Figure 10.

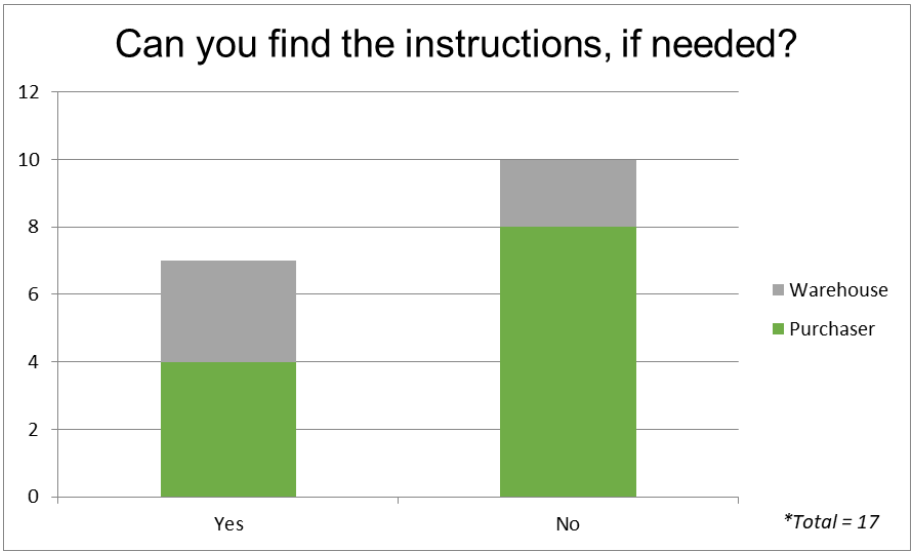

Figure 10. Comparison Graph of answers to Question 9

Fourteen out of 17 participants answered that similar cases keep repeating. Only two answered "No" to this. Comment quotes from "Yes" answers are found below.

"We have a large number of suppliers with a large number of employees (human errors). It is difficult to get package markings unambiguous, when the item might be intermediary. It shouldn't be brain science, but..."

"Insufficient information included in the shipment from supplier."

"Master data errors, for example MOQ."

"Large volume items the quantities don't match, bad markings on packages."

"Valmet internal problems."

"Repeating exception are much due to suppliers and their way of working."

"Repeating issues in Goods Reception have not been dealt with even if root cause is known."

"Purchasers don't care to demand suppliers to correct their ways. Also, shipments that continuously get shipped to wrong location don't seem to interest any one even though Valmet pays for reshipping."

"Shipments from certain suppliers continuously have same deficiencies, such as missing item codes which means Goods Reception cannot do receipt."

"Suppliers don't include needed packing slips and information to shipments."

Participants found that the biggest problems with the process were communication and long reply times.

"Unclearly described cases."
"Uncertainty of what information warehouse can see. Communication."
"Communication between purchasing and warehouse, why do we need to go through logistics?"
"Communication. Not a big problem. For example, creator creates wrong or purchaser replies wrong."

"Vacations / long absences. Creator gets no notification if receiver is on vacation."
"Some cases wait for reply an exorbitant time."
"It may take the purchaser too much time to reply."
"Time or lack of it, both at warehouse and in purchasing."

"Some cases are left hanging, even though purchaser has commented, and issue is resolved. Redundant notifications keep coming until someone closes the case."
"No one monitors that purchaser replies to cases. Items stand waiting for months on end for reply. Then same purchaser sends email asking why the purchase order line is still open, when the reason is, they have not replied to the GR exception case."

"Maybe the repeated item identification issues in Goods Receiving that have been happening lately. Problem is not in the tool but the badly marked packages and shipments (labels and markings are missing) and Goods Receiving does not have the use of item documentation."

On the question about monitoring of GR Exception cases three out of 12 participants found it to be insufficient and eight participants answered that they found it lacking. One participant commented on the matter that a case could be open for a full vacation period when the assigned handler is away.

When asked about their satisfaction with the current process, 12 participants said were satisfied or very satisfied. However, when asked if they would be satisfied if the process stayed the same in the future, nine participants answered that they would be satisfied and eight would only be somewhat satisfied or not satisfied at all.

4.3.3 Improvement

Participants of the survey were asked what information or features they would wish to be in the tool. Wished features were an easier way to see "the whole picture" meaning for example attached photos in one glance, a more user friendly address

book, direct messaging to supplier from the tool, out of office -function, possibility to add screen shots with copy paste in comment field, better report options, preview of case in report/list view, a monitoring responsible and improved email notification logic.

When asked for improvements for the process only seven participants replied with actual comments. One simply replied, *"The process is good."* Another found the search functions to be inadequate and remarked that a creator is able to, for example, write a supplier's name wrong which will exclude it from a search. One mentioned issue was that cases are being commented and then only saved when they should be sent back to creator. This causes an issue because the creator does not then get a notification about the case and it might remain hanging for a long time. The writer of this comment also added that it is more due to the users than the process but hoped it can be improved upon. A comment relating to same matter from another angle was also logged, it can be found in the quotes from some of the survey answers displayed below.

"After purchaser has replied to a case, they should no longer receive notifications, even if the case is not closed. If more info is needed, case should be resent to purchaser."

"Way of Working needs to be changed and communication barriers taken down."

"I would make managers responsible for monitoring handling of cases, including making sure feedback goes to suppliers who have caused the error."

"Should utilize reporting more to monitor repeating issues with same suppliers and getting info from suppliers about corrective actions."

Participants seemed to be satisfied with the process and tool despite the before mentioned complaints, but they did wish for improvements to be made. A comparison of the satisfaction of the two participant groups if process remains the same in the future can be seen in Figure 11.

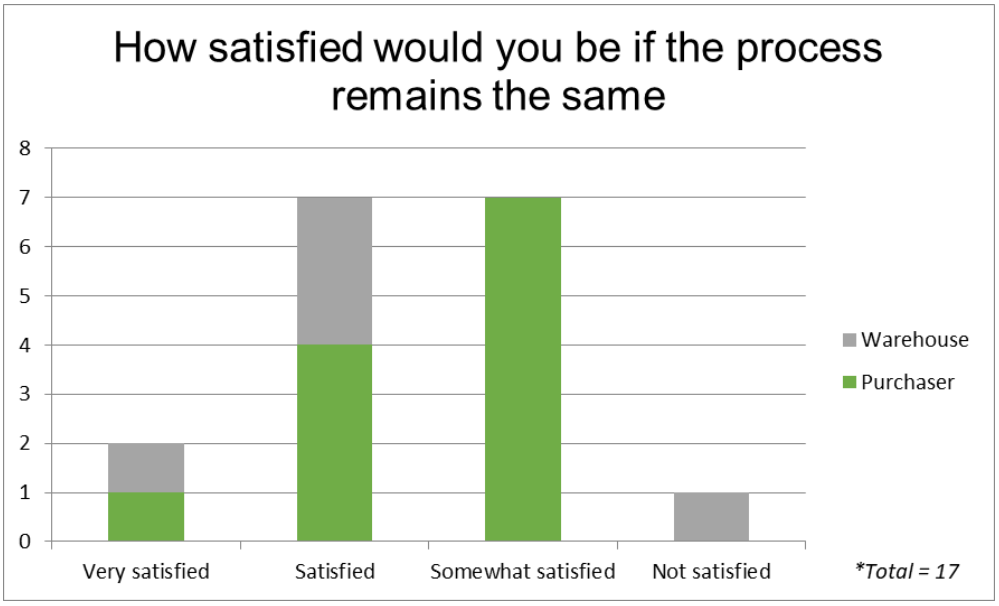

Figure 11. Comparison Graph of question 21

An interesting and unexpected result was that the participants expected their satisfaction to improve even if only the process was improved but the current tool remained in use. A comparison graph of the answers can be seen in Figure 12.

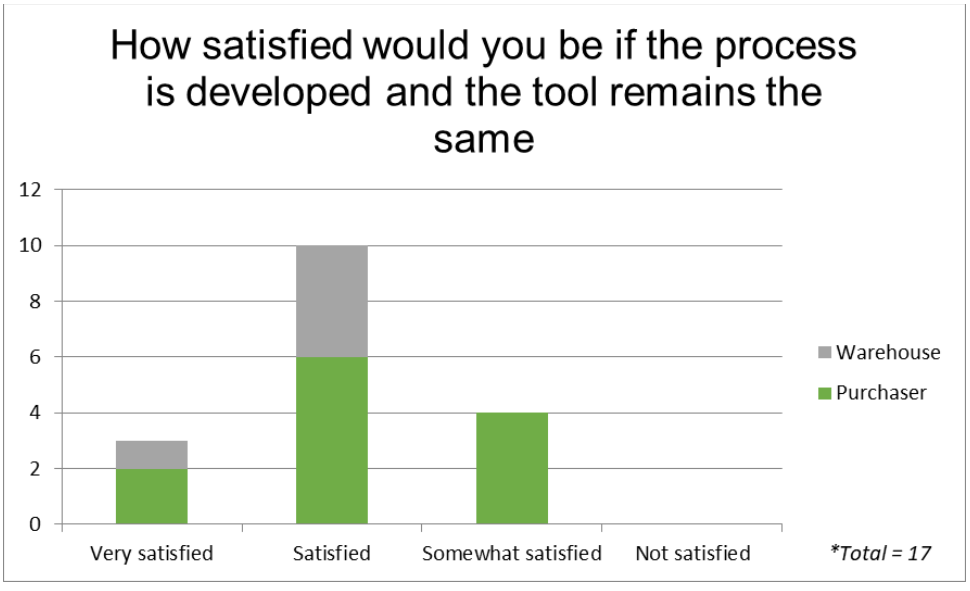

Figure 12. Comparison Graph of question 22

4.3.4 Supplier

Supplier related questions were asked only from the purchasers because they are responsible for the supplier related collaboration and communication. This means 12 participants in total answered questions from 27 to 31, which can be found in Appendix 1. According to the answers, suppliers are mostly contacted via email (100 %) and phone (58 %). When asked if participants analyze the root cause when handling a GR Exception case 75 % answered "Yes". Related open comments revealed that root causes were analyzed sporadically and depending on available time. One comment from the employees who did not analyze root causes was *"It is not required, I don't analyze."* When asked if a claim is always issued to supplier, when the cause of the exception was on supplier's side, 83 % answered "No". The quotes below are from participants who answered "No" to always issuing claims.

