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Introduction
to Management
Cybernetics

Integrated IT workflow applications

Learning Objectives
Session X

In this section...

- You will understand why the IT applications supporting the processes should be fully integrated

- You will take away the necessary requirements for an integrated “IT landscape”

- You will learn how to succeed in integrating your IT applications

Index X

The IT applications should best support the coordinated processes and reflect the process quality.

- The software applications **should best support the defined processes.**
- The IT should **best link the single processes and entities** of the company or the value network with each other, **supporting the collaboration** in distributed teams.
- By means of the IT-supported workflow, **feedback mechanisms** (sign-offs, traffic light signals) should be provided to users during process interfaces.
- IT should provide users with **an integrated view of the whole process, showing the interdependencies and possible effects of measures.**
- **Operative efficiency, transparency, real-time and "single truth"** (Oracle claim) are key.
- **Process-oriented, well channeled reporting** (task-related information push service) is required.
- **To optimize the whole business activity**, especially **co-ordination tasks around manifold interfaces** like a "360° view on **project management** including settlement and billing" and "**stock optimization**" should be supported by IT applications.
- Try **to capture and monitor the system's cost by IT.**

The quality and fit of company-specific IT solutions significantly contribute to the corporate success.

- IT applications should be **flexible to adapt to changing processes**. Even though ERP vendors have usually implemented a lot of industry experience in their applications, **processes should never be slaves of the ERP,** but should rather define the kind of support to be provided by IT-based ERP.
- Consider the opportunity of **improving your corporate flexibility** by means of IT.
- Keep your IT capable of **easy release updates** without any need for interface adaptations
- **Consider cloud-based access to ERP applications:** Service on demand may offer **flexibility and scalability** to your organization. Your IT should be able to breathe with the situational corporate challenges.
- The information system which supports the management decision-making process should **guide the management's attention to the most relevant business parameters for each respective situation** by means of a dynamically fed information cockpit.

Ideally, the IT applications are fully integrated.

- **Avoid IT “point solutions” and silo cultures;** the handling of interface problems which might arise can become challenging and expensive.
- Rather **select one suitable integrated ERP system.** By working with an integrated system you can minimize data checks and preparation tasks for analyses – saving time, cost and effort.
- Integrated IT systems support **process stability.**
- Strive for **data integration from machine data logging to data assessment and reporting.**
- For an integration platform architecture, **appropriate layers** are, according to the IEEE, “**business**”, “**user interface**”, “**integration**”, “**services**”, and “**data**” (acc. to the International Conference on Information Technology Systems and Innovation (ICITSI), 2018).
- **Avoid disruptions between different systems**, e.g. a production planning and an ERP system.
- **A unique database** helps prevent departments from working side-by-side without coordinated information. **Centrally managed data** avoids data incongruity and mismatch.

Appropriate applications are commercially available. The challenge is to find IT specialists with cybernetic understanding..

IT Applications for Networked Thinking

IT as Enabler and Supporter of the system “Corporation”

Current IT Support	Exploiting New Possibilities
• Technical maintenence of services (content server, communication server, ERP, network infrastructure, desktop computers, shared infrastructure (printers, facsimile, scanners etc., software) • Software updating (versions) and hardware updating (performance, replacement for aging) • Adaptation and extension of capacities • User training	• IT support of the business processes (project-related involvement of third parties, maintaining the data security) • IT contribution to improve the innovation capability (collaboration applications) • Enabling a cybernetic set-up supporting decision-making (visualization of interdependencies) • IT infrastructure for cybernetically designed controlling instruments (Balanced Scorecard, monitoring the system’s cost)

