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Mass Customization – was ist das?

Eine Herausforderung, vor der viele (die meisten?) KMU stehen

- Es gibt ein schwieriges **Gleichgewicht zwischen variantenspezifischer Anpassung** und **operativer Leistung**
  - Das Angebot von mehr Produktvarianten und mehr Anpassungsmöglichkeiten ermöglicht es KMU, die spezifischen Bedürfnisse jedes Kunden genau zu erfüllen
  - Die zunehmende Vielfalt/Anpassung führt jedoch tendenziell zu geringeren Volumina einzelner Produkte mit negativen Folgen für Kosten, Zeit und sogar Qualität

- Das Vorhandensein von **Personalisierung** (Maßanfertigung, Maßschneiderung, usw.) in kleinen und mittleren **produzierenden** Unternehmen (**KMU**) ist anerkannt:
  - „Es ist der Konkurrenzdruck, dem auch sie standhalten müssen“

Mass Customization: ein Ansatz global , um Vielfalt / Anpassung zu

- Das **Ziel** von Mass Customization ist die Entwicklung, Produktion, der Verkauf und die Bereitstellung von Waren und Dienstleistungen mit ausreichender **Vielfalt und Individualisierung,** sodass **fast jeder genau das finden** kann **, was er möchte, und das** zu einem **erschwinglichen Preis .**

- Folglich sind drei wesentliche Voraussetzungen erforderlich , um Mass Customization erfolgreich zu betreiben:
  - Verständnis für die individuellen **Bedürfnisse der Kunden,**
  - das Vorhandensein von Betrieben, die in der Lage sind, **einen kundenspezifischen Auftrag mit der gleichen Effizienz wie einen Standardauftrag zu bearbeiten** und
  - die Fähigkeit, jeden Kunden dabei zu unterstützen, die für ihn optimale Lösung zu finden, wodurch **die Komplexität der Wahl für den Kunden minimiert wird**

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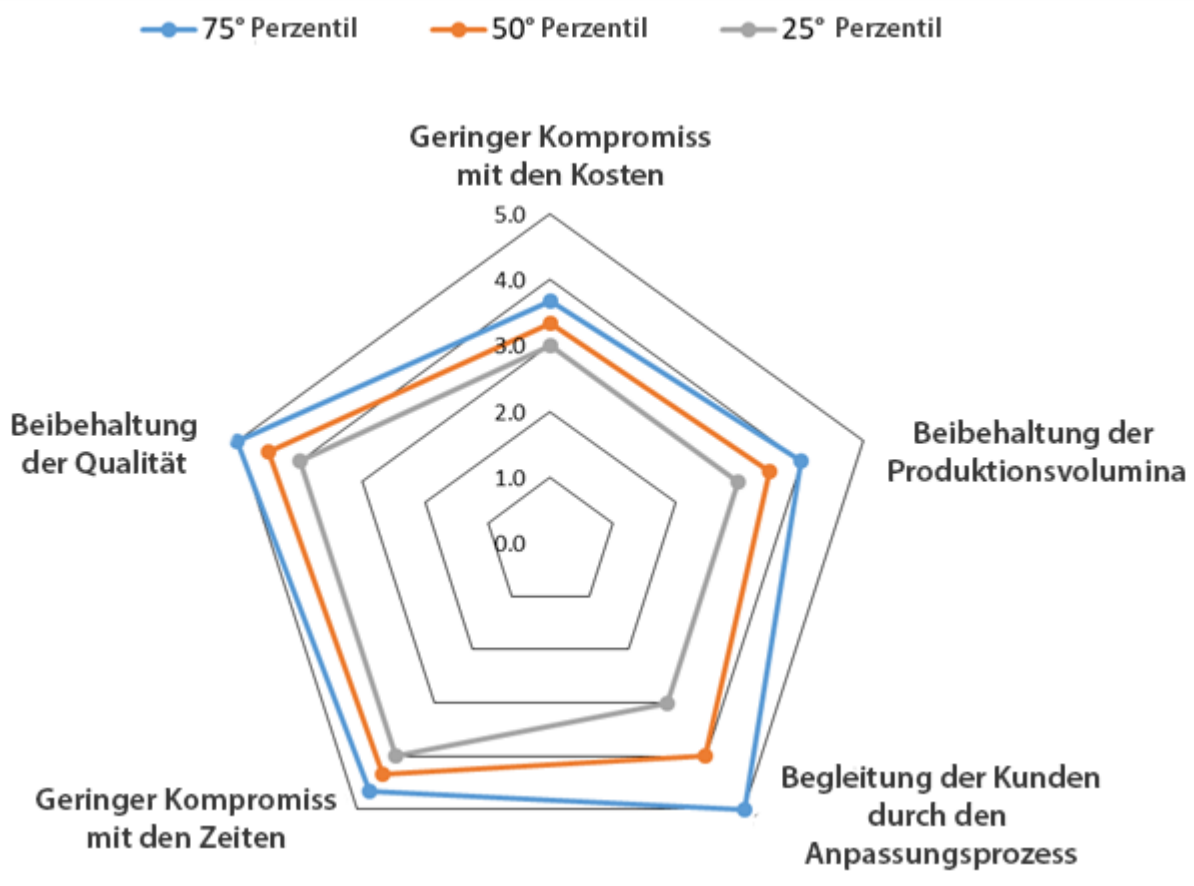
Mass Customization : Wie hoch ist ihr Niveau in italienischen KMU?

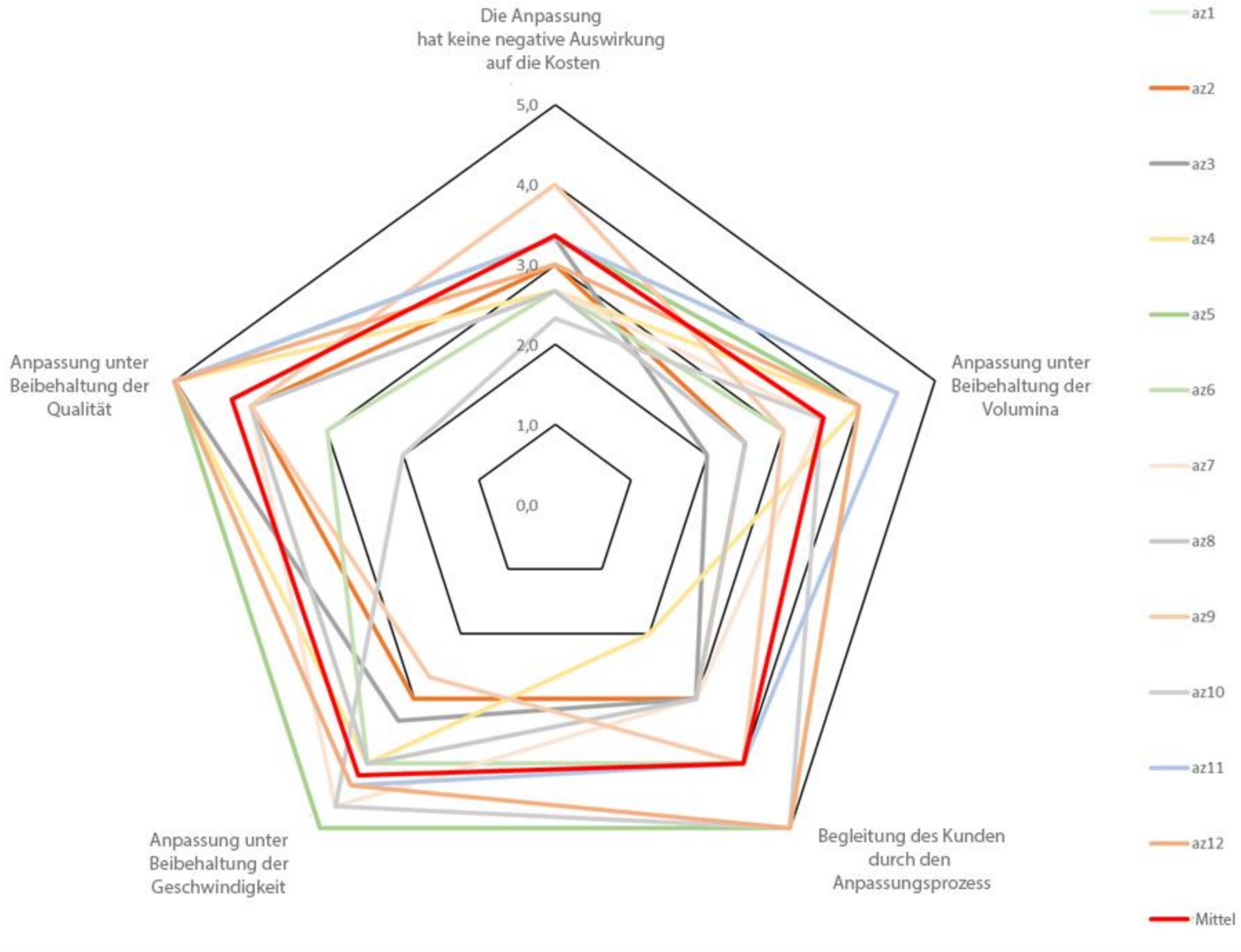
MC-Leistung: Überwindung der Zielkonflikte zwischen kundenspezifischer Anpassung und Betriebsleistung