> *"Claim procedure is not clear enough? Also, sometimes there is not enough time."*
>
> *"Depends on the price tag of the item. If a repeating issue, then maybe a claim is made."*
>
> *"Exceptions and development ideas are delivered in writing."*
>
> *"No carrot for making a claim, easier to agree a different way of doing."*

Of the two participants who answered "Yes", one commented that sometimes yes and sometimes no, depending on whether the supplier can easily fix the issue or not, as an example of easy was by sending more parts.

In line with the before mentioned result participants all estimated that GR exceptions seldom or rarely lead to claims. Participants were divided in two on question 31. "Are GR Exceptions discussed during regular supplier meetings". Half of them answered "Yes" and half "No".

5 Conclusions

Based on the study results the maturity of the process was found to be low and several problem points were identified in the way of working. Most problematic to the survey participants seemed to be the uncertainty of who should do what and how information should be communicated. This uncertainty seemed to lead to employees blaming the other function for problems, which may have built a divide between warehouse/logistics and purchasing which in turn prevents good communication.

Based on the findings the maturity level of this process was Disorder. Maturity level model was described in Figure 4. The indicators for Disorder are seen below in Figure 13.

Maturity Level	Indicators
Disorder	- Customers and requirements are not defined. - Crises start improvement - No alingment, Random Kaizen - Personalized

Figure 13. Caption of Maturity level Disorder
(Adapted from Laamanen & Tinnilä 2009, 92.)

The exceptions can be classified by Lean terms as defects that are waste. This whole process is not adding value in customer's view even though it is important when exceptions occur. The exceptions are internal quality issues or supplier non-conformance issues and could be handled in the quality processes relating to these. The goal of the handling process should be to prevent occurrence and not only solve.

Chapter 3 listed assumptions management stated at the start of the study. These assumptions were used as basis for forming questions for the survey. The assumptions were:

The tool is obsolete. This assumption was partly true. Valmet has stated in the defining of study subject that IBM/Lotus Notes (the software where current tool is built) was a sunset software and tools in it were no longer developed. During the study critical improvements needed to the tool were indentified which means a new tool was needed since the old one was no longer to be developed.

Users are unhappy with the tool. This assumption turned out to be only partly true. Based on the survey results, the tool's functionality was seen problematic to some extent. However, tool-related issues represented a minority in the significant issues revealed by the study, while a majority of the issues were directly related to the process flow and the users varied ways of working.

Supplier Claims are being issued based on GR exceptions. According to the survey results this assumption was false. According the the survey results quality claims were seldom issued as a result of a GR exception.

The process needs improvement. This was found to be true. All processes can always be improved. However, in this case the dissatisfaction of employees and the nature, number and reoccurrence of cases suggested that the efficiency for the process was not at a satisfactory level.

The number of exceptions is not declining. This was found to be true. The number of cases per year is displayed in Chapter 4.2 Figure 8.

Valmet management's view was that the GR exception tool was not working properly and the problems in the tool's functionality were causing delays in the GR exception handling process. In order to verify this, survey results, data analysis and observation were used to detect and identify the bottlenecks that are slowing the process down. A list of the significant bottlenecks identified from study results can be seen in the Table 7 in this chapter.

Table 7. Found problems in the process

Nr.	*Found issue in process*

1	Lack of an agreed way to operate between all participants
2	Email notification functionality works in a way that turns the notifications into spam which takes away from their effectiveness.
3	Existing report does not support monitoring progress
4	Address book in the tool is not user friendly
5	No instructions for handling process
6	Long handling times
7	Similar cases repeat
8	Suppliers are not issued Quality claims when they are at fault
9	Workload of some handlers is much heavier
10	Communication between stakeholders is not at a good level
11	Cases can be pending for an employee's whole vacation period

Instructions were available in the tool but they were limited to the features of the tool. Because of this, users said that they rely on colleagues for onboarding and guiding on how the process should be handled. This often means the way to operate is not unified and the risk of miscommunication is increased. Many users indicated in the survey answers that they were not familiar with the instructions which might explain some of the complaints they had about the tool and process. In addition, the instructions did not contain all the necessary information concerning the tool features. An example of this was a GR exception case pending open and sending notifications to handler after their reply. This might be due to them not clicking the button to return the case to creator after handling. In which case creator did not receive a notification before the case started sending reminders a week later to all involved. The "return to creator" feature was not included in the instructions available which means it is possible handlers had never been explained how it works.

Handlers complained about communication and the laborous investigating of what precisely is the cause of open GR exception cases. Often the cases seem to have very short descriptions of the issue, but they might have included an error code and classification, which helped to describe the issue. As shown in the survey results not all handlers were familiar with the classification and error coding possibilities or they were not sure how they were used. This might have been a contributing factor in the feeling poor communication between creator and handler. This conclusion was supported by the results to how much active time it took to handle one exception case on avarage. The avarage answer was 29 minutes and the medium 19 minutes. Most common answers were 10 minutes and 30 minutes. Unfortunately, it was not possible to get quantifiable data to verify the handling times per case, because the report that was available only notes the creation date of the GR exception case, not the closing date or handover times from stakeholder to stakeholder.

Analysis of the available quantitative data showed that most of the cases were due to certain suppliers and due to that certain handlers. It looks like the GR exception workload of some handlers is much heavier than others. This could contribute to the long handling times in some cases and explain partly the differences the survey showed in time used weekly for GR exception handling. When asked about the amount of time used per week on GR exception case handling the answers varied signifigantly. The estimates varied from 15 minutes to six hours. This might be explained by they way the exception handling work load was divided between handlers. Most handlers were purchasers and purchasers usually handle purchases from certain suppliers and from the GR exception data analysis we could see that some suppliers are involved larger amounts of exceptions than others.

Similar cases repeat. This was clear from both survey group answers. Often the similar cases are with the same suppliers as before. This can be explained by the lack of root cause analysis and lack of supplier quality claims being issued as a result of a GR exception caused by supplier. This was also noted to be an issue with internal Valmet suppliers. Observation showed that in internal cases the handling was done by investigating and contacting the worker level, but no internal quality issue was reported in the internal quality tool which would prompt a root cause analysis and corrective actions on the supplying side. As noted in the survey comments there is no

incentive for making a supplier claim or internal quality issue from GR exceptions. There were no instructions for doing so and management does not monitor or measure if these are being done or not. At current there seems to be no incentive to analyze the root cause and/or issue a claim to supplier when it is concluded that the cause was on supplier's side. It does make the handling of one case much faster when one doesn't issue an official claim but handles the case via phone or email. However, this leads to same issues repeating, because the exception may not raise any discussion at supplier end or come to the attention of management at either end. The immediate issue is resolved but the root cause might not be identified or removed. If the quality issue would be reported officially, it would prompt the supplier or Valmet department to make sure the issue will not repeat. Suppliers should also be made aware of what is expected of them to ensure a smooth goods receiving process. One way could be to implement Benwell's five-point plan for supplier conformance.

The GR handling processes way to operate has not been clearly defined and varies depending on who is the creator or the handler. Cases were found to depend heavily on the person assigned since no monitoring or substituting process was defined. Analyzing root causes was random and even if it was identified it did not always lead to corrective actions. One of the survey comments said it clearly: *"Repeating issues in Goods Reception have not been dealt with even if root cause is known."*.

At the time of the study there was no monitoring process or responsibility assigned for open GR Exception cases. Due to lack of follow up some cases were open for a long period time before being closed due to employee absences and heavy workloads. The follow up was left to the creator and handler of each case. One issue with handling times being erratic may also be that there was no agreed service level. Handlers had no deadline for commenting or returning the case to the creator. Futhermore, there was no agreed deadline for getting a case closed. If a creator or handler wanted to follow up their own cases they would have had to open each case to see the real status because the report offered a very limited set of information. The report only showed when the cases were created and the statuses; draft, open or closed. Because there were only three statuses available, one could not see was the case pending the creator's or handler's action without reading all the comments.

The users of the tool were unanimous in their survey answers that no functionality in the current tool was surpufulous. Which means that the new tool should include at least the current functionalities, in addition to the functions listed in Table 8. The listed functions were gathered from observations and survey results.

Table 8. List of new functionalities required in the tool

Nr.	*Needed functionality to tool*
1	Better visuality - Ability to see whole picture in one glance - Ability to see attachments in one glance
2	Possibility to message supplier from the tool
3	Out-of-Office function
4	User-friendly Address Book
5	Ability to add Screenshots with copy-paste
6	Preview of case in list view
7	Improved email notification functionality - to avoid spam
8	Possibility to see whose action case is pending
9	Better reporting and measuring functionalities - Easy way to see own cases - Possibility to measure handling times - Way to indicate if root cause analysis is marked done - Way to report root cause - Way to indicate if issue is caused by supplier - Way to indicate is related Quality claim/issue created

A new tool by itself cannot solve many of the issues found in this study. While it could make the handling easier and more user-friendly, it will not do much to improve the overall process, if the way to operate and the tool's features are not clear to all stakeholders. The handling times will not be shortened by better reporting tools, if a monitoring process and responsibility are not created at the same time. Lack of monitoring and follow up by management, can contribute to lack of quality in GR exception cases. Most of the issues raised were not related to the tool or its features but to the use and the way to operate. WTO (Way to Operate) instructions should be created and trained to the stakeholders to create a common understanding of how the whole handling process should be done. To solve the found issues improvement proposals were created based on the survey participants' improvement suggestions, researcher's own professional knowledge and literature studied. Improvement suggestions are listed next to the related issue in Table 9.

