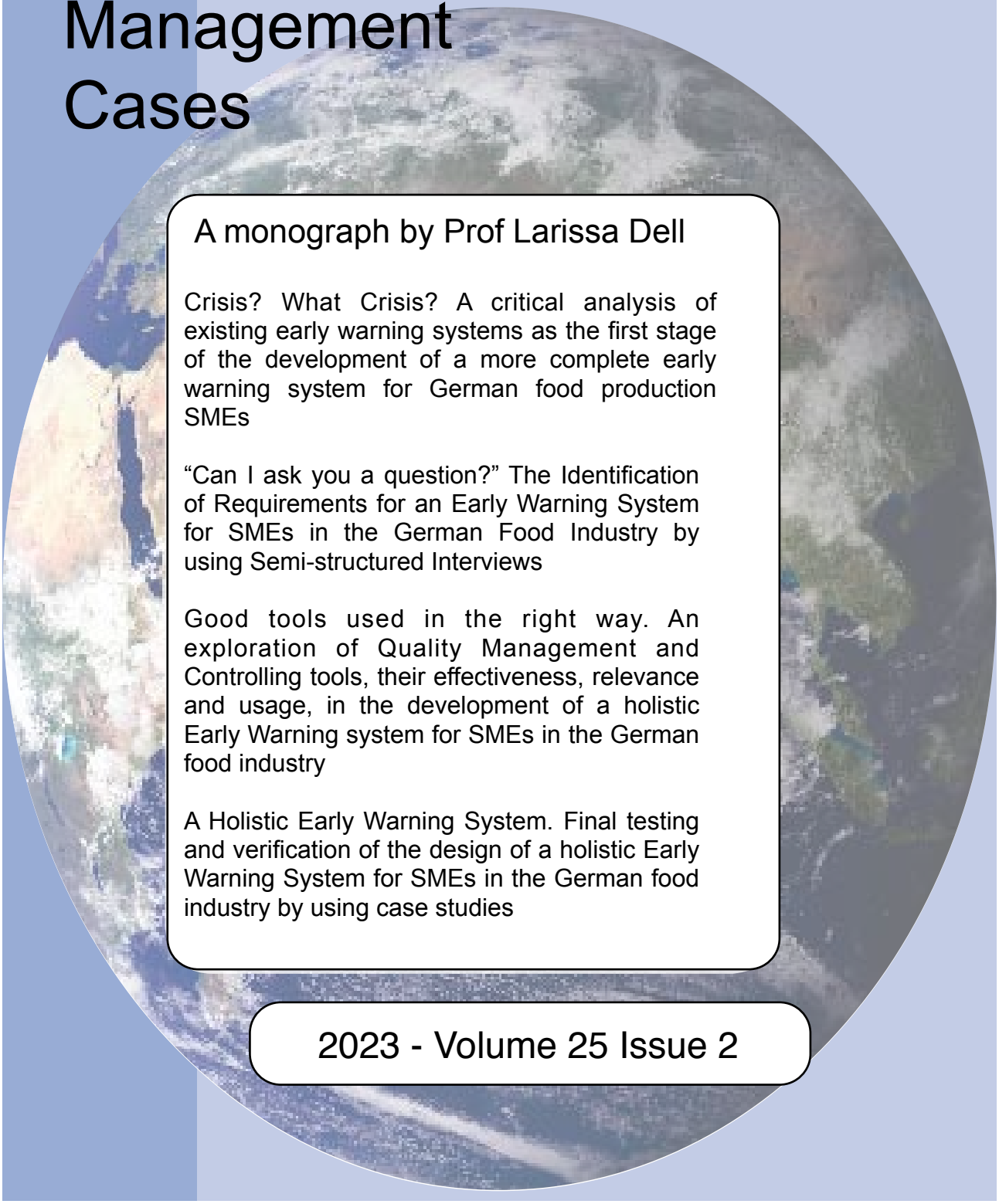
International Journal of Management Cases



A monograph by Prof Larissa Dell

Crisis? What Crisis? A critical analysis of existing early warning systems as the first stage of the development of a more complete early warning system for German food production SMEs

“Can I ask you a question?” The Identification of Requirements for an Early Warning System for SMEs in the German Food Industry by using Semi-structured Interviews

Good tools used in the right way. An exploration of Quality Management and Controlling tools, their effectiveness, relevance and usage, in the development of a holistic Early Warning system for SMEs in the German food industry

A Holistic Early Warning System. Final testing and verification of the design of a holistic Early Warning System for SMEs in the German food industry by using case studies

2023 - Volume 25 Issue 2

EDITORS

www.ijmc.org

www.circleinternational.co.uk

ISSN 1741-6264

International Journal of Management Cases is published by:

Access Press UK,
1 Hillside Gardens ,
Darwen,
Lancashire,
BB3 2NJ
UK

Contents

Crisis? What Crisis? A critical analysis of existing early warning systems as the first stage of the development of a more complete early warning system for German food production SMEs

Larissa Dell

"We need early warning systems, technologies to deflect an asteroid - and we need political preparedness as well. It needs to be clear who is to decide what, who launches the rockets, who presents which bills to its citizens. This is a planetary decision. We need to do this all together. Or it will not happen."

Rusty Schweickart

Abstract

The research project on which this paper is based, deals with the development of a simple Early Warning System (EWS) integrating both a quality management system (QMS) and controlling (CO) tools, focusing specifically on German SMEs in the food production industry.

An EWS can be defined as an information system designed to warn companies when problems arise. Most of the models designed to identify company risks/crisis are focused either on quantitative or qualitative factors. Several authors point out the need for a more holistic approach including both quantitative and qualitative factors.

This research was split into phases, starting with a critical analysis of existing EWSs, then the identification of requirements for an EWS by semi-structured interview. This was followed by an exploration of CO and QM tools, appropriate for recognizing risk factors of company failure, measurable by the company value, including shareholder value, market value, customer value, people value and future value. CO and QM tools were defined and categorized by comparison with those identified in the literature.

Two case studies were used to confirm and refine best-practice elements in EWSs. The case studies involved three semi-structured interviews per case study of the senior management of relevant functions: quality, controlling and the general management.

The EWS, developed during this work, enables companies in the food production industry to use the framework but customise for the company. Such a comprehensive, systematic approach (CO + QM) is currently unknown, both in research and also practice. Therefore, the work represents a new, innovative and implementable practical model.

This paper, the first of four, covers the critical analysis aspect of the research. It provides background and rationale to the work and an explanation of the research aim. The essential terms important for this work are derived and defined. It starts with the development stages of EWSs and forms of appearance, followed by the description of different models and approaches. It concludes with a synthesis section, demonstrating the extent to which there is agreement and also disagreement between researchers, summarised in a table with key literature sources and the contributions

they have made. There is an indication of what gaps in knowledge exist and which of these gaps this work aims to fill.

Keywords: Early Warning System, Risk, Crisis, Controlling , Quality Management System, Holistic Approach

Acknowledgements

Prof. Dr. Brian Terry and Dr. Seema Sharma, who acted as doctoral advisors. Both guided me well through the research path over three to four years.
Special thanks to the members of the University of Gloucestershire, Dr. Philippa Ward,

Dr. Barry Davies and Prof. Dr. Polke for their help in all matters of the doctoral study.

Funding:
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Abbreviations

AR	Action Research
BSC	Balanced Scorecard
CO	Controlling
EWI	Early Warning Indicator
EWS	Early Warning System
InsO	Insolvenzordnung
ISO	International Organization for Standardization
KPI	Key Performance Indicator
QM	Quality Management
QMS	Quality Management System
RM	Risk Management
RMS	Risk Management System
SME	Small and medium-sized enterprises
SOFT	Satisfactory, Opportunity, Fault, Threat
SWOT	Strengths, Weaknesses, Opportunities, Threats

1. The Problem and the Aim of the Research

The aim of this research project was to develop a simple, holistic early warning system (EWS) integrating both a quality management system (QMS) and controlling (CO) tools for German Small and Medium Enterprises (SMEs), especially within the food industry.

There are two main reasons why this research focuses on SMEs. The first is their value for the, in this case, German economy. In 2010 the German economy recorded 3.61 million SMEs with a total of about 15.48 million employees, generating more than €2 trillion turnover (IfM, 2016). Thus, they are an important pillar of the economic climate in Germany (Schoenewald, 2011). Between the years 2001 and 2009 the number of employees in SMEs grew by more than 13.6%, whereas the big companies' number of employees decreased by about 1.2%.

Nevertheless, SMEs – and this is the second reason for dealing only with SMEs – are the enterprises with a much higher probability than others of facing a crisis. The percentage of insolvencies of SMEs in comparison to big companies in Germany was 99.7% in 2012 (Bretz, 2012).

A company crisis does not automatically mean the death of the company. The outcome is mainly connected with the stage at which the management recognises the crisis and initiates counteractions. To have the possibility of seeing the symptoms at an early stage, the company needs an Early Warning System.

The survey of Roland Berger shows that in 2001 around 80%, and in 2003 around 70%, of the companies that got into a crisis, first identified the crisis only in the acute stage of a liquidity crisis (Welsch, 2010).

The beginning of a crisis lies a long time before illiquidity. Andreas Crone (2012) describes in the book “Modernes Sanierungsmanagement” six parts of crisis: Stakeholder, Strategy, Product, Success, Liquidity Crisis and, finally, Insolvency.