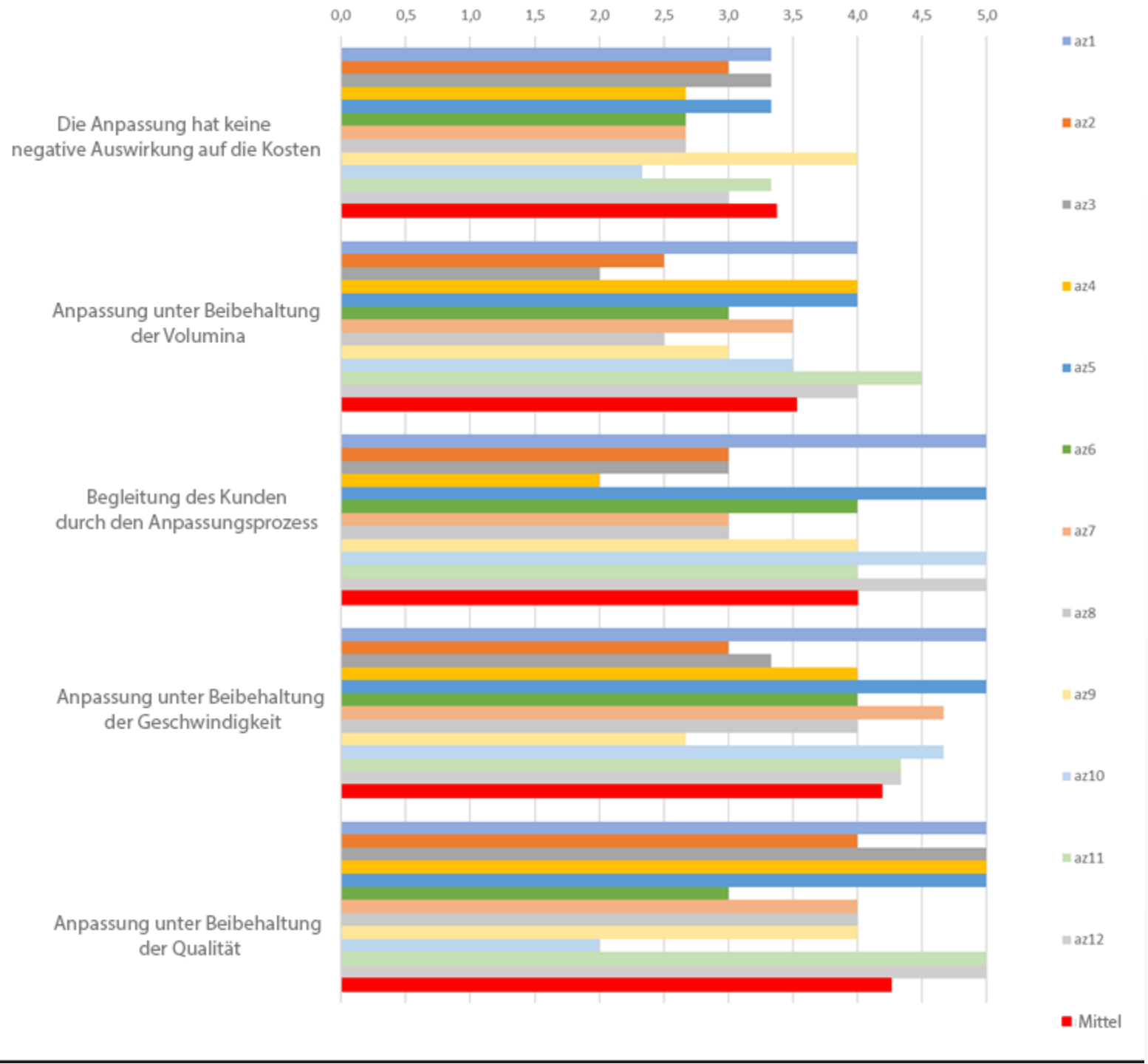


Inwieweit stimmen Sie den folgenden Aussagen auf der unten stehenden Skala von 1 bis 5 zu oder nicht zu?

1	2	3	4	5
ENTSCHIEDENER WIDERSPRUCH	BIN UNTERSCHIEDLICHER MEINUNG	STIMME WEDER ZU NOCH STIMME NICHT ZU	ZUSTIMMUNG	STIMME VOLLSTÄNDIG ZU

- Von KMU gut (oder ziemlich gut) erzielte Bilanzen
  - Vielfalt-Anpassung in Richtung Qualität
  - Vielfalt-Anpassung in Richtung Geschwindigkeit
- Bilanz für KMU weiterhin problematisch
  - Vielfalt-Anpassung in Richtung Volumina
  - Vielfalt-Anpassung in Richtung Kosten
- Bilanz mit großen Unterschieden zwischen den verschiedenen KMU
  - Vielfalt-Anpassung, um Kunden durch den Anpassungsprozess zu führen


Die Anpassung
hat keine negative Auswirkung
auf die Kosten
5,0
4,0
3,0
2,0
1,0
0,0
Anpassung unter
Beibehaltung der
Volumina
Begleitung des Kunden
durch den
Anpassungsprozess
Anpassung unter
Beibehaltung der
Geschwindigkeit
Anpassung unter
Beibehaltung der
Qualität
az1
az2
az3
az4
az5
az6
az7
az8
az9
az10
az11
az12
Mittel


0,0
0,5
1,0
1,5
2,0
2,5
3,0
3,5
4,0
4,5
5,0
Die Anpassung hat keine negative Auswirkung auf die Kosten
Anpassung unter Beibehaltung der Volumina
Begleitung des Kunden durch den Anpassungsprozess
Anpassung unter Beibehaltung der Geschwindigkeit
Anpassung unter Beibehaltung der Qualität
az1
az2
az3
az4
az5
az6
az7
az8
az9
az10
az11
az12
Mittel

Zusammenfassend:

- Markt- und Organisationskontext:
  - Hohe Präsenz einer gemischten Personalisierungsstrategie
  - Hohe Präsenz von starker Anpassung
  - Hohe Präsenz direkter Vertriebskanäle
  - Schwierigkeiten bei der Beschreibung des Produktbereichs *(das Sammeln von Daten zur kundenspezifischen Produktvielfalt erweist sich als sehr schwierig)*
  - Die technische Abteilung muss viele Aufträge bearbeiten, die keine Innovation erfordern

- Der Produktkonfigurationsprozess ist mit einer Besonderheit vorhanden:
  - Viele Aufträge zeichnen sich durch teilweise Konfigurierbarkeit aus
  - Perfekte Konfigurierbarkeit ist selten vorherrschend

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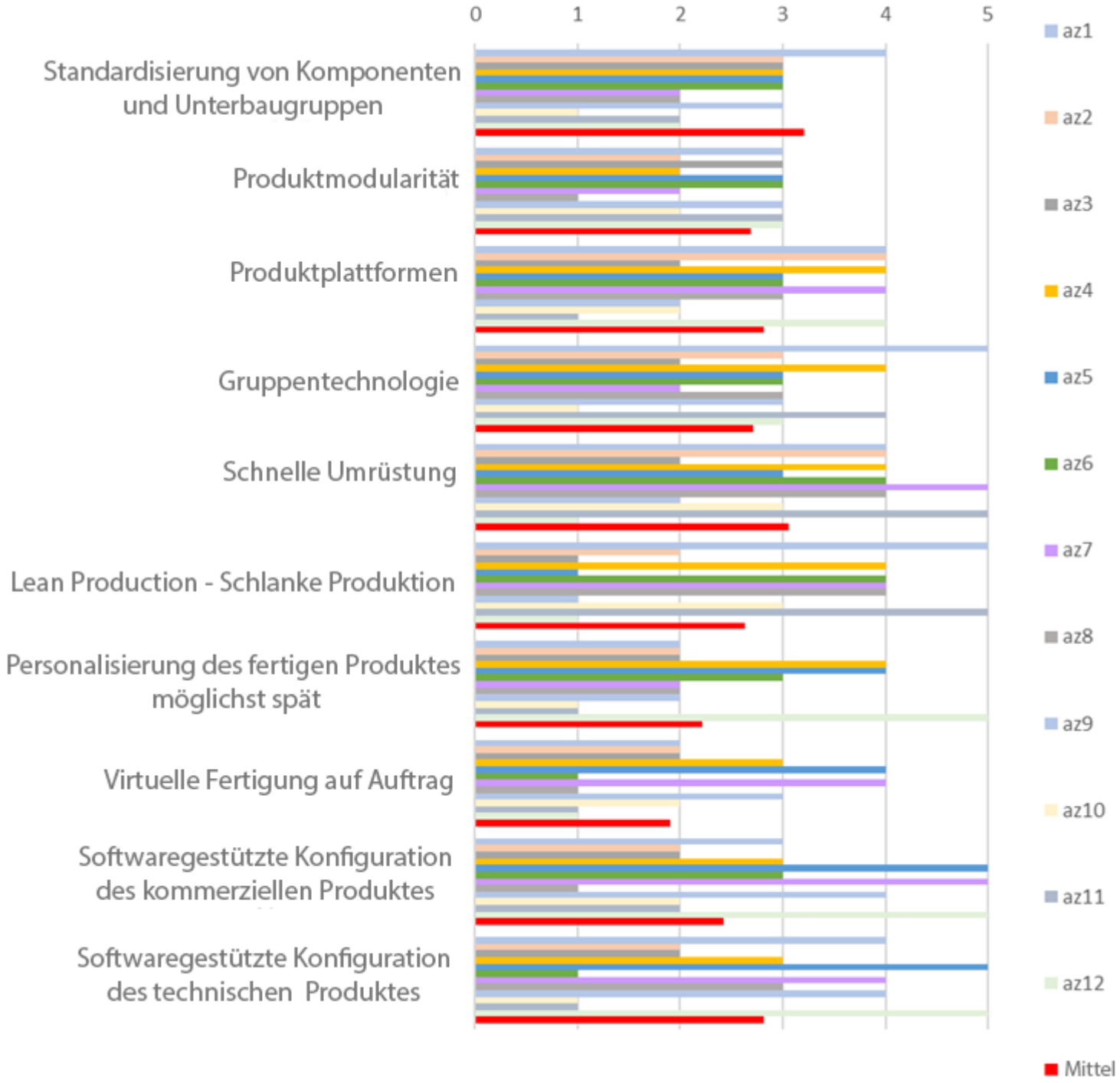
Hebel für Mass Customization

Welche sind das? Was sind Sie? Welche Wirkungen bringen sie?

