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IMPLEMENTATION OF GLOBAL MAKE TO INVENTORY STRATEGY AT BASF SE

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Table of contents

Table of contents II
List of figures II
List of tables III
Abstract 1

1 Introduction 1
1.1 Initial Situation 1
1.2 Desired situation 1
1.3 Motivations of the research 2
1.3.1 Objective target 2
1.3.2 Specific Objectives 2
1.4 Procedural method of this paper 3

2 Company overview 5
2.1 BASF 5
2.1.1 BASF Strategy 7
2.1.2 BASF Supply chain strategy 8
2.2 Make to Inventory 9

3 Literature review 11
3.1 Strategy 11
3.2 Supply chain 12
3.2.1 Supply chain strategy 12
3.2.2 Building blocks in the supply chain 12
3.3 Chemicals Industry Background 14
3.3.1 Industry Driving Forces 14
3.3.2 Chemicals Supply chain 15

4 Methodology of the study 18
4.1 Reference visits 18
4.2 Sample of the investigation 20
4.3 Validation of the survey 22

5 Analysis Strategy 23

5.1 M2I Strategy objectives 24
5.2 Alignment M2I Strategy 24
5.3 Coverage M2I strategy 26
5.3.1 Make to Inventory scenarios 26
5.3.2 Make to Inventory processes 26
5.3.3 Solution and systems 27
6 Analysis benefits 30
6.1 Non-conformance benefits 31
6.1.1 Considerations 31
6.1.2 Conceptual definitions 32
6.1.3 Methodology used 33
6.1.4 Calculation of benefit cases 33
6.2 Operational benefits 34
6.2.1 Considerations 34
6.2.2 Conceptual definitions 34
6.2.3 Methodology used 35
6.2.4 Calculation of benefit cases 36
7 Analysis Implementation approach 37
7.1 Development of a mapping tool for use in supply chain improvements projects (GSS/TI) 38
7.1.1 Purpose of the model 38
7.1.2 Introduction to model 39
7.1.2.1 Test structure: Areas M2I/ Process governance systems 39
7.1.2.2 Test content: Best practices in supply chain operations 40
7.1.3 Guidelines for test analysis 40
7.1.3.1 Guidelines for test procedure 40
7.1.3.2 Guidelines for test result analysis 41
7.1.3.3 Guidelines for Implementation of strategies 43
7.1.3.4 Second dimension of analysis: Size of the plant 43

7.1.4 Implications for practitioners 49
7.1.5 Implications for further research 49
7.1.6 Conceptual definitions 49
8 Business Case 52
8.1 Test of Maturity Model: Reference visits 52
8.2 Situation As - Is 53
8.3 Areas of Improvement 54
8.4 Towards the model to BE 55
8.4.1 Strategy inside the plants 56
9 Change Management: Implementation phase 58
9.1 Training 58
9.2 Communications 61
9.2.1 Message 61
9.2.2 Stakeholders management 61
9.2.3 Community 62
9.2.4 Channels 63
9.2.5 Global M2I Directory 64
9.2.6 Matrix of communication 64
Conclusions 65
Recommendations 67
Declaration of academic integrity 69
List of literature 70
External documentation 70

List of figures

Figure 1: Composition of this paper 4
Figure 2: BASF Strategy pillars 7
Figure 3: Interview process protocol 20
Figure 4: Sample of investigation 21
Figure 5: Analysis formulation strategy 23
Figure 6: Alignment evaluation: Strategic principles 24
Figure 7: Alignment evaluation: Supply chain 25
Figure 8: M2I Scenarios 26
Figure 9: M2I Processes level AENEIS 27
Figure 10: Benefit cases M2I Global Strategy 30
Figure 11: Implementation of the strategy analysis 37
Figure 12: Structure Model 39
Figure 13: Maturity level results 41
Figure 14: Volume of production 45
Figure 15: Model test plants 53
Figure 16: Clusters of maturity 55
Figure 17: Implementation strategy reference plants 56
Figure 18: House of trainning M2I 59
Figure 19: Trainning process 61
Figure 20: Stakeholder analysis 62
Figure 21: Communication process 64

List of tables

Table 1: BASF results 10 years 6

Table 2: Supply Chain Council. SCOR Process 14

Table 3: Criteria measurement size of plants 48

Table 4: Size of the plants 49

Table 5: Maturity Test. Reference visits 52

Table 6: Improvement areas reference visits 54

Key words[1]

ACCELERATOR: Project focusing on the group-wide process excellence through end-to-end process harmonization and governance across regions, business units and functions. Focus is on Order-to-Cash, Purchase-to-Pay and Planning.

AENEIS: Universal software for business process management.

BEST PRACTICES: Share knowledge/exchange know how (within the Procurement Verbund) on markets, suppliers, products/services, processes, etc...

BUSINESS SCENARIOS: They describe the different categories of production, and define best practices for each scenario.

BUSINESS EXPERTS: Experts on BASF business processes in their respective fields. They are being included in training activities for the >key users.

CAMELOT:[2] Supply Chain Management consultants.

CHANGE MANAGEMENT: refers to the coordination of a planned transition from situation A to situation B, with the goal of sustainable change within an organization.

CAT ERP: System in North and South America and Elastogran.

COBALT: Consolidated BASF Accounting, Logistic and Technic System, ERP System for BSF SE & Verbena sites.

CORE PROCESS: That unique capability that is central to a company's competitive strategy.

COSMOS Customer Oriented Service Management Operation System, SAP ERP system in Asia Pacific.

COUNTRY OF ORIGIN: The country where the goods were manufactured.

CROSS FUNCTIONAL TEAMS: Work teams composed of members from different functions or occupations within BASF (e.g. members from GSS/TI, members from GSS/SE, others).

DATA WAREHOUSE[3]: A repository of data that has been specially prepared to support decision-making applications. Synonym: Decision-Support Data.

END USER: User of SAP. He will be trained by key user.

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[1] Definitions consulted in BASF Glossary definitions.

[2] www.camelot-mc.com/

[3] Consulted in: www.inboundlogistics.com/cms/logistics-glossary

ERP: Enterprise resource planning system - collection of standard SAP-based business programs that allows BASF Group companies to automate and link most of their business processes at a global level in the future.

GATEKEEPER: Are responsible for consistency of all system data. Controls and approves all system changes.

FIT / GAP ANALYSIS: Comparison of BASF standard business processes with those of other business.

GHS: Globally Harmonized System of Classification and Labelling of Chemicals.

GLOBAL STRATEGY[4]: A strategy that focuses on improving worldwide performance through the sales and marketing of common goods and services with minimum product variation by country. Its competitive advantage grows through selecting the best locations for operations in other countries.

GOODS[5]: A term associated with more than one definition: 1) Common term indicating movable property, merchandise, or wares. 2) All materials which are used to satisfy demands. 3) Whole or part of the cargo received from the shipper, including any equipment supplied by the shipper**.**

GRS: Global Supply Chain & Process Innovation – organizational unit, global gatekeeper of all business processes related with supply chain.

GSS/T: Global Supply Chain & Process Innovation is a department BASF that covers the production field and manufacturing process that are present in the supply chain.

IRIS: SAP R3 Order- , Project-, Cost Center and Asset Reporting.

IS INFORMATION SERVICES: The global competence Center Information Services is responsible for all the BASF Group's IT/ IS activities worldwide. The primary focus involves the setting of standards and guidelines to guarantee the effective use of information technology as well as the provisioning of solutions and services for BASF-internal customers.

INVENTORY MANAGEMENT[6]: The process of ensuring the availability ofproducts through inventory administration.

KEY USERS: The Key users play a leading role in the process and system integration. Key Users are expected to have good process, SAP and master data

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[4] Ibid p. IV.

[5] Ibid p. IV

[6] Ibid p. IV

knowledge of respective areas. They are the contact persons for end users and support in case of technical or process relevant issues. They take part at the user acceptance test (> UAT), help improving the training material and ensure that end users at the individual sites are trained.

Key Performance Indicator (KPI)[7]: A measure which is of strategic importance to a company or department. For example, a supply chain flexibility metric is Supplier On-Time Delivery Performance which indicates the percentage of orders that fulfilled on or before the original requested date.

LEADTIME: Time from order to delivery.

MATURITY[8]: The concept of process maturity measures how well established are the end to end processes, the understanding of the supply chains and the actions that plants take to have a good performance. The supply chain maturity model presented in this paper is based upon concepts developed by the supply chain council.

MASTER DATA: Data related to vendors, customers, materials.

OPTIMIZATION: Practice of combining resources in a supply chain with the intent Of helping the supply chain functions in a smoother, timely and cost effective manner.

NEXT: New excellence targets - supported by project Accelerator NEXT will help BASF to act more flexible in today's increasingly challenging market. Focus is on investments, bundling of resources, energy efficiency, new IT technology and process optimization.

ONE PROJECT: One is migrating 230 BASF companies currently on multiple ERP systems to the Cobalt globally harmonized process platform. The global platform in Cobalt delivers significant strategic benefits to BASF in addition to streamlining the considerable technical efforts required to enable the Accelerator and Global Finance Transformation (GFT) harmonized processes.

PILOTS: First production plants where the TO BE concept is tested and where the potential improvement is defined.

PROCESS OPTIMIZATION: Streamlining Processes.

PUSH: Push production is based on forecast demand.

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[7] Ibid P. IV.

[8] YARROW, Paul. Global process expert. M2I. GSS/TI 2012.

QZ SYSTEM: Certificate of Analysis worldwide system used for application of BASF Group for the processing of Certificates of Analysis.

SAMETIME: Web conferencing and chat system.

SCOR: Supply Chain Operations Reference-Modell.

STANDARDIZATION: One of BASF strategies which may be applied in order to achieve better prices/conditions or reduce BASF's internal cost. Harmonize goods, services, packaging, etc...

UAT: User Acceptance Test is a test phase during which the functionality of the ERP-systems is comprehensively tested under real-life conditions. This involves a step-by-step review of the correct system procedures. Together with the key users, test cases were developed that reflect real business processes.

List of abbreviations

AE	American English
AP	Crop Protection
APT	Global Operations Crop Protection
APICS	Advancing Productivity, Innovation, and Competitive Success
BASF	Badische Anilin- & Soda Fabrik
BPM	Business Process modelling
B2R	Book to Report (department at BASF)
BE	British English
BoM	Bill of materials
BPMN	Business Process Modelling Notation
BS-F	Forecast to Finished Goods (department at BASF)
BS-SF	Forecast to Finished Goods (department at BASF)
BU	business unit
CA	Inorganics
CC	Catalysts
CP	Petrochemicals
EC	Coatings (department at BASF)
EC	European Community
ED	Dispersions & Pigments (department at BASF)
Ed.	Editor
EM	BASF Care Chemicals (department at BASF)
EN	BASF Nutrition & Health (department at BASF)
EV	Performance Chemicals (department at BASF)
EU	European Union
IDoc	Intermediate Document
IT	Information Technology
GI	Goods Issue
GmbH	Gesellschaft mit beschränkter Haftung
GR	Goods Receipt
KU	Polyurethanes (department at BASF)
LIMS	Laboratory Information Management System
MES	Manufacturing Execution Systems
MRP	Material Resource Planning

NCM	Non Conformance Management (department at BASF)
OMG	Object Management Group
OTC	Order to Cash (department at BASF)
p.	page, pages
P2P	Purchase to Pay (department at BASF)
PBG	Product BASF Group
PO	process order
QM	Quality Management (department at BASF)
SE	Societas Europaea
TM	Transport Management (department at BASF)
U.S.	United States
Y	year

Abbreviations used in SAP

BASIS	BASF-wide Information System on Substance
BW	SAP Business Information Warehouse
CAT	Common American Template
CoA	Certificate of Analysis
COBALT	Consolidated BASF Accounting, Logistic and Technic System
COSMOS	Customer Oriented Service Management & Operational System
ERP	Enterprise Resource Planning
PBG	Product BASF Group. Systeme Anwendungen Produkte
PRD	Product (Trade Name)
Z2L	SAP production system at BASF
ZHL	SAP test system at BASF

Abstract

Implementation of global Make to inventory strategy at BASF

Optimization and harmonization are key factors to have a good performance in the chemical industry. BASF developed a senior project called Accelerator. The aim of this project was the harmonization and integration of the processes globally.

The core process of production was left out from the project and was to be analysed. The department Make to Inventory (GSS/TI) was established in 2010 to complete the objectives of Accelerator.

GSS/TI has been developing its own strategy. This paper will report the phases of the formulation of the strategy and will establish some guidelines for the implementation phase that is taking place in 2012 and 2013.

1 Introduction

The purpose of this study is to establish a research framework for Make to Inventory (M2I) management and to empirically investigate how a global strategy of Make to Inventory will have an influence at BASF SE from the business environment perspective. In addition, this research also examines whether successful production processes will improve the performance of the supply chain. Since this research serves to close a gap in the literature of supply chain risk management, this research is expected to make a significant contribution to the academic and business world.

1.1 Initial Situation

GSS/TI was created on June 2010 as a department to extend the objectives of the senior project Accelerator in the field of production. Considered this as a key interphase with others processes such as Order to Cash (OTC), Transport Management (TM), and Purchase to Pay (P2P). The main objective was to integrate all manufacturing processes in the whole supply chain.

GSS/TI currently has global experts and is in the process of establishing its community with regional experts and business experts. Furthermore, the department is developing a strategy to establish governance in processes.

1.2 Desired situation

The challenge for Make to Inventory is to drive the process harmonization in more than 70 global and regional operational business units with more than 750 production plants.

This implementation will cover the following strategic building blocks:[9]

- Business Processes

[9] KLINGER, George. SC & IS Report. GSS/TI successfully completes M2I strategy development. May 2012

- M2I Solutions & Systems
- Organisational Development
- Development of a global M2I expert network and community

Major improvements are expected to be realized which will significantly contribute to the overall success of BASF.

1.3 Motivations of the research

1.3.1 Objective target

The objective target is to perform an analysis of the implementation of the global strategy of Make to Inventory at BASF SE.

Besides that, this thesis represents a detailed description of the development of the global strategy from the beginning of the project and the foundation of the department Make to Inventory until the actual phase. Also, further considerations will reflect the impact of GSS/TI at BASF SE.

1.3.2 Specific Objectives

• Develop a source of information of the overall strategy GSS / TI as a framework for a deeper investigation in the future.

• Evaluate the methodology used for the selection of pilots (reference plants) and check the representation of the samples, as the main source of information.

• Consolidate the benefit cases and monitor all the process via KPI measurement.

• Analyse the methodology followed to date by GSS / TI in the first stage of the strategy M2I.

• Develop a concept to measure the maturity of the processes within the production plants of BASF.

1.4 Procedural method of this paper

After this short introduction, this paper will lead the reader through nine further chapters. These chapters describe the different phases of the strategy of Make to Inventory.

The second chapter provides an overview of BASF SE and relevant information of the department of Make to Inventory department.