Questions for Reflection

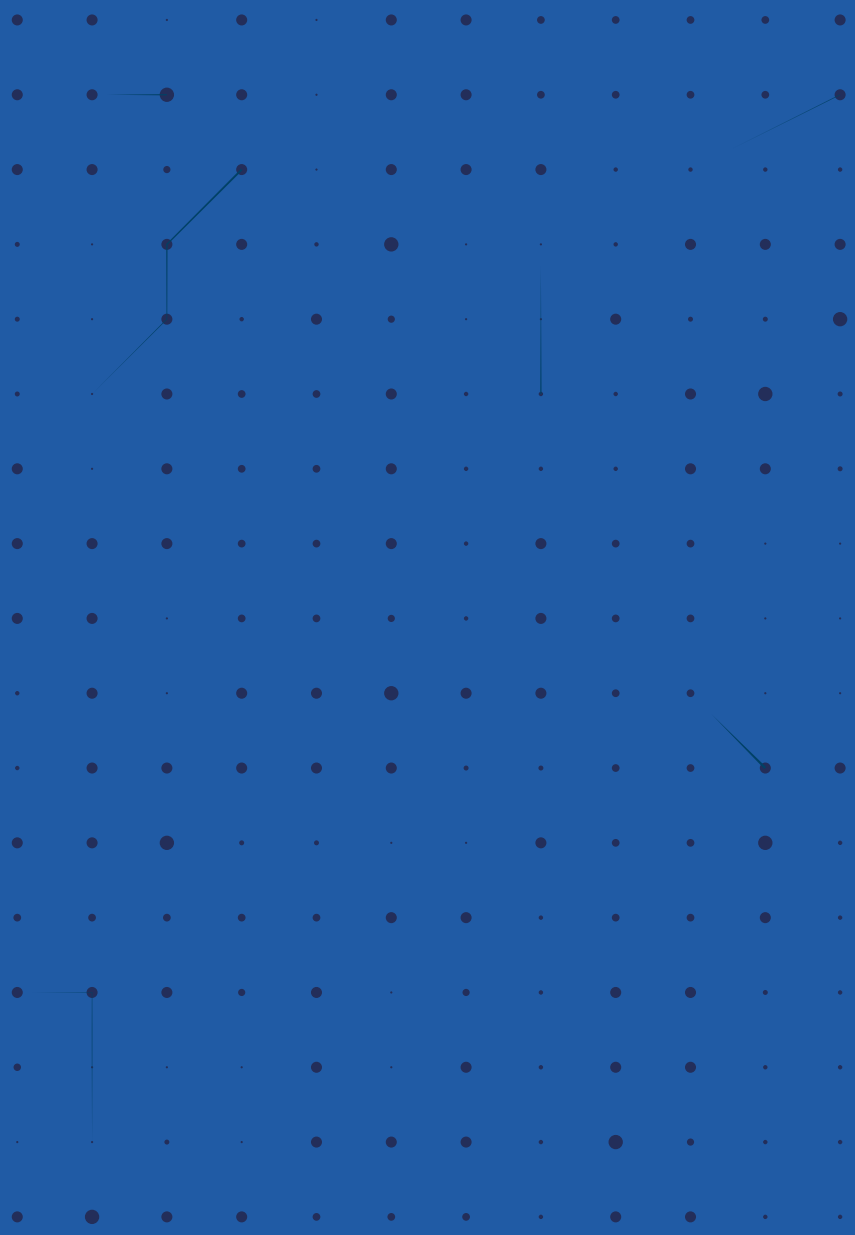
1. **How positively do your employees assess the IT support of the processes?**
2. **Does IT initiate strategic and/or operative need for action?**
3. **Are system costs in your organization recorded and evaluated by IT systems?**
4. **How well can your IT adapt to changes in your organization or business environment?**
5. **Is your IT really integrated? Where might there be any IT “island solutions”?**

Summary of Section

- The IT applications should **best support the coordinated processes** and reflect the process quality.
- The IT applications should be **flexible to adapt to changing processes.**
- Ideally, the IT applications are **fully integrated.**
- IT should **dynamically provide the most relevant management information for each individual situation.**

Relevant Sources for Further Reading

- **Hetzler, Sebastian:** Real-Time-Control. Für das Meistern von Komplexität, Campus Verlag, Frankfurt am Main 2010, 978-3-593-39205-9.
- **Lang, Michael; Amberg, Michael (Hrsg.):** Dynamisches IT-Management – So steigern Sie die Agilität, Flexibilität und Innovationskraft Ihrer IT, Symposion Publishing, Düsseldorf 2012, 978-3-863-29431-1.
- **Priantari, Rini; Kurniawan, Novianto Budi:** 2018 International Conference on Information Technology Systems and Innovation (ICITSI), IEEE 2018. Bandung-Padang, Indonesia, DOI 10.1109/ICITSI.2018.8696013.