Hebel für Mass *Customization*

- L1 - Schnelle Umrüstung
- L2 - Standardisierung
- L3 - Produktmodularität
- L4 - Gruppentechnologie
- L5 – Möglichst späte Personalisierung des Endproduk
- L6 - Paralleles 3D-Engineering
- L7 - Von Software unterstützte Produktkonfiguration
- L8 - Produktplattformen
- L9 – Fertigung auf virtuelle Bestellung


0
1
2
3
4
5
Standardisierung von Komponenten und Unterbaugruppen
Produktmodularität
Produktplattformen
Gruppentechnologie
Schnelle Umrüstung
Lean Production - Schlanke Produktion
Personalisierung des fertigen Produktes möglichst spät
Virtuelle Fertigung auf Auftrag
Softwaregestützte Konfiguration des kommerziellen Produktes
Softwaregestützte Konfiguration des technischen Produktes
az1
az2
az3
az4
az5
az6
az7
az8
az9
az10
az11
az12
Mittel

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Der Einsatz von MC-Hebeln in italienischen KMU

Durchschnittlicher Gebrauch von MC-Hebeln

Wie verbreitet sind die folgenden Praktiken in Ihrem Unternehmen?

1	2	3	4	5
ÜBERHAUPT NICHT	WENIG	AUSREICHEND	SEHR	SEHR SEHR VIEL

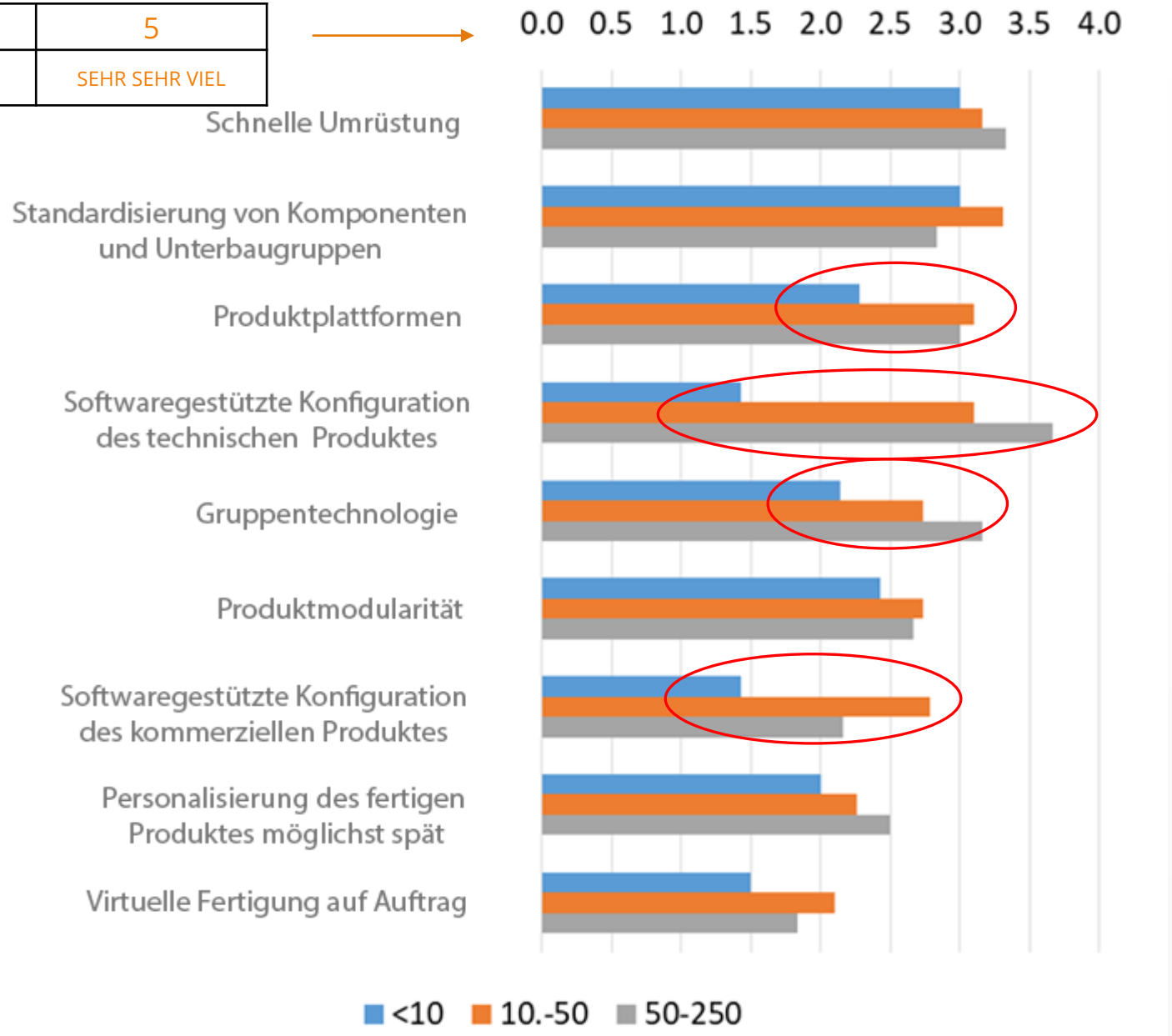
- Die Verwendung von MC-Hebeln ist nicht hoch
  - Allerdings werden die grundlegenden MC-Hebel (schnelle Umrüstung und Standardisierung von Komponenten und Unterbaugruppen) im Durchschnitt recht gut genutzt.
- Insbesondere die fortgeschritteneren Ansätze werden nur begrenzt genutzt für:
  - Gemeinsamkeit erhöhen (z. B. Produktplattformen und -gruppen Technik) und
  - Abgleich der Kundenseite mit der Technik- und Produktionsseite (z. B. Produktmodularität und Softwareunterstützung für kommerzielle

Einsatz von MC-Hebeln in Unternehmen unterschiedlicher Größe

Wie verbreitet sind die folgenden Praktiken in Ihrem Unternehmen?

1	2	3	4	5
ÜBERHAUPT NICHT	WENIG	AUSREICHEND	SEHR	SEHR SEHR VIEL

- Die Nutzung der Softwareunterstützung für die Produktkonfiguration (sowohl auf technischer als auch auf kommerzieller Seite) der Gruppentechnologie- und (in geringerem Maße) Produktplattformen zeigen eine Abhängigkeit von der Größe des KMU



Vorhandensein von MC-Hebeln

- Nutzungsgrad der MC-Hebel:
  - Nicht groß
  - Von Hebel zu Hebel sehr unterschiedlich
  - Abhängig von der Größe (weniger von kleineren Unternehmen verwendet)

- Diese Situation wirft eine Reihe von Fragen auf:
  - Liegt das an finanziellen und personellen Engpässen?
  - Liegt das an der Begrenzung des Aktivitätsvolumens?
  - Hängt dies mit der begrenzten Formalisierung von Wissen und Prozessen zusammen?
  - **Ist dies die Ursache für die immer noch bestehende Schwierigkeit, Vielfalt / Individualisierung und Kosten in Einklang zu bringen?**

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Welchen Weg soll ich in meinem Unternehmen einschlagen?

Vorhandensein von MC-Hebeln

	PRODUKT
Reifegrad II V	Teilestandardisierung: Regelmäßige Rationalisierung, um nicht mehr benötigte Teile zu eliminieren
	1
1	Nie getan
2	Wir haben Teile standardisiert und Teile eliminiert, die wir nicht mehr benötigen, ABER dies war eine einmalige Initiative
3	(1) Es gibt ein systematisches Verfahren zum Entfernen von Teilen, die nicht mehr benötigt werden UND (2) Dieses Verfahren wird regelmäßig bei EINIGEN Teilefamilien durchgeführt
4	(1) ..... UND (2) Dieses Verfahren wird regelmäßig bei ALLEN Teilefamilien durchgeführt

Vorhandensein von MC-Hebeln

	PRODUKT	PRODUKT
Reifegrad II V	Teilestandardisierung: Regelmäßige Rationalisierung, um nicht mehr benötigte Teile zu eliminieren	Standardisierung von Teilen: Tägliche Begrenzung der Einführung neuer Teile
	1	2
1	Nie getan	Der Verbreitung von Teilen wird KEINE Aufmerksamkeit geschenkt durch: (1) Konstruktions-/Fertigungsingenieure und Einkaufspersonal und (2) die Organisation
2	Wir haben Teile standardisiert und Teile eliminiert, die wir nicht mehr benötigen, ABER dies war eine einmalige Initiative	Die Aufmerksamkeit auf die Verbreitung von Teilen wird gelenkt von: (1) Konstruktions-/Fertigungsingenieuren und Einkaufspersonal (2a) KEINE Anleitung zur Teilestandardisierung (2b) KEINE SW-Unterstützung für die Teilestandardisierung
3	(1) Es gibt ein systematisches Verfahren zum Entfernen von Teilen, die nicht mehr benötigt werden UND (2) Dieses Verfahren wird regelmäßig bei EINIGEN Teilefamilien durchgeführt	(1, 2a) Teilstandardisierungsrichtlinien existieren für Konstruktions-/Fertigungsingenieure und Einkaufspersonal und werden IRGENDWIE durchgesetzt (2b) KEINE SW-Unterstützung
4	(1) ..... UND (2) Dieses Verfahren wird regelmäßig bei ALLEN Teilefamilien durchgeführt	(1, 2a) Richtlinien für Konstruktions-/Fertigungsingenieure und Einkaufspersonal existieren und werden sehr streng durchgesetzt, (2b) Es gibt SW-Unterstützung