The third chapter gives the reader a review of relevant literature in strategy, supply chain, supply chain management, some information about the background of the chemical industry and an overview of BASF strategy. The theoretical underpinning of this thesis is represented by the strategy concept.

The forth chapter gives a detailed description of the methodology followed during the study of Make to Inventory includes the criteria of selection of reference visits, the sample of the investigation and the validation of the survey.

The fifth chapter presents the analysis of the formulation of the strategy. It gives an overview of Make to Inventory strategy and explains the process, mission objectives and alignment with the strategy of BASF.

The sixth chapter describes first identification of benefits for M2I when implementing the global Make to Inventory strategy based on combined analysis from many months with global experts.

The seventh chapter provides the different approaches for the implementation of Make to Inventory and describes in detail a model to measure the maturity of the plants based on a multidimensional analysis.

Chapter eight provides a business case where the maturity model is tested and the results are analysed in order to formulate strategies for the implementation phase.

Finally chapter nine presents the plan of communication that has been developed to support the implementation phase and it also gives some key success factors and recommendations.

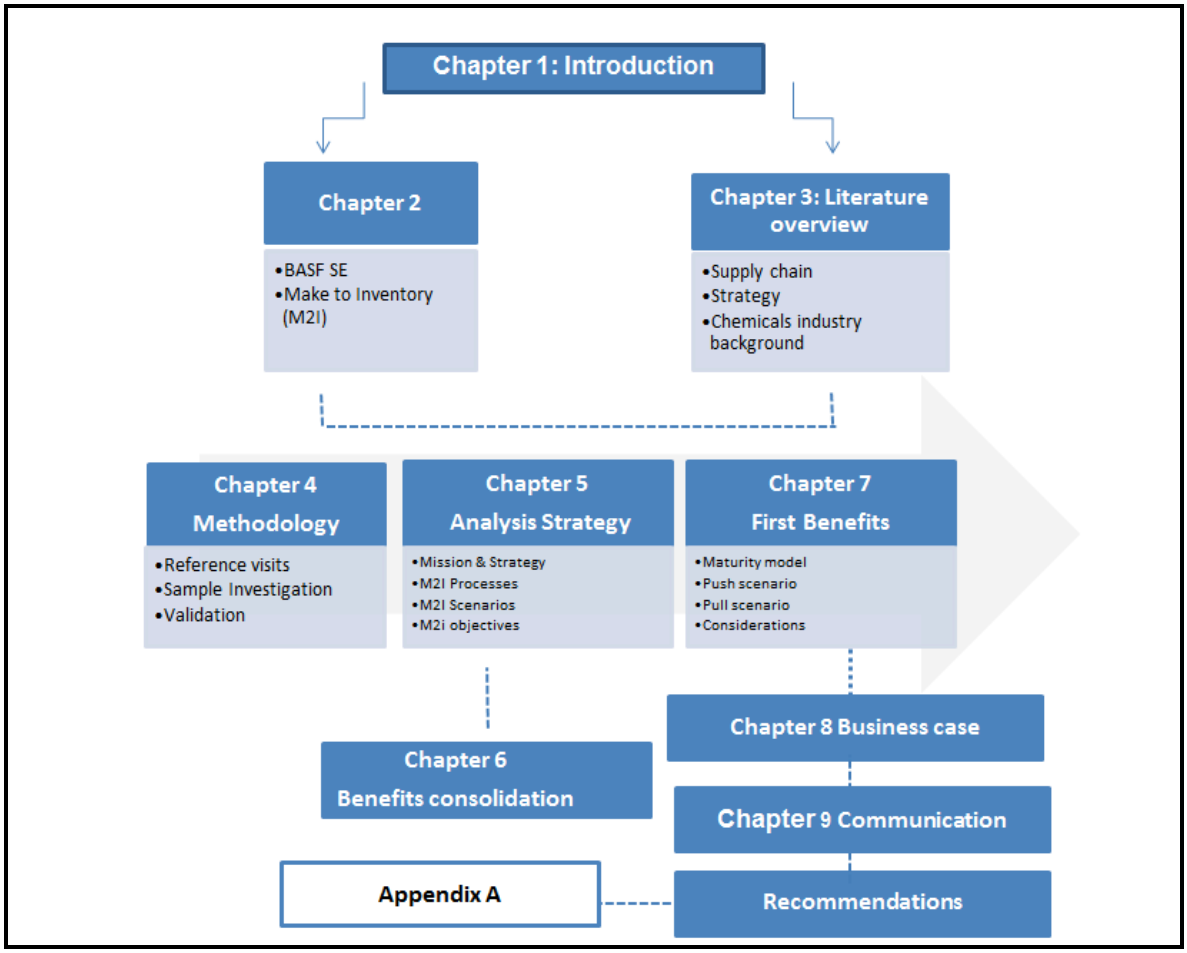


Figure 1: Composition of this paper

2 Company overview

2.1 BASF

BASF is the world's leading chemical company[10]. Its portfolio ranges from chemicals, plastics and performance products to agricultural products, fine chemicals as well as oil and gas.

BASF's six business segments contain 15 divisions which bear the operational responsibility and manage its 70 global and regional business units[11]. The divisions develop strategies for our 76 strategic business units and are organized according to sectors or products.

BASF creates chemistry to help its customers in virtually all industries to be more successful. With its high value products and intelligent solutions, BASF plays an important role in finding answers to global challenges such as climate protection, energy efficiency, nutrition and mobility. Moreover, BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (AN).

In the past 10 years, BASF sales have grown on average by 7.8 percent per year that means that it has grown faster than the chemical market. (4.8% 2011). In 2011, BASF posted sales of €73.5 billion and income before special items of approximately €8.4 billion[12].

[10] BASF SE, Communications & Government Relations report. Ludwigshafen, 2010

[11] BASF SE, Communications & Government Relations (2010), passim

[12] BASF SE, Financial report. Ludwigshafen 2011.

Table 1: BASF results 10 years[13]

Ten-year summary – Statement of income

Million €	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sales and earnings[1]										
Sales	32,216	33,361	37,537	42,745	52,610	57,951	62,304	50,693	63,873	73,497
Sales %		4%	13%	14%	23%	10%	8%	-19%	26%	15%
Income from operations before depreciation and amortization (EBITDA)	5,105	5,110	7,685	8,233	9,723	10,225	9,562	7,388	11,131	11,993
(EBITDA) %		0%	50%	7%	18%	5%	-6%	-23%	51%	8%
Income from operations (EBIT)	2,641	2,658	5,193	5,830	6,750	7,316	6,463	3,677	7,761	8,586
(EBIT)%		1%	95%	12%	16%	8%	-12%	-43%	111%	10.6%
Income before taxes	2,641	2,168	4,347	5,926	6,527	6,935	5,976	3,079	7,373	8,970
Income (%)		-18%	101%	36%	10%	6%	-14%	-48%	139%	22%
Income before minority interests	1,599	976	2,133	3,168	3,466	4,325	3,305	1,655	5,074	6,603
Income before minority interests (%)		-39%	119%	49%	9%	25%	-24%	-50%	207%	30%
Net income	1,504	910	2,004	3,007	3,215	4,065	2,912	1,410	4,557	6,188
Net income (%)		-39%	120%	50%	7%	26%	-28%	-52%	223%	36%

As the table shows, in the last year BASF presented significant growth in all the segments (with the exception of Oil and Gas). And in all the regions, including emerging markets where the company had a growth of 17% and has an ambitious goal of 45% of total sales for 2020.

Nevertheless, BASF was affected on 2011 by the disaster of Japan, and the stop of crude production in Lybia. Although this had an impact in the cost of raw material the company was able to manage this situation by striving to lower costs and further improve the productivity and internal processes.[14]

BASF is committed to operational excellence, and this is shown in the formulation of programs and projects such as NEXT, STEP, Accelerator, Project ONE[15], that have as one common aim the harmonization of all the processes and integration of new companies such as Cyba.

[13] BASF SE, Financial report. Ludwigshafen 2011

[14] *Ibid*. Pag 6

[15] Senior projects BASF: SE

2.1.1 BASF Strategy

BASF´s promise is based in three fundamental questions that provide the company with a strong foundation to move forward:

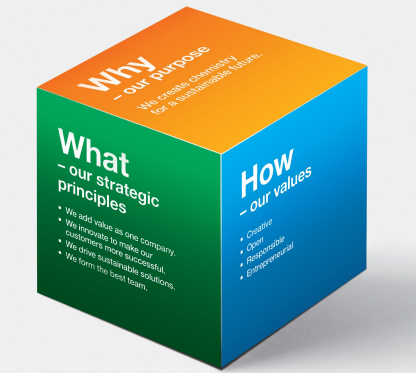


Figure 2: BASF Strategy pillars

1. **WHY?** What is the **purpose of BASF**[16]**?**

BASF creates chemistry for a sustainable future.

BASF combines economic success, social responsibility and environmental protection. Through science and innovation, the company enables its customers to meet the current and future needs of society. In this way BASF contributes to solutions for global challenges.

There are three major areas in which innovations based on the chemistry will play a key role.

- Resources, environment and climate
- Food and nutrition
- Quality of life

16 BASF SE, Communications & Government Relations report. Ludwigshafen, 2010

2. **WHAT?** What are the **strategic principles for BASF[17]?**

To make the contribution and to fulfil its corporate purpose BASF is based on the following four strategic principles:

• Adding value as one company: BASF is unique in the industry. No other chemical company has such a broad technology basis, and customer service. By combining these strengths and acting across divisions, BASF will create value as one company.

• Innovating to make its customers more successful: this principle stresses the fact that BASF will now focus more strongly on market and customers, focusing on developing innovative solutions.

Drive sustainable solutions: BASF will make sustainability the start point for new business opportunities more actively than in the past.

• Form the best team: BASF also wants to live up to this claim in the future.

3. **HOW** it acts? This is defined by **BASF values[18]:**

- Creative
- Open
- Responsible
- Entrepreneurial

These values are crucial for BASF to bring to life its purpose as a company: Create chemistry for a sustainable future.

2.1.2 BASF Supply chain strategy[19]

BASF`s desire is to have a complete value chain, from basic chemicals to consumer oriented products and to achieve profitable processes by operational

[17] *Ibid,* Pag 4.
[18] *Ibid,*. Pag 4.
[19] GSS/SS. BASF Supply chain strategy. Ludwigshafen 2011.

excellence: saving raw materials, energy and costs by closely interlinking production.

BASF wants to connect its technologies and its technological knowledge more closely. This enables diverse competencies from all divisions and units worldwide to come together and to be used in completely new areas of application.

"Having a better understanding of its customers' value chains will allow to optimally bringing the expertise to bear. This also means a need to further develop business models and logistics on the basis of customer Interaction Models."[20]

The objectives of BASF strategy are:

- Understand customer value chains.
- Follow the scale, integration and raw material conditions.
- Establish a community of experts and teams who are close to customers.
- Follow multidisciplinary innovation & technology
- Reliable, low-cost logistics
- Operational and technology excellence
- Reduce complexity
- Differentiated business models and logistics

2.2 Make to Inventory[21]

Make to Inventory is a company-wide core business process. It describes, optimizes and coordinates all process steps from material entry via production to inventory management[22]. Quality management and site logistics are also integrated parts of process as well as Business process governance, Business Systems Governance and Shop Floor systems Governance.

[20] *Ibid*,Pag 9.
[21] Documents may also refer to make-to-stock, so these two terms are used as synonyms within this paper.
[22] cf. M2I Intranet

The aim of Make to Inventory is to provide accurate and standardized processes that will guarantee an improvement of real-time system information, coordination of raw material purchase levels, and real-time stock transparency. Thus, it will provide optimal inventory levels ensuring that BASF adheres to its delivery promises.

In order to define and ensure global operational processes on adequate level, M2I has to define business best practices, and structure the global expert network in order to get collaboration with strategic partners. The first step is to discuss and finalize regional approaches for global benefit analysis and elaborate criteria for pilot selection.

3 Literature review

3.1 Strategy

The word strategy is used implicit in different terms; in this thesis the concept will be used based on Mintzberg´s definition of strategy[23]:

Strategy is a plan: It is an intended course of action, a guideline (or set of guidelines) to deal with a situation. By this definition strategies have two essential characteristics: they are made in advance of the actions to which they apply, and they are developed consciously and purposefully.

Strategy as a ploy: it defines it as a specific manoeuvre intended to outwit an opponent or competitor.

Strategy as a pattern: specifically, a pattern in a stream of actions. This means that a strategy is consistency in behaviour, whether or not intended. Plans are intended strategy, whereas patterns are realized strategy; from this we can distinguish deliberate strategies, where intentions that existed previously were realized, and emergent strategies where patterns developed in the absence of intentions, or despite them.

Strategy as a position: specifically a means of locating an organization in an "environment". By this definition strategy becomes the mediating force, or "match", between organization and environment.

Strategy as a perspective: Strategy it´s not only a chosen position, but also an ingrained way of perceiving the world. In this respect, strategy in this respect is to the organization as personality is to the individual. What is of key importance it is that strategy is a perspective shared by members of an organization, through their intentions and / or by their actions.

[23] MINTZBERG. Henry. 5 P's Strategy.

3.2 Supply chain

For the purpose of this thesis, It is recommendable to refer to Mentzer´s definition of the supply chain (2001, pp. 3-5a[24]) as a group of entities directly involved in the flows of products, services, finances, and information from a source to a customer. Furthermore, as an evaluation and analysis of the development of M2I strategy will be made it's also necessary to clarify these concepts:

3.2.1 Supply chain strategy

The definition of the strategy in the supply chain is a topic that diverse authors have described: Narasimhan[25], Kim, & Tan, defined it as patterns of decisions related to supply chain activities, in accordance with the overall corporate competitive strategy. Rouse includes the supply chain in his definition of enterprises, since it is "a goal-directed organization of resources and activities[26]", adding that "supply chains can be viewed as extended enterprises linking upstream and downstream providers of raw materials, components, products, services and so on" (2009, p. 441). supply chain is also frequently considered as a physical system. A physical system is one "made up of real components occupying space" (Blanchard, 2008, p. 5)[27].

3.2.2 Building blocks in the supply chain

Managers should consider the supply chain as the interface of key business processes across the supply chain through three primary elements:

- The supply chain network structure
- The supply chain processes
- Management components

[24]MENTZER. Supply Chain Management.
[25] MILLER TAN. Hierarchical reactions and Supply Chain Planning 2002
[26] ROUSE WILLIAM. Engineering the Enterprise as a System
[27]BENJAMIN S. Blanchard – System ingeniering management.

It is important to consider the supply chain as an integration of all the process that happen across the chain these include purchasing, manufacturing, stocks, warehousing and distribution, as well as define goals and strategies how to achieve it.