Table 9. List of improvement proposals

Nr.	*Found issue in process*	*Immediate improvement suggestion*	*Long term improvement suggestion*
1	Lack of an agreed way to operate between all participants	Assign a project team to assemble Way to Operate guidelines and distribute them to stakeholders	Arrange training for guidelines and improve them on feedback given in training
2	Email notification functionality works in a way that turns the notifications into spam which takes away from their effectiveness.	Assign a person to give a short training about how notifications work.	Develop a better notification functionality for new tool
3	Existing report does not support monitoring progress	Create a temporary reporting tool with Excel that will help track cases that have been open too long	Develop better reporting and monitoring possibilities in new tool

4	Address book in the tool is not user friendly	-	Make sure new tool has a more user-friendly address book
5	No instructions for handling process	Use created guidelines as a temporary instruction	Assign a team to create instructions on whole handling process, WTO and tool
6	Long handling times	Give a description of required quality of GR exceptions in guidelines	Address needed quality of case info in instructions and training. Assign responsibility of monitoring case quality.
7	Similar cases repeat	Require root cause analysis and both immediate and long-term corrective actions from handlers	Make sure new tool has possibility to mark and monitor corrective actions process and negotiate conformance points with suppliers
8	Suppliers are not issued Quality claims when they are at fault	Make sure guidelines are given also to when quality claim is needed. Require handlers to create them.	Make sure new tool has possibility to monitor if quality claim is issued or not
9	Workload of some handlers is much heavier	Make sure workload from GR exceptions is noted in the employee's overall workload assessment	-
10	Communication between stakeholders is not at a good level	Address this in guidelines.	-
11	Cases can be pending for an employee's whole vacation period	Make sure employees are instructed on how to follow-up other persons case when substituting	Require new tool to have an out-of-office functionality

5.1 Limitations and future development

The theoretical background was difficult to form as articles focusing on handling deviations in goods receiving did not seem to exist. Many search word combinations were tried in both Google Scholar and the university's library's search engine, such as

"goods receipt reception deviation", "goods receipt error", "goods receipt exception" and "supplier compliance goods receipt" and the same with goods reception and receiving, to no avail. Goods Receiving related literature and articles often only included one or a few sentences related to the topic. Articles on exception and deviation handling were focusing on software development and did not fit this study topic. A few articles that seemed promising based on the abstract were not available for reading with the university's credentials. The research focuses on how to eliminate the exceptions, but no research seems to have been dedicated to how to handle them effectively when they do occur. Due to not finding directly related sources, topics such as goods reception itself and improving processes were chosen. Theory on software procurement was included to help understand what is needed for a procurement project in order to gain results that can be utilized also for the procurement of a new software tool for the process.

The purpose of the study was to get a picture of the current state of the GR Exception handling process and find its problem points. Then use the gathered information to suggest improvements and list found requirements for the software tool used in handling GR exceptions. Studying the current process was not as easy as first thought because documentation of the process and instructions were limited. However, a questionnaire survey provided good information and observation helped understand the basic process even though ways of working varied between employees slightly.

This study focused only on listing functions and features found while observing the current state and analyzing questionnaire results and report data. Because defining all requirements is a demanding task and would require more resources. In this study only a preliminary list of needed functions was defined to give a view of what is needed in the user's view and to gain a starting point for further study and development. The results of this study can only be applied elsewhere if a similar exception handling process exists.

A good view of the current state and its issues was established, and improvement ideas were found. Originally it was planned to get a more detailed requirements list for the software tool. After studying the theory and literature of software procurement I realized that the undertaking would be too great for this thesis as it

would require a dedicated project team. I also found that the quantitative data available was limited. Getting sufficient quantitative data would have required collecting data manually from the exception cases and this would have taken resources and thus limited the study to only that data.

A financial analysis of the GR Exception process would have been difficult to do, because of the lack of quantitative data about handling times. The only cost that would be easy to calculate is the labor cost of the one warehouse person working on creating and handling the exceptions as his main duty. This means that at least one person's full year work hours is used for handling the exceptions in addition to an unknown amount of work hours spent by the Goods Reception personnel, logistics office workers and purchasers.

It would be difficult to calculate how many of late outbound deliveries are late due to GR exceptions because there are other functions between the process chain that might also contribute to the lateness. It would require laborious analysis of the whole warehouse process and comparison of lines with GR exception against late outbound lines and investigation of possible other contributing factors such as late packing or late pick up by the forwarder. One would also need to consider the cases where the one line could cause delay of other lines that needed to be shipped together with it. The financial aspect was excluded due to the data being insufficient and unreliable.

The participation rate of the questionnaire survey was adequate, but since it was sent to a selected group it was expected to be higher. The survey was conducted during summer vacation period which might have contributed to the lack of answers. Selection of questions proved to be good and useful information was gathered from the survey. In retrospect the analyzes of the answers could have been better. It mostly focused on the quantitative data from the survey and picking interesting comments from the qualitative question answers. More information could have been extracted from the qualitative answers if simplification had been used to categorize them. This would have helped to see more trends in the answers.

Although the author tried to remain neutral throughout the research process, bias may have influenced how the survey questions were designed. It is difficult to

estimate whether a fully objective perspective at all stages of the research process was achieved. It is difficult to assess one´s own impartiality since the author knew the process and people before the study was conducted.

The listed improvement suggestions can be implemented to operative process. The most critical things to be done next are to define and describe a common way of working and establish a monitoring process. The user stories, process map and listed functional requirements can be used as a basis in an actual procurement preparation project for a new software. Further preparation for procurement can be done by continuing the requirements analysis with doing steps described in chapter 2.3.1 Procurement Preparation and then sending out requests for quotations to software developers or ask for tool suggestions from Valmet's current portfolio from the companies own IT department. In addition, the four suppliers that are in the top ten of most exceptions per supplier every year should be involved in a project to analyze root causes of exceptions and correct the causes to significantly reduce repeating exceptions. The lessons learned from that project could be applicable to other suppliers as well and internal improvement points may also be found that will reduce overall number of exceptions.

One take away from this study is that even if an organization has a process that's been used for years it doesn't mean it is thought out or functioning effectively. A simple process can be difficult if there is no unified way of working and the process lacks management and documentation to support it.

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Appendices

Appendix 1. Summary of questionnaire survey answers

Question 1.

GR exception questionnaire (Warehouse and logistics)

What is usually your role in handling GR exceptions?

Answer Choices	Responses	
Creator	40,00 %	2
Handler	20,00 %	1
Process owner	40,00 %	2
	Answered	**5**
	Skipped	**0**

GR exception questionnaire (Purchasing)

What is usually your role in handling GR exceptions?

Answer Choices	Responses	
Creator	0,00 %	0
Handler	100,00 %	12
Process owner	0,00 %	0
	Answered	**12**
	Skipped	**0**

Question 2.

GR exception questionnaire (Warehouse and logistics)

Describe the GR exception process briefly in your own words

Answered	**5**
Skipped	**0**

GR exception questionnaire (Purchasing)

Describe the GR exception process briefly in your own words

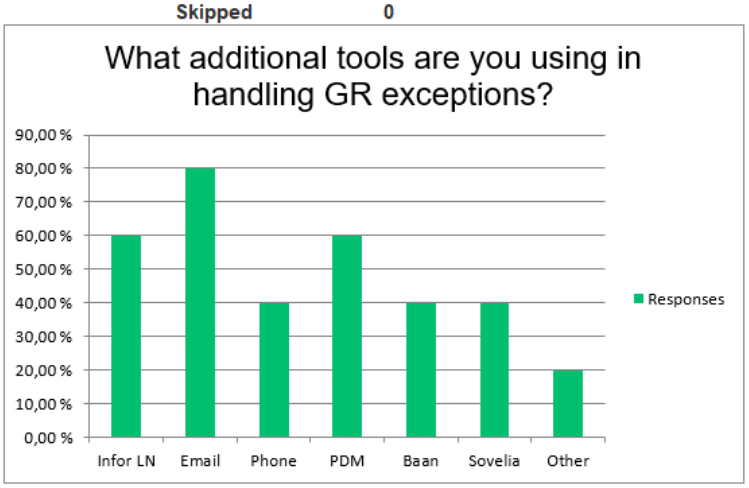
Answered	**11**
Skipped	**1**

Question 3.

GR exception questionnaire (Warehouse and logistics)

What additional tools are you using in handling GR exceptions?