A successful leader has to know the company processes, constantly develop new goals, innovate, make sure that the organization is still true to its core values and continues to nurture a culture that fosters continual learning (Frontiera & Leidl, 2012). To have the possibility of an overview of the whole area, s/he has to have an appropriate Management System.

Most of the models designed to identify company risk or crisis are focused either on quantitative, such as the operative EWS of Krystek & Müller-Stewens (1993) or Altman`s Z-Score model (Altman, 1968), developed further by others (Kurschus, Cvilikas, & Sarapovas, 2015) and also Fulmer`s H-Score model (Fulmer, Moon, Gavin, & Erwin, 1984) etc., or qualitative, such as the “weak signals” of Ansoff (1976) or Argenti`s A-model (Kurschus, Cvilikas, & Sarapovas, 2015). Several authors point out the need for a more holistic approach including both quantitative and qualitative factors (Bedenik, Drilo & Labas, 2012; Purvinis, Sukys & Virbickaite, 2005; Kurschus, Cvilikas & Sarapovas, 2015).

This is the central rationale of this research: to develop an approach that entails an optimum consideration of both quantitative and qualitative factors.

1.Relevance of the research

EWS success factors comprise issues related to market, company background/ identity, continuous improvement, resources, structure, processes and competence – these factors are regulated in ISO 9001 (Hinsch, 2014) and can be monitored by a quality management system (QMS). However, additional factors that are related to corporate aims and strategy need to be included and can be monitored by a CO system.

This research, therefore, draws on the combination of an existing QMS approach (Foster, 2013), where the process is driven by customer expectation (Evans, 2014) alongside consideration and integration with a Controlling system. From this (Bruhn, 2011) QM and CO are combined to form the proposed, more holistic EWS.

Companies within the food production industry need to demonstrate high quality, as its lack can lead to serious problems (Petersen & Nüssel, 2013), thus most have a quality management system (QMS) based on ISO 9001ff (Ruderer, 2009). This need and the evident use of QMS make the sector appropriate to the needs of this research.

1.2 Previous work within this topic

Table 1 provides a summary of recent examples of EWS. It is evident that regulations have influenced EWSs (Woll, 2007), and it is becoming apparent that such regulations now explicitly require an EWS to be in place; in particular, this is evident through the ISO 9001:2015 regulations.

Table 1 Previous work within this topic

Year	Description	Source
Four generations of Early Warning System (EWS)		
1970 - 1975	1. Generation of the EWS: focussing on handling threats by operative early warning, finance indicators, expansion and risks.	Hauser, 1989 Schulenburg, 2008
1975 - 1980	2. Generation of the EWS: operative early recognition indicators and potential chances and risks.	Schulenburg, 2008 Krystek & Müller-Stewens, 1993
1980 - 1990	3. Generation of the EWS: strategic early recognition of soft signals, strategic radar, potential chances and riks.	Welsch, 2010 Krystek & Müller-Stewens, 1993
1990 - thitherto	4. Generation of the EWS: strategic and operative early clarification, networking thinking, chances, risks and action.	Schulenburg, 2008 Krystek, 2007 Krystek & Müller-Stewens, 1993
Regulations		
1998	KonTraG (law for control and transparency in public limited companies – concern big companies!), require a holistic approach for EWS, where it explicit warn for only focussing to one area, such as for e.g. finance.	Woll, 2007
2007	BASEL II: requirement of an EWS.	Woll, 2007 Ruderer, 2009
2015	ISO 9001-2015 requires a risk oriented Quality Management System.	Hinsch, 2014

1.3 Research Project Structure

The project started with an explanation of aims, clarification of definitions and a review of the literature. There was a critical analysis of the current situation and existing systems. The project then outlined and explained the methodology used, identified requirements for an innovative and relevant EWS, followed by the exploration of CO & QM tools, appropriate for recognizing risk factors of company failure. The development of the EWS was then described and it was analysed for practical use by a case study. Finally, the development of best practice elements led to the conclusion.

2.Definitions

The defined terms are an essential part of this work in order to provide clarity in a confusing area. The definitions originate from the literature, as well as from the author, when no suitable source was found.

2.1 EWS

An Early Warning System (EWS) can be defined as an information system designed to warn companies when problems arise (Löhneysen, 1982) and where companies have to initiate counteractions (Götze & Mikus, 2000). The aim of an EWS is to identify risks/crisis in real time, where the company has enough time to handle them (Löhneysen, 1982). However, Trustorff (2012) states that an EWS has to recognize risk in the formation phase.

Bedenik, Drilo, & Labaš (2012, p. 672) perhaps give the best summary by saying that: "The role of early warning systems as an instrument for crisis aversion is in: revealing weak signals, transferring important information about environmental changes, prevention of business crisis, and constructing a creative base for timely and appropriate response".

An EWS is also a valuable tool for risk identification, informing its user in time about latent (invisible but existing) risks, thus optimizing company control (Romeike & Hager, 2013). It makes it possible for companies to gain valuable time for adequate reaction to imminent dangers or for using possible opportunities (Ruderer, 2009). The EWS is appropriate if it is able to recognize the risks both correctly and early enough (Hillebrand, 2005). Kloss (1984) states that both the environment and the company give out recognizable signs, which should be noticed.

The crucial point here is to identify the correct problem, especially considering the focus on SMEs. "In the SME sector the company's crisis identification is specific because of the nature of SME business management which creates the strong reliance of business results on human resources and environmental factors" (Kurschus, Cvilikas & Sarapovas, 2015, p. 152).

Furthermore, the information search and processing expenditure can be enormous, so that it is not within the capabilities of SMEs, in contrast to the large companies (Schlüter, 2004). The management has to start with the company policy and strategic plan, reducing complexity so that information for investigation could be found close to the symptoms, without an endless search for alternative problems (Kelders, 1996). This means that EWSs should be able to recognize both risks and an ongoing crisis (Reimer & Fiege, 2009).

2.2 Risk

"Risks are those events with the potential to have a significant negative impact on the organization " (Hopkin, 2013, p. 1). Schaper (2010) adds that Risk is an economic action combined with risk of loss. Risk in an organizational context is usually defined as anything that can have a significant impact on the fulfilment of corporate objectives, which can also be an opportunity (Hopkin, 2013). Krystek & Moldenhauer (2007) describe Risk as a companion for each business activity.
To bring clarity to the purpose of this initiative, the word 'risk' is used, throughout this work, to indicate negative events and/or those events with an unacceptable level of uncertainty.

2.3 Crisis: Types, Stages and Process

Company Crisis is a severe problem which often gets ignored. It can be described as an economic difficulty or as a threat to the company which will reach to the very border of its existence (Krystek, 1987). The final stage of a crisis is insolvency, which involves judicial proceedings (Crone & Werner, 2012).

Crisis is a process, and knowledge about its stages helps recognition of the signs and facilitates their better handling in an appropriate manner, which can be either active or reactive (Krystek & Moldenhauer, 2007). The crisis process can be of varying length, where extreme forms of long-lasting, only gradually accelerating, crisis processes are found, as well as abruptly-occurring ones, with rapid acceleration and extremely short processing time (Löhneysen, 1982). Krystek & Moldenhauer (2007) state that for the findings of appropriate starting points for crisis prevention and crisis management, a subdivision of the crisis process into distinct phases can, and must, be made.

The beginning of a crisis can be described as a combination of the efficiency factors, which are no longer workable, for the reason that one or more factors are no longer available (Bratschitsch & Schnellinger, 1981). The crisis could be calculable as well as incalculable, differing in the time during which the management has the opportunity to react (Krystek & Moldenhauer, 2007). The calculable crisis sends warning signals and the organization should react immediately to the crisis with a management and communication process (Löhneysen, 1982).