Vorhandensein von MC-Hebeln

	PRODUKT	PRODUKT	VERFAHREN
Reifegrad II V	Teilestandardisierung: Regelmäßige Rationalisierung, um nicht mehr benötigte Teile zu eliminieren	Standardisierung von Teilen: Tägliche Begrenzung der Einführung neuer Teile	Standardisierung von Produktionsabläufen
	1	2	3
1	Nie getan	Der Verbreitung von Teilen wird KEINE Aufmerksamkeit geschenkt durch: (1) Konstruktions-/Fertigungsingenieure und Einkaufspersonal und (2) die Organisation	Der Ausbreitung von Produktionsläufen durch die Organisation und einzelne Konstruktions- und Herstellungsingenieure wird keine Aufmerksamkeit geschenkt
2	Wir haben Teile standardisiert und Teile eliminiert, die wir nicht mehr benötigen, ABER dies war eine einmalige Initiative	Die Aufmerksamkeit auf die Verbreitung von Teilen wird gelenkt von: (1) Konstruktions-/Fertigungsingenieuren und Einkaufspersonal (2a) KEINE Anleitung zur Teilestandardisierung (2b) KEINE SW-Unterstützung für die Teilestandardisierung	(1) Es ist für Konstruktions-/Fertigungsingenieure einfach, dieselben Routings wiederzuverwenden (weil die Routing-Datenbank gut organisiert ist und weil die Routings in Klassen gruppiert sind).
3	(1) Es gibt ein systematisches Verfahren zum Entfernen von Teilen, die nicht mehr benötigt werden UND (2) Dieses Verfahren wird regelmäßig bei EINIGEN Teilefamilien durchgeführt	(1, 2a) Teilstandardisierungsrichtlinien existieren für Konstruktions-/Fertigungsingenieure und Einkaufspersonal und werden IRGENDWIE durchgesetzt (2b) KEINE SW-Unterstützung	(1) ..... UND (2) Es gibt Regeln und SW-Unterstützung, um die Einführung neuer Produktionsläufe zu begrenzen
4	(1) ..... UND (2) Dieses Verfahren wird regelmäßig bei ALLEN Teilefamilien durchgeführt	(1, 2a) Richtlinien für Konstruktions-/Fertigungsingenieure und Einkaufspersonal existieren und werden sehr streng durchgesetzt, (2b) Es gibt SW-Unterstützung	(1) ..... UND (2) ..... UND (3) Wir schaffen Produktionszyklen, die Produkte il as differenzieren spät wie möglich

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Ein Tool und ein schlanker Ansatz

II. Forschungsergebnisse – *Phase 3: Vorschlag für neue MC-Implementierungsrichtli*

- NEUE MC-IGs für KMU-

Participants:
1) Moderator
2) Idea generating group (3–6 of company's senior staff)

Required tools:
1) Paper-based MC maturity grid
2) Template for idea for advancements generation
3) Template for MC implementation plan generation

		PROCEDURE FOR MC-IGs USE	GOAL(S) OF THE STEP
PREPARATION FOR MC-IGs USE	0	Selection of the group for MC-IGs use	To select company personnel for MC-IGs use. The assembled group must be composed of senior staff (engineers and managers) belonging to all main departments affected by the grid areas and who have decision-making power in the company. Optimal size: 3–6 people
DONE IN COMPANY	1	Introduction to mass customization concept	To provide basic insights to the company staff about the mass customization concept, goals and implications
	2	Short presentation of the company	Done by the company staff. The goal of this step is to give an overview of the company and product assortment to let the moderator identify the most important areas to start with
	3	Introduction to use of the MC-IGs	To provide fundamental insights to the company staff about the procedure for use of the MC-IGs
Steps 4 to 7 are to be repeated for every grid area	4	Explanation of the grid area	To clarify terminology used and its meaning to company staff
	5	Explanation of every maturity level in the grid area	To help company staff gain a deep understanding of each of the maturity levels of the considered grid area
	6	Determining the maturity level of the company in the grid area	To determine the company's maturity level in the considered grid area of the MC maturity grid. Repeating this step for every grid area yields the MC maturity level of the company
	7	Generating new ideas for advancement in the grid area	To generate ideas compatible (in the judgement of the company staff) with the current state of the company in that grid area
	8	Assess interdependencies between and sustainability of improvements	To identify (a) sustainability of the proposed improvements, and (b) interdependencies between the proposed improvements. The moderator helps company staff reach this objective
	9	Generating ideas for increasing the sustainability of proposed improvements	To generate additional improvement ideas and/or to split and reframe previously (1...8) proposed improvements in order to increase the sustainability of each improvement idea
	10	Determining staff's perceived priorities of the improvement ideas	To determine the priorities that the staff (in particular, an initiative implementer) assigns to each initiative. The initiative priority considers benefits (short-/long-term), required efforts (money, personnel time, resistance to overcome), and other considerations (i.e. personal working problems) that the initiative implementer considers important
	11	Generating the MC implementation plan	To sequence improvements based on staff-percieved priorities (10) while satisfying improvement sequence constraints (8, 9)

Verfahren zur Verwendung von MC-IGs

Descrizione dell'idea	Area della griglia	Priorità	Impatto	Sforzo	Interdipendenze

Legenda: B - Basso; M - Medio; A - Alto; MA - Molto alto

01 Ideengenerierungsvorlage für Fortschritte bei der Mass Customization -Fähigkeit

Sequenza di realizzazione	Idea	Priorità	Impact	Sforzo	Interdipendenze
1					
2					
3					
4					
5					
6					

Legenda: B - Basso; M - Medio; A - Alto; MA - Molto alto

02 Vorlage zur Erstellung eines Verbesserungsplans in Richtung MC 4.0

- 12 BEREICHE DES ENTWICKELTEN MC-REIFEGRAD RASTERS -

12 Rasterbereiche des MK-Reifegradrasters vor der empirischen Prüfung:

1. Standardisierung von Teilen: Periodische Rationalisierung, um nicht mehr benötigte Teile zu eliminieren
2. Standardisierung von Teilen: Tägliche Begrenzung der Einführung neuer Teile
3. Standardisierung von Produktionsabläufen
4. Produktmodularisierung
5. Gruppierung von Teilen in Familien durch ein auf Ähnlichkeit basierendes Klassifizierungssystem
6. Produktraum organisiert in klar abgegrenzten Produktfamilien
7. Organisation von Maschinen/Montagestationen in der Werkstatt, um die Geschwindigkeit und Effizienz der Verarbeitung von Teile-/Produktfamilien zu maximieren
8. Geringe und kontinuierlich reduzierte Rüstzeiten
9. Technischer Konfigurator
10. Verkaufskonfigurator
11. Bestände auf optimalem Niveau halten
12. Ausgeklügelte und zuverlässige Unterstützung für die Bestimmung der Verfügbarkeit von Zusagen

- 13 RASTERBEREICHE DES ENTWICKELTEN MC-REIFERASTERS -

13 Bereiche des MC-Reiferasters:

1. Teilestandardisierung: Regelmäßige Rationalisierung, um nicht mehr benötigte Teile zu eliminieren
2. Standardisierung von Teilen: Tägliche Begrenzung der Einführung neuer Teile
3. Standardisierung von Produktionsabläufen
4. Gruppieren Sie Teile mithilfe eines auf Ähnlichkeit basierenden Klassifizierungssystems in Teilefamilien
5. Produktraum organisiert in klar abgegrenzte Produktfamilien
6. Produktmodularisierung _
7. Einrichtung mit Anordnung von Arbeitsmaschinen und Montagestationen, um die Überfahrtsgeschwindigkeit und Effizienz der Verarbeitung von Stück- und Produktfamilien zu maximieren
8. Niedrige und konstant kurze Rüstzeiten
9. Konfigurator Techniker
10. Verkaufskonfigurator _
11. Lagerbestände auf optimalem Niveau halten
12. Ausgeklügelte und zuverlässige Unterstützungen zur Ermittlung der Verfügbarkeit „at the Promise“.
13. 3D-Druck / Fertigung Zusatzstoff

- PRÜFUNG MC MATURITY GRID / SME 1 – Produktfamilie 1 -

Metallverarbeitung SPA (AG)