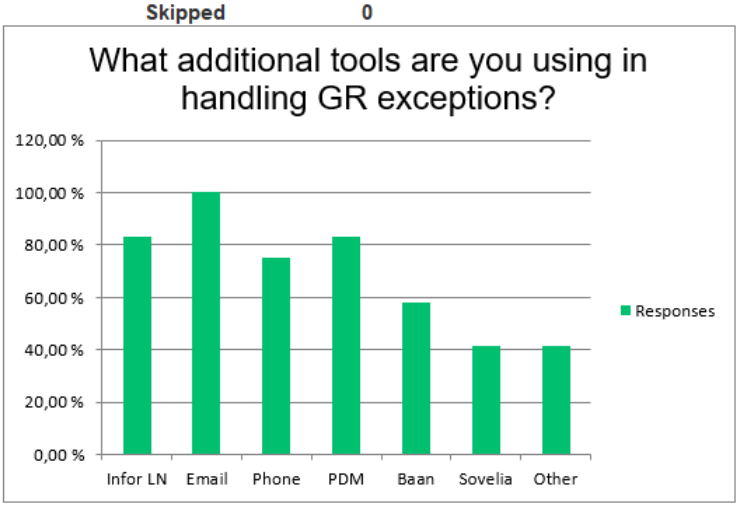
Answer Choices	Responses	
Infor LN	60,00 %	3
Email	80,00 %	4
Phone	40,00 %	2
PDM	60,00 %	3
Baan	40,00 %	2
Sovelia	40,00 %	2
Other	20,00 %	1
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

What additional tools are you using in handling GR exceptions?

Answer Choice	Responses	
Infor LN	83,33 %	10
Email	100,00 %	12
Phone	75,00 %	9
PDM	83,33 %	10
Baan	58,33 %	7
Sovelia	41,67 %	5
Other	41,67 %	5
	Answered	**12**
	Skipped	**0**



Question 4.

GR exception questionnaire (Warehouse and logistics)

What is the most laborous part/phase in the GR exception process?

Answered	**5**
Skipped	**0**

GR exception questionnaire (Purchasing)

What is the most laborous part/phase in the GR exception process?

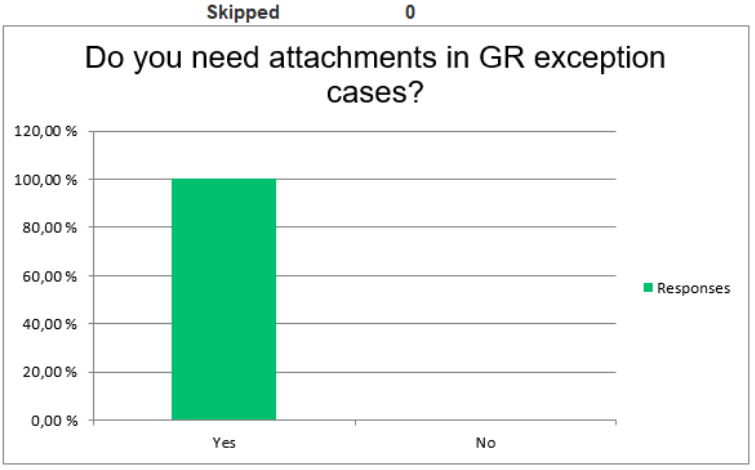
Answered	**12**
Skipped	**0**

Question 5.

GR exception questionnaire (Warehouse and logistics)

Do you need attachments in GR exception cases?

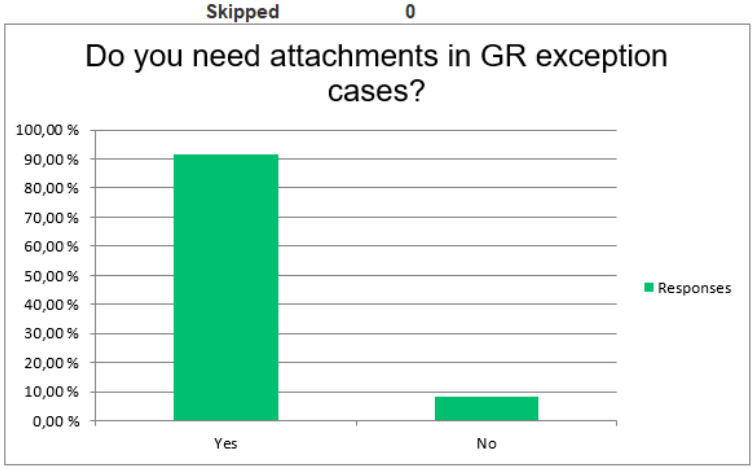
Answer Choices	Responses	
Yes	100,00 %	5
No	0,00 %	0
Other (Free comment)		3
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

Do you need attachments in GR exception cases?

Answer Choices	Responses	
Yes	91,67 %	11
No	8,33 %	1
Other (Free comment)		1
	Answered	**12**
	Skipped	**0**

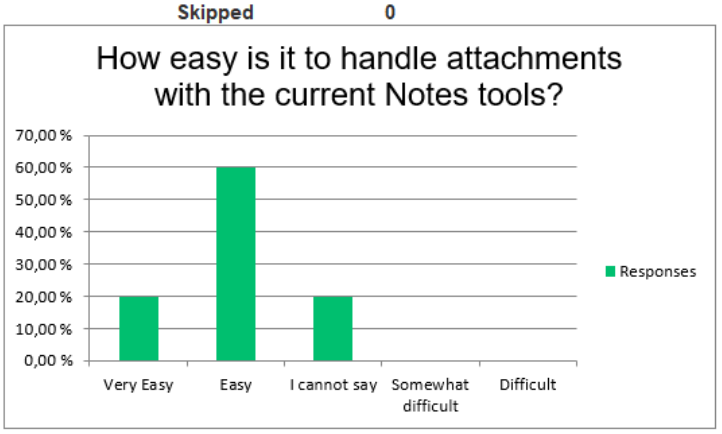


Question 6:

GR exception questionnaire (Warehouse and logistics)

How easy is it to handle attachments with the current Notes tools?

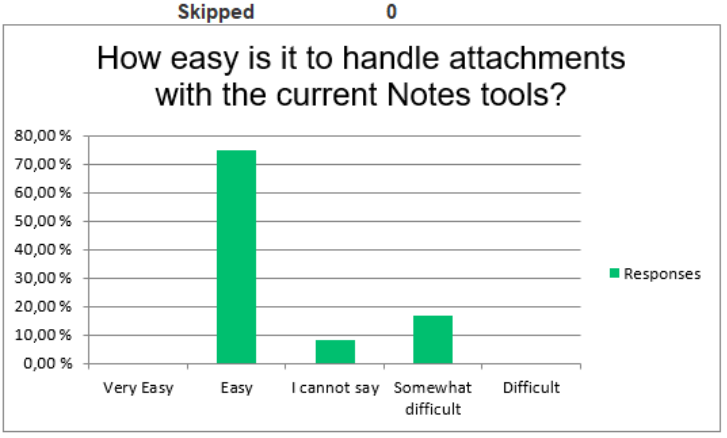
Answer Choices	Responses	
Very Easy	20,00 %	1
Easy	60,00 %	3
I cannot say	20,00 %	1
Somewhat difficult	0,00 %	0
Difficult	0,00 %	0
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

How easy is it to handle attachments with the current Notes tools?

Answer Choices	Responses	
Very Easy	0,00 %	0
Easy	75,00 %	9
I cannot say	8,33 %	1
Somewhat difficult	16,67 %	2
Difficult	0,00 %	0
	Answered	**12**
	Skipped	**0**

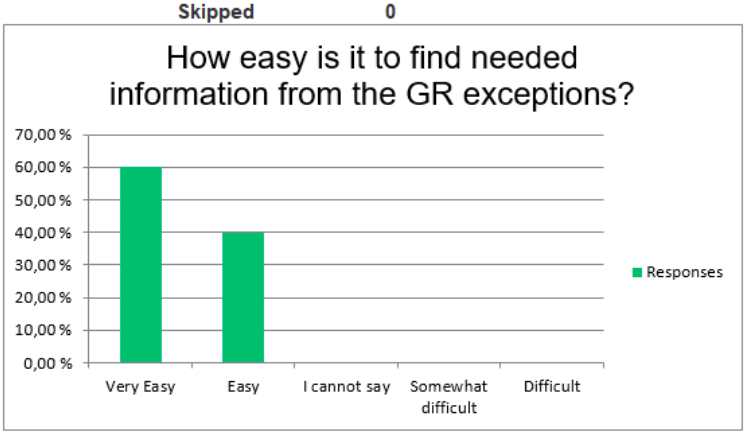


Question 7.

GR exception questionnaire (Warehouse and logistics)

How easy is it to find needed information from the GR exceptions?

Answer Choices	Responses	
Very Easy	60,00 %	3
Easy	40,00 %	2
I cannot say	0,00 %	0
Somewhat difficult	0,00 %	0
Difficult	0,00 %	0
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

How easy is it to find needed information from the GR exceptions?

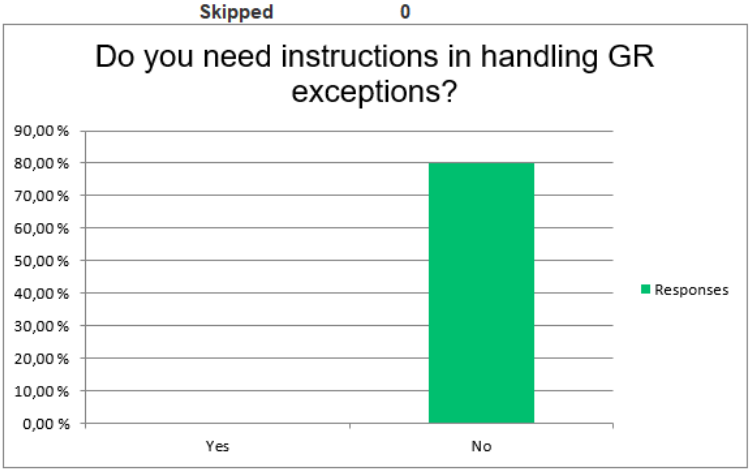
Answer Choices	Responses	
Very Easy	8,33 %	1
Easy	83,33 %	10
I cannot say	0,00 %	0
Somewhat difficult	8,33 %	1
Difficult	0,00 %	0
	Answered	**12**
	Skipped	**0**

Question 8.

GR exception questionnaire (Warehouse and logistics)

Do you need instructions in handling GR exceptions?