Furthermore, the design of processes will assure rational behaviour of the individual or companies that are part of the supply chain. It is necessary to define control mechanisms to be able to audit the performance of supply chain according to the plan, by coordinating activities and processes in order to build links between supply chain members and making the right decisions. [28] Understand the maturity level of the supply chain will have a result in:

(1) Better control of the results; (2) more accurate forecast of goals, costs and performance; (3) higher effectiveness in reaching defined goals and the management ability to propose new and higher targets for performance.[29]

The use of maturity models based on KPI – Key Performance Indicators – to analyse the activities from logistical supply cycles to manufacturing and distribution are currently used by companies to analyse the performance of their logistical processes.[30] This could be considered as an opportunity for companies to define a strategy and to face trade-offs, as well as to identify items that are considered critical to quality improvement of logistical services rendered to the client.

The supply chain council developed a framework (Supply Chain Operations Reference – SCOR) to measure the supply chain of firms taking into account the definition of end-to-end processes. It is based in five different capabilities areas that describe processes in detail:

[28] KLEMENCIC. EVA. Management of the supply chain. February 2006

[29] (LOCKAMY and MCCORMACK, 2004; Poirier and Quinn, 2004; McCormack et al., 2008

[30] SCPM3. The Supply Chain Process. Management Maturity Model

Table 2: Supply Chain Council. SCOR Process

SCOR Process	Definitions
Plan	Processes that balance aggregate demand and supply to develop a course of action which best meets sourcing, production, and delivery requirements.
Source	Processes that procure goods and services to meet planned or actual demand.
Make	Processes that transform a product to a finished state to meet planned or actual demand.
Deliver	Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management.
Return	Processes associated with returning or receiving returned products for any reason. These processes extend into post-delivery customer support.

Source: Supply Chain Council, SCOR Version 7, 2005, p. 7

As the table above illustrates SCOR measures the best practices in five processes of the supply chain.

3.3 Chemicals Industry Background[31]

The chemicals industry is composed of companies that manufacture and/or distribute chemicals. The products produced by chemical companies are generally used as intermediate products for the final products in their industry produces. The industry is divided in two categories:

Commodity chemicals that include polymers, petrochemicals, as well as basic inorganic chemicals and fertilizers and are generally produced in large quantities at a lower price, Specialty chemicals cover a diverse range of less common chemicals, are produced in smaller quantities at a higher cost, and are often supplied on a contract-by-contract basis.

3.3.1 Industry Driving Forces

(Wit off and Reuben, 1996, p. 19) identifies a number of characteristics of the chemicals industry[32]:

[31] Consulted in: http://globaledge.msu.edu/Industries/Chemicals/Background

[32] WITCOFF and REUBEN. Industrial organic chemicals, 1996

- Maturity and its consequences (the market is nearing saturation, technology is well diffused and barriers to entry are low).
- Participation in international trade (chemicals are truly a global industry).
- Competition from the developing countries.
- Capital intensiveness and significant economies of scale apply (particularly for commodities).
- Criticality and pervasiveness (chemicals are critical to the economy of a developed country).
- Freedom of market entry (providing capital is available turnkey plants can be readily purchased).
- Strong regulation (particularly for environmental protection and individual safety).
- High research and development expenses (the industry relies on engineers and technologists).
- Dislocations (i.e. the industry is vulnerable to random events).
- A key feature of the industry is the high proportion that materials comprise of the production costs (CEFIC, 2000)

3.3.2 Chemicals Supply chain

Narasimhan and Das (1999) [33]point out that a company's agility may be improved by properly managing its supply chain, which, according to Bal, Wilding and Gundry (1999), can become a virtual corporation. (Naylor et al., 1999)[34], it is only recently that the chemicals industry has begun to think in terms of managing holistically the activities making up the supply chain Mullin, 2000).[35]

Automatic data collection and information generation becomes a critical part of sophisticated supply chain management. Electronically collected data serves to

[33] NARASIMHAN. An empirical investigation of supply chain strategy typologies and relationships to performance 1999

[34] NAYLOR ET AL, *Developing Lean and Agile Supply Chains in the UK Housebuilding.*1999

[35] MULLIN, Enhancing Value Stream Agility: The UK Speciality Chemical Industry. 2000

ensure the complete tractability of every action and step associated with a specific batch (Harrold, 2000)[36], something that is crucial in connected industries such as pharmaceutical.

Collaboration often means sharing information among the supply chain members to remove any potential barriers to effective co-operation or to prevent distortion of the actual picture of the material and information flows (Lee et al., 2000, Cachon and Fisher, 2000)[37].

Collaboration is also a requirement of early involvement of suppliers and customers in product and process designing. Similar to what is taking place in many other industries, close partnership with suppliers and with customers will be crucial to shortening product development cycles and securing the market share. Responding to changing customer– supplier relationships stimulated by business consolidation will require that supply chain management becomes an increasingly important issue.

Shortening supply lead times contributes and improves the responsiveness to order volume changes. As the supply lead time to the ultimate customers is the total cycle time of every supply unit along the supply chain, a prime imperative is to reduce the total cycle time throughout the whole supply chain (Mason- Jones and Towill, 1999)[38].

In contrast to traditional lean production, another fundamental approach to attaining agility in supply chains is to shift some of the company's fixed cost base towards variable costs (Katayama and Bennett, 1999).[39]

Coordinating agility along a typical chemicals industry supply chain would certainly be complex and present many challenges for managers. Flexibility and agility would be achieved in different ways at different points along the value stream.

Lean production and cost reduction through efficient operations and even recycling may well be necessary but not sufficient. To cater for a variety of orders with smaller quantities, faster changeover will be essential. (Mileham et al.1999). [40]

[36] HARROLD, Logistics Support Vessel, 2000

[37] CACHON and FISHER, Supply chain inventory management and the value of shared information, 2000

[38] MASON- jones and TOWILL, Total cycle time compression and the agile supply chain, 1999

[39] KATAYAMA and BENNETT, On Requisites for Lean Management Transfer and Organizational Enabler, 1999

The ability to eliminate cross-contamination during changeover will determine the efficient use of facilities and the reliability and consistency of product quality. Of course, on-time delivery and good customer service will continue to be the basic requirements.

In conclusion, we can aim that to achieve a competitive advantage companies have to increase the maturity of its supply chains by having a more integrated and collaborative processes, this will not only result in a lower cost but also it will improve the costumer level of satisfaction. The Optimisation of the complete value chain will have an impact on the demand of the market, the key processes and long relationship with all the stakeholders.

[40] MILEHAM et al. Operational Responsiveness in BTO Supply Chains, 1999

4 Methodology of the study

The goal of the study is to obtain data from real life situations in order to prove in practice the scenarios and processes built by M2I, share knowledge, needs, and improvement potentials within the areas of scope.
There are reference visits conducted in different plants engaging the different types of supply chain and segments of the chemical industry.
The data collection process is conducted in a semi-structured questionnaire format through digital recording and note taking. The research design utilized flexible and mixed methods where the qualitative data is extracted from interviews conducted by business-oriented experts. The idea is to develop a grounded theory in support of the strategy developed internally.

4.1 Reference visits[41]

In order to identify the situation As- Is and the improvement potentials, GSS/TI together with Camelot: group of consultants hold reference visits in different plants.

Preparation for the plant visit

A date and time is scheduled with the primary executive contact to gather the participant study group and present the research study material to them. (Kick off meeting) The presentation enables the participants to better understand the research process of M2I, the expert's expectations, and the time or length required for the visit depending on the plant complexity.

After the kick off meeting and once the hand-out document of M2I is sent to the contact person, the dates and times for each plant is checked, normally by the lotus notes system, and the reference visit is scheduled with an agenda that is distributed to the plant.

[41] Based on pilots reference visits Nov 2011.

Before any interviews occur, the group of experts of M2I and Camelot have to ensure the requirements and work-place conditions are the most convenient to do the interviews. The notes and significant documentation of the plant are transcribed into Word and power point documents and distributed in the share point portal, so that each participant can prepare the meeting.

During the visit to the plant visit

The day of the interview, the representatives of M2I and Camelot, have to arrive at the plant in anticipation, and all the rooms and meeting place should be booked in advance for a proper interview environment i.e. conference room. Once the researcher and participant are together, a presentation should be made and an introduction of M2I department (3 hours)

Afterwards, the experts start to follow the questionnaire. Since these questions are open-ended, discussions could be hold, and should be noted for future analysis. Even though the estimative time to complete the questionnaire is one hour, some variants between the plants must be considered, and allow more time depending on the processes complexity and the environment of the visit.

Hence, the visits take a semi structured approach in the collection of data. The group of experts have to be open to the methodology wishes of each plants, it is expected that in some visits presentations from the plants are shared with the team. In any approach the team has to take notes of any comment or observation that could be relevant for future data analysis.

Each interview is stored electronically in a separate file designated with the business unit's name. At the end of the session the experts will prepare a presentation for the plants with the preliminary results, the first improvement potentials and the further steps.

Follow-up reference visit

Once the reference visit, is finished an internal meeting is proposed, to identify further task within the group of experts, and to prepare the next meeting with the plant to present official results and further steps.

The group of consultants from Camelot and M2I gather together and analyse the situation as it is in the plants, and estimates the potential improvement areas.

In the figure below, the methodology used is described in detail:

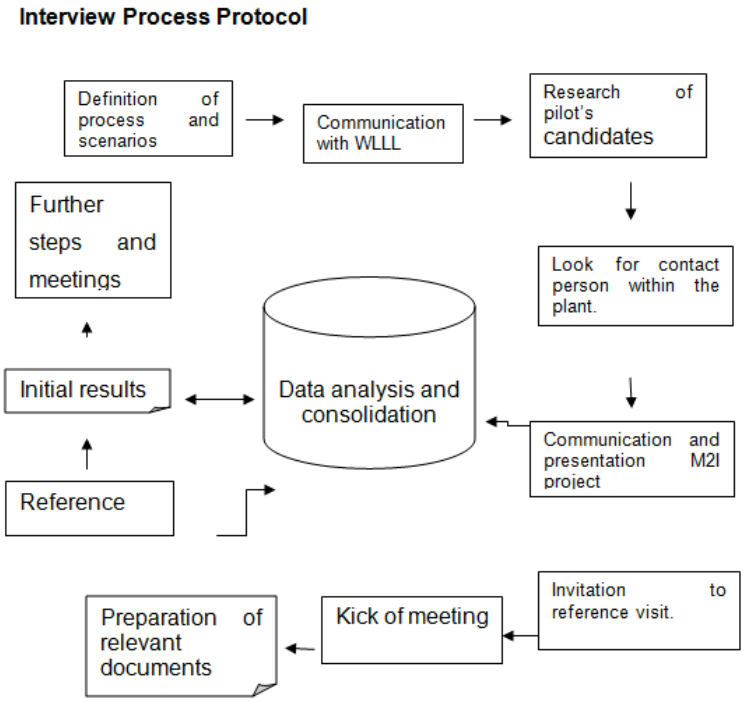
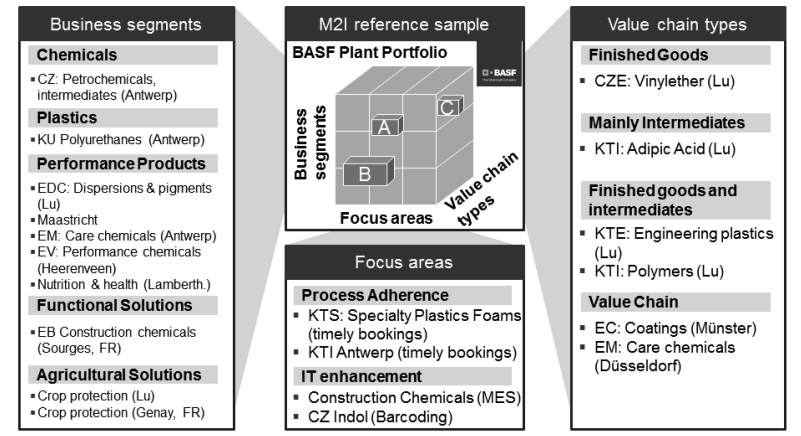


Figure 3: Interview process protocol[42]

4.2 Sample of the investigation

In order to see the validity and reliability of the sample taken for the study is important to analyse if the sample covers the business segment, the type of value chain and the sites that are in the scope of M2I.

[42] Based on: QUINN PATTON, Michael. Methodology of evaluation used: qualitative evaluation checklist. 2003



Value Chain Types	
Description	# of plants
Complete Value Chain	12 plants in 3 value chains
Only intermediates	1
Only finished goods	4
Intermediates & finished goods	4

Business Segment	
Description	# of plants
Chemicals	6
Plastics	7
Performance Products	5
Functional Solutions	2
Agricultural Solutions	1

Sites / Regions	
Description	# of plants
Ludwigshafen	9
Antwerp	4
Other EU sites	8
North America	(in progress)

Figure 4: Sample of investigation[43]

Figure 4 illustrates five modules that were taken into account in the selection of pilots for the first phase in the formulation of the strategy:

- Value chain type: As the table shows. The sample chosen covers the 4 types of supply chain with M2I.
- Business Segments: At present, the sample covers most of the business segments within BASF, nevertheless the segment Oil and gas has not been taken into account.
- Sites Regions: Until now the pilots candidates are from Europe but a visit to North America is going to take place. It is suggested to take also some plant from other regions such as Asia and South America, Nevertheless and due to the lack of M2I community in these regions the approach seems difficult.

[43] NEU, Jens. Strategy Make to Inventory volume 7. Share point 2012.

- Sizes: Until now the study has focused on the verbunds sites such as Antwerp and Ludwigshafen, and plants of medium size it is suggested to take also plants of small size.

4.3 Validation of the survey

Validity is an important factor in the formulation of a strategy, the evaluation method in this paper is necessary to accept the validity of the methodology and survey conducted in the strategy of M2I. This evaluation will be based on the following criteria[44]:

- Role of Observer: A high degree of participation by the observer is perceived, as the questionnaire is shared with the plants in advance before the reference visits take place.
- Insider versus outsider perspective: The questionnaire was designed by the team of experts of M2I, even though it was made by analysing all the production processes it did not take into account views of outsiders, this is why is suggested to welcome a feedback of the questionnaire from the observer in each reference visit.
- Who conducts the Inquiry: This questionnaire was designed to incentive open discussions during the workshops. Each question shall open new debates and involve the participation of the observer.
- Duration of questionnaire: Even though the questionnaire was made to last one hour, it has been observed that it could last until 5 hours; it is suggested to keep it shorter.
- Focus of observations: The questionnaire has a broad focus as it includes production, warehouse management, quality and master data. (Scope of M2I)

[44] Based on: Evaluation methods. Innovation Center for Community and Youth Development. 2005

- Use of concepts: The questionnaire uses technical vocabulary that could result in a problem for the observer to understand the questions. (E.g. abbreviations, name of transactions, special terminology used within M2I.)