➢ **Produktfamilie Hydraulikaggregate**

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Product modularization	Grouping of parts into families through a similarity-based classification system	Product space organized in clearly distinguished product families	Organizing machines/assembly stations on the shop floor in order to maximize the speed and efficiency of processing part/product families	Low and continuously reduced set-up times **SKIPPED**	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
1	Never done	No attention is paid to parts proliferation by the organization, design/production engineers and purchasing staff	No attention is paid to production sequence proliferation by the organization and by the individual design and production engineers	No modularization at all	Parts are not grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes)	No product families (modular and/or scaled) exist	Machines are clustered on the shop floor based on their functional similarity	Set-up times are VERY LONG; no systematic reductions of set-up times are being applied	Bills of materials (BOMs) and production sequences (if present) are manually defined by production engineers, eventually copied and modified from similar BOMs/production sequences	Customers, salesmen and technical-sales employees do not have any structured support in choosing all the specific characteristics of the product and in controlling their compatibility	We do not have a production planning and control system that can assure an acceptable service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) and maintain working capital (finished products, modules, components, parts and raw materials) at an acceptable level	It is difficult for us to say whether or not the products that are available in the finished products stock or that are in production are available to promise
2	There is a systematic procedure to eliminate parts no longer needed and this procedure is done periodically for some part families	No guidelines and no SW support exist, but design/production engineers and purchasing staff pay attention to parts proliferation	It is easy to reuse the same sequences (because the production sequence database is well organized and because production sequences are grouped in classes)	In some of our product families, the products have been thought about in such a way that each product function is performed by a specific chunk and does not need to interact with other chunks	Parts are grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes); part families are formed through use of production and design engineers' experience; no structured classification system exists	A portion of the product assortment is composed of products clustered in product families (modular and/or scaled) according to similarities in product functions and product-related production processes. But, the clustering is not guided by design procedures	Machines and assembly stations are able to process different parts/products with similar efficiency and are clustered based on the part/product families to which they are dedicated	Set-up times are NEITHER LONG NOR SHORT; reductions of process set-up times are achieved by continuous analysis of and changes made in the technology used (use of machines with low set-up times, fasteners, positioning aids, standardized tools, etc.) and organization (standardization of set-up procedure, using offline set-up, etc.) or by application of special tools dedicated to part families and/or product families	For some product families, BOMs and/or production sequences are automatically generated for a lot of possible variants of the product family, starting from the provided product specifications	Customers, salesmen and the technical-sales employees have structured support (but do not have any SW support) in choosing all the specific characteristics of the product and in controlling their compatibility	We have a production planning and control system that can assure an acceptable service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) while maintaining working capital (finished products, modules, components, parts and raw materials) at an acceptable level	If we look for a certain quantity of a given finished product, we know how much of it is available to promise in our stocks and how much is available to promise in production, but in the latter case, we are not really dependable regarding when they will be available in the warehouse. If the product is not yet launched into production, we apply some fixed lead times for the promise that are common for several products
3	There is a systematic procedure to eliminate parts no longer needed, and this procedure is done periodically for all part families	Guidelines for design/production engineers and purchasing staff exist and are applied; no SW support	+ there are rules and SW support to limit the introduction of new production sequences	We thought all of our product families in a modular way: We have families of modules (each function is performed by only one module) with standardized interfaces	Parts are grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes); part families are formed through a structured manual classification system	A considerable portion of the product assortment is composed of products clustered in product families (modular and/or scaled) according to similarities in product functions and product-related production processes. Clustering is guided by design procedures. The distinction between product families is good, but can still be considerably improved	+ the positioning and organization of the machines/assembly stations minimizes the time the parts/products take to pass through autonomous production units	Set-up times are VERY SHORT; reductions of process set-up times are achieved by continuous analysis of and changes made in the technology used (use of machines with low set-up times, fasteners, positioning aids, standardized tools, etc.) and organization (standardization of set-up procedure, using offline set-up etc.) and by application of special tools dedicated to part families and/or product families	For almost all product families, BOMs and/or production sequences are automatically generated for most of the possible variants of the product family, starting from the provided product specifications	Customers and/or salesmen and/or technical sales employees use SW that supports them in choosing the main characteristics of the products and in controlling their compatibility (at least for the most important product families)	We have a production planning and control system that can assure a very good service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) while maintaining working capital (finished products, modules, components, parts and raw materials) at a very low level	We know exactly how much of each product is available to promise, both in our stocks and in production and, in the latter case, we are very dependable regarding when the product will be available in the warehouse
4		Guidelines for design/production engineers and purchasing staff exist and are applied very rigorously; SW support exists	+ we make production sequences that differentiate products as late as possible	Our modules may have a longer life than single product families (product platforms exist)	Parts are grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes); part families are formed through an automatic (SW) classification system	The whole product assortment is composed of products clustered in product families (modular and/or scaled) according to similarities in product functions and product-related production processes. Clustering is guided by design procedures that are deeply absorbed by the whole company's organization. Product families are clearly distinguished and do not overlap	+ a system is in place to continuously improve the speed and the efficiency of the autonomous units in processing the parts/product families		BOMs and production sequences (if needed) are automatically generated for almost all possible variants, starting from the provided product specifications	Customers and/or salesmen use SW that supports them in choosing all the characteristics of the products and in controlling their compatibility (for all or almost all of the product families)	We have a production planning and control system that can assure us an optimal service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) while maintaining working capital (finished products, modules, components, parts and raw materials) at an optimal level	We are able to tell exactly how much and when a specific product variant to be promised to a customer will be available in the warehouse and we are also able to modify the configuration of products already launched in production in order to be able to promise customized products at the earliest delivery date in a reliable way and without incurring additional production costs or decreasing the level of service to our customer

13 bis 12 = 23.298.085.122.481

Maturity level of company in the given grid area

Company is currently in between the maturity levels in the given grid area

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- PRÜFUNG MC MATURITY GRID / SME 1 – Produktfamilie 2 -

Metallverarbeitung SPA (AG)

- **Produktfamilie flexible Schläuche**

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Product modularization	Grouping of parts into families through a similarity-based classification system	Product space organized in clearly distinguished product families	Organizing machines/assembly stations on the shop floor in order to maximize the speed and efficiency of processing part/product families	Low and continuously reduced set-up times **SKIPPED**	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
1	Never done	No attention is paid to parts proliferation by the organization, design/production engineers and purchasing staff	No attention is paid to production sequence proliferation by the organization and by the individual design and production engineers	No modularization at all	Parts are not grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes)	No product families (modular and/or scaled) exist	Machines are clustered on the shop floor based on their functional similarity	Set-up times are VERY LONG; no systematic reductions of set-up times are being applied	Bills of materials (BOMs) and production sequences (if present) are manually defined by production engineers, eventually copied and modified from similar BOMs/production sequences	Customers, salesmen and technical-sales employees do not have any structured support in choosing all the specific characteristics of the product and in controlling their compatibility	We do not have a production planning and control system that can assure an acceptable service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) and maintain working capital (finished products, modules, components, parts and raw materials) at an acceptable level	It is difficult for us to say whether or not the products that are available in the finished products stock or that are in production are available to promise
2	There is a systematic procedure to eliminate parts no longer needed and this procedure is done periodically for some part families	No guidelines and no SW support exist, but design/production engineers and purchasing staff pay attention to parts proliferation	It is easy to reuse the same sequences (because the production sequence database is well organized and because production sequences are grouped in classes)	In some of our product families, the products have been thought about in such a way that each product function is performed by a specific chunk and does not need to interact with other chunks	Parts are grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes); part families are formed through use of production and design engineers' experience; no structured classification system exists	A portion of the product assortment is composed of products clustered in product families (modular and/or scaled) according to similarities in product functions and product-related production processes. But, the clustering is not guided by design procedures	Machines and assembly stations are able to process different parts/products with similar efficiency and are clustered based on the part/product families to which they are dedicated	Set-up times are NEITHER LONG NOR SHORT; reductions of process set-up times are achieved by continuous analysis of and changes made in the technology used (use of machines with low set-up times, fasteners, positioning aids, standardized tools, etc.) and organization (standardization of set-up procedure, using offline set-up, etc.) or by application of special tools dedicated to part families and/or product families	For some product families, BOMs and/or production sequences are automatically generated for a lot of possible variants of the product family, starting from the provided product specifications	Customers, salesmen and the technical-sales employees have structured support (but do not have any SW support) in choosing all the specific characteristics of the product and in controlling their compatibility	We have a production planning and control system that can assure an acceptable service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) while maintaining working capital (finished products, modules, components, parts and raw materials) at an acceptable level	If we look for a certain quantity of a given finished product, we know how much of it is available to promise in our stocks and how much is available to promise in production, but in the latter case, we are not really dependable regarding when they will be available in the warehouse. If the product is not yet launched into production, we apply some fixed lead times for the promise that are common for several products
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4		Guidelines for design/production engineers and purchasing staff exist and are applied very rigorously; SW support exists	+ we make production sequences that differentiate products as late as possible	Our modules may have a longer life than single product families (product platforms exist)	Parts are grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes); part families are formed through an automatic (SW) classification system	The whole product assortment is composed of products clustered in product families (modular and/or scaled) according to similarities in product functions and product-related production processes. Clustering is guided by design procedures that are deeply absorbed by the whole company's organization. Product families are clearly distinguished and do not overlap	+ a system is in place to continuously improve the speed and the efficiency of the autonomous units in processing the parts/product families		BOMs and production sequences (if needed) are automatically generated for almost all possible variants, starting from the provided product specifications	Customers and/or salesmen use SW that supports them in choosing all the characteristics of the products and in controlling their compatibility (for all or almost all of the product families)	We have a production planning and control system that can assure us an optimal service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) while maintaining working capital (finished products, modules, components, parts and raw materials) at an optimal level	We are able to tell exactly how much and when a specific product variant to be promised to a customer will be available in the warehouse and we are also able to modify the configuration of products already launched in production in order to be able to promise customized products at the earliest delivery date in a reliable way and without incurring additional production costs or decreasing the level of service to our customer

Maturity level of company in the given grid area

Company is currently in between the maturity levels in the given grid area

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- PRÜFUNG MC MATURITY GRID / SME 1 – Produktfamilie 2 -

Metallverarbeitung SPA (AG)