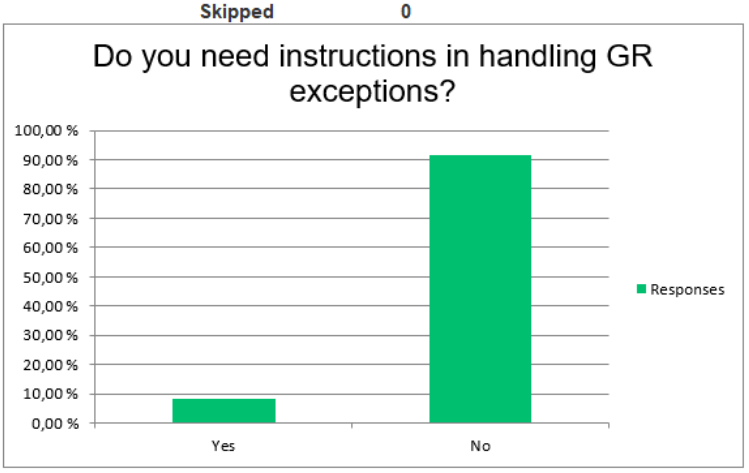
Answer Choices	Responses	
Yes	0,00 %	0
No	80,00 %	4
Other (Free comment)		3
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

Do you need instructions in handling GR exceptions?

Answer Choices	Responses	
Yes	8,33 %	1
No	91,67 %	11
Other (Free comment)		2
	Answered	**12**
	Skipped	**0**

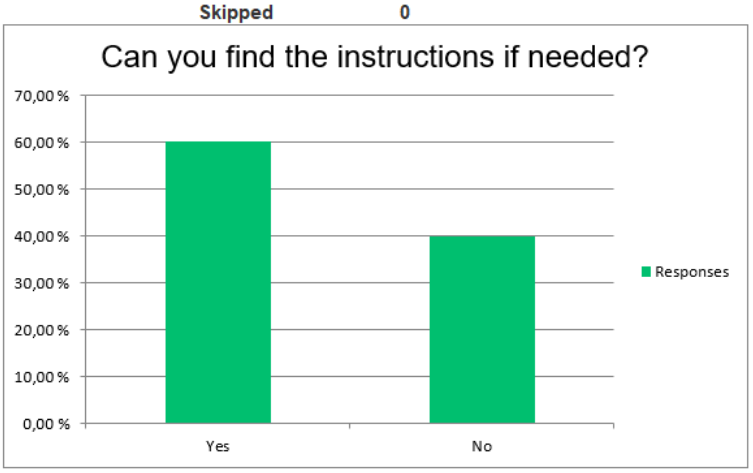


Question 9.

GR exception questionnaire (Warehouse and logistics)

Can you find the instructions if needed?

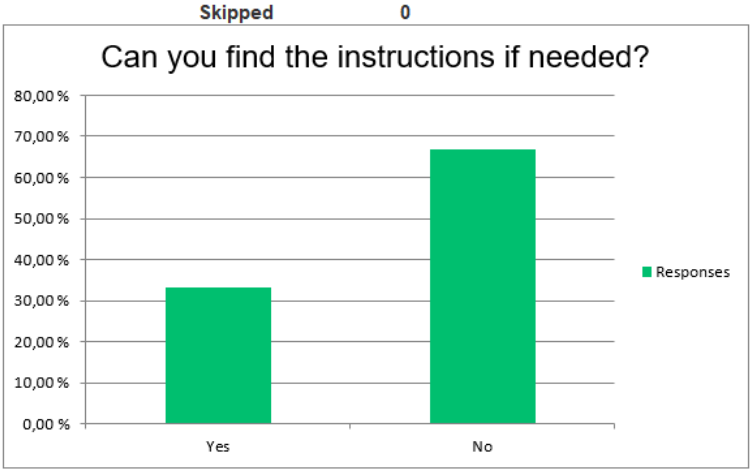
Answer Choices	Responses	
Yes	60,00 %	3
No	40,00 %	2
Other (Free comment)		1
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

Can you find the instructions if needed?

Answer Choices	Responses	
Yes	33,33 %	4
No	66,67 %	8
Other (Free comment)		5
	Answered	**12**
	Skipped	**0**

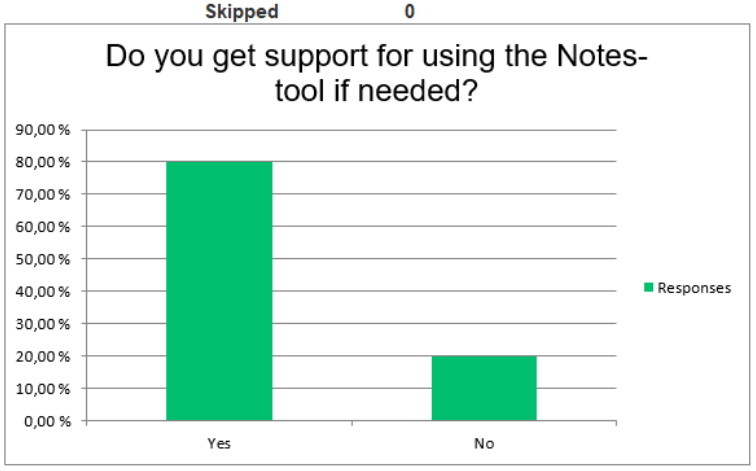


Question 10.

GR exception questionnaire (Warehouse and logistics)

Do you get support for using the Notes-tool if needed?

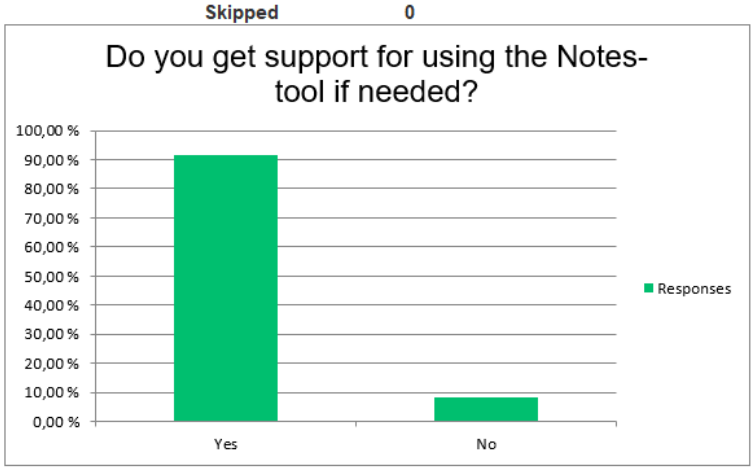
Answer Choices	Responses	
Yes	80,00 %	4
No	20,00 %	1
Other (Free comment)		0
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

Do you get support for using the Notes-tool if needed?

Answer Choices	Responses	
Yes	91,67 %	11
No	8,33 %	1
Other (Free comment)		4
	Answered	**12**
	Skipped	**0**



Question 11.

GR exception questionnaire (Purchasing)

How big portion of your weekly working time is spent handling GR exceptions? (Estimate in either percentage or hours)

Answered	**12**
Skipped	**0**

GR exception questionnaire (Warehouse and logistics)

How big portion of your weekly working time is spent handling GR exceptions? (Estimate in either percentage or hours)

Answered	**5**
Skipped	**0**

Question 12.

GR exception questionnaire (Warehouse and logistics)

How much active working time does one GR exception take on average? (Estimate in minutes or hours)

Answered	**5**
Skipped	**0**

GR exception questionnaire (Purchasing)

How much active working time does one GR exception take on average? (Estimate in minutes or hours)

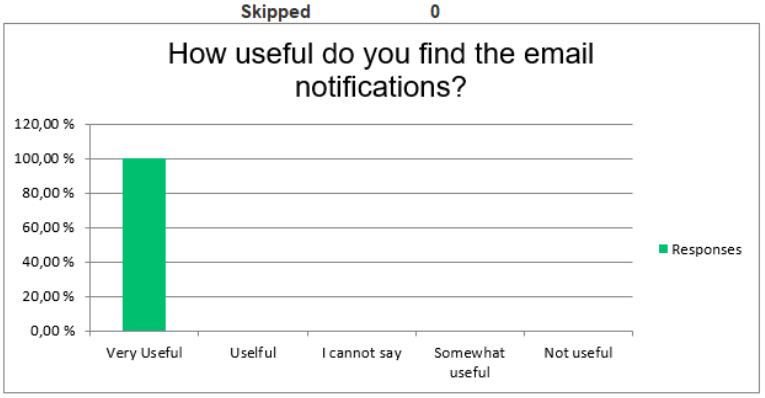
Answered	**12**
Skipped	**0**

Question 13.

GR exception questionnaire (Warehouse and logistics)

How useful do you find the email notifications?

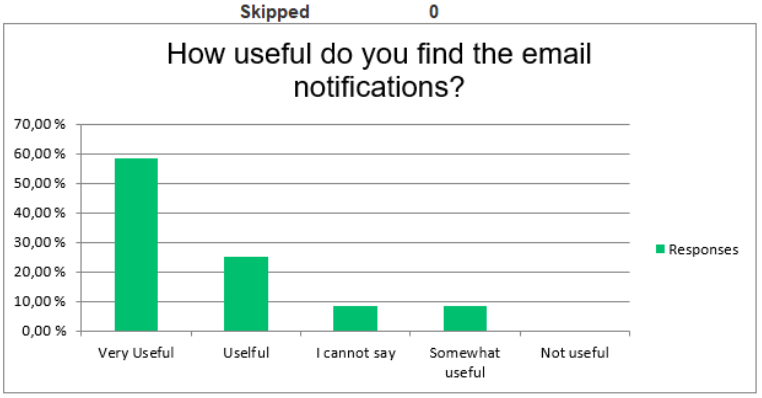
Answer Choices	Responses	
Very Useful	100,00 %	5
Uselful	0,00 %	0
I cannot say	0,00 %	0
Somewhat useful	0,00 %	0
Not useful	0,00 %	0
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

How useful do you find the email notifications?