5 Analysis Strategy

The first steep to formulate a supply chain strategy is to differentiate the desirable from the undesirable situation. Roberto Perez Franco[45] suggests a set of criteria to identify if the strategy is aligned with management objectives:

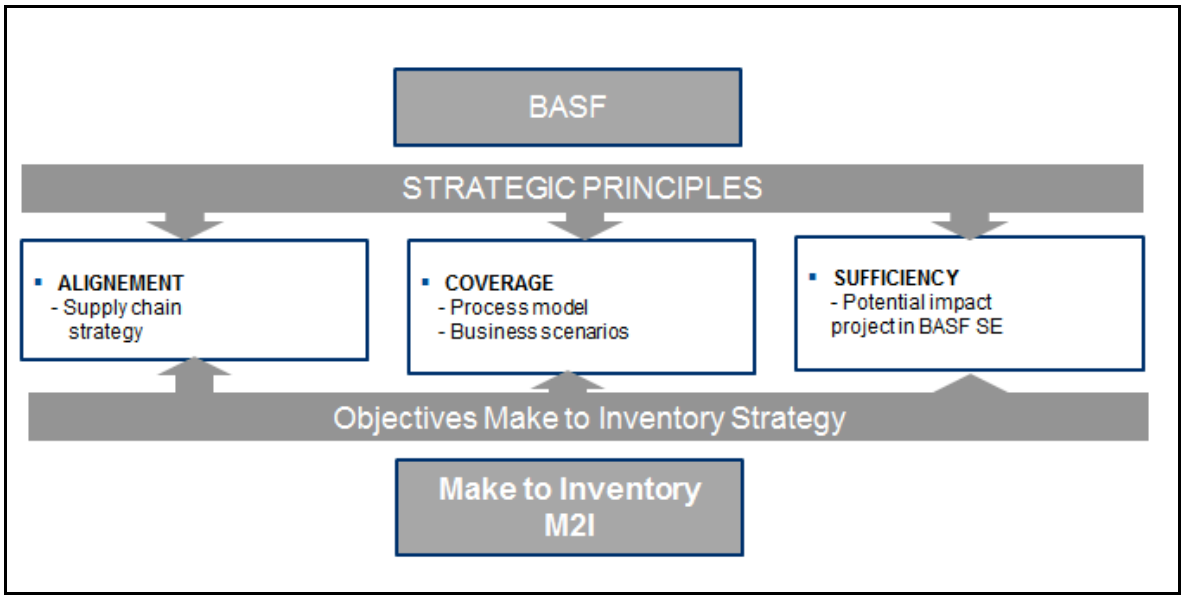


Figure 5: Analysis formulation strategy

- Alignment: If there is an internal consistency among the components of a supply chain strategy.
- Coverage: Weather each supply chain strategy is explicitly directed to the area of interest that matter to the organization.
- Sufficiency: If the supply chain strategy, once executed, fulfil the strategic imperative of the organization.

[45] FRANCO, Roberto. A methodology to capture, evaluate and reformulate a firm's supply chain strategy as a conceptual system. 2010

In this chapter I will use this set of criteria to identify if the M2I global strategy is aligned with BASF philosophy.

5.1 M2I Strategy objectives

The strategy of M2I aims to develop and define global process landscape which applies to all regions, and integrate them in enterprise (ERP) and production (MES) systems through alignment of GRS/TI, GTF, and GS/E.[46]

The project also aims to establish a network of global, regional and business process experts identified as M2I community. Partner with IT Gatekeepers to provide a Change Request "solution team" by combining business process and IT knowledge.

Finally the project proposes Interfaces to other global core processes such as Purchase to Pay (P2P), Order to Cash (OTC), Transport Management (TM), and Non Conformance Management (NCM) as it assumes benefits through cross-functional synergies.

5.2 Alignment M2I Strategy

It is important to see whether M2I global strategy is aligned with BASF philosophy.

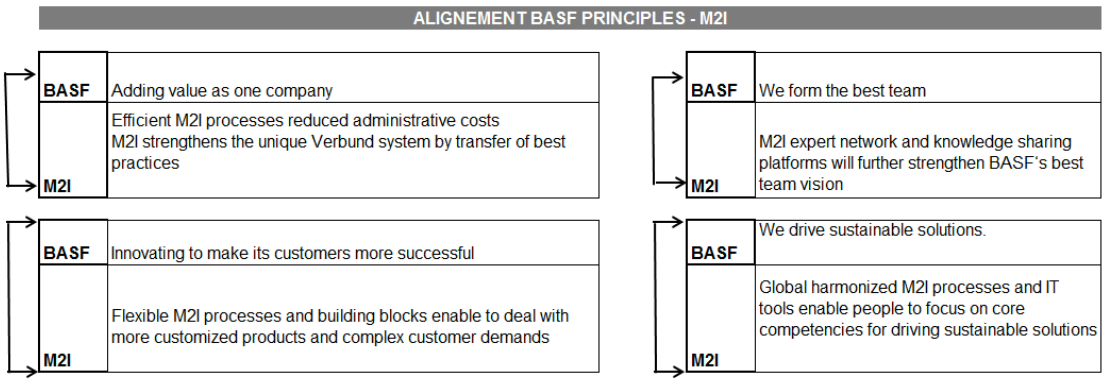


Figure 6: Alignment evaluation: Strategic principles[47]

[46] NEU, Jens. Op cit. P21.

As the figure shows it exists a high degree of connection between BASF principles, stated in the four pillars of the strategy and the objectives of M2I, it is also useful to compare the strategy in terms of the supply chain:

The aim of Make to Inventory is to integrate the manufacturing process in the supply chain to reflect the reality in the processes and establish guidelines in the areas of production, quality management and warehouse / storage management.

BASF	Operational and technology excellence. Reliable, low-cost logistics	Differentiated business models and logistics	Establish a community of experts and teams who are close to customers.	Follow the scale, integration and raw material conditions.
STRATEGY SUPPLY CHAIN				
M2I	Process optimization and harmonization becomes a major challenge, considering that more than 70 global and regional operational business units with more than 750 production plants are performing M2I operations.	To reflect the high diversity of production within BASF, flexible To-Be process modules were defined	M2I has to define business best practices, and structure the global expert network in order to get collaboration with strategic partners.	The aim of make to inventory is to provide accurate and standardized processes that will guarantee an improvement of real-time system information, coordination of raw material purchase levels, and real-time stock transparency.

Figure 7: Alignment evaluation: Supply chain[48]

The objectives of Make to Inventory in terms of supply chain are:

- Coordination of M2I processes between different stages of value chains
- Optimized administration of processes along value chains
- System support to create transparency within the value chain and reduce administrative efforts
- Integrated system support to enable effective execution of M2I related process

[47] BASF M2I Strategy. Project Results and Path Forward.2012

[48] Ibid P.25

5.3 Coverage M2I strategy

5.3.1 Make to Inventory scenarios

The scenarios structure the whole possible combinations of process steps into a defined list of standard BASF-variants.[49]

All these physical steps are accompanied by transactions and documents generated by SAP which can assist the process. A brief graphical overview is given below:

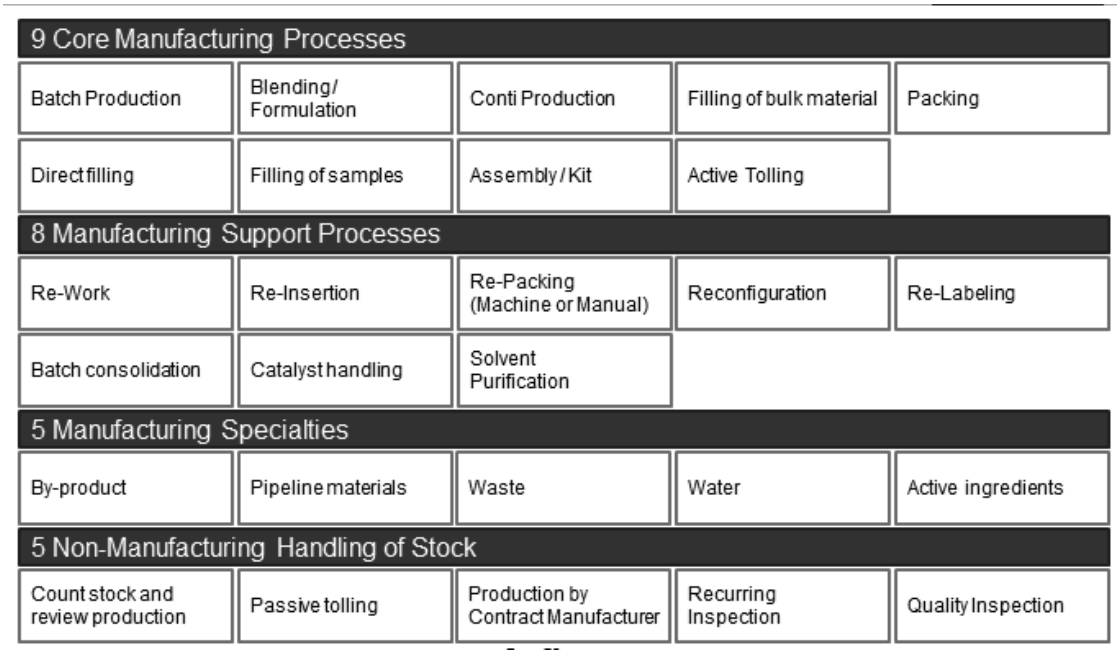


Figure 8: M2I Scenarios[50]

5.3.2 Make to Inventory processes

Make to Inventory (M2I) processes describe, optimize and coordinate all steps from material entry to production to inventory management. All processes are defined to use SAP ERP module PP-PI. Thus, repetitive manufacturing is not supported by the global M2I process model.[51]

[49] HODEL, Bruno. M2I Business Scenarios- 04.04.2012 (updated), Ludwigshafen, 2012

[50] GSS/TI. Make to Inventory. SharePoint.2011

[51] HODEL, Bruno. M2I Business Scenarios- 04.04.2012 (updated), Ludwigshafen, 2012

The software AENEIS provides a list of End to End processes from level 1 to level 5. The figure below shows the aggrupation of processes.

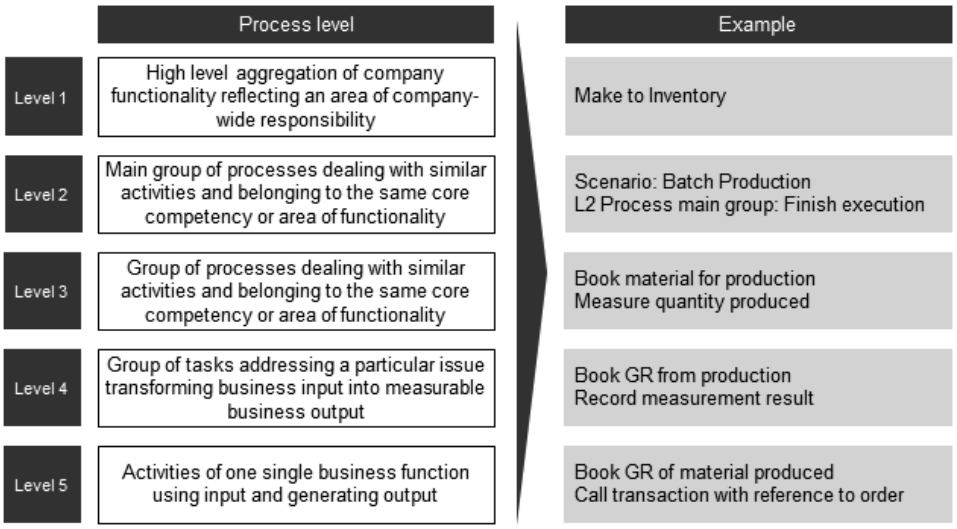


Figure 9: M2I Processes level AENEIS[52]

5.3.3 Solution and systems

Make to Inventory has identified systems that could represent a solution to integrate the supply chain

- Standard SAP[53]

SAP PP:

SAP R/3 has a highly integrated Production Planning System known as SAP PP. This module is divided into two Sub-modules, 'PP-PI' and 'Production General'. This module is in charge of Master data and the Bill of materials; routings work Centres and stores it in one separate component.

SAP SCM:

[52] NEU, Jens. Master presentation GRS/TI "Make to Inventory" - V10.2, Ludwigshafen, 2011

[53] Besides COBALT exist two further SAP ERP system within the BASF group, called CAT and COSMOS, responsible for the regions North America and Asia / Pacific. Since these two systems will be integrated to COBALT due to Project One, this paper does not go into details regarding CAT and COSMOS

Result of the computation of production planning performance data. The production plan created in PP/DS can be evaluated in the Plan Analyser using a table of key figures such as setup times or stock levels. The key figures are evaluated by a point system which results in a total score derived either by adding up the individual points or by using a formula.

- Support tools

Order cockpit:[54]

An administrative tool for prioritizing offers and verifying the logic of offer detection in the real-time decisions.

Access Database:[55]

Access is a database tool for gathering and understanding all the information. It provides a convenient way to enter, navigate and report out the data.

This tool is useful for collection of contact information accurately from large data base.

- Middleware[56]:

It is software that connects applications. The aim is to link the database system to Web servers. This allows users to request data from the database using forms displayed on a Web browser, and it enables the Web server to return dynamic information.

- Quality:

In the area of Quality, Make to inventory aims to integrate the interfaces and develop a strategy in LIMS system.

- Production:

[54] http://help.sap.com/saphelp_spm21
[55] http://office.microsoft.com/en-us/access/
[56] http://www.middleware.org/whatis.html

In the field of production Make to Inventory aims to harmonize the ERP systems and establish global guidelines for processes.

- Warehouse Management:

At the moment there are different warehouse systems that are being used. The strategy in this field is focus on the development of a EWM project for the management of warehouses.