- Produktfamilie der Montagelinien

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Product modularization	Grouping of parts into families through a similarity-based classification system	Product space organized in clearly distinguished product families	Organizing machines/assembly stations on the shop floor in order to maximize the speed and efficiency of processing part/product families	Low and continuously reduced set-up times **SKIPPED**	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
1	Never done	No attention is paid to parts proliferation by the organization, design/production engineers and purchasing staff	No attention is paid to production sequence proliferation by the organization and by the individual design and production engineers	No modularization at all	Parts are not grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes)	No product families (modular and/or scaled) exist	Machines are clustered on the shop floor based on their functional similarity	Set-up times are VERY LONG; no systematic reductions of set-up times are being applied	Bills of materials (BOMs) and production sequences (if present) are manually defined by production engineers, eventually copied and modified from similar BOMs/production sequences	Customers, salesmen and technical-sales employees do not have any structured support in choosing all the specific characteristics of the product and in controlling their compatibility	We do not have a production planning and control system that can assure an acceptable service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) and maintain working capital (finished products, modules, components, parts and raw materials) at an acceptable level	It is difficult for us to say whether or not the products that are available in the finished products stock or that are in production are available to promise
2	There is a systematic procedure to eliminate parts no longer needed and this procedure is done periodically for some part families	No guidelines and no SW support exist, but design/production engineers and purchasing staff pay attention to parts proliferation	It is easy to reuse the same sequences (because the production sequence database is well organized and because production sequences are grouped in classes)	In some of our product families, the products have been thought about in such a way that each product function is performed by a specific chunk and does not need to interact with other chunks	Parts are grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes); part families are formed through use of production and design engineers' experience; no structured classification system exists	A portion of the product assortment is composed of products clustered in product families (modular and/or scaled) according to similarities in product functions and product-related production processes. But, the clustering is not guided by design procedures	Machines and assembly stations are able to process different parts/products with similar efficiency and are clustered based on the part/product families to which they are dedicated	Set-up times are NEITHER LONG NOR SHORT; reductions of process set-up times are achieved by continuous analysis of and changes made in the technology used (use of machines with low set-up times, fasteners, positioning aids, standardized tools, etc.) and organization (standardization of set-up procedure, using offline set-up, etc.) or by application of special tools dedicated to part families and/or product families	For some product families, BOMs and/or production sequences are automatically generated for a lot of possible variants of the product family, starting from the provided product specifications	Customers, salesmen and the technical-sales employees have structured support (but do not have any SW support) in choosing all the specific characteristics of the product and in controlling their compatibility	We have a production planning and control system that can assure an acceptable service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) while maintaining working capital (finished products, modules, components, parts and raw materials) at an acceptable level	If we look for a certain quantity of a given finished product, we know how much of it is available to promise in our stocks and how much is available to promise in production, but in the latter case, we are not really dependable regarding when they will be available in the warehouse. If the product is not yet launched into production, we apply some fixed lead times for the promise that are common for several products
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4		Guidelines for design/production engineers and purchasing staff exist and are applied very rigorously; SW support exists	+ we make production sequences that differentiate products as late as possible	Our modules may have a longer life than single product families (product platforms exist)	Parts are grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes); part families are formed through an automatic (SW) classification system	The whole product assortment is composed of products clustered in product families (modular and/or scaled) according to similarities in product functions and product-related production processes. Clustering is guided by design procedures that are deeply absorbed by the whole company's organization. Product families are clearly distinguished and do not overlap	+ a system is in place to continuously improve the speed and the efficiency of the autonomous units in processing the parts/product families		BOMs and production sequences (if needed) are automatically generated for almost all possible variants, starting from the provided product specifications	Customers and/or salesmen use SW that supports them in choosing all the characteristics of the products and in controlling their compatibility (for all or almost all of the product families)	We have a production planning and control system that can assure us an optimal service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) while maintaining working capital (finished products, modules, components, parts and raw materials) at an optimal level	We are able to tell exactly how much and when a specific product variant to be promised to a customer will be available in the warehouse and we are also able to modify the configuration of products already launched in production in order to be able to promise customized products at the earliest delivery date in a reliable way and without incurring additional production costs or decreasing the level of service to our customer

Maturity level of company in the given grid area

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SKIPPED *Grid area skipped because workshop participants considered this area irrelevant to their company*

- PRÜFUNG MC-REIFEGRID / KMU 2 -

Soft Automation SPA

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Product modularization	Grouping of parts into families through a similarity-based classification system	Product space organized in clearly distinguished product families	Organizing machines/assembly stations on the shop floor in order to maximize efficiency of processing part/product families	Low and continuously reduced set-up times	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
					SKIPPED		SKIPPED	SKIPPED			SKIPPED	SKIPPED
1	Never done	No attention is paid to parts proliferation by the organization, design/production engineers and purchasing staff	No attention is paid to production sequence proliferation by the organization and by the individual design and production engineers	No modularization at all	Parts are not grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes)	No product families (modular and/or scaled) exist	Machines are clustered on the shop floor based on their functional similarity	Set-up times are VERY LONG; no systematic reductions of set-up times are being applied	Bills of materials (BOMs) and production sequences (if present) are manually defined by production engineers, eventually copied and modified from similar BOMs/production sequences	Customers, salesmen and technical-sales employees do not have any structured support in choosing all the specific characteristics of the product and in controlling their compatibility	We do not have a production planning and control system that can assure an acceptable service level at the subsequent stage (production of parts, assembly of final products or product delivery to the customer) and maintain working capital (finished products, modules, components, parts and raw materials) at an acceptable level	It is difficult for us to say whether or not the products that are available in the finished products stock or that are in production are available to promise
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Interreg
V-A Italia-Austria 2014-2020
Mass Customization 4.0
European Regional Development Fund

EUROPEAN UNION

Università degli Studi di Padova

dtg

Sammlung der entstandenen Ideen

Generierte Verbesserungsideen

Soft Automation SPA

Realiz. order	Idea	Priority	Impact	Effort	Interdependence
-	Formalize the product families; classify and study the product trends; and analyze the market opportunities for the current products (grid area 6)	N/S	L – in the short term H – in the long term	L	Positive effect on grid area 10 Sales configurator
-	Determine the activities that compose products/services and list them (grid area 10)	N/S	M – in the short term	L – for energy plants H – for the whole product assortment	Positive interactions with 6 Product space organized in clearly distinguished product families
-	Modularize the high-level software and manufacturing execution systems (MES) (grid area 4)	N/S	H – when imple-mented	M	Positive interactions with 10 Sales configurator

Legend: L – Low; M – Medium; H – High; VH – Very High; N/S – Not specified

Interreg
V-A Italia-Austria 2014-2020
Mass Customization 4.0
European Regional Development Fund

EUROPEAN UNION

Università degli Studi di Padova

dtg

Definition eines Plans ausgehend von individuellen Ideen

- PRÜFUNG DES MC-REIFEGRIDS -

Umsetzungspläne erstellt

Soft Automation SPA

Realiz. order	Idea	Priority	Impact	Effort	Interdependence
-	Formalize the product families; classify and study the product trends; and analyze the market opportunities for the current products (grid area 6)	N/S	L – in the short term H – in the long term	L	Positive effect on grid area 10 Sales configurator
-	Determine the activities that compose products/services and list them (grid area 10)	N/S	M – in the short term	L – for energy plants H – for the whole product assortment	Positive interactions with 6 Product space organized in clearly distinguished product families
-	Modularize the high-level software and manufacturing execution systems (MES) (grid area 4)	N/S	H – when imple-mented	M	Positive interactions with 10 Sales configurator

Legend: L – Low; M – Medium; H – High; VH – Very High; N/S – Not specified

Umsetzungspläne erstellt

Metallverarbeitung SPA

Realiz. order	Idea	Priority	Impact	Effort	Interdependence
1	Planning supplier by using realistic delivery times and not the required supply lead-times (grid area 11)	VH	H	ML	No
2	A combined idea (ideas 1 and 2): • Analyze the historical use of parts (idea 1) • Create a system that will offer a main option and alternative options for some parts in the design process (idea 2) (grid areas 1 and 2)	M	H	H	4 Product Modularization
3	Define a commercial dialogue to guide the choices for sizing of the hydraulic power units (grid area 10)	M	H	M	Some, with Standardization (grid areas 1 and 2)
4	Study modularization for the hydraulic power units family of products (grid area 4)	ML	H	H	10 Sales configurator (commercial dialogue) and 1 and 2 Standardization (partially)
5	Define different throughput times for different product types (grid area 3)	L	ML	L	No

Legend: L – Low; ML – Medium-Low; M – Medium; H – High; VH – Very High

Soft Automation SPA

Realiz. order	Idea	Priority	Impact	Effort	Interdependence
-	Formalize the product families; classify and study the product trends; and analyze the market opportunities for the current products (grid area 6)	N/S	L – in the short term H – in the long term	L	Positive effect on grid area 10 Sales configurator
-	Determine the activities that compose products/services and list them (grid area 10)	N/S	M – in the short term	L – for energy plants H – for the whole product assortment	Positive interactions with 6 Product space organized in clearly distinguished product families
-	Modularize the high-level software and manufacturing execution systems (MES) (grid area 4)	N/S	H – when imple-mented	M	Positive interactions with 10 Sales configurator

Legend: L – Low; M – Medium; H – High; VH – Very High; N/S – Not specified

Interreg
V-A Italia-Austria 2014-2020
Mass Customization 4.0
European Regional Development Fund

EUROPEAN UNION

Università degli Studi di Padova

dtg

Was ist in den Testunternehmen passiert?