Answer Choices	Responses	
Very Useful	58,33 %	7
Uselful	25,00 %	3
I cannot say	8,33 %	1
Somewhat useful	8,33 %	1
Not useful	0,00 %	0
	Answered	**12**
	Skipped	**0**

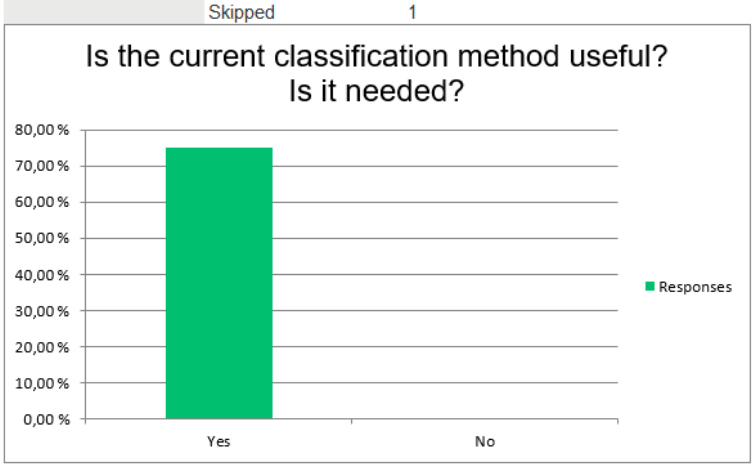


Question 14.

GR exception questionnaire (Warehouse and logistics)

Is the current classification method useful? Is it needed?

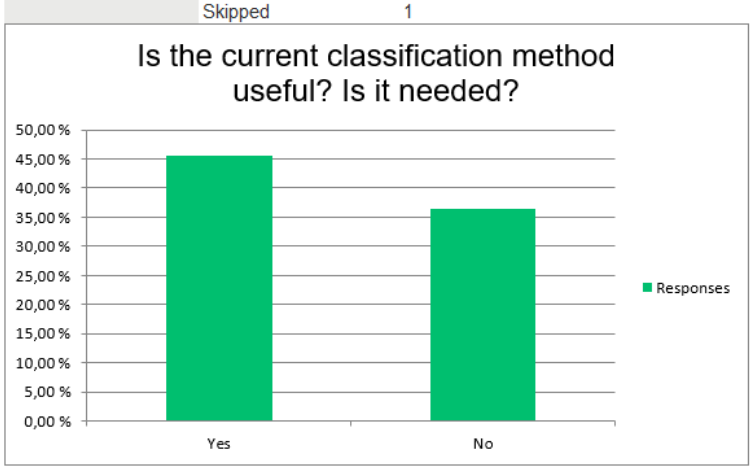
Answer Choices	Responses	
Yes	75,00 %	3
No	0,00 %	0
Other (Comment Use)		1
	Answered	4
	Skipped	1



GR exception questionnaire (Purchasing)

Is the current classification method useful? Is it needed?

Answer Choices	Responses	
Yes	45,45 %	5
No	36,36 %	4
Other (Comment Use)		6
	Answered	11
	Skipped	1



Question 15.

GR exception questionnaire (Warehouse and logistics)

Which stakeholders are you in contact with regarding GR exceptions?

Answer Choices	Responses	
Logistics	60,00 %	3
Purchasing	100,00 %	5
Sales	20,00 %	1
Suppliers	20,00 %	1
Technical support	0,00 %	0
Engineering	0,00 %	0
Warehouse/reception	80,00 %	4
Other (please specify)	20,00 %	1
	Answered	**5**
	Skipped	**0**

GR exception questionnaire (Purchasing)

Which stakeholders are you in contact with regarding GR exceptions?

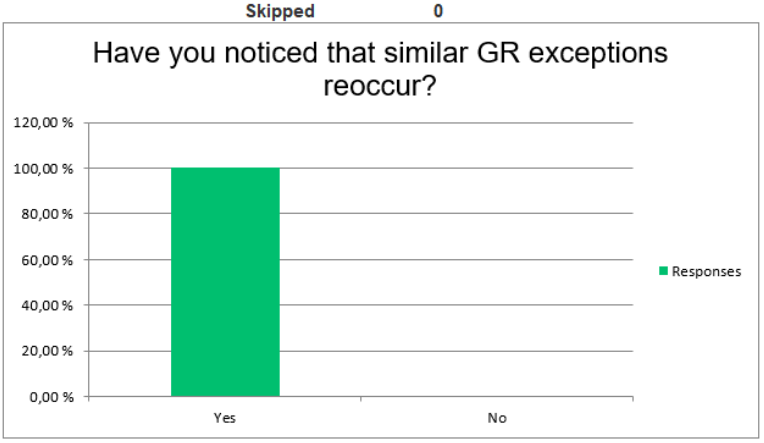
Answer Choices	Responses	
Logistics	91,67 %	11
Purchasing	83,33 %	10
Sales	25,00 %	3
Suppliers	25,00 %	3
Technical support	100,00 %	12
Engineering	25,00 %	3
Warehouse/reception	25,00 %	3
Other (please specify)	8,33 %	1
	Answered	**12**
	Skipped	**0**

Question 16.

GR exception questionnaire (Warehouse and logistics)

Have you noticed that similar GR exceptions reoccur?

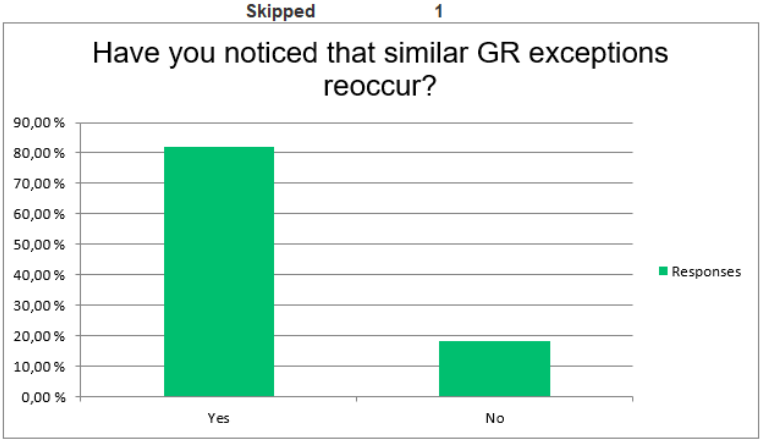
Answer Choices	Responses	
Yes	100,00 %	5
No	0,00 %	0
If you replied Yes, comment what the cause might be		5
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

Have you noticed that similar GR exceptions reoccur?

Answer Choices	Responses	
Yes	81,82 %	9
No	18,18 %	2
If you replied Yes, comment what the cause might be		7
	Answered	**11**
	Skipped	**1**

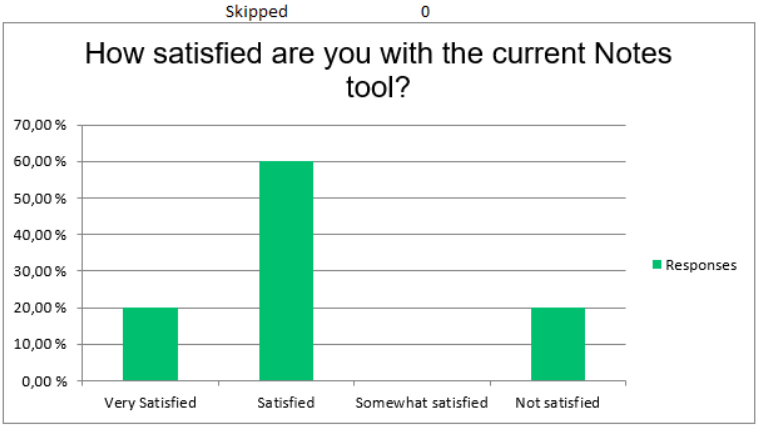


Question 17.

GR exception questionnaire (Warehouse and logistics)

How satisfied are you with the current Notes tool?

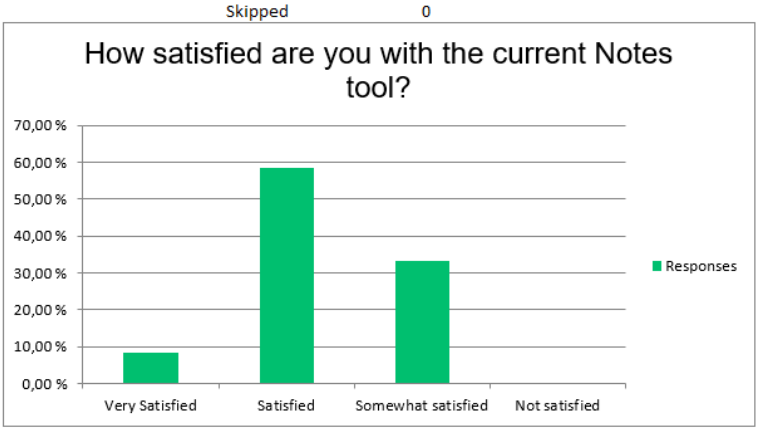
Answer Choices	Responses	
Very Satisfied	20,00 %	1
Satisfied	60,00 %	3
Somewhat satisfied	0,00 %	0
Not satisfied	**0,2**	**1**
	Answered	**5**
	Skipped	0



GR exception questionnaire (Purchasing)

How satisfied are you with the current Notes tool?