6 Analysis benefits

Methodology:

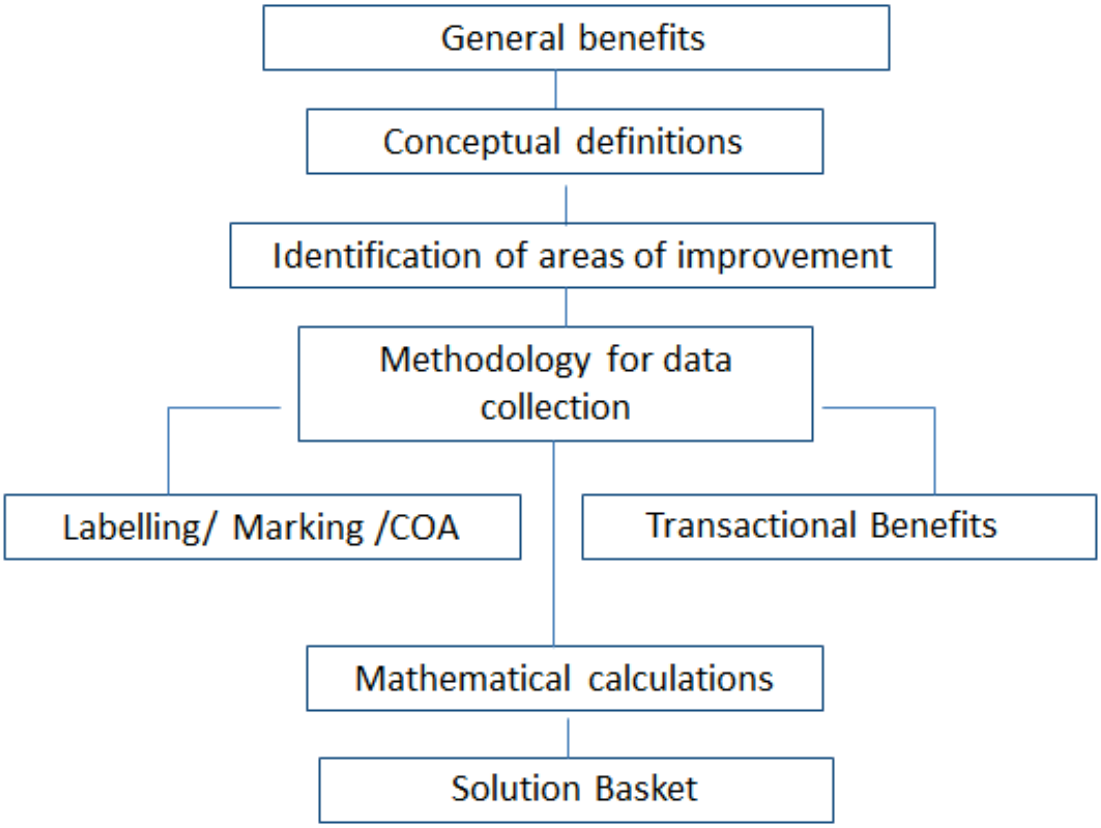


Figure 10: Benefit cases M2I Global Strategy

This chapter describes first identification of benefits for M2I when implementing the Global Make to Inventory strategy. Hence, the information that is provided here is the consolidation of combined analysis from many months of research that helped to identify benefit potentials.

The input and knowledge comes from the experience of processes from the expert Paul Yarrow, who was a key actor in developing these benefit cases. The calculations and final consolidation was part of my contribution to the project.

- Improvement potentials

Process harmonization and unified system support	Automation of batch number handling
Use of transaction tools	Labelling
Mobile devices, barcoding and scanners	Value chain integration
Shop floor integration	Immediate booking and confirmation
QM process integration	Master data
WM / EWM implementation	M2I reporting
Interface planning to production	Process for corrections

This benefit potential is divided in three subgroups:

Quick wins[57]: These types of benefits do not require big implementation effort. What is needed is mostly training and information. The benefits classified in this area are: use of transaction tool, automation of batch number, booking and confirmation.

Process harmonization: These benefits include changes in processes and making solutions available.

Solution enhancement: This type of benefits includes the implementation of system such as SAP PP and the increase of maturity of processes and solutions.

6.1 Non-conformance benefits

6.1.1 Considerations

It is important to consider the Inheritance of data neither as a possible solution nor only for decreasing the number of complains but also to guarantee that the

[57] Klinger. Op cit P.1

manufacturing date contains the batch characteristics such as the country of origin.[58] “

This concept applies to process orders, production orders, and subcontract purchase orders in goods movement scenarios.

At present Make to Inventory is developing a functional design, the objective of this model is the harmonization of data information in labelling, costumer documents and COAs; Inheritance functionality in COA and an authorization concept.

6.1.2 Conceptual definitions

Certificate of Analysis: Document that provides a summary of testing results on samples of products.

The CoA reflects the product specification and is requested by the customer in a customer order. This specification includes for example test parameters, test methods and its test results. Due to customer or legal requirements it can include the manufacturing date, the release date and the best before date. These dates are either printed in the format DD.MM.YYYY or MM.YYYY.[59]

Product label: It provides some general information about a product and its characteristics. All printed labels must follow the CLP (Regulation on Classification, Labelling and Packaging of Substances and Materials) requirements. Therefore they have to display the product name, dangerous material information, symbols, pictograms, coding, weight and address. Depending on customer or legal requirements a manufacturing date may need to be printed on the label as well.[60]

[58] An overview of inherited batch characteristics in different inheritance scenarios can be found in Burkei (2011), passim.
[59] cf. ARNOLD/HOELLE/OTT (2011), p. 2.
[60] *Ibíd.* Pág. 31.

Marking texts: The marking texts are a BASF standardised label that is used for consignment. There exist two different printing versions, the simple marking text and the marking text that displays in addition specific customer information. The marking texts are used for identification by order number at goods issue to the customer.[61,]

6.1.3 Methodology used

To see the number and costs of non-compliance at BASF, it is required to access the data tool business warehouse. This tool provides the main problems of non-compliance as well as the costs and detail reason.

In the case of Make to Inventory, it is important to consider the cost of labelling, marking and COA, because these are the ones affected by production, specifically in the date of manufacturing and in the country of origin.

For this analysis ten operations units were analysed: (AK, AP, APF, CA, CC, CCC, CDA, CP, CZ, EB, EC, ED, EDK, EF, and EM) in a period of time of three months: (September to December 2011).

6.1.4 Calculation of benefit cases

On the period of time given, NCM had a cost of 94,320.42 EUR due to problems in labelling and marking. The total of complaints was 163, from which M2I has effect on 99. (Manufacturing date / Country of Origin) this will represent a cost of € 57,286.64 EUR, and a cost of € 578.65 per complaint. If we project the results for a period of one year we will have a total of 229,146.54.

On the other hand, considering the problems of COA, NCM registered a total cost of €171,750.33 related to wrong documents. From this 178 complains Make to Inventory has effect on 51 COAs where the date is wrong. This gives us a total cost of € 49,209.37 meaning an estimative of € 196,837.46 per year.

[61] CF. ARNOLD (2008), P. 3.

Hence, the maintenance and inheritance of the manufacturing date will result in an annual benefit of € 425,984.00 based on the complaints reported in the business warehouse.

6.2 Operational benefits

6.2.1 Considerations

In order to build End-to-End processes that represent the relevant business scenarios, it is recommendable to use SAP in the daily business in a timely manner. The following benefit has been calculated for the use of SAP for the whole possible combinations of process steps.

All these physical steps are accompanied by transactions and documents generated by SAP which can assist the process.
Further documentation and information about the BASF variant and standard SAP transaction are suggested in order to follow the best practices determined by Make to inventory.

6.2.2 Conceptual definitions

PO release via cockpit: Make to Inventory has defined as a best practice that all the activities related to process orders (e.g. release, confirm) in SAP ERP should be executed using the order cockpit.[62] By doing this process in SAP it is estimated that the plant will save 10 seconds in each transaction.

Batch determination: Make to Inventory has defined that when a batch or stock determination is in use, all components can be assigned to a batch number and the material will be issued to the Process Order on a FIFO basis automatically[63]. By doing this in SAP it is estimated that the plant will save 60 seconds.

Teco Set via Cockpit: Make to Inventory has defined as a best practice that when all process order related bookings including all corrections have been completed,

[62] HODEL, Bruno. Business scenarios.2011
[63] *Ibid.*, p. 53

the process order status should be set to TECO.[64] By doing this in SAP, it is estimated that the plant will save 10 seconds.

Usage Decision: Make to Inventory has defined that when the final inspection has been performed and the usage decision is given, deliveries to customer may only take place. The locally generated usage decision code can be used in the batch classification. By doing this in SAP, it is estimated that the plant will save 10 seconds.

SAP functionality will reduce the time of production, and taking into consideration the classification of the size of plants an analysis of number of inspection lots, process orders and transfers requests was made.

Number of process orders: 527 big sites. 80 medium sites. 60 small sites.

Inspection Lots per week: 538 big sites. 203 medium sites. 80.7 small sites.

TR processed per week: 2108 big sites. 320 medium sites. 240 small sites

6.2.3 Methodology used[65]

Firstly, an estimative time saving in seconds for the implementation of SAP functionality was made and the result was extrapolated to a 50 week year saving.

Secondly, the size and proportion of plants was considered in the model. Big (6%) medium (11%) and small (83 %).

Thirdly some assumptions were taken such as the percentage of implementation and the average global daily cost of an FTE for a 220 day year. This is the figure used in payback calculations for Change Requests.

[64] *Ibid.*, p. 53

[65] YARROW. Paul. Methodology concept.2011

6.2.4 Calculation of benefit cases

For the calculation of benefits two scenarios were considered: First considering the size of the plants and the second one without distinction.

The time saved per item due to the use of SAP system was the following: Po release via cockpit (10s), Auto Batch determination (60s), Teco via cockpit (10s), auto usage decision (10s), Auto transfer requests (10s). This time then was extrapolated in a week and year base.

In the first scenario we took into account the number of process orders, inspection lots and transfer requests proceed in a week by a big, medium or small plants and we compared against the time saved in SAP having as a result a final benefit of 1.068.081 Euros.

In the second scenario distinction was not made. Analysing the data from Business Warehouse we had an average of 20.000 process orders, 15.060 inspection lots and 110.777 transfer requests, applying this figures against the time saved in SAP we had a final benefit of1.022.943 Euros.

7 Analysis Implementation approach

This paper aims to analyse the methodology, formulation and benefits of Make to Inventory strategy.

As part of the investigation, it will be important to define the dimensions that the department has to take into account when implementing the Global Strategy.

In this chapter an analysis will be made following the methodology below:

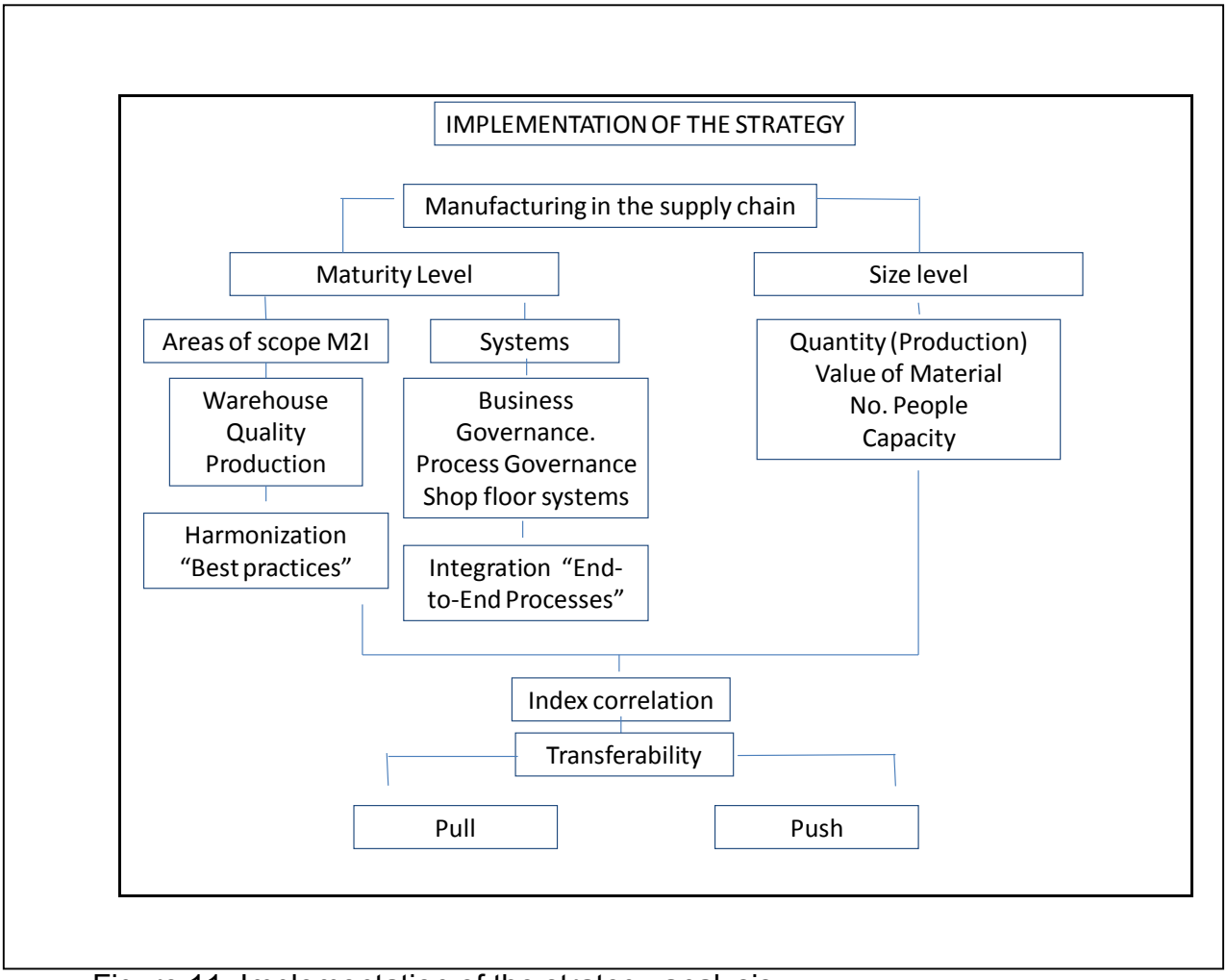


Figure 11: Implementation of the strategy analysis

7.1 Development of a mapping tool for use in supply chain improvements projects (GSS/TI)[66]

"By having an overall performance and adopting a strategic view of the processes a company can increase the overall performance."[67]

This maturity model aims to aid GSS to position the maturity of its plants worldwide relative to (Production, Warehouse and Quality) areas and assumes that plants could present different level in different processes.

Need and requirements of GSS/TI for a quick assessment tool

In order to use best practice and enhance business performance in the supply chain, M2I has to be able to map the current state of plants and point out direction towards best practices in different business scenarios.

Even though it exists different models to measure the maturity level, there only exist a few that take into account other considerations that are important for Make to Inventory such as size and transferability of the processes[68].

This model pretends to follow a multi- dimensional approach and to define new strategies. Furthermore, this tool is expected to be of easy application to be transferable to 230 different manufacturing plants.

7.1.1 Purpose of the model

The aim of this model is to measure the maturity level of plants based on an evaluation of best practices within the scope of Make to Inventory. This will be a key parameter when defining the position of plants (Situation As it is) and

66 The Description Of This Model Is Based O n The Methodology Used On Jens And Röglinger, Maximilian, "What Makes A Useful Maturity Model? A Framework Of General Design Principles For Maturity Models And Its Demonstration In Business Process Management" (2011). *Ecis 2011 Proceedings.* Paper 28.

67 WILLIAMS, Kathy. "What Constitutes a Successful Balanced Scorecard?" Strategic Finance 86, no. 5 (2004).

68 The maturity model explained here, is developed from the use of best practices, further information can be found in: Blanchard, D. (2007) Supply Chain Management Best Practices, John Wiley & Sons, New Jersey

developing strategies to define requirements to achieve certain level of maturity (To be situation).