- LANGFRISTIGE BEOBACHTUNGSBEWERTUNG DES MC-REIFEGRIDS -

Metallverarbeitung SPA

Produktfamilie Hydraulikaggregate

- Nach fast drei Jahren wurden die beiden KMU erneut angesprochen, um herauszufinden:

- ✓ Wenn der erstellte Umsetzungsplan von den Unternehmen befolgt wurde
- ✓ Wenn Fortschritte im MC-Status des Unternehmens in fast drei Jahren erzielt wurden
- ✓ Wenn das entwickelte MC-Reifegradraster in der Lage ist, die eingetretenen Änderungen im MC-Status der Unternehmen zu erfassen

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I / II / V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Grouping of parts into part families through a similarity-based classification system	Product space organized in clearly distinguished product families	Product modularization	Organizing machines/assembly stations on the shop floor in order to maximize the speed and efficiency of processing part/product families	Low and continuously reduced set-up times **SKIPPED**	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
1	Never done	NO attention is paid to parts proliferation by: (1) design/production engineers and purchasing staff and (2) the organization	No attention is paid to production sequence proliferation by the organization and by the individual design and production engineers	Parts are not grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes)	Products are not clustered in product families	No modularization at all	Machines are clustered on the shop floor based on their functional similarity	We do not have a clear view of set-up times because we have never considered them	BOMs and PSs (if present) are manually defined possibly by modifying similar BOMs/PSs *(BOM - bill of materials PS - production sequence)*	Customers, salesmen and the technical-sales employees (CSTS) do not have any structured support to choose the specific characteristics of the product and to control their compatibility	We do not have a production planning and control system that assures an acceptable service level at the subsequent stage *(production of parts, assembly of final products or delivering product to the customer)* and maintains working capital *(finished products, modules, components, parts and raw materials)* at an acceptable level	It is difficult for us to say whether or not the products that are available in the finished products stocks or are in production are available to promise
2	We standardized the parts and we eliminated parts no longer needed *BUT* this was an isolated initiative	Attention is paid to parts proliferation by: (1) design/production engineers and purchasing staff (2a) NO parts standardization guidelines (2b) NO SW supports for part standardization	(1) It is easy for design/production engineers to reuse the same sequences (because the production sequence database is well organized and because production sequences are grouped in classes)	(1) Parts ARE grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes), (2) The criteria used are NOT FORMALIZED and coincide with the production and design engineers' experience	(1) A PORTION of the product assortment is composed of products clustered in product families according to similarities in product functions and product-related production processes (2) But the way the clustering is obtained is NOT GUIDED by design procedures	(1) In SOME of our product families, all of the products have been thought about such that each product function is performed by a specific chunk (module) and is not performed through interaction with more chunks	(1) Machines and assembly stations are able to process different parts/products (within a family) with similar efficiency *AND* (2) Machines and assembly stations are clustered based on the part/product families to which they are dedicated	(1) Set-up times are VERY LONG *AND* (2) No systematic reductions of set-up times are being applied	for A LOT of possible product variants of SOME product families BOM and/or PS are automatically generated	CSTS have a structured support (without SW) to choose ... and control ...	We have a production planning and control system that assures an acceptable service level at the subsequent stage (...) and maintains working capital (...) at an acceptable level	We know how much of each product is available to promise both in our stocks and in production but in the latter case, we are not really dependable regarding when they will be available in the warehouse. If the product is not yet launched into production, we apply some fixed lead times that are common for several products for the promise
3	(1) There is a systematic procedure to eliminate parts no longer needed *AND* (2) This procedure is periodically done on SOME part families	(1, 2a) Part standardization guidelines for design/production engineers and purchasing staff exist and are SOMEHOW applied, (2b) NO SW support	(1) ..... *AND* (2) There are rules and SW support to limit the introduction of new production sequences	(1) ..... *AND* (2) Part families are formed through a FORMALIZED and structured MANUAL classification system	(1) A CONSIDERABLE PORTION of the product assortment is ... *idem* ... (2) The way the clustering is obtained is GUIDED by design procedures (3) The distinction between product families is good, but can still be improved considerably	(1) We designed ALL of our product families in a modular way: We have families of modules (each function is performed by only one module) with standardized interfaces	(1) ..... *AND* (2) ..... *AND* (3) The positioning and organization of the machines/assembly stations minimizes the time the parts/products take to pass through them	(1) Set-up times are NEITHER LONG NOR SHORT *AND* (2) Reductions of process set-up times are achieved by continuous analysis of and changes made in: used technology (use of machines with low set-up times, fasteners, positioning aids, standardized tools,etc.) and organization (standardization of set-up procedure, using offline set-up, etc.) OR by application of special tools (dedicated to part families and/or product families)	for MOST possible product variants of ALMOST ALL product families BOM and/or PS are automatically generated	C or S or TS use software to choose the MAIN characteristics of the products and to control their compatibility (at least for the MOST IMPORTANT product families)	We have a production planning and control system that assures a very good service level at the subsequent stage (...) and maintains working capital (...) at a very low level	We know how much of each product is available to promise both in our stocks and in production and, even in the latter case, we are very dependable regarding when the product will be available in the warehouse
4	(1) ..... *AND* (2) This procedure is periodically done on ALL part families	(1, 2a) Guidelines for design/production engineers and purchasing staff exist and are applied very RIGOROUSLY, (2b) SW support exists	(1) ..... *AND* (2) ..... *AND* (3) We make production sequences that differentiate products as late as possible	(1) ..... *AND* (2) Part families are formed through an AUTOMATIC (SW) classification system	(1) THE WHOLE product assortment is ... *idem* ... (2) ...*idem* ... and these design procedures are DEEPLY ABSORBED by the whole organization (3) Product families are CLEARLY DISTINGUISHED and do not overlap each other	(1) ..... *AND* (2) Our modules may have a longer life than single product families (product platforms exist)	(1) ..... *AND* (2) ..... *AND* (3) ..... *AND* (4) A system is in place to continuously improve the speed and efficiency of the autonomous units in processing parts/product families	(1) Set-up times are VERY SHORT *AND* (2) Reductions of process set-up times are achieved by ...*idem* ... AND by application of special tools ...*idem* ...	for ALMOST ALL possible product variants of ALL product families BOM and/or PS are automatically generated	C and/or S use a software to choose ALL of the characteristics of the products and to control their compatibility (for ALL or ALMOST ALL of the product families)	We have a production planning and control system that assures an optimal service level at the subsequent stage (...) and maintains working capital (...) at an optimal level	We know exactly how much and when a specific product variant to be promised to a customer will be available in the warehouse and we are also able to modify the configuration of products already launched in production in order to be able to promise customized products at the earliest delivery date in a reliable way and without incurring additional production costs or decreasing the level of service to our customer

Maturity level of the company in the given grid area

Company is currently in between the maturity levels in a given grid area

Company is still in transition from one maturity level to another in the given grid area

SKIPPED *Grid area skipped because workshop participants considered this area irrelevant to their company*

Grid area where advancement has been recorded

Advanced maturity level

Maturity level of the company in the first assessment

Company is now in transition from one maturity level to another in the given grid area

- LANGFRISTIGE BEOBACHTUNGSBEWERTUNG DES MC-REIFEGRIDS -

Metallverarbeitung SPA

- **Produktfamilie der flexiblen Schläuche**

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I II V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Grouping of parts into part families through a similarity-based classification system	Product space organized in clearly distinguished product families	Product modularization	Organizing machines/assembly stations on the shop floor in order to maximize the speed and efficiency of processing part/product families	Low and continuously reduced set-up times **SKIPPED**	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
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Grid area where advancement has been recorded

Advanced maturity level

Maturity level of the company in the first assessment

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- LANGFRISTIGE BEOBACHTUNGSBEWERTUNG DES MC-REIFEGRIDS -

Metallverarbeitung SPA

- **Produktfamilie der Montagelinien**

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Grouping of parts into part families through a similarity-based classification system	Product space organized in clearly distinguished product families	Product modularization	Organizing machines/assembly stations on the shop floor in order to maximize the speed and efficiency of processing part/product families	Low and continuously reduced set-up times **SKIPPED**	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
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Grid area where advancement has been recorded