11

Introduction
to Management
Cybernetics

Measuring cybernetic excellence

Learning Objectives
Session XI

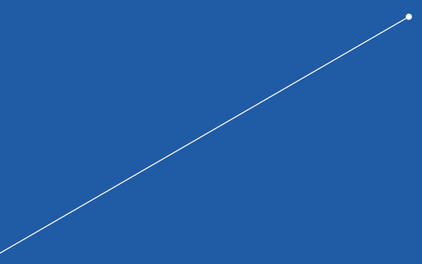
In this section...

- You will learn which informative value you can expect from traditional KPI systems

- You will be introduced to an overview of risks and opportunities

- You will be introduced to the nature of cybernetics-oriented reporting systems

- You will gain practice-proven means for an effective risk management



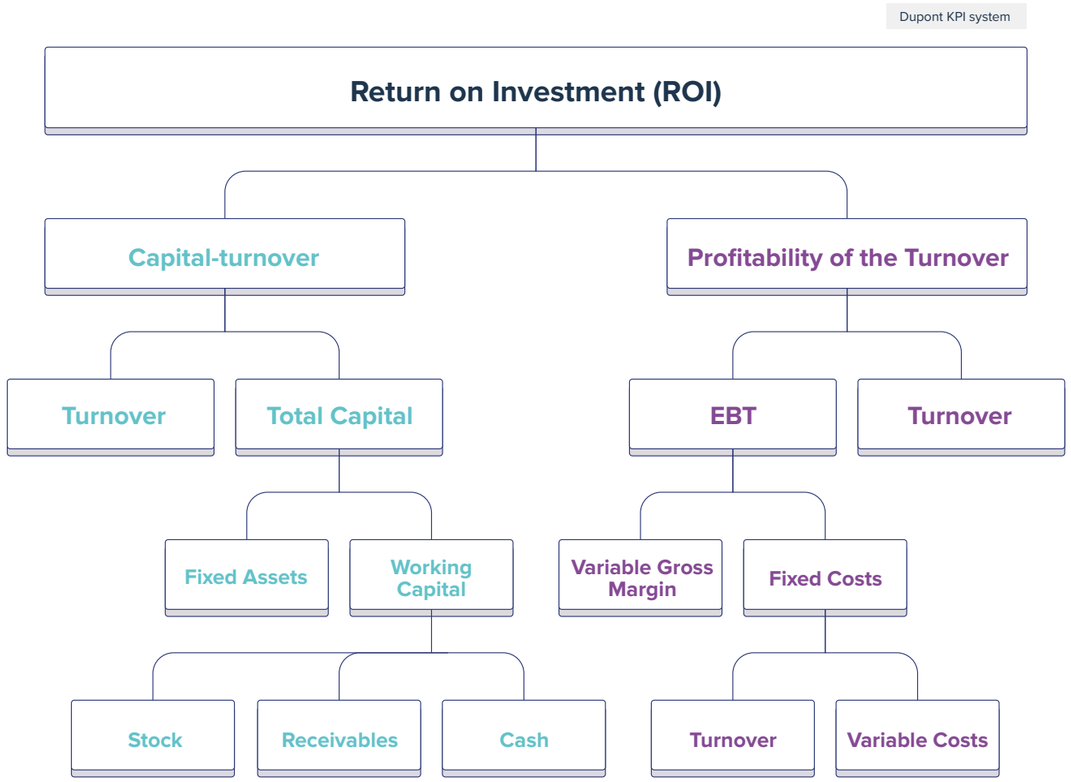
Classic Key Performance Indicators (KPIs) PAGE 174

Performance KPIs are pure indicators and are often optimized without considering their mutual relationships.