By understanding how harmonized are processes in the areas of Quality, Warehouse and production, and determining whether plants have End – to – end processes that are reflected in the systems GSS/TI will be available to provide solutions that can result in a better performance of the whole supply chain.

7.1.2 Introduction to model

7.1.2.1 Test structure: Areas M2I/ Process governance systems

(Quality, Warehouse, Production) / (Business systems, Process Systems. Shop Floor Systems)

This model combines the typical maturity models in two-dimensional way, (where one axis describes the practices to be measured for maturity and the other axis outlines the degree or level of maturity for each practice) and the maturity model SCMAT that states five maturity levels.

The following figure represents the structure:

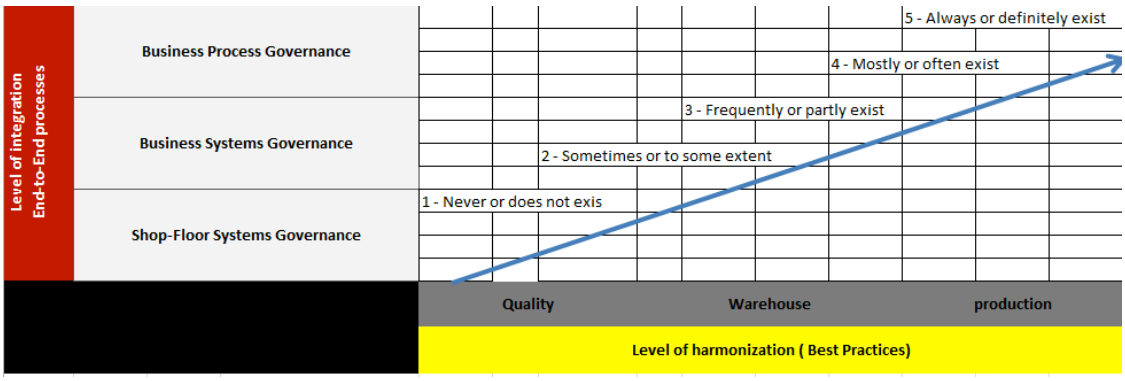


Figure 12: Structure Model

7.1.2.2 Test content: Best practices in supply chain operations

This model is developed in line with other maturity models proposed by the Supply Chain Council such as SCOR and SCMAT. It adopts best practice statements and questions that are found in the survey of Global Make to Inventory strategy, as well as the following documents:

- Business scenario Blueprint
- Overview M2I
- Blueprint_M2I Planning.doc[69]
- Blueprint_Process_M2I_B2R_Cognis_ToBe.doc[70]
- M2I Target Blueprint Technical.doc[71]
- Quality Best Practices
- Workshops with expert members

7.1.3 Guidelines for test analysis

7.1.3.1 Guidelines for test procedure

This model can be carried out by GSS/TI at BASF either alone or with a group of consultants. The test-team gives qualitative experienced-based answers to each stated best practice according to what they believe is the company's current maturity. This could be made by email, in a Telco or during a reference visit.
The main objective is to answer the related best practice in the ranging from 1 = "never or does not exist" to 5 = "always or definitely exist".
After this evaluation is made the team will immediately notice some pain points coloured in red.

[69] HODEL. Op cit. P. 34
[70] Ibid. P. 34
[71] Ibid P.34

7.1.3.2 Guidelines for test result analysis

First of all, GSS/TI should discuss during workshops their understanding of best practices in the area of quality, warehouse and production. It is also essential to agree on a maturity score for every practice that will be evaluated.

The highest maturity level correspond to world best practice in a determined area, a well performed company does need to have best practices in all its capability areas, as other dimensions should be considered in the model such as the size of the company. GSS/TI will have to classify the areas considered as being more important.

The result of the evaluation will be create a graph were experts will be able to identify easily potential improvements (gaps). As the figure below shows:

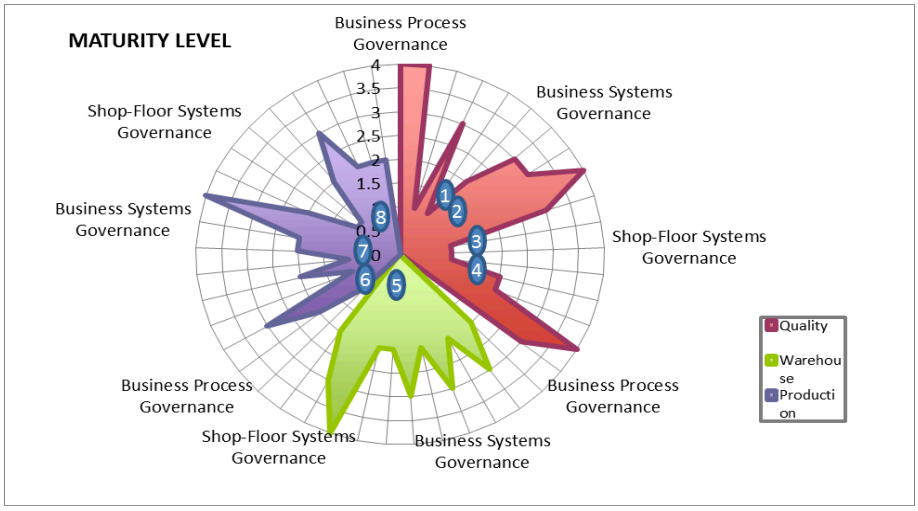


Figure 13: Maturity level results

Once the graphic is shown experts could do an analysis of gaps identified across the supply chain. The level of maturity will be indicated with a detailed description[72]:

1. Ad Hoc: understanding of supply chain management. The practices in the supply chain of the plant are not structured and are ill defined. There is not measurement of the performance of the processes. The roles and tasks are not clear within the employees inside the site. Little or no knowledge of best practices. The lack of information results in non-traceability. Low connectivity in the process produces high waiting time.
2. Defined: Low understanding of Supply chain management. Basic operational processes are defined and documented. Jobs and organizational basically remain traditional. It exist some measurement to indicate the performance of processes. Value based optimization off-line. Different points of information about the processes in the supply chain, constant variation between the physical and system inventory. The systems are used for basic functionalities (MRP).
3. Linked: Good understanding of supply chain management. It exists control procedures in some sections of the supply chain. The level of collaboration is high but there are gaps in some of the processes. The use different systems (LIMS, PANDA, and SAP) can result in an issue for the transferability of the data. Some discrepancies between information and physical location may still exist across sites. The capacity of the warehouse could be used better compared to the production, confirmations are done automatically.
4. Integrated: High understanding of Supply chain management. Value of line processes is well described. The measurement of the processes permits to manage timely the bottlenecks of the production. There is a transferability of knowledge between the supplier, the distributor and the users. Guidelines

72 This model is based on an analysis to assess Supply Chain Performamce in reference to the SCOR methodology and GMAT model. More information can be found at Supply Chain Council (2001) Supply-Chain Operations reference-model – Version 5.0, Supply Chain Council. The definitions presented have been adapted to the case of Make to Inventory processes.

of Make to Inventory processes are available. There is a traceability of all the processes by having the information in the systems. Some discrepancies between the physical time and the Stock time are managed properly thanks to the status management and the code of variants.

5. Extended: Complete understanding of supply chain management. The process documentation describes in detail the activities to complete a process. Appropriate measurement allows consistency and comparability. The collaboration allows having end to end processes with connectivity between the supply chain actors. Total scheduled adherence, the orders are posted with quantity confirmation and planned time consumption. The information in a central point such as SAP/ ERM facilitates the flow of information, usage decisions and total traceability of the processes. Planning, forecasting and replenishment are coordinated across the supply chain.

7.1.3.3 Guidelines for Implementation of strategies

For the implementation phase the model will made two distinctions:

- Maturity levels (1 – 3): Short term improvement potential

In the beginning the global experts should focus in this maturity level in order to guarantee a global level of maturity for the all production plants within BASF. The strategies will be oriented to a process level, in operational levels.

- Maturity levels (4 – 5) Best worldwide plants

For the plants situated in this position, GSS/TI should focus on strategies to increase the size of the circle in all the capabilities areas that were measured. An example of this could be the implementation of interphases between systems.

7.1.3.4 Second dimension of analysis: Size of the plant

When analysing maturity, the size of the plants must also be considered. This might be an important factor when implementing strategies and trying to increase the overall performance of the supply chain.

The aim of this analysis is to provide a classification of 230 manufacturing plants and establish the criteria to measure its size. It is important to consider different dimensions to have a reliable and valid classification, knowing that the use of one parameter would be a simplistic and non-valid consideration.

For the benefit of appropriate policy formulation, the variables chosen for this analysis were the following ones:

- Production personnel:

This factor considers the number of people who work in the shop floor in each plant. In this analysis this parameter is important because it gives an idea of the operational size of the plant. In most of the cases the amount of direct labour is correlated with the amount of finished goods produced. In this case after doing a correlation analysis the relation between both variables was 0.74 meaning a positive and proportional relation.

On the other hand, taking into account the economics law of diminishing returns, it is known that after certain point there is a decrease in the marginal output of production as the amount of the labour capital is increased, while holding all others constants. For this reason is important to consider other factors to have a better understanding of the size of plants.

- Volume of sales produced: Total of production produced in a plant.

This factor considers the amount of finished goods produced in a plant. Even though we can easily define size by the level of production, other factors such as type of material produced, level of technology, number of employees in production, complexity of the processes, business scenarios will determine the quantity and size of production, reason why this factor shouldn't be consider alone.
As an example we could compare the production cycles of two materials:

Material	Hel.Gn L 8730
Material type	50025570
Kilograms	350 kg
Volume	3156.171
Plant	BTC IB Tarragona

Material	Basonat HA 300 230KG 1A1
Material Type	50045814
Kilograms	230KG
Volume	1.315,334
Plant:	BASF Korea Ltd. Company Data

Figure 14: Volume of production[73]

Two products from the operating unit of pigments are compared. The cycle of production is longer for the second material, giving as a result a lower level of production in a month.

- Capacity of the warehouse:

The capacity of storage can be a parameter to determine the size of a plant in terms of the stock and valued material that the plant belongs. Nevertheless, several storage locations can be assigned to a plant, or same storage locations can be assigned to different plants under the same warehouse number.

This consideration is important to take because in some cases big plants share the warehouse and don't require having its own one. The type of production and business scenario will also influence the need of storage locations.

- Number of Process orders[74]: Average of process orders produced by plant in one week.

Process orders are SAP documents that indicate the manufacture of a product in a certain date and in a specified quantity. Higher number of process orders will increase the level of production for a plant.

[73] COBALT, Production SAP (Z2L). Production date

[74] *Ibid,* page 26.

Nevertheless is relevant to consider the value of the process order above the quantity. The aggregate of production will be determined by the volume record in the process orders.

- Inspection lots[75]:

An inspection lot occurs when a specific plant requests to inspect a specific quantity of a material.
They are created as a result of goods movements or deliveries to customer. This parameter reflects the level of activity in a production plant, furthermore is the basis for making usage decisions.
Inspection lots include several operations and can be carried out in a work centre, it can contain inspection characteristics and quality information.

The number of inspection lots gives an estimative of the material produced by a plant that is being inspected.

Methodology used for Analysis:

1. Collection of information and data of manufacturing plants using The Business Warehouse and SAP (Z2L) system.
2. Classification of 230 plants in a list taking into account the variables (Production personnel, total personnel, volume of sales, total capacity, No business units)
3. Statistical analysis with values of production, in order to get a parameter that gives a classification of big, medium and small size. In this case the analysis gave an estimative of classification.
4. Filter the table of plants per variable (bigger to smaller values) and apply the percentage found in the statistical study for each variable studied.
5. Collection of information of transactions (Process orders and Inspection lots) of the plants in the Business Warehouse taking into account the SAP code for each plant.

[75] Yarrow, Paul. Op cit P.9

6. Transfer of results and definition of criteria for further research.

Result of the analysis

These results can be used as a parameter to classify the size of production plants for the Global Make to Inventory strategy and for future projects. The dimensions evaluated are related to the information of the plant list.
This classification is hoped to be of value for the calculation of benefits and the implementation phase of the strategy.
On the other hand the classification could be used as a parameter to identify the transferability of benefits.

VOLUMEN	SCALE
BIG SIZE PLANTS	Greater than 290000
MEDIUM SIZE PLANTS	Between 88639 and 290.000
SMALL SIZE PLANTS	Less than 88639

PEOPLE PRODUCTION	SCALE
BIG SIZE PLANTS	More than 340
MEDIUM SIZE PLANTS	Between 125 and 340
SMALL SIZE PLANTS	Less than 125

TOTAL EMPLOYES	SCALE
BIG SIZE PLANTS	More than 665
MEDIUM SIZE PLANTS	Between 665 and 285
SMALL SIZE PLANTS	Less than 285

TOTAL CAPACITY	SCALE
BIG SIZE PLANTS	Greater than 11091625
MEDIUM SIZE PLANTS	Between 11091625 and 301000.00
SMALL SIZE PLANTS	Less than 301000.00

TOTAL INSPECTION LOTS	SCALE
BIG SIZE PLANTS	More than 340
MEDIUM SIZE PLANTS	Between 170 and 340
SMALL SIZE PLANTS	Less than 170

TOTAL PROCESS ORDERS	SCALE
BIG SIZE PLANTS	More than 130
MEDIUM SIZE PLANTS	Between 65 and 130
SMALL SIZE PLANTS	Less than 65

TOTAL MATERIALS	SCALE
BIG SIZE PLANTS	More than 130
MEDIUM SIZE PLANTS	Between 65 and 130
SMALL SIZE PLANTS	Less than 65

Table 3: Criteria measurement size of plants

%Big Sites	6	13
%Medium Sites	11	25
% Small Sites	83	191
Total	**100%**	**229**

Table 4: Size of the plants

7.1.4 Implications for practitioners

This model could represent a simple and quick tool which could be used as an eye-opener for Global Make to Inventory strategy. This model will give a hint of the areas of improvement and can fruitfully be used in other projects to evaluate the maturity across diverse supply chains.

7.1.5 Implications for further research

The model presented here is not finally developed and need further adjustments in the structure and content. The areas could be redefined (systems) and best practices should also be up to date.

Further research on the topic will be welcome and highly recommended.