Advanced maturity level

Maturity level of the company in the first assessment

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- LANGFRISTIGE BEOBACHTUNGSBEWERTUNG DES MC-REIFEGRIDS -

Soft Automation SPA

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level I V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Grouping of parts into part families through a similarity-based classification system	Product space organized in clearly distinguished product families	Product modularization	Organizing machines/assembly stations on the shop floor in order to improve the speed and efficiency of processing part/product families	Low and continuously reduced set-up times	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
				SKIPPED			SKIPPED	SKIPPED			SKIPPED	SKIPPED
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2	We standardized the parts and we eliminated parts no longer needed *BUT* this was an isolated initiative	Attention is paid to parts proliferation by: (1) design/production engineers and purchasing staff (2a) NO parts standardization guidelines (2b) NO SW supports for part standardization	(1) It is easy for design/production engineers to reuse the same sequences (because the production sequence database is well organized and because production sequences are grouped in classes)	(1) Parts ARE grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes), (2) The criteria used are NOT FORMALIZED and coincide with the production and design engineers' experience	(1) A PORTION of the product assortment is composed of products clustered in product families according to similarities in product functions and product-related production processes (2) But the way the clustering is obtained is NOT GUIDED by design procedures	(1) In SOME of our product families, all of the products have been thought about such that each product function is performed by a specific chunk (module) and is not performed through interaction with more chunks	(1) Machines and assembly stations are able to process different parts/products (within a family) with similar efficiency *AND* (2) Machines and assembly stations are clustered based on the part/product families to which they are dedicated	(1) Set-up times are VERY LONG *AND* (2) No systematic reductions of set-up times are being applied	for A LOT of possible product variants of SOME product families BOM and/or PS are automatically generated	CSTS have a structured support (without SW) to choose ... and control ...	We have a production planning and control system that assures an acceptable service level at the subsequent stage (...) and maintains working capital (...) at an acceptable level	We know how much of each product is available to promise both in our stocks and in production but in the latter case, we are not really dependable regarding when they will be available in the warehouse. if the product is not yet launched into production, we apply some fixed lead times that are common for several products for the promise
3	(1) There is a systematic procedure to eliminate parts no longer needed *AND* (2) This procedure is periodically done on SOME part families	(1, 2a) Part standardization guidelines for design/production engineers and purchasing staff exist and are SOMEHOW applied, (2b) NO SW support	(1) ..... *AND* (2) There are rules and SW support to limit the introduction of new production sequences	(1) ..... *AND* (2) Part families are formed through a FORMALIZED and structured MANUAL classification system	(1) A CONSIDERABLE PORTION of the product assortment is ... *idem* ... (2) The way the clustering is obtained is GUIDED by design procedures (3) The distinction between product families is good, but can still be improved considerably	(1) We designed ALL of our product families in a modular way: We have families of modules (each function is performed by only one module) with standardized interfaces	(1) ..... *AND* (2) ..... *AND* (3) The positioning and organization of the machines/assembly stations minimizes the time the parts/products take to pass through them	(1) Set-up times are NEITHER LONG NOR SHORT *AND* (2) Reductions of process set-up times are achieved by continuous analysis of and changes made in: used technology (use of machines with low set-up times, fasteners, positioning aids, standardized tools,etc.) and organization (standardization of set-up procedure, using offline set-up, etc.) OR by application of special tools (dedicated to part families and/or product families)	for MOST possible product variants of ALMOST ALL product families BOM and/or PS are automatically generated	C or S or TS use software to choose the MAIN characteristics of the products and to control their compatibility (at least for the MOST IMPORTANT product families)	We have a production planning and control system that assures a very good service level at the subsequent stage (...) and maintains working capital (...) at a very low level	We know how much of each product is available to promise both in our stocks and in production and, even in the latter case, we are very dependable regarding when the product will be available in the warehouse
4	(1) ..... *AND* (2) This procedure is periodically done on ALL part families	(1, 2a) Guidelines for design/production engineers and purchasing staff exist and are applied very RIGOROUSLY, (2b) SW support exists	(1) ..... *AND* (2) ..... *AND* (3) We make production sequences that differentiate products as late as possible	(1) ..... *AND* (2) Part families are formed through an AUTOMATIC (SW) classification system	(1) THE WHOLE product assortment is ... *idem* ... (2) ...*idem* ... and these design procedures are DEEPLY ABSORBED by the whole organization (3) Product families are CLEARLY DISTINGUISHED and do not overlap each other	(1) ..... *AND* (2) Our modules may have a longer life than single product families (product platforms exist)	(1) ..... *AND* (2) ..... *AND* (3) ..... *AND* (4) A system is in place to continuously improve the speed and efficiency of the autonomous units in processing parts/product families	(1) Set-up times are VERY SHORT *AND* (2) Reductions of process set-up times are achieved by ...*idem* ... AND by application of special tools ...*idem* ...	for ALMOST ALL possible product variants of ALL product families BOM and/or PS are automatically generated	C and/or S use a software to choose ALL of the characteristics of the products and to control their compatibility (for ALL or ALMOST ALL of the product families)	We have a production planning and control system that assures an optimal service level at the subsequent stage (...) and maintains working capital (...) at an optimal level	We know exactly how much and when a specific product variant to be promised to a customer will be available in the warehouse and we are also able to modify the configuration of products already launched in production in order to be able to promise customized products at the earliest delivery date in a reliable way and without incurring additional production costs or decreasing the level of service to our customer

Maturity level of the company in the given grid area

Company is currently in between the maturity levels in a given grid area

Company is still in transition from one maturity level to another in the given grid area

SKIPPED *Grid area skipped because workshop participants considered this area irrelevant to their company*

Grid area where advancement has been recorded

Advanced maturity level

Maturity level of the company in the first assessment

Company is now in transition from one maturity level to another in the given grid area

- ERGEBNISSE DER LANGFRISTIGEN BEOBACHTUNGSBEWERTUNG -

Metallverarbeitung

Real. order	Idea	Priority	Impact	Effort	Interdependence	Realized
1	Planning supplier by using realistic delivery times and not the required supply lead-times (grid area 11)	VH	H	ML	No	IN PROCESS
2	A combined idea (ideas 1 and 2): • Analyze the historical use of parts (idea 1) • Create a system that will offer a main option and alternative options for some parts in the design process (idea 2) (grid areas 1 and 2)	M	H	H	6 Product modularization	YES
3	Define a commercial dialogue to guide the choices for sizing of the hydraulic power units (grid area 10)	M	H	M	Some, with Standardization (grid areas 1 and 2)	IN PROCESS
4	Study modularization for the hydraulic power units family of products (grid area 6)	ML	H	H	10 Sales configurator (commercial dialogue) and 1 and 2 Standardization (partially)	IN PROCESS
5	Define different throughput times for different product types (grid area 3)	L	ML	L	No	YES

Legend: L – Low; ML – Medium-Low; M – Medium; H – High; VH – Very High; N/S – Not specified

Soft Automation SPA

Real. order	Idea	Priority	Impact	Effort	Interdependence	Realized
-	Formalize the product families; classify and study the product trends; and analyze the market opportunities for the current products (grid area 5)	N/S	L – in the short term H – in the long term	L	Positive effect on grid area 10 Sales configurator	YES
-	Determine the activities that compose products/services and list them (grid area 10)	N/S	M – in the short term	L – for energy plants H – for the whole product assortment	Positive interactions with 5 Product space organized in clearly distinguished product families	IN PROCESS
-	Modularize the high-level software and manufacturing execution systems (MES) (grid area 6)	N/S	H – when implemented	M	Positive interactions with 10 Sales configurator	IN PROCESS

Legend: L – Low; M – Medium; H – High; VH – Very High; N/S – Not specified

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Nächste Schritte

Nächste Schritte

- Heute senden wir Ihnen die gedruckte Tabelle im A3-Format zu

- Am kommenden Donnerstag (29. April) stehen wir Ihnen oder Ihren Kolleginnen und Kollegen, die heute nicht teilnehmen konnten, für Gespräche zur Verfügung
  - Zusammensetzung der Analysegruppe
  - Eventuelle Zweifel an den Betriebsverfahren
  - Alle anderen Fragen, die Ihnen einfallen, bevor Sie mit der Analyse beginnen

- Die Analyse sollte mit einem halbtägigen Meeting erfolgen. Ein zweites ausführliches Treffen ist geplant (und wir haben bereits eine ad hoc entwickelte Instrumentierung) für jeden, der dies wünscht.
  - Aus methodischen Gründen stellen wir es Ihnen nicht früher vor, da es die Ergebnisse beeinflussen könnte. Wir sind bereit, es Ihnen später zu präsentieren, tatsächlich werden wir alle zusammen ein Ad-hoc-Treffen haben, um gemeinsam Erfahrungen auszutauschen.

II. Forschungsergebnisse – *Phase 3: Vorschlag für neue MC-Implementierungsrichtli*

- NEUE MC-IGs für KMU-

Participants:
1) Moderator
2) Idea generating group (3–6 of company's senior staff)

Required tools:
1) Paper-based MC maturity grid
2) Template for idea for advancements generation
3) Template for MC implementation plan generation

		PROCEDURE FOR MC-IGs USE	GOAL(S) OF THE STEP
PREPARATION FOR MC-IGs USE	0	Selection of the group for MC-IGs use	To select company personnel for MC-IGs use. The assembled group must be composed of senior staff (engineers and managers) belonging to all main departments affected by the grid areas and who have decision-making power in the company. Optimal size: 3–6 people
DONE IN COMPANY	1	Introduction to mass customization concept	To provide basic insights to the company staff about the mass customization concept, goals and implications
	2	Short presentation of the company	Done by the company staff. The goal of this step is to give an overview of the company and product assortment to let the moderator identify the most important areas to start with
	3	Introduction to use of the MC-IGs	To provide fundamental insights to the company staff about the procedure for use of the MC-IGs
Steps 4 to 7 are to be repeated for every grid area	4	Explanation of the grid area	To clarify terminology used and its meaning to company staff
	5	Explanation of every maturity level in the grid area	To help company staff gain a deep understanding of each of the maturity levels of the considered grid area
	6	Determining the maturity level of the company in the grid area	To determine the company's maturity level in the considered grid area of the MC maturity grid. Repeating this step for every grid area yields the MC maturity level of the company
	7	Generating new ideas for advancement in the grid area	To generate ideas compatible (in the judgement of the company staff) with the current state of the company in that grid area
	8	Assess interdependencies between and sustainability of improvements	To identify (a) sustainability of the proposed improvements, and (b) interdependencies between the proposed improvements. The moderator helps company staff reach this objective
	9	Generating ideas for increasing the sustainability of proposed improvements	To generate additional improvement ideas and/or to split and reframe previously (1...8) proposed improvements in order to increase the sustainability of each improvement idea
	10	Determining staff's perceived priorities of the improvement ideas	To determine the priorities that the staff (in particular, an initiative implementer) assigns to each initiative. The initiative priority considers benefits (short-/long-term), required efforts (money, personnel time, resistance to overcome), and other considerations (i.e. personal working problems) that the initiative implementer considers important
	11	Generating the MC implementation plan	To sequence improvements based on staff-percieved priorities (10) while satisfying improvement sequence constraints (8, 9)

Verfahren zur Verwendung von MC-IGs

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Danke für die Aufmerksamkeit