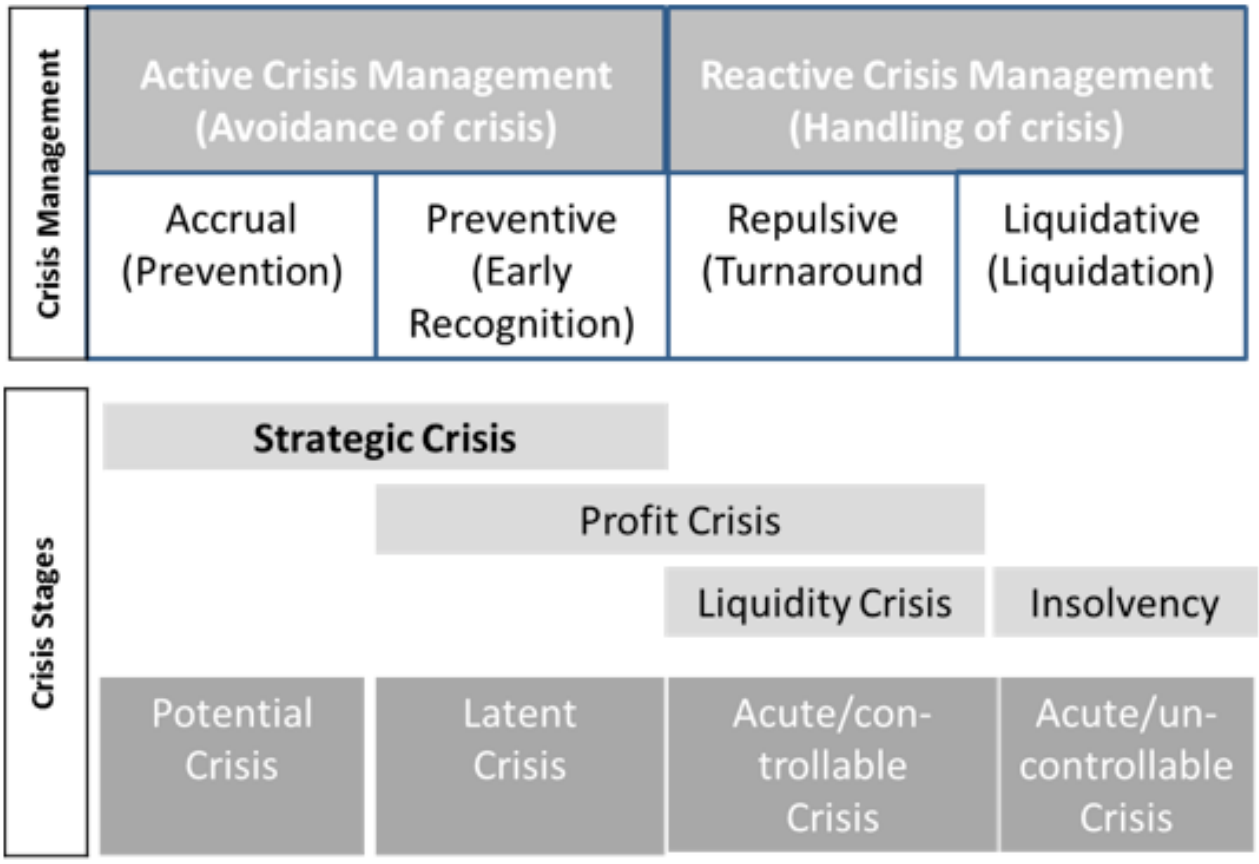
The incalculable crisis, in contrast, does not send any warning signals and the company has to conduct simulation scenarios for the recognition of them (Reineke, 1997). The establishment-, growth-, or maturity-crises are a part of the Life Cycle Stage and can cause suffering within the company if the counteraction does not work. There could be the beginnings of stagnation, shrinking, or growth crisis, which attack the development of a Company (Hohlberger & Damlachi, 2010).

Furthermore, a selling-, management-, purchasing-, technological-, or organizational crisis brings about an imbalance of the company and leads, at the end, to failure (Ackemann, 1986).

Each crisis stage marks the degree of the threat to the company, and it is indisputable that a crisis is at hand, when the company is over-indebted or illiquid and for this reason has to file for insolvency (Crone & Werner, 2012). This part is clearly defined by law (Hauschildt & Leker, 2000), but the aim of this research was to recognise the risks before a crisis arises and even if it does so, then it is better to realise the crisis at the beginning of the process. This begins with the potential crisis (shown in the figure below), where the company does not really realise that it has a problem (Krystek & Moldenhauer, 2007) because the symptoms of a crisis are difficult to see (Crone & Werner, 2012). The company needs to analyse the state of its health continuously (Krystek & Moldenhauer, 2007).

When the company can clearly recognise a long-standing crisis, it is already acute.

Figure 1 Crisis Stages and Crisis Management



Source: Welsch (2010)

The avoidance of crisis, “Active Crisis Management” is subdivided into Accrual and Preventive Crisis Management (Krystek & Moldenhauer, 2007). Accrual Crisis Management has, as reference point, the Potential Crisis, during which the aim is to avoid the onset of a crisis by specific prognosis (Leker, 1993). At the stage of Latent Crisis, the company should still be able to recognize the crisis in time and initiate appropriate measurements for Avoidance of Crisis (Krystek & Moldenhauer, 2007).

The handling of an existing crisis is called “Reactive Crisis Management”, subdivided into Repulsive and Liquidative Crisis Management (Leker, 1993). At the acute/ controllable crisis stage, Repulsive Crisis Management is responsible for taking all actions to effect Turnaround (Crone & Werner, 2012).

An acute/uncontrollable crisis is no longer manageable, and the company should be liquidated to achieve the best creditor satisfaction (Krystek & Moldenhauer, 2007).
The proposed EWS clearly needs to work before any crisis or at the potential crisis stage.

2.4 Quality Management

The success of many German companies is due to the quality of their products and services. Experience shows that these companies set Quality as a company aim as well as integrate it in the strategy and philosophy, led by employees and management (Brüggemann & Bremer, 2012).

ISO 9001 is the industry standard for Quality Management and its focus includes Continuous Improvement, Internal Customer-Contractor Relationship, Process-driven Organization and Working Structure, and Involvement and Motivation of all Employees.

In general, it can be said that Quality Management has the following stated principles, which a company has to demonstrate and improve:

- Customer focus
- People-centred leadership
- The management follows a systems approach; the company a process approach and decision-making a factual approach
- Continual improvement and a mutually beneficial supplier relationship (Tricker, 2014).

The advantage of a QMS is that you have a clearly defined process flow, clear company structures, high transparency, increased efficiency, traceability of products, sustainable quality consciousness, better image, reduction of mistakes and cost-cutting (Seghezzi, Fahrni, & Herrmann, 2007). By definition, QMS is a Management System for the conduct and control of a company in terms of quality, which, in turn, determines the policy and aims as well as the achievement of those aims (Giebel, 2011). ISO 9001 is appropriate as the basis for using the company flow chart for integration of additional management systems (Wagner & Käfer, 2010).

To maintain the effectiveness of an organization, its activity must be identified, linked, conducted and controlled, as the control loop of the model includes the customers, as well as the interested party, and therefore goes beyond corporate boundaries – only the Finance component is excluded (Giebel, 2011).

This work aims to remedy this omission of CO, explained below, and leads to the connecting of this to a suitable model of the effective relationships through a process model.

2.5 Controlling

Controlling is a management subsystem and has the role of supporting the management. Management has the task of planning, controlling, organising and leading the staff. Controlling ensures the necessary supply of data and information. A Controller can be compared with a doctor who is struggling to keep his patient in lifelong health; in the same way, the Controller is seeking a permanent positive development of the company (Fiedler, 2001).

To continue with this analogy, the necessity for a Controller is because of the individual nature of the decisions in every part of the company - as in a human body, where every part has its own individual purpose. A Controller (Doctor) has to check if all parts of the company (body) are working together towards the main goal and, if not, to analyze which part is not and what the reasons may be (Küpper et al., 2013).

Weber & Schäffler (2008) state that a Controller is responsible for business results, finance, processes and strategic transparency. Horváth & Gleich (2012) go a step further and assert that the company vision and corporate mission are the corner

stones of Strategic Controlling, which includes the product life-cycle concept, portfolio-analysis, SOFT-analysis, scenario-techniques and can be considered an appropriate tool for the EWS, which is often used to identify the first site of attack for a given scenario becoming reality.

Operative Controlling, in contrast, brings its aims and plans for measures into line with Strategic Controlling (Weber & Janke, 2013), which means it analyses and detects the market share, price development and so on. The task is to produce operational budgets, which include the financial plan, projected balance sheet, etc. followed by cost planning and operative control (Fiedler, 2001).

However, “Controllers ensure the transparency of business results, finance, processes and strategy and thus contribute to higher economic effectiveness. Controllers co-ordinate secondary goals and the related plans in a holistic way and organise a reporting system which is future-oriented and covers the enterprise as a whole. Controllers moderate and design the controlling process of defining goals, planning and management control so that every decision maker can act in accordance with agreed objectives. Controllers provide managers with all the necessary company management data and information. Controllers develop and maintain controlling systems” (International Group of Controlling, 2013).

3. Previous work within this topic

3.1 Development Stages of EWS in the Business Economics Literature

Early Warning Systems are not a new development in business, but were used, long before their application to business subjects, especially in the military field where their aim is to avoid surprise attacks (Rieser, 1980). Krystek (1987) adds that in other fields such as medicine, biology, meteorology and geology, early warning systems are long-established.

In the field of Economics, Aguilar’s (1967) concept of "Environmental Scanning” was mentioned by Hauff (2010) and followed in the early 1970s by the first generation: the so-called “operative” early warning. This not only focused on determining and identifying latent risks or threats (Kirschkamp, 2007) but also on detecting them so early that there still remained sufficient time to effect appropriate counteractions (Krystek & Moldenhauer, 2007). The basis for this EWS was historical values (Kirschkamp, 2007) meaning that reporting procedures were developed on the basis of key performance indicators (Hauff, 2010), where the early recognition was carried out in the classic bookkeeping way. KPIs do not really work efficiently in showing discrepancies, because there is only a signal for the internal, not external, environment (Hauser, 1989).

The development of the so-called “second generation” took place from 1977 to 1979 (Hauff, 2010) and included consideration of chances and opportunities (Krystek & Moldenhauer, 2007), as well as the lengthening of the planning horizon (Hauff, 2010). While the first generation only worked with annual plans and internal indicators, in the second generation, indicators were developed which were designed to identify longer-term changes, both internal and external (Hauser, 1989). These EWSs could not only recognize risks and dangers, but also latent opportunities and chances (Krystek & Moldenhauer, 2007).