Classic Key Performance Indicators (KPIs)

KPI systems aggregate performance indicators without optimizing the interactions between the performance-creating areas

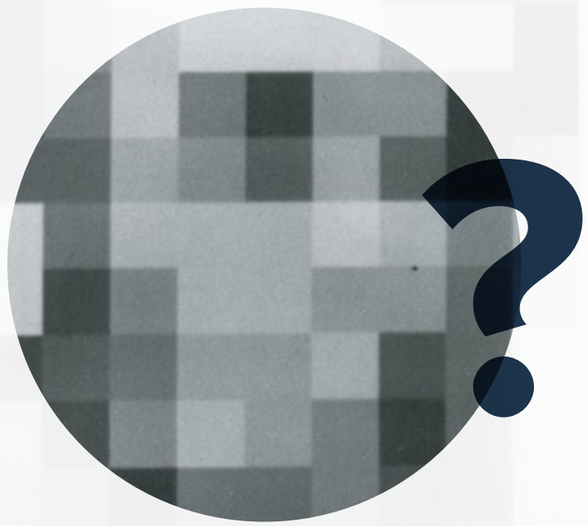
Aggregation in a KPI System



- A KPI system does not coordinate and thus does not optimize the activities
- It leaves unsolved interest conflicts
- It does not optimize the total result, but only “shows” it

The more we focus on details the less we understand the big picture.

ANALYSIS VERSUS HOLISTIC APPROACH AND INTEGRATION



Abraham Lincoln

- Often, the meaning is only recognized from a certain distance.
- Success does not depend on the analysis of each detail, but rather on the comprehension of the big picture.
- Companies are characterized by their “surface behaviour”, not by their partial functions.

Integrative Approach, as opposed to the analytic approach

Recognition of patterns from holistic view, even though it might be “out of focus

Analyze complex systems by observing the system’s behaviour and influence it by aligning the key variables.

Understanding Complex Systems

To understand the behaviour of complex systems, any approach that is limited to partial areas is not suitable.

- Address your analysis towards the whole system
- Observe variables that can easily be captured
- Try to recognize changes, fluctuation, trends, leaps, thresholds and reversions of trends
- Try to understand the relationships between the observed changes and the constellation of the variables
- Carefully adjust and bundle these variables

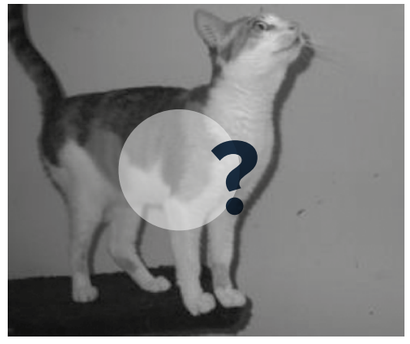
The behaviour of complex systems can only be understood with a holistic view.

...Versus Integration

Example: Intention of a cat

A cat’s intention to jump cannot be derived from the analysis of its single cells.

Only the observation of the cat as whole, combined with personal experience, allows the conclusion that the cat is intending to jump.



Under VUCA conditions, special controlling methods and instruments are useful to lead companies.

Integrated Leadership Concept

Concept	Instruments	Effect
Corporate foresight	Scenario technique, Analysis of strategic risks	➡ Strategic flexibility and adaptability
Innovation management process	Creativity techniques, Initiative portfolio	➡ Capability of developing and adapting
Holistic approach to business processes	Business process modeling, Capturing and molding effect networks, operational risk self-assessment (ORSA) process	➡ Process stability while improving the efficiency, accepted and enforceable solutions
Complexity management	Internalization of risks, balanced scorecard concept, beyond budgeting approach	➡ Cybernetically meaningful decision-making, follow-up of measures, multi-dimensional view regarding results
Corporate policies	Corporate mission statement, leadership statement	➡ Orientation, providing meaning
Cybernetic leadership approach	Self-organization, cybernetic discourse, recursively designed structures, trust as the basis of business, triggering of intrinsic motivation factors	➡ Making use of the personal potential of employees and development of the organizational self-regulation capabilities and dynamics

In quality management, cost is recorded as the total of the cost of failure and the cost of preventative measures.