Answer Choices	Responses	
Very Satisfied	8,33 %	1
Satisfied	58,33 %	7
Somewhat satisfied	33,33 %	4
Not satisfied	**0**	**0**
	Answered	**12**
	Skipped	0



Question 18.

GR exception questionnaire (Warehouse and logistics)

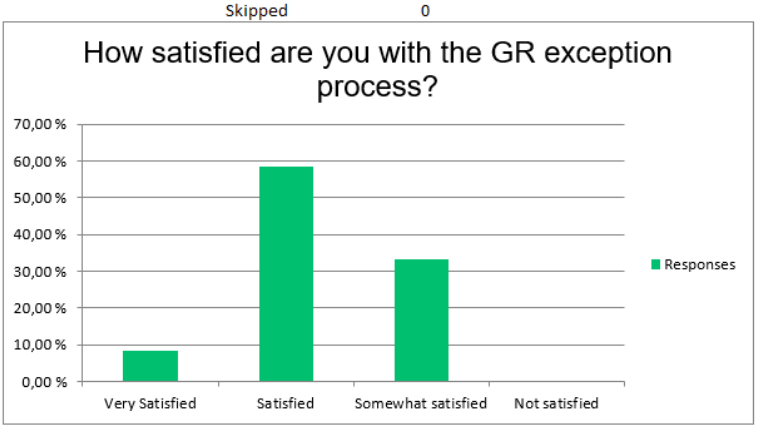
How satisfied are you with the GR exception process?

Answer Choices	Responses	
Very Satisfied	40,00 %	2
Satisfied	40,00 %	2
Somewhat satisfied	0,00 %	0
Not satisfied	**0,2**	**1**
	Answered	**5**
	Skipped	0

GR exception questionnaire (Purchasing)

How satisfied are you with the GR exception process?

Answer Choices	Responses	
Very Satisfied	8,33 %	1
Satisfied	58,33 %	7
Somewhat satisfied	33,33 %	4
Not satisfied	**0**	**0**
	Answered	**12**
	Skipped	0



Question 19.

GR exception questionnaire (Warehouse and logistics)

What is the most problematic aspect in GR exception handling in your opinion?

Answered	**5**
Skipped	**0**

GR exception questionnaire (Purchasing)

What is the most problematic aspect in GR exception handling in your opinion?

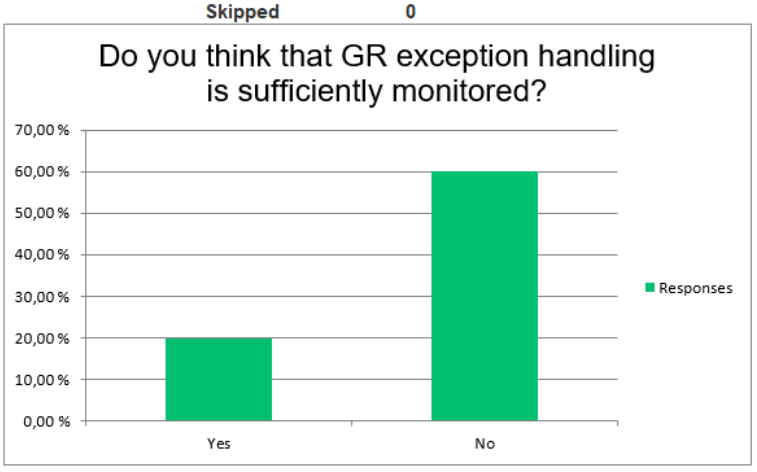
Answered	**10**
Skipped	**2**

Question 20.

GR exception questionnaire (Warehouse and logistics)

Do you think that GR exception handling is sufficiently monitored?

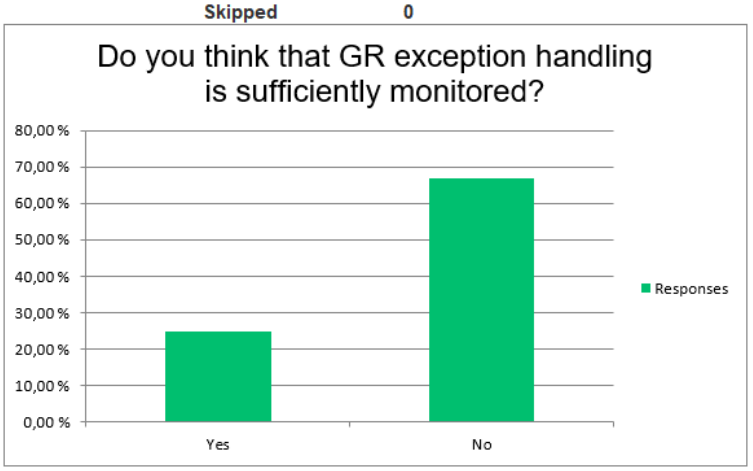
Answer Choices	Responses	
Yes	20,00 %	1
No	60,00 %	3
Other (Free comment)		2
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

Do you think that GR exception handling is sufficiently monitored?

Answer Choices	Responses	
Yes	25,00 %	3
No	66,67 %	8
Other (Free comment)		2
	Answered	**12**
	Skipped	**0**

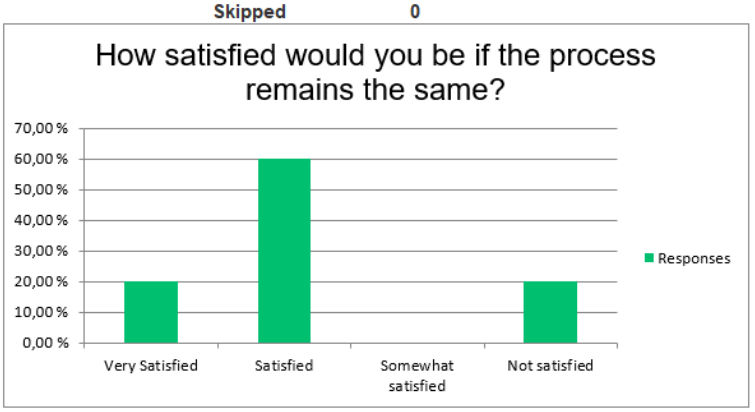


Question 21.

GR exception questionnaire (Warehouse and logistics)

How satisfied would you be if the process remains the same?

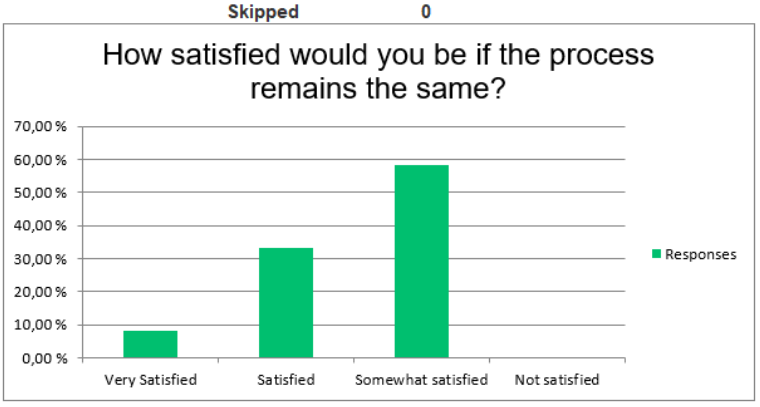
Answer Choices	Responses	
Very Satisfied	20,00 %	1
Satisfied	60,00 %	3
Somewhat satisfied	0,00 %	0
Not satisfied	20,00 %	1
Other (Free Comment)		2
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

How satisfied would you be if the process remains the same?

Answer Choices	Responses	
Very Satisfied	8,33 %	1
Satisfied	33,33 %	4
Somewhat satisfied	58,33 %	7
Not satisfied	0,00 %	0
Other (Free Comment)		2
	Answered	**12**
	Skipped	**0**

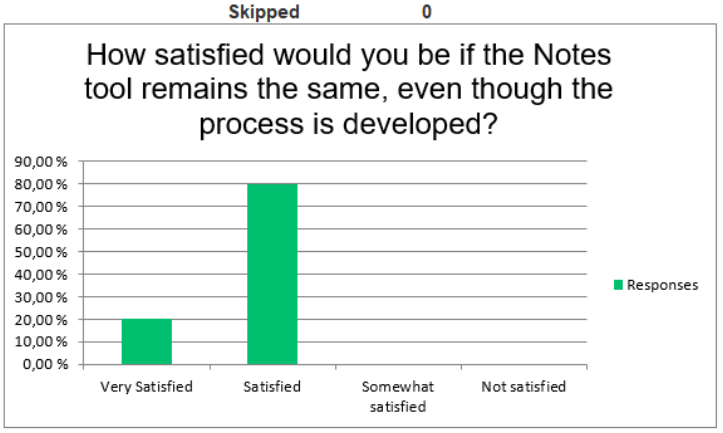


Question 22.

GR exception questionnaire (Warehouse and logistics)

How satisfied would you be if the Notes tool remains the same, even though the process is developed?