“Strategic” forecasting is the third generation (Krystek, 2007) with the additional goal of early detection of risks and opportunities, as well as the initiation of appropriate counteractions (Schlüter, 2004). Krystek (2007) adds that the Ansoff (1976) Concept of “Weak Signals” is useable in this stage for the identification of Threats and Opportunities, both internal and external.

In contrast, Kirschkamp (2007) makes a further differentiation, where he divides the second generation into two parts: the ‘operative early’, on the basis of indicators, and ‘early’, with reference to a "strategic radar", which he calls the third generation. The forecasting is, for him, the fourth generation (Kirschkamp, 2007).

The last generation is based on Ansoff’s (1976) concept of "weak signals", which states that all changes and discontinuities in the corporate environment and the company itself via “weak signals" hint, where their observation predictions allow, with a sufficient forerun (Hauff, 2010).

However, the recognition of the crisis in time, in relation to the handling of the crisis by the EWS, shows whether the system is suitable for this purpose (Krystek, 2007). Quite simply, the crisis can be said to have been recognised in time when the company has enough time to handle it (Löhneysen, 1982).

3.1.1 EWS – forms of appearance

The historical stages of development for early warning approaches are very diverse and can be divided therefore into several different forms of appearance (Krystek, 1987):

3.1.2 Cross-organizational framework

One of the first and fundamental differentiations is the differentiation between the microeconomic and the macroeconomic early warning, where the macroeconomic early warning is not limited to just one company but considers whole regions or countries (Hauff, 2010). The focus here is on the early detection of cyclical development and changes (Nerb, 2001).

There is a variety of distinctive forms. A description of all features at this point is not helpful and would go beyond the scope of this work.

3.1.3 Differentiation between ‘operative’ and ‘strategic’ Early Recognition

Bedenik, Drilo, & Labaš (2012) describe ‘operative’ as short- term oriented and ‘strategic’ early warnings as long-term settings. Krystek & Müller-Stewens (1993) go into more detail by differentiating between operative early warnings, which are followed by short term measures of success and mainly aim at detecting risks, and strategic early warnings which have long term objectives, profit potentials and try to detect risks and chances. There are two ways of signal detection: by monitoring, which is the analysis of the environment limited to a single phenomenon, and by scanning, which is the activity of acquiring information (Kirschkamp, 2007).

Kunze (2000, p. 40) describes “environmental scanning” as “(…) the acquisition and use of information about events and trends in an organisation’s external environment,

the knowledge of which would assist management in planning the organisation's future courses of action". Hillebrand (2005) states that scanning is the formal scanning of the environment and the company with the aim of identification of the "weak signals", which afterwards will be analysed and completed by monitoring. Monitoring analyses the supposed changes in detail and describes them together with the forecast of the potential consequences (Kunze, 2000).

The operative EWS tries to prevent crises by frequently using instruments such as business ratios, projections and indicators (Kirschkamp, 2007). They are past-oriented, which has the disadvantage that some risks cannot be recognized in a timely way (Hillebrand, 2005).

The recognition of strategic risks is achieved by locating the signal of the discontinuous change, then analysis and subsequent evaluation of its relevance (Trustorff, 2012). With a strategic EWS it is more or less impossible to recognize the signs by indicators, which is the reason for the use of discontinuous factors and the advantage of more time for counteraction (Hillebrand, 2005). Kunze (2000) describes discontinuity factors as radar, which is oriented to "shadows" or "weak signals" signalling changes in the company environment.

Ruderer (2009) states that an EWS should be in use for both operative and strategic areas. "Operational early warning deals with data of high concreteness whereas strategic early warning deals with data of low concreteness" (Kirschkamp, 2007, p. 13).

3.1.4 Concepts of Strategic Early Warning Systems

3.1.4.1 Concept of Kirsch and Trux

One of the first concepts of Strategic Early Warning Systems was developed in 1979 by Kirsch and Trux. This characterizes strategic early recognition as a multi-paradigm problem and describes it metaphorically as "Disperse-Suck-Filter-System with systematic recycling and automatic filter check" (Krystek & Moldenhauer, 2007).

Due to the low precision of the dispersed and sucked signals they must be filtered (Hammer, 1998) and then checked for relevance (Krystek & Moldenhauer, 2007). However, errors can occur so that information and signals will be incorrectly evaluated and eliminated as irrelevant. Hammer (1998) states that in order to avoid this error and correct it, a so-called 'recycling' should be installed in the system offering the possibility of bringing back these filtered signals into circulation in order to be able to pick up them again, when the context changes. Recycling and verification of the relevance criteria can be seen, according to Müller (1986), as the main characteristic of strategic early recognition.

3.1.4.2 Concept of Battelle Institute

The Battelle Institute developed the first practical system for strategic early recognition in the early 1980s, also presented by Krystek (1987). Hauff (2010) states that this system is understood as being based on dynamic-based environmental analyses, a whole business-related monitoring system. It is divided into the following five sub-functions of early recognition (Hauff, 2010):

- Sign-oriented environment analysis
- Comparison between the premises of the strategic planning and the sign specific scenario results
- Evaluation of the deviation determination
- Search for strategic treatment alternatives
- Evaluation and decision about strategic treatment alternatives

3.1.4.3 Concept of Hammer

As a first process step, Hammer (1998) describes the observation of defined early clarification relevant corporate and environmental areas, and the recording of weak signals via “scanning” then monitored via "monitoring" (Hauff, 2010). The results obtained must then be documented, which categorises them directly during this first step, and they are then subjected to a first relevance test.

The second phase deals with the analysis of these weak signals and also evaluates the potential impact, using mathematical and statistical methods that determine the behaviour- and distribution patterns of signals (Hauff, 2010). Hammer (1998) argues for the analysis of the causes of these calculated patterns.

In Hammer’s (1998) third step there follows verification through objective and reasonable relevance, which is done by using a so-called discontinuity survey, a survey of “experts” in terms of their assessment of a specific question. Müller & Zeiser (1980) add that according to this survey three aims should subsequently be reached: determination of the potential impact of potential changes, determination of the probability for the appearance of these and finally the assessment of the necessity and urgency of reaction strategies. Hauff (2010) goes one step further and states that if reaction strategies seem to be necessary, these strategies have to be developed in an additional stage. Afterwards, this will then be evaluated, and a selection will be made (Bertram, 1993).

The last and most difficult part, according to Hammer (1998), is the implementation of the strategies developed in Phase 4 into concrete actions. This includes points such as the creation of operative plans, the organization and the monitoring of implementation (Hauff, 2010). Bertram (1993) states that Hammer’s concept is one of the most far-reaching considered, due to its detailed classifications and control function.

However, a few models will be outlined below, as also appropriate for the analysis of crisis, as well as insolvency.

3.1.5 Quantitative Models

3.1.5.1 Approach of Beaver

The approach, in the form of a univariate discriminant analysis, was developed in 1966 by William Beaver. Beaver (1966) carried out research, over a period of 5 years on 79 both successful and crisis-affected companies, based on 30 indicators, before any entrance into insolvency (Krystek, 1987). He pointed out the ratio of cash flow to (total capital / debt capital) as the most appropriate indicator for prediction of insolvency risks and states that it possesses a success rate of 78% for 5 years in advance

(Business Failure, 2008). The success rate of Beaver's formula is high but is due to the fact that its evaluations took place after the announcement of the results from researched companies and therefore it was "tailored" in accordance with these results (Business Failure, 2008).

3.1.5.2 Altman's Z-score

In order to take account of complexity, a bankruptcy diagnostics model based on linear multivariate discriminant analysis was developed by Altman (1968) (Kurschus, Cvilikas & Sarapovas, 2015). Altman (1968) examined 33 company pairs (solvent and insolvent, within the same industry sector and as far as possible with equal balance sheets) based on 22 KPIs (Deppe, 1992) and finally concluded that the following 5 KPIs provide the best results (Student Accountant, 2008; Kurschus, Cvilikas, & Sarapovas, 2015):

- Working capital / total assets = working capital over assets (X1)
- Retained earnings / total assets = return on assets (X2)
- Profit before interest and tax / total assets = profitability of assets (X3)
- Market value of equity / book value of debt = equity coverage ratio (X4)
- Sales / total assets = income to assets (X5)

"The first formula of Altman (1968) for company bankruptcy diagnosis faced criticism for omitting the specifics of sector, company size, geographical area and other important criteria, but this model was used in parallel as the background for company's financial state analysis and for further development of company crises assessment models" (Kurschus, Cvilikas, & Sarapovas, 2015, p. 154). Eidelmann (1995) adds that especially the index "sales / total assets", which is highly industry-dependent, were criticized in this model

Altman's adjusted formula was as follows (Kurschus, Cvilikas, & Sarapovas, 2015):
$Z = 6.56X1 + 3.07X2 + 6.72X3 + 1.05X4$

The range must be specified, due to the above information and in this formula is from 1.1.to 2.6.

The calculated KPI 'Z' of a company, can now be classified as follows: (Deppe, 1962):

- Companies with a Z of more than 2.99 are not in danger of insolvency
- Companies with a Z of less than 1.81 are in acute danger of insolvency
- Companies with a Z of 1.81 to 2.99 are in the "grey zone", which means that in the overlap area, errors of the first kind (insolvent companies are classified as solvent) and of the second type (solvent companies are classified as insolvent), may occur.