Quality Cost Record

	Qualitätskostenentwicklung in Unternehmen xyz	Stand 2008		Stand 2009		Ziel 2010	
		[EUR]	[%]	[EUR]	[%]	[EUR]	[%]
A	**Interner Ausschuss**	1.528.667	66,1	1.449.167	61,4	1.223.333	51,0
	Materialwert des Ausschusses	500.000	21,6	425.000	18,0	400.000	16,7
	Transformationskosten des Ausschusses	400.000	17,3	340.000	14,4	320.000	13,3
	Kapitalkosten für zusätzl. Lagerhaltung durch Ausschuß	6.667	0,3	5.667	0,2	5.333	0,2
	Abfallwirtschaft	10.000	0,4	8.500	0,4	8.000	0,3
	Doppeltarbeit, Nacharbeit	20.000	0,9	20.000	0,8	20.000	0,8
	falsche oder ineffiziente Planung	136.000	5,9	180.000	7,6	150.000	6,3
	Blindleistung	80.000	3,5	40.000	1,7	40.000	1,7
	Trouble shooting	76.000	3,3	80.000	3,4	80.000	3,3
	mangelhafte Informationskanalisierung	300.000	13,0	350.000	14,8	200.000	8,3
B	**Kundenreklamationen**	163.000	7,0	210.000	8,9	305.000	12,7
	Gutschriften an Kunden	90.000	3,9	160.000	6,8	150.000	6,3
	Verwaltungsaufwand, Personal	40.000	1,7	40.000	1,7	40.000	1,7
	Kundenbesuche	3.000	0,1	10.000	0,4	15.000	0,6
	Materialsanierung	30.000	1,3	0	0,0	100.000	4,2
	Anwalt-/Gerichtsverfahrenskosten	0	0,0	0	0,0	0	0,0
	entgangener Gewinn	0	0,0	0	0,0	0	0,0
	Imageverlust	0	0,0	0	0,0	0	0,0
	Vertrauensverlust, Auftragsverlust, Kundenverlust	0	0,0	0	0,0	0	0,0
C	**Toleranzüberschreitung**	212.000	9,2	255.000	10,8	185.000	7,7
	Beschichtungsdicke	0	0,0	0	0,0	0	0,0
	Materialstärke	0	0,0	0	0,0	0	0,0
	Überlappungsmaß	0	0,0	0	0,0	0	0,0
	Sicherheitsüberproduktion	5.000	0,2	5.000	0,2	5.000	0,2
	überhöhte Materialqualität	0	0,0	70.000	3,0	50.000	2,1
	überhöhte Verarbeitungsqualität	0	0,0	0	0,0	0	0,0
	Überqualifikation von Personal	45.000	1,9	0	0,0	0	0,0
	Überqualifikation von Maschinen	162.000	7,0	150.000	6,4	130.000	5,4
	Personalüberschuss	0	0,0	30.000	1,3	0	0,0
D	**Qualitätssicherung und Vorbeugung**	410.200	17,7	445.000	18,9	685.000	29,6
	Personal in Q-Sicherung	275.000	11,9	250.000	10,6	280.000	11,7
	Kontroll- und Meßgeräte der Q-Kontrolle	0	0,0	60.000	2,5	60.000	2,5
	Kontroll- und Regelgeräte in Produktion	0	0,0	30.000	1,3	0	0,0
	Personalschulung, Q-Zirkel, Methoden	5.000	0,2	5.000	0,2	30.000	1,3
	EDV-Einsatz zur Datenerfassung und -auswertung	0	0,0	0	0,0	160.000	6,7
	Arbeitsabläufe und Arbeitsanweisungen	130.200	5,6	100.000	4,2	25.000	1,0
	Standardisierung	0	0,0	0	0,0	0	0,0
	Teamarbeit	0	0,0	0	0,0	10.000	0,4
	externe Beratung	0	0,0	0	0,0	70.000	2,9
	rechtzeitige Information und flüssige Kommunikation	0	0,0	0	0,0	40.000	1,7
	Lieferantenaudits	0	0,0	0	0,0	10.000	0,4
	Summe der Qualitätskosten [EUR]	2.313.867	100,0	2.359.167	100,0	2.398.333	100,0
	Umsatz [EUR]	12.060.000		10.700.000		12.000.000	
	Qualitätskosten bezogen auf den Umsatz [%]	19		22		20	