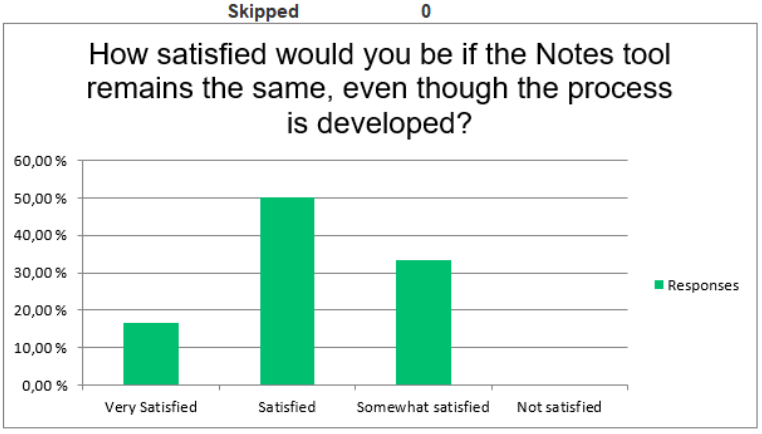
Answer Choices	Responses	
Very Satisfied	20,00 %	1
Satisfied	80,00 %	4
Somewhat satisfied	0,00 %	0
Not satisfied	0,00 %	0
Other (Free Comment)		0
	Answered	**5**
	Skipped	**0**



GR exception questionnaire (Purchasing)

How satisfied would you be if the Notes tool remains the same, even though the process is developed?

Answer Choices	Responses	
Very Satisfied	16,67 %	2
Satisfied	50,00 %	6
Somewhat satisfied	33,33 %	4
Not satisfied	0,00 %	0
Other (Free Comment)		2
	Answered	**12**
	Skipped	**0**



Question 23.

GR exception questionnaire (Warehouse and logistics)

Do you think that some feature in the current tool is unnecessary?

Answered	**4**
Skipped	**1**

GR exception questionnaire (Purchasing)

Do you think that some feature in the current tool is unnecessary?

Answered	**6**
Skipped	**6**

Question 24.

GR exception questionnaire (Warehouse and logistics)

What information or features would you like add to the current tool?

Answered	**4**
Skipped	**1**

GR exception questionnaire (Purchasing)

What information or features would you like add to the current tool?

Answered	**5**
Skipped	**7**

Question 25.

GR exception questionnaire (Warehouse and logistics)

How would you improve the current process?

Answered	**4**
Skipped	**1**

GR exception questionnaire (Purchasing)

How would you improve the current process?

Answered	**5**
Skipped	**7**

Question 26.

GR exception questionnaire (Warehouse and logistics)

Is there an existing Valmet tool that would in your opinion be suitable for GR exceptions handling?

Answered	**4**
Skipped	**1**

GR exception questionnaire (Purchasing)

Is there an existing Valmet tool that would in your opinion be suitable for GR exceptions handling?

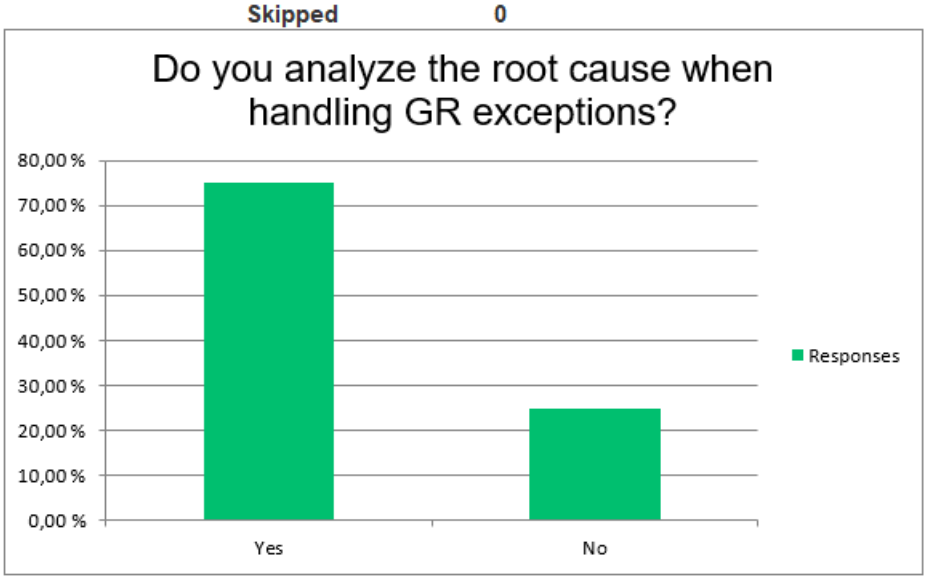
Answered	**5**
Skipped	**7**

Question 27. (Purchasing only)

GR exception questionnaire (Purchasing)

Do you analyze the root cause when handling GR exceptions?

Answer Choices	Responses	
Yes	75,00 %	9
No	25,00 %	3
Other (please specify)		5
	Answered	**12**
	Skipped	**0**

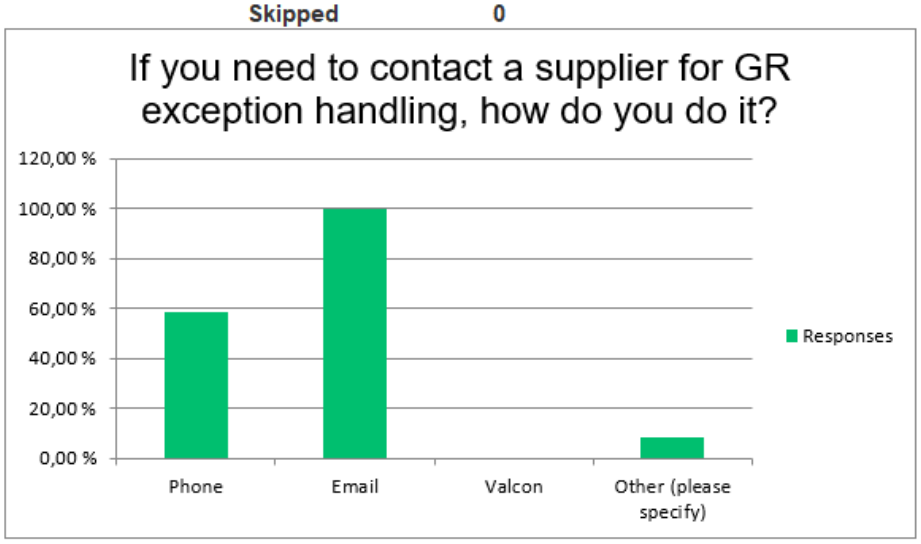


Question 28. (Purchasing only)

GR exception questionnaire (Purchasing)

If you need to contact a supplier for GR exception handling, how do you do it?

Answer Choices	Responses	
Phone	58,33 %	7
Email	100,00 %	12
Valcon	0,00 %	0
Other (please specify)	8,33 %	1
	Answered	**12**
	Skipped	**0**

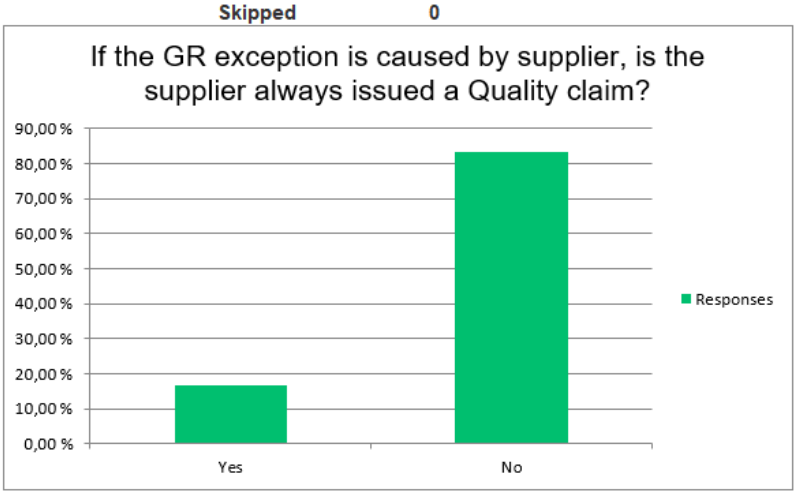


Question 29. (Purchasing only)

GR exception questionnaire (Purchasing)

If the GR exception is caused by supplier, is the supplier always issued a Quality claim?

Answer Choices	Responses	
Yes	16,67 %	2
No	83,33 %	10
Other (please specify)		5
	Answered	**12**
	Skipped	**0**

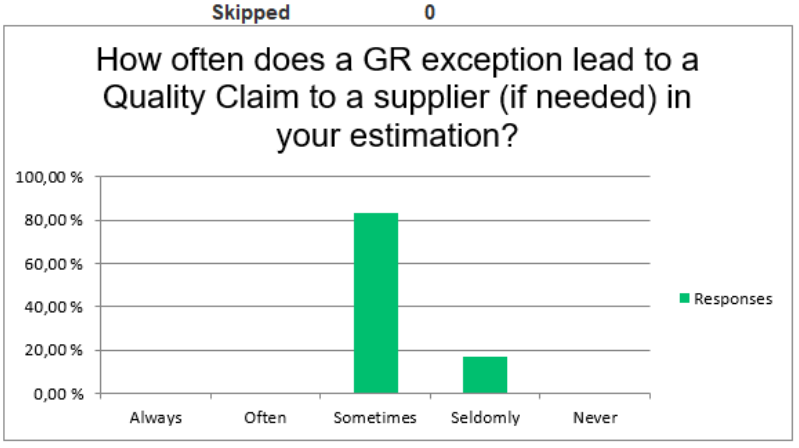


Question 30. (Purchasing only)

GR exception questionnaire (Purchasing)

How often does a GR exception lead to a Quality Claim to a supplier (if needed) in your estimation?

Answer Choices	Responses	
Always	0,00 %	0
Often	0,00 %	0
Sometimes	83,33 %	10
Seldomly	16,67 %	2
Never	0,00 %	0
Other (free comment)		0
	Answered	**12**
	Skipped	**0**



Question 31. (Purchasing only)

GR exception questionnaire (Purchasing)

Are the GR exceptions discussed during regular supplier meetings?

Answer Choices	Responses	
Yes	50,00 %	6
No	50,00 %	6
Other (please specify)		4
	Answered	**12**
	Skipped	**0**