A further criticism of Altman's Z-score, made by Eidelmann (1995) was the focus on large companies with an average value of about $ 100 million (no company had a value below $ 20 million).

3.1.5.3 Fulmer's Model

Fulmer (1984) developed the so-called 'Fulmer's model', which includes 9 criteria that differ almost completely from those of Altman. In order to determine its function, Fulmer (1984) examined 30 corporate pairs, which had an average value of just $455,000 (Hospitality Review, 2006). Kurschus, Cvilikas, & Sarapovas (2015) state that Fulmer's model is treated as the one which can be used for SMEs and which was already empirically tested by research in New Zealand's economy.

Additional forecasting models which have been developed, e.g. by Springate (1978) or Taffler & Tisshaw (1977), will not be discussed in detail as they all have one thing in common: they are purely quantitative and relate only to historical values. An overview of each underlying KPI of the respective models is summarized in the following table (Kurschus, Cvilikas, & Sarapovas, 2015):

Table 2 Comparison of the criteria used in models for crisis identification

Models\ Criteria	Altman classic, 1986	Altman modified for Ltd's, 2000	Fulmer, 1984	Taffler & Tisshaw, 1977	Springate, 1978
Net working capital/ Assets	+	+			+
Retained earnings / Assets	+	+			
Retained earnings from previous years / Assets			+		
Profit before interests and taxes / Assets	+	+			+
Profit before taxes / Short-term liabilities				+	+
Profit before taxes / Assets			+		
Market value of equity / Liabilities	+				
Book value of equity / Book value of liabilities		+			
Sales / Assets	+	+	+		+
Cash flow / Liabilities			+		
Liabilities / Assets			+		
Short-term liabilities / Assets			+	+	
Long-tangible assets			+		
Working capital / Liabilities			+		
Long-profit before interests and taxes			+		
Short-term assets / Liabilities				+	
(Fast-moving assets – Short-term liabilities) / Operating expenses				+	

Source: Kurschus et al., 2015

The early recognition of risks of insolvency by KPIs based on balance sheets has, however, been strongly criticized. Schneider (1985) for example, believes that backward-looking indicators for forecasting future insolvency risks may be applied only if the following points are fulfilled:

- It can be proven that a valid probability of this indicator is existent both in the past and in the future
- This probability is constant over time
- There is a stochastic independence of bankruptcies, which is to say that no bankruptcies can be caused by bankruptcies

But these criteria cannot be met and will also not be fulfilled (Deppe, 1992).

3.1.6 Qualitative Models

3.1.6.1 Argenti's Model

In his A-score model, Argenti (1976) asserted that the primary measurement of data is not quantitative, based on information of a financial nature, but qualitative, such as the quality of the management or the market structure (Kurschus, Cvilikas, & Sarapovas, 2015). He developed a total of 17 criteria, which he divided into 3 groups: Management Weaknesses, Management Errors and Crisis Symptoms (Kurschus, Cvilikas & Sarapovas, 2015), which also included the building of sequential stages (Business Failure, 2008). To each of these criteria Argenti (1976) gives a specific code, on which basis the criteria should be scored and evaluated.

4. Overview of Previous Work

In summary, the development of EWSs is basically a process of evolution. The concepts of Aguilar (1967) and especially the concept of Ansoff (1976) can be taken as the origin of early detection. These were only strategic and qualitative in nature. Aguilar (1967) extended it by adding to the "scanning" component that of "monitoring", as the scanned risks cannot be recognized as such immediately because they are of a potential nature and accordingly must be checked regularly.

The work of Kirsch & Trux (1979) builds on these concepts and leads to a discontinuities detail form. Furthermore, they add the filter system, as a further component. Development of these concepts sought to make the search and evaluation of risk quantifiable and, for this reason, tangible for business and corporate governance.

The purely quantitative approaches based on crisis and insolvency risk calculation include the Beaver (1966), Altman (1986) "Alman's Z-score" or Fulmer (1984), Taffler & Tisshaw (1977), Springate (1978), which aimed to express the stability based on past values of the company's balance sheet by the use of only a few KPIs.

Krystek & Müller-Stewens (1993) picked up the theoretical approaches and developed primarily a key figure model by which risks could be quantified. However, since key figures are based on historical data, risks can only be recognized shortly before, or even after, their entry, this concept can only be used as an operative EWS. In addition, the ratios have been calculated only on the basis of internal company data and

disagree with, for example, Aguilar's (1967) "environmental scanning". Krystek & Müller-Stewens (1993) extended the model by a system, based on extrapolations and indicators and which predicted the "near" future and also took key figures from the business environment into consideration. Depending on the choice of indicators, this concept was also able to be given a partial strategic orientation. The advantage of this concept was that early detection, with reference to the ability to present the procedure on a scheduled basis, was implementable in a company. However, it is quite clear that the largely operative alignment is not sufficient to recognize all business risks and take counteractions, since the real weak signals and discontinuities cannot be quantified.

The Table below gives an overview of the previous concepts.

Table 3 Literature overview of concepts dealing with crisis or risk recognition

Concept \ Alingnment	Strategic/ operative	Qualitative/ quantitative	Precise/ vague	Theoretical/ practical	Internal / external
Beaver (1966)	operative	quantitative	precise	practical	internal
Aguilar (1967)	strategic	qualitative	vague	theoretical	prevalent external
Argenti (1976)	operative	qualitative	precise	practical	internal
Ansoff (1976)	strategic	qualitative	vague	theoretical	prevalent external
Taffler & Tisshaw (1977)	operative	quantitative	precise	practical	internal
Springate (1978)	operative	quantitative	precise	practical	internal
Battele-Institut (1978)	strategic	qualitative	vague	theoretical	prevalent external
Kirsch & Trux (1979)	strategic	qualitative	vague	theoretical	prevalent external
Altman (1986)	operative	quantitative	precise	practical	internal
Krystek & Müller-Stewens (1993)	prevalent operative	prevalent quantitative	precise	practical	prevalent internal
Hammer (1998)	strategic	prevalent qualitative	precise	practical	internal + external

Most of the models designed to identify company risk or crisis, as shown above, are focused either on ‘operative’, ‘strategic’, ‘quantitative’, or ‘qualitative’ models. Several authors point out the need for a more holistic approach (Bedenik, Drilo & Labas 2012; Purvinis, Sukys & Virbickaite, 2005; Kurschus, Cvilikas & Sarapovas, 2015; Geißler, 1995; Hammer, 1998).

This is the central rationale of this work: to develop an approach that entails an optimal consideration of strategic, operative, quantitative and qualitative factors.

Before the development of this model is described, a few approaches for risk and crisis identification should be mentioned.

5. Approaches to Risk and Crisis Identification

5.1 Bookkeeping Approach

Accounting data can be used for a variety of financial ratios that are indicative of the company's financial characteristics – solvency, liquidity, the contributions of debt in relation to equity in financing operations, the asset cover for the equity interests, rate of return, the interest cover given by the level of profits, the financial implications of the relationships between the separate and aggregative amounts of the different classes of assets and between the different classes of liabilities (Leker, 1993).

Leker (1993) analysed the possibility of an earlier diagnosis, before the manifest crisis arises, by a statistical method, where he developed KPIs, which send development signals, using debts and low accruals on the balance sheet, in comparison with other companies. The Earnings, Finance and Profit status emphasise the critical development.

The EWS forecast models of BEAVER, ALTMAN, WEIBEL, BEGHARDT and PERLITZ which were analysed by Deppe (1992) also use the balance sheet as their basis.
Hauschildt & Leker (2000) used the balance sheet as the basis for different KPIs to analyse how far they were appropriate for crisis diagnosis. The definition of the crisis, measurements and the tools of the balance sheet were clearly defined, however, the time necessary for handling the crisis was not defined. They state that when the result of the analysis shows the manifest crisis, shortly before insolvency, there is no space for a Turnaround.

To try to solve the problem of time Hauschildt & Leker (2000) analysed the usage of Participated Controlling analyses. Although no specific advice was given, it was clear that the crisis would be recognized much sooner by the Controlling analysis.

The result of the survey of Institut für Unternehmungsplanung also shows Controlling as the most appropriate location for Early Recognition (Krystek & Moldenhauer, 2007).

5.2 Controlling Approach

Company crises are connected by economic activity to the economic action and companies will not be able to eliminate them completely (Arlinghaus, 2007). Arlinghaus (2007) adds that Risk and Opportunity go together – he who does not risk will not win. In this way it is important to evaluate how high the risk is (Löhneysen, 1982). To manage risks the company has to foresee, identify, evaluate and control both Risk and the Opportunity (Reimer & Fiege, 2009). The company has to be aware of the past and the future in terms of Strength, Weakness, Opportunity and Threat (SWOT) analysis, which supports the leadership in decision making (Arlinghaus, 2007).

However, an Early Warning System should not only focus on the solutions to the problems when they have already reached a certain level, but aim to discover them early, before they have a disadvantageous impact on the company (März, 1983). "To

finish first, you first must finish" (Pocalyko, 2011, p. 1). Most companies do not die because they are wrong; most die because they do not commit themselves. They fritter away their valuable resources (Kautt, 2013).