Internal errors and reworking are only a part of the system cost. The objective is the optimization of the total system cost.

Internal Errors and Reworking

System Cost

		Last Year		Objective Present Year		Plan Next Year	
		[kEUR]	[%]	[kEUR]	[%]	[kEUR]	[%]
A	**Internal blunder and rework because of systemic deficiency**	**0**	**0**	**0**	**0**	**0**	**0**
	Material cost of waste, due to systemic deficiency						
	Transformation cost of waste, due to systemic definiency						
	Capital cost of avoidable stock-keeping, due to missing alignment						
	Cost of parallelly carried out work, due to missing alignment						
	Cost of rework, caused by systemic deficiency						
	Cost of “blind performance, due to not sufficiently defned processes and objectives						
	Cost of the implementation of illusive solutions (symtom treatment)						
	Troubleshooting cost related to systemic deficiencies						
	Cost of missed out operative performance, due to a motivation deficit						
	Cost of individual capabilities and ideas						
	Cost of too little variety (incapability of homeostasis)						
	Cost of missing networking (incapability of emergence)						
	Subsequential cost of an inappropriate reduction of the complexity						
	Cost of organizational incapability to spontaneously recognize patterns						
	Cost of missing feedback mechanisms						
	Cost of missing orientation in potential effects						
	Cost of inside-out planning (missing orientation in scenarios)						
	Subsequential cost of missing hedging measurements						
	Cost of not having recognized the systems (markets, organizations) behaviour						
	Cost of avoidable internal meetings						
	Cost of re-scheduling orders (additional setup times, delays) that is usually not reflected in the post-calc.						

First, internal errors and resulting rework, tolerance exceedance and commercial loss should be registered.

Tolerance Exceedance, Commercial Loss

B	**Tolerance exceedance (avoidable reserve), due to systemic deficits**
	Cost of arbitrary relations (unnecessary complexity)
	Cost of avoidable diversity (e. g.: assortment, options), missing modularization
	Cost of overdrawn reporting routines
	Cost of complicated decision structures
	Cost of unnecessarily complex information systems
	Cost of avoidable material reserve, due to missing specs or process reliability
	Cost of avoidable over-production, due to missing process reliability or professionality
	Cost of avoidable material quality, due to missing experience or professionality
	Cost of avoidable over-qualification of personnel
	Cost of avoidable overspecification of machines or equipment
	Cost of avoidable personnel, due to exeggerated flexibility or amendable planning

C	**Commercial loss with customers and with suppliers due to syszemic deficiency**
	Price reductions, due to justified claims/comlaints
	Credit vouchers to customers, due to justified claims/complaints
	Cost of customer visits needed die to claims/complaints
	Cost of lawyers and court proceedings, caused by disputable performance
	Missed out margin, die to lost orders
	Cost of consequences, due to missing end-to-end contracts
	Cost of insufficient involvement of suppliers in the definition of contracts with customers

Then, well-coordinated preventative measures should be defined and implemented to reduce the cost of failure and to optimize the total system cost.