7.1.6 Conceptual definitions

- Level of Maturity: For the purpose of this analysis, maturity will be considered as the level of understanding/ strategic view (Manufacturing within the supply chain) against the level of activity/ performance: what are the actions taken by the plants to accomplish their understanding when doing manufacturing processes[76]. These actions include:

[76]YARROW, Paul. Maturity definition.2011

- Level of integration: This term refers to the level of connectivity across the supply chain. In Make to Inventory, this concept is represented by End – to – end processes that represent the whole supply chain from P2P to OTC. For the purpose of this analysis the level of integration will be measured by the use of governance systems.
- Level of Harmonization: This term refers to the adjustments of differences among different processes. For the purpose of this analysis best practices are considered in the three areas within the scope of Make to Inventory: Quality, Production, and Warehouse.
- End – to – End processes[77]: This term refers to the beginning and end points of the supply chain. The theory embraces the philosophy that eliminating many steeps in the supply chain will optimize the performance in the processes. In Make to Inventory End-to-end processes represent the relevant business scenarios, e.g. confirmation of process order. These scenarios structure the whole possible combinations of process steps into a defined list of standard BASF-variants.
- Business Governance systems[78]: This term refers to the use of shared data basis that provides integrated support for all the business processes in a company such as BASF. Complete integration and avoidance of isolated solutions results in a decentralized system in which resources can be managed on a company-wide basis.
- Process Governance systems: This term refers to standardized, integrated process solutions within the BASF landscape based on business requirements and scenarios. By having integrated process BASF will be able to improve the performance and reduce interruptions to business processes.
- Shop floor systems:[79] They are used in different levels in decision- making processes as an instrument for monitoring, controlling, planning business operations, and analysing data from the area of production. The shop floor systems contain informative key figures which help to permanently monitor

[77] http://www.investopedia.com/terms/e/end-to-end.asp
[78] BASF Intranet.2011
[79] BASF. Information systems.2011

the key aims in production (short lead times, good on-time delivery performance, good capacity load utilization, low costs) in order to be in a position to take necessary action in good time.

- SAP Standard transactions: Global BASF transactions in the field of logistics and production. SAP (Z2L) includes a wide range of transactions to complete the processes.
- SAP MII: SAP Manufacturing integration and intelligence. This application solves the disconnect between the plant floor and the rest of the enterprise. It ensures that all the data that affects manufacturing is visible in real time. Including information about orders, materials, equipment status, costs, and product quality.[80]
- SAP ERM[81]: SAP Enterprise Risk Management. This application is an integrated framework to proactively manage enterprise risk in context of corporate strategy and business performance.
- LIMS:[82] Labour Information und Management System. Application that support the workflow and data management from the laboratories to the site where production is located.
- PANDA[83]: Production and Distributed Analysis system. Designed for analysis as well as production

[80] SAP Help Portal. Application supply chain management.
[81] http://www.sap.com/news-reader/index.epx?pressid=7707
[82] http://www.lims.de/grundlagen.htm
[83] http://iopscience.iop.org/1742-6596/119/6/062036

8 Business Case

8.1 Test of Maturity Model: Reference visits

The model created was tested in eight reference sites, to measure the level of maturity of the plants, and to see possible clusters of classification.

With the help of experts from Make to Inventory and Camelot consultants, the questionnaire was reformulated based on real information from reference visits during multiple workshops. (See survey appendix A).

Afterwards, the evaluation of each questionnaire was made obtaining the results shown in the table below:

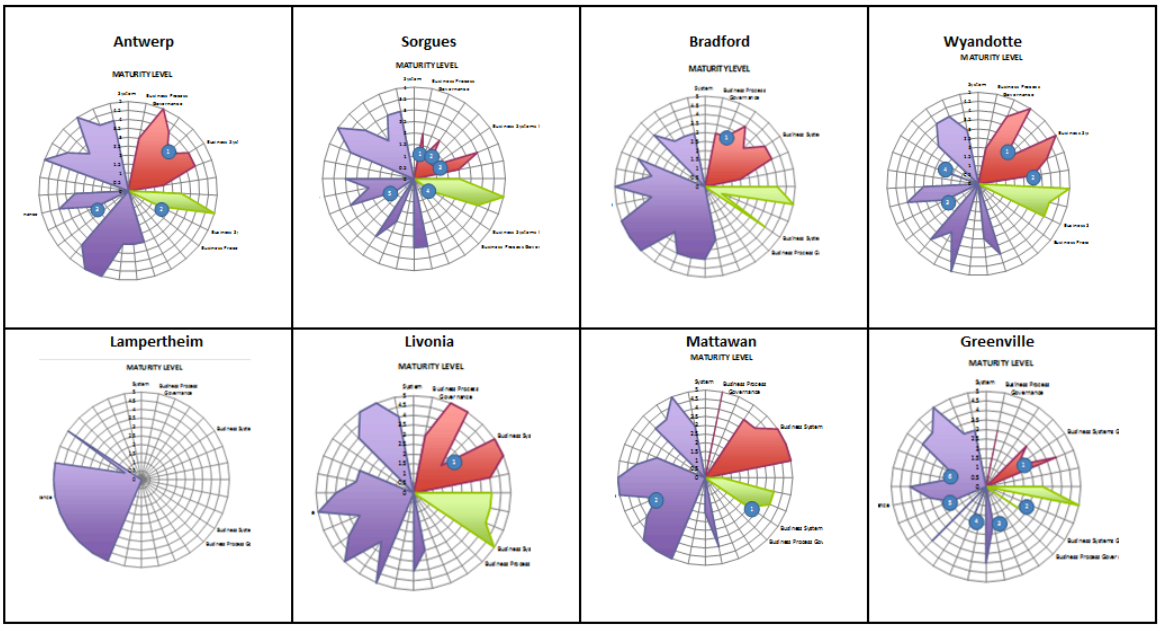


Table 5: Maturity Test. Reference visits[84]

As the table shows for each reference visit three areas were considered: Quality (Red), Warehouse (Green) and Production (Purple). In each of these areas best practices were evaluated and given a ranking from one to five depending on the performance of the plant.

[84] Own analysis made of the surveys filled during the reference visits.

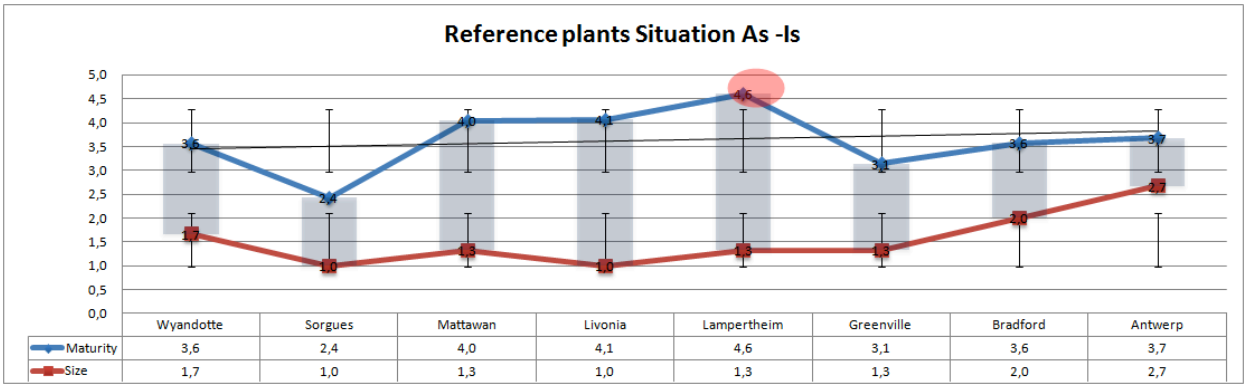
A consolidated result for these three areas is shown for each plant in a graphic where the observer can see the gaps in numbers. This analysis is useful to understand the actual position of the plants and the areas of improvement.

On the other hand, the model also showed the size of the plants, as a hint of how far the level of maturity could be increased depending on the complexity.

This analysis will provide suitable information for the implementation of the global Make to Inventory at BASF SE.

8.2 Situation As - Is

The first results show that the average of maturity for the reference visits is 3,6 what means that most of the plants have a good understanding of supply chain management. Nevertheless, there are gaps in some of the processes and there are different systems in use that could result in issues with data transferability.
Another observation was that during the exploration phase plants of different sizes were considered, this shows again the validity of the formulation of Make to Inventory strategy. The higher size was Antwerp that is considered as a Verbund site and the smallest plants were Livonia and Sorgues. In the table below there is a detail description of Maturity and Size for each plant considered.



	Wyandotte	Sorgues	Mattawan	Livonia	Lampertheim	Greenville	Bradford	Antwerp
Maturity	3,6	2,4	4,0	4,1	4,6	3,1	3,6	3,7
Size	1,7	1,0	1,3	1,0	1,3	1,3	2,0	2,7

Figure 15: Model test plants

As the figure illustrates the plant with highest level of maturity is Lampertheim. Nevertheless the validity of evaluation for this plant was very low, taking into account that the maturity was based just on 13 questions out of 33, reason why it is highly recommendable to verify the survey for this plant.

On the other hand, the plant with lowest level of Maturity is Sorgues, due to the fact that the plant presents several weaknesses in the area of Quality. The plants of Wyandotte (3.6), Greenville (3.1), Antwerp (3.7) and Bradford (3.6) show a level of maturity linked and the plants of Mattawan (4.0), Livonia (4.1) and Lampertheim (4.6) showed a very high level of maturity.

Even though, this first evaluation is relative and based on opinions rather than scientific data it outlines an overall situation of the plants in study. It is also required to allow a tolerance error of 5% to get a better and more reliable measurement of the test.

8.3 Areas of Improvement

In this first analysis, several gaps for different plants were identified using the information of the survey. These improvements were contrasted to results provided by Camelot based on the visits to have a complete analysis of improvements, the information is summarized below:

Name of the plant	Insp. Lots	Batch Number	BMBC	Relevant training	Cockpit	Interface SAP to PCS	Integration QM	WM	Labeling
Greenville	x	x	x		x		X	X	
Sorgues				x	x	x	X	X	X
Bradford				x		x		x	X
Wyandotte	x	x	x	x	x		X		X
Antwerp					x		X	X	X
Livonia	x	x		x	x	x	x	X	
Mattawan		x	x		x		X		
Lampertheim		x						x	X

Table 6: Improvement areas reference visits[85]

In the table above, it can clearly be seen that we can see that there are improvement areas with high level of transferability is the case of the Order Cockpit, the integration of QM and the implementation of WM/ EWM.

Other areas that are also important are the automation of the Batch Number, Labelling among the other benefits.

[85] Results reference visits.

8.4 Towards the model to BE

For the implementation of the M2I strategy, some areas of prioritization have to be identified. In the case of the plants analysed one option will be to cluster the plants based on the level of maturity versus the size.

One first approach was made where four different clusters were identified.

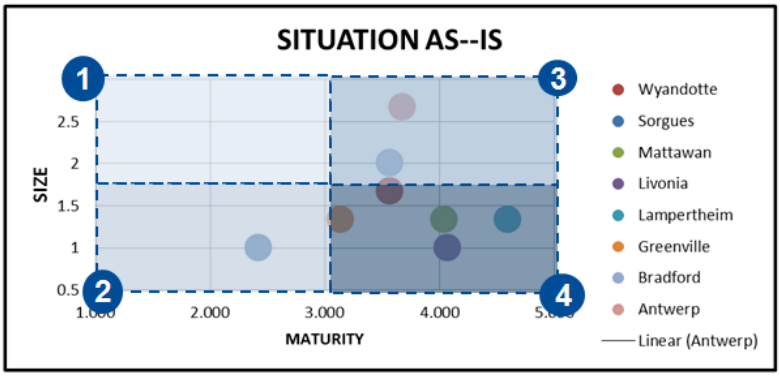


Figure 16: Clusters of maturity

As figure 16 shows, there are four clusters identified: First cluster with high size and low level of maturity with no plants, second cluster that represents low size and low level of maturity, in this level the plant of Sorgues is positioned and it is considered to be a cluster with high level of transferability as at present many plants with the same size show similarities in the level of maturity.

In the third square the plants of Antwerp and Bradford are positioned, this cluster represents high size and high level of maturity and finally we see the forth cluster were most of the plants from the reference visits are positioned and that represent small plants with significant level of maturity.

During the pilot phase one approach to increase level of maturity might be to focus on big plants with small maturity and follow this direction towards high maturity and small size, as a result the order of prioritization will go in this sense: (1, 2, 3, 4) and the objective is to reach the highest and the most suitable level of maturity depending on the size of the plant.

These clusters will be considered as an option to determine the level of transferability among plants and it will be a reference to determine an estimative of

benefits and area of improvements, and mobilizing and convincing BUs/plants to participate in M2I implementation projects.

Once this first step is done and a promising area is identified regard to improvement potential, it is highly recommendable to go to the plants complete deeper assessments to identify specific needs.

8.4.1 Strategy inside the plants

To increase the performance and reach a high degree of harmonization concerning M2I related processes and solutions, Make to Inventory should design an implementation plan for each site.

Meanwhile, for some of the plant is needed to start the implementation from phase 1 for others it will be more convenient to start in phase 2 depending on the complexity of the plant, size and degree of harmonization. It does not exist a fix plan for all the plant but this road map might be used as a guideline.

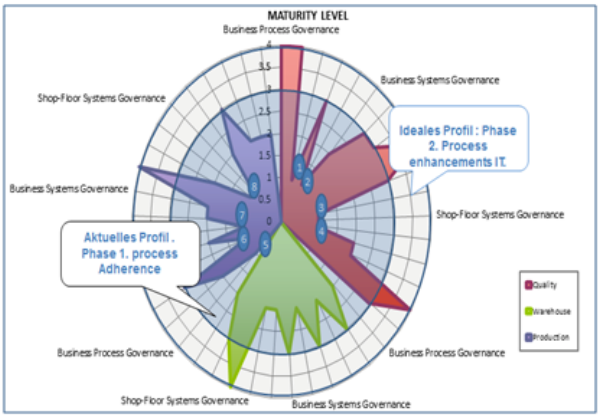


Figure 17: Implementation strategy reference plants

- Phase 1

The first target is to achieve a linked maturity level, this phase is the basis for guarantee a sustainable growth. Fast implementation is desirable as benefits are quickly realized and integration of acquired companies will be facilitated, administrative efforts will be reduced and core processes are treated. In terms of benefits this phase will deal with two types of benefits:

Quick wins:[86] This area includes the use of transaction tools, automation of batch number handing and implementation of booking and confirmation. For these benefits no big implementation efforts are considered but instead it is required a complete training and suitable information.

Process Harmonization: The benefits included in this area are: labelling, value chain integration, master date, QM process integration, process for corrections. Here, some changes in processes are needed as well as making existing solutions available for the plants.

- Phase 2[87]

Once that the plant has a linked level of maturity is convenient to enhance some solutions that include the implementation of systems and the increase of the maturity level already reach by the site.

The benefit covered in this phase are the implementation of Mobil devices, barcoding and scanners, shop floor integration, QM process integration, WL/EM implementation the interphase planning to production and M2I production[88].

- Phase 3

After the implementation of the project, the maturity of the plant should be assessed again. This will ensure the sustainability of the project and will be helpful to identify new improvements and further gaps in the supply chain.

[86] Camelot. Make to Inventory strategy V18. Ludwigshafen 2012.
[87] Hodel, Bruno. Interview
[88] *Ibid.* Pag 55.

9 Change Management: Implementation phase

Within BASF the senior project GSS/E has identified a methodology for the implementation and execution of projects. This structure is divided in success factors that are essential to ensure the transference of knowledge and involve all the actors that will take part in the implementation of the strategy.
This paper will prioritize in activities related to change management that are considered essential to guarantee the success of the project worldwide.