Figure 2 Chinese Character for Crisis

Source: Löbig (2010)

The Chinese Character for Crisis, shown above, is made up of the signs for Chance and Threat (Hornstein, 2009), the idea of which is also expressed by an old Chinese proverb: "When the wind of change is blowing some people build walls and other build windmills" (Löbig, 2010, p. 64).

It is important, that the whole organization recognizes that Risk should not only be seen as a negative but can also have the potential to deliver improvement and lead the company into (more) success. Furthermore, it is an opportunity to have the possibility of identifying weaknesses of the system and then implementing an improvement process (Arlinghaus, 2007).

Löhneysen (1982) tried to design an EWS as a conceptual framework which shows the internal and external dangers at an early stage. Her opinion was that the level of threat will be measurable if the company establishes a basis with indicators which show it. The development of the system should include people, plant and the combination of people and plant in a certain relationship, as well as the determination of the internal and external monitoring area. The features should show the gap between the aim and the actual features of the company. The gap can be described variously as an aim, as normal, as crisis or as insolvency. She tries to achieve the quantification of crisis features, but the concrete result of the way the company has to recognise the crisis, is missing. The basic question is how the crisis situation is distinguishable from the normal situation.

Péter Horváth (Bratschitsch & Schnellinger, 1981) spoke at the Pfingsttagung Innsbruck 1979 about Zero-Base-Budgeting as a Crisis-Management Tool. He concluded that it would be appropriate as prophylaxis for the company, supplying detailed information for crisis planning. The company policy will be articulate; communication, motivation, coordination and control will be improved.

The above-mentioned arguments support the appropriateness of Controlling as an EWS, but will the information including operational results, such as plan figures,

operative key figures, possibility of query and informal information search by Controlling be enough?

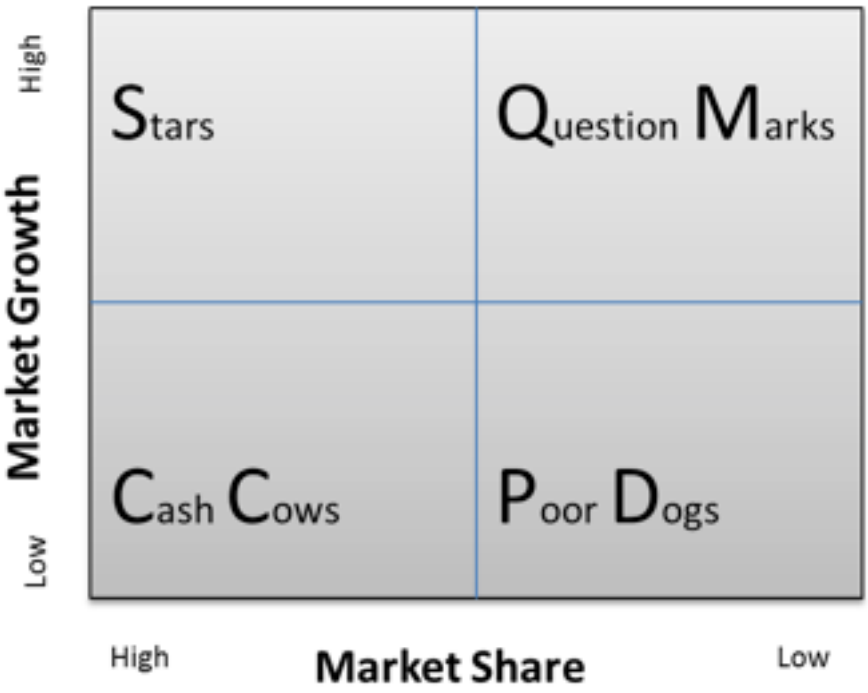
The fundamental idea of Ansoff's Concept (1976) is, in addition to the strategic plan, the impulse of weak signals for strategic discontinuity from the corporate environment (Löhneysen, 1982). At centre stage is the strategic discontinuity gathering from vague information, which does not explain what the content and the reception of the signals are. Ansoff (1976) does not give a definition of "Weak Signals". For this reason, the interaction of theory and early recognition require critical analysis of their suitability (Hauser, 1989).

A timeline of strategic planning is, in general, about five to ten years. It can be divided into six phases: 1. Strategic Analysis, 2. Development of Strategic Options, 3. Evaluation and Selection of the Most Promising Strategy, 4. Strategy Programs and Measures, 5. Realisation, 6. Strategic Control (Fiedler, 2001).

The connection between operative (up to one year) and strategic planning (five to ten years) delivers "tactical planning", which translates the qualitative, mostly relatively non-concrete information of the strategic planning into detailed, quantitative action-, budget-, and schedule-, planning of the operative division (Weber & Schäffel, 2011).

Hauser (1989) attempts to combine the Portfolio Analysis of Boston Consulting Group with Ansoff's concept of "Weak Signals", for the analysis of suitability for an early warning tool.

Figure 3 Portfolio Analysis



Source: Hauser (1989)

Hauser (1989) tries to structure the definition of an Early Warning Indicator (EWI) in different approaches. One interpretation of EWI is the 'If-Then' relation between the indicator and incident. In a second way, he tries to name them as 'operation' for short monitoring and 'strategic' for long monitoring, as well as qualitative and quantitative indicators. The efficiency of the EWI is a pattern which systematically monitors the relevant development of the company. The company has to fix the external and internal area of monitoring (Brühwiler, 2003). For every area, an indicator that sends a signal every time access changes should be developed (Bedenik, Drilo & Labaš, 2012).

Classical indicators show a clear relationship between indicator and occasion, while the analyst with the fundamental concept "Weak Signals" of Ansoff (1976) has only the possibility of guessing or intuition (Koch, 1996). How can the company bring the components of Market Definition, Gathering and Filtering of Information, Planning, etc. together as a whole system for the EWS?

5.3 Approach of the Balanced Scorecard (BSC)

The BSC, as a controlling tool, was developed by Kaplan and Norton in the 90s, and moves away from the traditional one-dimensional structure by adding Financial, Customer, Internal Business Process, as well as Learning and Growth and combines Vision and Strategy with the Objectives, Measures, Targets and Initiatives (Weber & Schäffel, 2011).

The BSC is a strategic tool appropriate for designing the whole planning, monitoring and control process, combining the key performance indicators from the past with the future value drivers (Allenspach, 2006), measurable by Company Value = Shareholder, Market, Customer, People, Future Value (Töpfer, 2000). Schröder (2005) states that the BSC combines aims and KPIs together.

Wolf (2010) confirms that the conventional KPI-systems are past and figure/ quantitative oriented, where the relation to the success process and company strategy is missing and the BSC, in contrast, can be described as the link between strategy development and implementation in the operative business. Schröder (2005) denotes the BSC as an aim-, not a KPI-, system, where the qualitative aims play a significant role, especially for risk management, and where not all information is decision-based, but also information-based, such as new laws. In conclusion, it means that in contrast to traditional agreed targets, the BSC does not only focus on quantitative factors, but also on qualitative.

The Balanced Scorecard acts as an EWS for emerging issues, which enables the company to implement changes. Krüger (cited in Hauser, 1989) analyses the success and failure by economic pressure and concludes that the lack of "Product/Market-Concept" is the most significant failure factor in the strategy area. The data basis of BSC are product-, and market-, related sales planning that will be evaluated by using data from market research and historical data (Weber & Schäffel, 2011).

Brühwiler (2003) states that the BSC is not appropriate as "stand-alone" for an EWS, as it does not include the environment, and is more a targeted system, whereas the QM is a leading model, describing the important elements, processes and functions of

a company by the determination of the organisational context, and together they can build the appropriateness for an EWS (Brühwiler, 2003).

6. Summary

The development of EWS has grown historically and has been formulated in more detail and partly adapted to the circumstances. With the awareness that risks exist for companies and that they can be detected even at an early stage in order to initiate adequate countermeasures, it is seen that it is now necessary to come to a very detailed division between operational, strategic, qualitative and quantitative, internal and external areas and EWSs. Numerous tools and methods have also been developed in order to identify individual risks and risk areas. However, the existing literature is very limited to the general, and thus relatively superficial, representation, as the concepts were developed for the application to many, if not all, types of enterprises and companies. This fact is apparent in Table 3, where only 2 of the 6 concepts, which have not been devoted to pure quantification, as e.g. an insolvency model, work not only in the theoretical sense, but also provide practical approaches such as the relatively precise function and description of its parts (Krystek & Müller-Stewens, 1993, as well as Hammer, 1998). However, these concepts also have a more one-sided view. Thus, the work of Hammer (1998) is very much focused on the strategic part of an EWS, while Krystek & Müller-Stewens (1993) are devoted to the operational view of the risks. Hammer (1998) concentrates on giving a very detailed structure of how a (strategic) EWS has to look, but without considering how its so-called "5-point plan", could be used or with which appropriate tools. Krystek & Müller-Stewens (1993), on the other hand, are very focused on a key indicator and / or indicator-based EWS, which, however, can only meet the operational requirements. This lack of depth in the descriptions and implementation approaches is a gap that ultimately leaves a lot of scope for individual interpretation or even intuition and is difficult to close for the SME.