Preventative Measures, Total System Cost

D	**Effort for preventative measurements for systemic meaningful proceeding**
	Cost of functional qualification measurements
	Cost of training in cybernetics principles
	Cost of system analysis
	Cost of designing and implementing end-to-end processes
	Cost of designing and implementing stabilizing feedback mechanisms
	Cost of adequate process-oriented re-allocation of personnel resources
	Cost of adequate process-oriented machinery and equipment
	Cost of integrating of information systems
	Cost of end-to-end contracts with customers/suppliers
	Cost of deriving and communicating clear objectives
	Cost of developing and implementing value-oriented incentives

Total system cost	**0**	**0**	**0**	**0**	**0**	**0**
Organizational turnover						
System cost, referred to the turnover [%]						

By means of strategic and operational risk self-assessment, all risk becomes evident and an effective risk management will be possible.

Operational Risk Self-Assessment

The probability of the risks and the associated costs should be quantified by everyone.

- Address your analysis towards the whole system
- Observe variables that can easily be captured
- Try to recognize changes, fluctuation, trends, leaps, thresholds and trend-reversions
- Try to understand the relationships between the observed changes and the constellation of the variables
- Carefully adjust and bundle these variables

The self-assessment can be structured (standard report)

- **...according to the involved entities (e.g. sales, engineering, production planning, finance and others)**
- **...or according to process phases (e.g. acquisition, order confirmation, order execution, settlement)**

The single inputs should be aggregated for top management.
The risk reporting should be updated in monthly cycles, involving all functions.

Questions for Reflection

1. **How are performance and success measured in your organization?**
2. **Is enough attention paid to the ‘big picture’ or is the focus on details?**
3. **How is the quality of interface communication evaluated?**
4. **How are system costs determined? What measures are derived from the evaluations?**
5. **How are strategic and operative risks registered in your organization? How are they dealt with?**

Summary of Section

- **Performance KPIs are pure indicators** and are often optimized without considering their mutual relationships.
- **KPI systems only aggregate** performance indicators without optimizing the interactions between the performance-creating areas.
- The more we focus on details, the less we **understand the big picture.**
- Therefore, analyze complex systems by **observing the system's behaviour** and influence it by coordinating the key variables. The behaviour of complex systems can only be understood with a holistic view.
- Under VUCA conditions, **selected controlling methods and instruments** are useful to lead companies.
- With regards to the recording and optimizing of quality cost, **the system cost can be managed**. The objective is the optimization of the total system cost.
    - First, **internal errors and the resulting reworking, tolerance exceedance and commercial loss** caused by a lack of cybernetic quality should be registered.
    - Then, **well-coordinated preventative measures** should be defined and implemented to reduce the cost of failure and to optimize the total system cost. This bundle usually consists of process optimization, training and leadership.
- By means of **a strategic and an operational risk self-assessment**, all risk becomes evident and an effective risk management will be possible.

Relevant Sources for Further Reading

- **Auer, Ludwig von:** Ökonometrie – Eine Einführung, Springer Gabler Fachmedien, Wiesbaden 2016, 978-3-366-247868-4.
- **Hetzler, Sebastian:** Real-Time-Control. Für das Meistern von Komplexität, Campus Verlag, Frankfurt am Main 2010, 978-3-593-39205-9.
- **Kaplan, Robert S.; Norton, David P.:** Balanced Scorecard, Schäffer-Poeschel Verlag, Stuttgart 1997, 3-791-01203-7.
- **Malik, Fredmund:** Führen, Leisten, Leben, Campus Verlag, Frankfurt am Main 2006, 978-3-593-38231-9.
- **Senger, Harro von:** Supraplanung. Unerkannte Denkhorizonte aus dem Reich der Mitte, Carl Hanser Verlag, München 2008, 978-3-413-65-8.
- **Terje, Aven; Zio, Enrico:** Knowledge in Risk Assessment and Management, John Wiley & Sons, Chichester 2017, 978-1-119-31788-3.
- **Weick, Karl E.; Sutcliffe, Kathleen M.:** Das Unerwartete Managen. Wie Unternehmen aus Extremsituationen lernen, Schäffer-Poeschel Verlag, Stuttgart 2010, 978-3-731-02968-9.