9.1 Training

The transference of knowledge is essential to implement a global process such as the strategy of M2I.

The process should start by the Global process experts with an analysis gap to identify the existing material against the need of new material, In this phase the collaboration of experts is also recommendable to identify the process variants and the regional requirements.

In the next stage the collaboration between regional experts and business experts is needed to identify process improvements, some documentation must specify the training requirements and contain the information that needs to be transmitted to the end user. All the specifications related to transactions, language, processes, tasks, time, rolls must be written to create the required material.

In BASF SE, GSS/ET is the department that has responsibility for the production of new material and all the activities related to change management, a close cooperation with this department needs to be established to support the pilots and implementation projects.

- Existing material:

Currently there is a list of 56 training files related to M2I. This package was created on 2011 as part of the integration of CIBA to BASF. Most of the documents refer to transactions, quick references and Blueprints.

Regional material from America and from Europe has been written in previous years.

- Model to be:

The training package should focus on the importance of manufacturing processes as part of the supply chain. It should include general foundations of the processes of Make to Inventory as well as modules that will build up the required knowledge for all Make to Inventory processes. Figure 18 shows a training model.

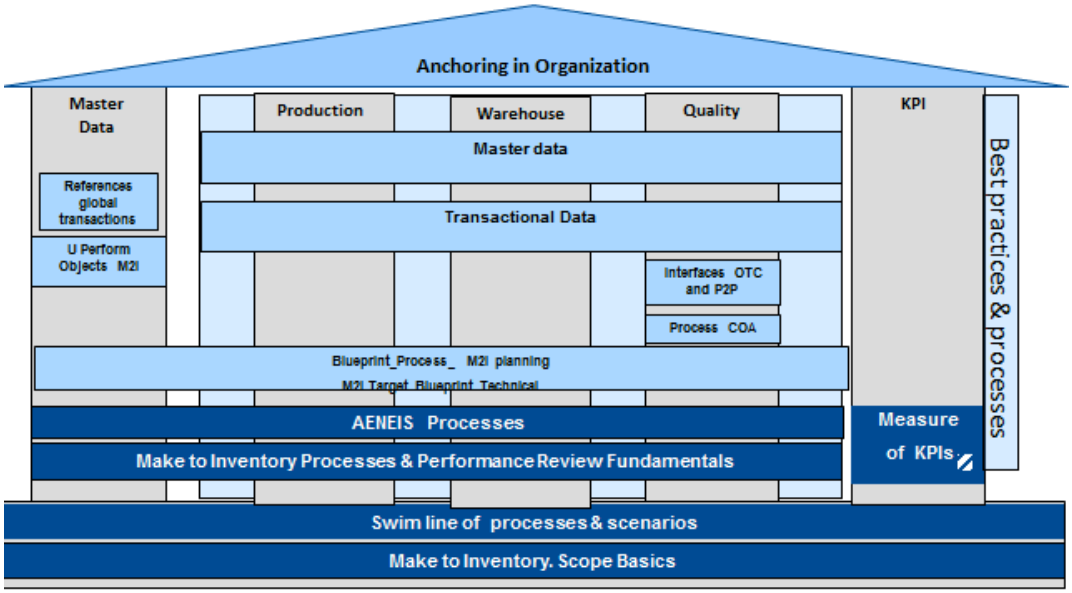


Figure 18: House of training M2I[89]

In the case of Make to Inventory is recommendable to build a house with the general foundations and the modules that will require training.

[89] Wairkar, Interview: May 29 2012.

Foundations:

The general material should include a serie of basic knowledge for Make to Inventory with a swim line of processes and scenarios. It should also contain general information about performace review fundamentals and model of processes in AENEIS, this content should be customized to train the end user.

Modules

Mater data: In the field of master data the user should be informed about the use of SAP in the production planning module and MRP-planning. All the activities concerning the creation of material master. (Bill of material, production version, material master for raw materials, etc.)

Production: In the field of production it is important to show the end user the importance of doing accurately processes and timely processes to have a good performance in the whole supply chain.

Warehouse: Material based on master data, warehouse operations and count of stock should be created. This material should target the expert users. On the other side the transactional data should target end users.

Quality:[90] Material related to the interfaces of Make to Inventory with other departments such as OTC and P2P, other material that support all the processes of the creation of COAs.

KPI: In the definition of the Key Performance Indicators, is essential that the users know in which part of the process the measurements should be made and what are the fundamental of these indicators.

Training process

The figure below represents the process for training and the final publication of the material in the platform U perform. At present Make to inventory is in the revision of the existing material.

[90] Georges, Michel. Meeting 01.07.2012

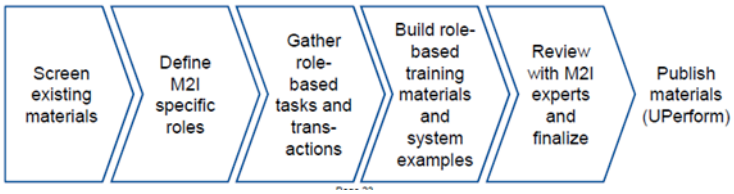


Figure 19: Training process[91]

9.2 Communications

Early engagement activities have the purpose to reach out the affected employees and inform the changes within the community. Gather feedback and identify the information needs.

9.2.1 Message

The core message of Make to Inventory is to "Establish governance on process and create the M2I community"[92] the additional four pillars tells the receptor how M2I will arrive to the global to be process:

- Reducing completely by harmonization, identification of necessary variants by establishing clear business rules.
- Ensure outside-in and best practice perspective.
- Use KPI´s to assess process efficiency and effectiveness.

9.2.2 Stakeholders management

A summary of the stakeholder register for Make to Inventory was put in the next quadrants. The set of actions, will continue throughout the project life cycle and will involve two-way communications. This analysis will help M2I to focus on development of an appropriate strategy for managing each key stakeholder.

[91] Training template. GSS/SE
[92] NEU, Jens. Global Strategy GSS/TI. PP.

In the chart below, it is shown the commitment and knowledge of the key stakeholders:

1.Business Supply Chain	5.WLL, P2P, NCM, OTC	9.Plants levels
2.Business Release Mgmt.	6.IT Community	10.BASF Group
3.gPEX, rPEX, BEX	7.Executives	11.Regional communities
4.GRS/TI – Camelot	8.Training team	12. Suppliers.

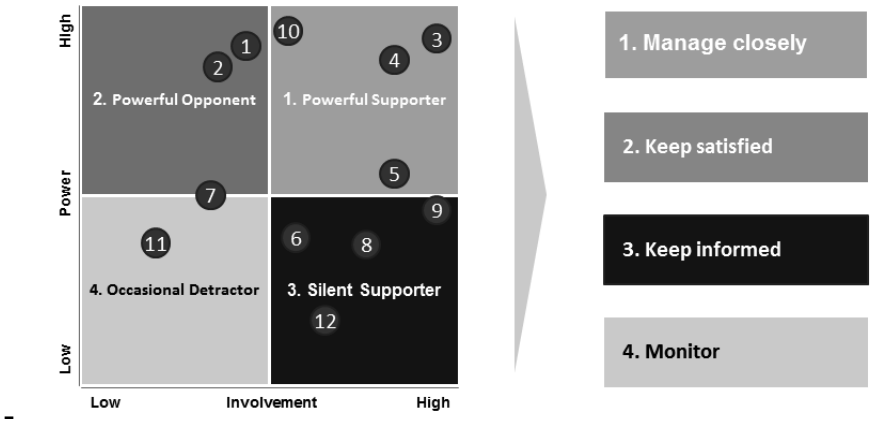


Figure 20: Stakeholder analysis

The identified group of stakeholders must be involved in the rollout of the global strategy M2I and a communication plan should be formulated with all the concrete actions to involve the stakeholders in an early stage.

9.2.3 Community

The community identified for Make to Inventory is divided in three categories:

Core community M2I: It includes the Global process experts for Make to Inventory.

Extended network community: it includes the global process experts as well as the regional business experts, the business units that are divided in key users and end users.

Multipliers: The aim of Make to Inventory is to extend the community with ambassadors that are installed already across the regions. Until now the

multipliers that have been contacted are: the supply chain community, technical community, information community, supply chain council, manufacturing community NA.

Regional process experts and global process experts should work together in the validation of multipliers, identification of channels to address them, and spare the communication for Make to inventory.

9.2.4 Channels

In order to spread the message of Make to Inventory and involve all the stakeholders and communities it is essential the use of adequate channels. Make to Inventory has identified different types of channels:

Distribution lists: it consists of different email lists that could be used as direct channels of communication. They are pertinent as they involve the multidisciplinary groups with a powerful impact in end users.

Intranet: Considered as the main platform of communication of the group. It will contain all the news and information of the global strategy as well as other projects that have being implemented by Make to Inventory.

Connect BASF[93]: This platform can be used to link all the communities across the regions. Through forums and posts a pull approach might be considered to motivate other communities to be part of Make to Inventory communities.

Portal M2I[94]: This online medium could be potentially considered in the future to spread the voice and relevant information of Make to Inventory. An electronic file might be the best solution to spread the voice.

Regional Channels: Regional experts can work together with global experts and business experts in the identification of communities, and channel across the regions to extend the network of Make to inventory.

[93] www.connect.basf.com

[94] ://www.information-services-and-supply-chain-management.basf.net/it-is/gs

9.2.5 Global M2I Directory

This directory contains a complete list of key users and end users for Make to Inventory. This list might be considered as a tool to address easily people in the production plants across the regions for getting specific information and when defining the concept of training.

9.2.6 Matrix of communication

For the implementation phase a matrix has been consolidated to gather all the activities related to change management. The communication concept should integrate the training concept, the involvement of communities and stakeholders, the stages that are already defined for change management the business release.

This matrix has been developed following the RACI (Responsible, Accountable Consulted, Informed) and gives dates where the activities should be done. The communication concept should support all the activities of change management form the kick off until the post Go-live of projects. (Figure 20) An overview of this concept can be also seen in the appendix 3.

Figure 21: Communication process[95]

These key activities are essential to ensure the implementation phase and therefore ensure the success of the global strategy of Make to Inventory.

[95] GSS/E BASF SE

Conclusions

- This paper analysed the strategy formulated in Make to Inventory at BASF SE. The analysis shows that the strategy is consistent based on two evaluations: The alignment with the mission of BASF and the coverage of the areas in scope of Make to Inventory. Furthermore, it is shown that the project will support the harmonization and integration of processes in the field of production. It will establish global processes and complete the aim of Accelerator project.
- The definition of a global process is based on capabilities of the supply chain that follows the strategy of BASF, considers the conditions of the market establishes a model of processes and installs a network of systems and community.
- In terms of methodology it is shown that the strategy is well supported and well defined. Nevertheless the survey for the visits in the plants shows some gaps, as it does not contain all the relevant information needed by Make to Inventory for the identification of improvement potential and the identification of the situation As- Is.
- The process Make to Inventory is considered to be the last piece of the project Accelerator to include all the cross- functional processes within the supply chain.
- Make to Inventory will improve operational information flow between production, execution, quality management & warehouse (the main focus areas of the M2I group). It will allow BASF to contribute to the reliable, smooth, and cost-efficient worldwide flow of goods. This benefits both the regional and global business units, and therefore BASF customers.
- BASF needs to appropriate tools such as inventory management to support the continued growth of its business.

- The benefits discovered in the global strategy shows the high impact that the project might have by establishing global end- to – end processes that are supported by adequate systems.
- Accurate and standardized processes will guarantee an improvement of real-time system information, coordination of raw material purchase levels, and real-time stock transparency. Thus, it will provide optimal inventory levels ensuring that BASF adheres to its delivery promises.
- In order to determine the direction of M2I, it is necessary to understand its current position and the possible avenues through which the model to be is formulated. For this purpose a Maturity concept is assessed via a short questionnaire in order to cluster and prioritize plants.
- Maturity is defined as the level of understanding/ strategic view (Manufacturing within the supply chain) against the level of activity/ performance: what are the actions taken by the plants to accomplish their understanding when doing manufacturing processes.
- A tool to measure the maturity of the plants in the fields of Quality, production and management is developed developed to identify how far the processes are from best practices and identify variants in processes. Out of this assessment make to inventory can potentially define clusters of maturity and define the position of the plants. This will help to identify the transferability of benefits.
- In the first phase of the implementation phase Make to Inventory should focus on plants with low process maturity to drive process improvement projects, whereas in the second phase Make to Inventory might focus on plants that require IT enhancements.
- Key performance indicators (KPIs) are essential to measure the performance of the production plants across all the regions and to develop accurate and timely processes.
- The five pillars of change management should involve the whole organization of BASF SE to ensure the success of the project.

Recommendations

- Make to Inventory has to select first pilots for the implementation phase. It is suggested to use the maturity tool to identify the position of the plants, define clusters of maturity and identify transferability of benefits.
- To implement a competitive strategy, Make to inventory has to ensure that plants have the foundations to follow end to end processes. (First levels of maturity) A general concept of training must be developed by the global experts and regional experts to identify local needs.
- The assessment of maturity should be based on best practices identified in the processes and business scenarios. Hereby, the survey might be modified to contain all the relevant information.
- Global process experts need to write a report with the global transactions that must be available for all the production plants.
- Make to Inventory needs to staff regional process experts across all the regions to extend its process experts network and to ensure the transference of knowledge. This concept should be enclosed to the development of communities and ambassadors able to spread the message of M2I.
- Cross functional collaboration and partnerships are needed to achieve the execution of the strategy Make to Inventory.
- In the short term Make to Inventory should focus on quick wins benefits that require low level of effort and higher transferability.
- The use of a single point of truth (SAP) is essential to consolidate transparent information across the supply chain. Furthermore, Make to Inventory should focus on the use of proper systems and interfaces in the area of Quality, production and warehouse.
- Cooperation with GT/P is essential to improve the activities in the shop floor systems.

- Full integration of GSS/TI in the operational processes needs to be established.
- A maturity re-assessment is recommended to measure and ensure the project success, therefore is essential to identify specific need in the production plants, and estimate potential benefits.
- A pull approach is highly recommended for the implementation phase of the global strategy of M2I.
- Global initiatives and projects with impact on M2I strategy (e. g. EWM, LIMS strategy) have to be aligned with M2I to be process model and project schedule.
- The model presented here is not finally developed and need further adjustments in the structure and content. The areas could be redefined (systems) and best practices should also be up to date.
- Further research should be follow to identify what other dimensions can have an impact in the maturity concept.

Declaration of academic integrity

With this statement I declare, that I have independently completed the above Thesis entitled with “Implementation of global make to inventory strategy at BASF”. The thoughts taken directly or indirectly from external sources are properly marked as such. This thesis was not previously submitted to another academic institution and has also not yet been published.

Ludwigshafen, July 25 2012

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