This research seeks to close this gap, not by giving a "handbook" but at least a guide. In Table 3 It is easy to see that most criteria are quite strictly separated from one another. Among the most elementary separations in these EWSs are:

- Theoretical and practical
- Operational and strategic
- Quantitative and qualitative

For a holistic and applicable EWS, however, it is crucial to combine these sub-areas so that a smooth transition from the strategic to operative area, which includes both quantitative and qualitative aspects, is possible. It is precisely the interplay and the linking of the quantitative and qualitative areas that are particularly important to emphasize. In the literature, these criteria are strictly and stringently assigned to operational (quantitative) and strategic (qualitative). It is, however, a fact that these factors are inseparable because (almost) every quality can be quantified and (almost) every quantity describes a certain quality.

In the literature, "black-and-white thinking" has prevailed. There has been an attempt to divide the hard-to-grasp issue of an EWS into as many individual parts as possible, which, however, cannot, and do not, have a clear separation point, and attempts were made to make these sub-areas individually transparent, comprehensible and

applicable. This is a correct approach in a complex situation, but the parts have to be reassembled afterwards, so that the end=product is interlocked again and practicable, as otherwise it becomes a non-applicable, theoretical creation.

The subsequent parts of this work seek a combination of the best and most appropriate aspects of EWSs to provide a detailed practical recommendation. This is based on the two principal areas of CO and QMS and is supported by a pool of common tools and methods that are relevant for this branch of business, which combine to form a practically applicable, effective, relevant and holistic EWS.

“Can I ask you a question?” The Identification of Requirements for an Early Warning System for SMEs in the German Food Industry by using Semi-structured Interviews

Larissa Dell

“The art and science of asking questions is the source of all knowledge.”

Thomas Berger

Abstract

The research project on which this paper is based, deals with the development of a simple Early Warning System (EWS) integrating both a quality management system (QMS) and controlling (CO) tools, focusing specifically on German SMEs in the food production industry.

An EWS can be defined as an information system designed to warn companies when problems arise. Most of the models designed to identify company risks/crisis are focused either on quantitative or qualitative factors. Several authors point out the need for a more holistic approach including both quantitative and qualitative factors.

This paper, the second of a series of four, provides an Identification of the requirements for an Early Warning System for SMEs in the German Food Industry, by the use of Semi-structured Interview.

Keywords: Early Warning System, Controlling, Quality Management System, Holistic Approach, Semi-structured Interview, Expert Interview

Acknowledgements

Prof. Dr. Brian Terry and Dr. Seema Sharma, who acted as doctoral advisors at the University of Gloucestershire. Both guided me well through the research path over three to four years.

Special thanks to the members of the University of Gloucestershire, Dr. Philippa Ward, Dr. Barry Davies and Prof. Dr. Polke for their help in all matters of the doctoral study.

Funding:
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Abbreviations

AR	Action Research
BSC	Balanced Scorecard
CO	Controlling
EWS	Early Warning System
ISO	International Organization for Standardization
QM	Quality Management
QMS	Quality Management System
SAP	Systems, Applications and Products

SME Small and medium-sized enterprises
SWOT Strengths, Weaknesses, Opportunities, Threats

1. Introduction
2.

In the previous article, 'Crisis? What Crisis?', the search for an effective and appropriate EWS for Food Industry SMEs in Germany was introduced and it was shown that most of the existing models were either quantitative or qualitative whereas the central rationale of this work was to develop an approach that entails an optimum consideration of both quantitative and qualitative factors, and create a holistic EWS. Due to the lack of information in the literature on the existence, implementation and, design of EWSs for the food production industry (Ruderer, 2009), it was necessary to collect additional data through semi-structured interviews. In this second article, the rationale for using interviews is given, the structure of the interviews is described alongside the theoretical basis, drawn from an ongoing systematic literature review to inform topics to be addressed. In addition, issues that emerge from the interviews are also examined within the literature (Yin, 2014).

The requirements for a holistic EWS had been defined, categorised and compared to those identified in the literature and a unified listing drawing on both sources had been developed. The interview partners were given a short introduction and explanation of the research and background of the interview. Their responses were recorded, correlated and analysed. This article gives an overview of the applied methodology and methods for problem solving, as well as the selection of interviewees and the analysis of results. This is followed in the next article, "Good tools used in the right way", by an exploration of CO and QM tools, appropriate for recognizing risk factors of company failure.

The research was split into 4 phases, which were developed sequentially. The four phases each used semi-structured interviews as its core data generation mechanism.

2. Semi-structured Interview

The process of "Semi-structured Interview" provides structure while allowing improvisation; the interviewee has the opportunity to add important insights as they arise during the course of conversation, while the previously prepared questions offer a measure of focus (Myers, 2013). "If I conduct an interview, I am a constructionist" (McNamee & Hosking, 2013, p. 55). Saunders, Lewis, & Thornhill (2012) add that the Semi-structured interview is used to gather data that is normally analysed qualitatively.

"Expert Interview" is typically used for exploring a new field or for orientation in an unstructured field (Bogner, Littig & Menz, 2009). Flick (2010) helps by describing an Expert Interview as a specific form of applying semi-structured interviews, representing a group of specific experts. Semi-structured interviews seem to be appropriate to the chosen world view as constructivist, for this research, and the complexity of the topic, which can only be handled by having personal conversations with experts. It helped to identify requirements of EWS, as well as to explore best-practice elements of Controlling and Quality Management tools for the development of an EWS in SMEs.

3. Identification of requirements for EWS (Phase 1)

"The selection of expert-Interviewees was based on purposive sampling" (Flick, 2010, p. 168). An expert in this context could be defined as, "a person who is responsible for the solution of the problem or who has access to information needed for answering the questions" (Mayer, 2008). The experts here are either employed as interim managers or as turnaround consultants/advisors in struggling companies, with more than five years' experience in such roles. By virtue of their profession, this type of manager will have seen more of this situation than most.

Initially, three turnaround/interim management experts, listed in the table below, participated in semi-structured interviews.

Table 1 Interviewees from Phase I

Date	Interviewee	Background
23.06.2015	Expert 1	Experience: Turnaround Consultant/ Interim Manager / Consultant for EWSs
26.06.2015	Expert 2	Experience: Turnaround Consultant/ Interim Manager/Consultant for Excellence and Change Management
25.06.2015	Expert 3	Turnaround and Interim Management Advisor

The structure (guideline) of the interviews was drawn from an ongoing systematic literature review. The responses of the interviewees in the face-to-face interviews were audio-recorded and verified directly after interview by playback of all answers. This method generated rich data relevant to the research questions, which were exploratory in nature. As ISO 9001:2015 only came in in October 2015 and mandates a risk-oriented quality management system, this research required an approach that was able to explore tools that might not have been considered relevant or important, previously. Therefore, exploratory research offers a mechanism for considering the variations of experiences to date.

The requirements for an EWS were defined, categorised and compared to those in the literature and a unified listing drawing on both sources was developed, which was later shown to the interviewee during Phase II.

4. Analysing

For data analysis and confirmation, the interview protocols were transcribed and the data reduced by applying categories of requirements, best practice tools and aspects of how to manage and avoid company failure (Flick, 2010). Interview results were analysed after each of the three phases following six steps, recommended by Mayer (2008) as follows:

1. Marking Answers
   Audio and written records were extensively transcribed to produce a report and passages which were recognized as answers, were marked.

2.Classification by Category scheme
Categorization of the answers and tabulation of data permitted the inspection of differences among groups and helped to determine relationships between variables.

3.Establishment of Internal Logic
Establishment of internal logic between the individual pieces of information enabled consideration of both contradictions and confirmations.

4.Text Development for Internal Logic
The internal logic was detailed and specified in written form.

5.Text Analysis with Interview Excerpts
The analysis of text and interview excerpts was carried out.

6.Research Report
Finally, a report of the opinions, interpretations, recommendations, and results was produced.

The aggregated results of the interviews built an important basis for the EWS approach. as well as for the validation and final refining. In addition to establishing a sound theoretical basis, it was also vital to consider best-practice elements.

5. Ethics

The interview partners were asked for their permission to conduct audio recordings or to make notes and their names were anonymized following work by Flick (2009) and Yin (2014) Participation was entirely voluntary, and confidentiality was guaranteed for interviewees and participants in the research. Finally, each research participant had the opportunity to review their answers. Interview, protocol and other data were stored safely on the researcher`s personal computer and destroyed following completion and submission.

6. Confirmation of requirements for EWS

The main requirements for an EWS in the Food Production Industry were confirmed by the Turnaround Consultants and Interim Managers (Interview answers from Phase I). The information coming directly from the interviews is shown in italics for clarity.

The questions asked were as follows:

I.1 Are early warning systems an issue today?
I.2 What requirements must an early warning system in the food industry meet?
I.3 Which business areas must it be able to cover?
I.4 How important should it be in the company?
I.5 Which interest groups does it have to be tailored to?
I.6 Is there suitable software for an early warning system?
I.7 Who should be responsible for the adequacy of the early warning system?

6.1 Early Warning Systems – a topic in this day and age

The crucial results from these interviews are as follows:

-The (working) world is becoming increasingly complex: inconstant, uncertain, ambiguous and a complex environment and the only way to respond to such developments in good time, without trying to dominate the uncertainty, is to recognize risks in a timely fashion and prevent them at an early stage.

Janßen & Riediger (2015) state that due to globalisation, companies are much more affiliated with each other (the number of multinational companies has increased in the last 50 years from 7,000 to 104,000; it is estimated that it will reach 140,000 by 2020) and increase the complexity of risk.

-EWSs help to detect crises and counter them in order to control them early on, which increases the possibility of protecting assets and, in the end, of securing jobs.

Löhneysen (1982) describes the EWS as an information system designed to warn companies when problems arise where companies have to initiate counteractions (Götze & Mikus, 2000). The first participant summed up with the statement that

- they have to meet the requirements of risk management and help to connect to the future through information sampling.

The mentioned connection to the future equates to those identified in the literature review by Bedenik, Drilo, & Labaš (2012, p. 672) that “Indicators and EWSs are becoming more important as they can predict possible future changes in their early stages and thereby reduce the time needed to make adequate decisions”.

-EWSs are definitely an important topic in the Food Production Industry. They help to prevent large-scale disease by the improvement of information on, and thus prevention of, health hazards that are causally attributed to food consumption.

Bedenik, Drilo, & Labaš (2012, p. 672) conclude that, “The role of early warning systems as an instrument for crisis aversion is in: revealing weak signals, transferring important information about environmental changes, prevention of business crisis, and constructing a creative base for timely and appropriate response”.

-To be able, in both a timely and complete way, to protect the health of consumers, the company has to get warnings on prominent food and possibly product recalls of dangerous food and animal feed.

6.2 Requirements which an EWS in the food Production Industry has to fulfil

-EWSs should be holistic (strategic and operational) and practicable – so not too complex!

The literature review goes one step further and warns, Trustorff (2012), about the examination of operative and strategic risks in terms of independent reference parameters (potential for success versus operational success), time horizon (long-term versus short-term) and target dimension (strategic versus operational). In the long term the threats of potential success will affect the success and the liquidity situation of the company by wrong strategic decisions or changes in the company environment going unremarked. Conversely denoting a high operational risk potential produces a considerable restriction of the scope of action for handling strategic risks.

- It is not enough to collect purely financial data.

Kurschus, Cvilikas, & Sarapovas (2015) also state that it is not enough to look only at financial statements and financial ratios, because management capabilities, environment, human resources, ownership, and other qualitative factors are also important for preventing failure.

- if I do not every day check the direction in which the values go, I have a problem relatively quickly.

-All participants revealed that they need business numbers, production figures and the forecast of changes that can be expected in their industry in the future.

The literature review explains it in more detail by describing the design as a system, which should include people, plants and the combination of people and plants for a specific relationship (Löhneysen, 1982). These elements record data, stimuli, impulse, signals and information about a specific situation or development by analyzing them, measuring the probability of their occurrences and determining the strength of their effect on the company (Hahn, 1979).

-First interviewee indicated that EWSs have to bring in the information that is important for their business to them every day.

The information about risk coming from different sources should be combined to form a holistic system (Brühwiler, 2001).

-In summary, a Comprehensive Early Warning System consists of three areas: strategy, performance and operational financial economics. It should include quantitative (hard) and qualitative (soft) factors, which have to be future-oriented.

Wiedemann (1984) adds that it is important not only to look at quantitative but also qualitative aspects, which demands holistic thinking. Furthermore, strategic risks, due to the high degree of uncertainty, are difficult to quantify or calculate (Trustorff, 2012).

7. Business areas which an EWS should be able to cover

- Early Warning Systems should have an integrated financial Controlling system, so that the interaction between strategic and operational corporate management can be monitored and evaluated interactively.

This is in line with the results of literature (Meier, 2007 or Hauschildt & Leker, 2000).

- However, the internal and external risks for all business processes and relevant support processes must be considered.

The literature review also states through Löhneysen (1982) that an EWS should identify both internal and external dangers at an early stage.

- The Financial Economic Area, liquidity sizes, centralized Profit & Loss sizes, working capital - no area can be outsourced. All business areas have to be monitored.

Hauser (1989) stresses the fact that the company has to fix the external and internal area of monitoring and, for each area, there should be developed an indicator that sends a signal every time access changes.

- The necessary risk indicators must be identified, properly selected and analyzed and evaluated iteratively. It must first be created, and later observed, what is important for the company, for each sector, and this is of paramount importance. The whole thing will need effective and efficient communication to internal and external areas.

The literature review confirms this view in Ruderer (2009): that a modern EWS does not only predict as early as possible the future development but is also an entry point for critical discussion of cause-and-effect relationships, where the employees have continuously to deal with changes occurring in the company environment.

-An EWS should hold an independent position in a company, where neutral analysis and assessment is possible. However, it should be a top management information system – monitored by management.

7.1 Priority which an EWS should have in a company

This generally corresponds to the literature review in Bedenik, Drilo, & Labaš (2012) that monitoring is not a backroom function but instead an active process involving managers at all levels who share an awareness of the risks that the organisation faces by providing them with necessary organistional flexibility.

- Employee Fluctuation is an important parameter and is not anchored directly in the financial management area originally, but in the power economic sector in human resources. This can include a million things and should be configured accordingly.

Also, Brühwiler (2001) states that the information about risk coming from different sources should be combined to form a holistic system.

-In the end, the CEO must have a Management Cockpit, which shows him what happens daily and where the bottlenecks are, and where he has to intervene or respond.

This is in line with the results of the literature review, where “Some companies have developed a panel of early warning indicators, sometimes referred to as a risk dashboard, to track movement in selected areas that are crucial to the company`s well-being.” (Best`s review, June 2009).

7.2 Stakeholders by whom it should be agreed.

-EWSs should be designed for internal and external stakeholders with different reports, ideally based on central systems. The processes can possibly be extended to external suppliers and their value-added processes; other risks, barriers to trade or from natural disasters should be checked and adapted if necessary.

This is in line with the literature review, that early warning system has to satisfy some demand (Krystek & Moldenhauer, 2007).

-The data should be prepared in accordance with demand, especially in small businesses.

In general, this corresponds with the literature review that the information search and information processing expenditure is enormous, so that it is not manageable for SMEs because of lack of sufficient technological and human resources, in comparison to big companies, to overview the whole area (Schlüter, 2004).

-Top management is interested in liquidity figures; the Production Manager is interested in machine runtimes OEE (Overall Equipment Effectiveness). Timely data delivery also creates transparency and trust towards shareholders or lenders.

Gleißner & Meier (2001) state that an EWS has to predict the future of a company`s relevant variables as early as possible, as accurately as possible, as comprehensibly as possible and that employees are to be sensitized to critical handling of the recognition of changes in their area.

7.3 Software appropriate for an EWS

-Standard tools or software à la SAP for SMEs are not known - there are mostly self-made solutions.

This generally corresponds to the literature review, that the recommendation is, in general, to use Office applications (Ruderer, 2009), such as Excel, Visio, etc., as no EWS software, appropriate for SMEs exists.

7.4 Persons who are responsible for the appropriateness of the EWS

-The responsibility for the suitability of an EWS is definitely a management matter and is to be established accordingly at the highest decision-making and control level.

This is in line with the literature review that the CEO is responsible for the risk management, which is in the first step in any process or, to be precise, a management process (Brühwiler, 2001).

-It is important to understand that the property, resource, communication-oriented and timely handling of the relevant risks only works if the roles and responsibilities are clearly defined and are embedded in the organizational structures of the company.

This generally corresponds to the literature review that the CEO has to set up appropriate reporting obligations for the responsible divisions, which include all major risks and elements of risk management and amendments thereto (Schmidt, 2015).

-The EWS must be initiated in a top-down process, and thus the responsibility lies somewhere in the management. It could be located at the "Head of Controlling" but the commitment should come from the management.

What is even more important is that, in addition to developing such measures, they be a part of the reports that reach top management so that awareness is created at the highest level (Kurschus, Cvilikas, & Sarapovas, 2015).

-In contrast, it was also stated that there could be a range of appropriate people, depending on the specific CEO, CFO, IT - and which one has the experience- to select and create a list of requirements under normal circumstances, where the company has to decide what it wants to achieve, what needs should be included, how flexible and transparent it needs to be, and how safe it must be afterwards.

8. Summary

Requirements, which an EWS in the Food Production Industry has to fulfill, according to the results of semi-structured interviews carried out with Turnaround experts, and which also comply with the literature review:
EWSs should:

a. help recognize risks in a timely fashion and prevent them at an early stage
b. be holistic (strategic and operational) and practicable, so not too complex
c. be future-oriented
d. include quantitative (hard) and qualitative (soft) factors
e. monitor all business areas
f. consider internal and external factors
g. be a top management information system – monitored by management
h. be designed for internal and external stakeholders with different reports
i. match characteristics of the company (culture, structure, size and type of management)
j. be under the responsibility of the management with reference to its suitability

The above set of requirements was used for the development of an EWS approach for SMEs within the food production industry and the identification of appropriate tools.

This is covered in the third article in the series, “Good tools used in the right way”.

Good tools used in the right way. An exploration of Quality Management and Controlling tools, their effectiveness, relevance and usage, in the development of a holistic Early Warning system for SMEs in the German food industry.

Larissa Dell

"It is essential to have good tools, but it is also essential that the tools should be used in the right way".

Wallace D. Wattles

Abstract

This article, the third in a series of four, is based upon a research project to develop a simple Early Warning System (EWS) integrating both a quality management system (QMS) and controlling (CO) tools, specifically for German SMEs in the Food Industry sector.

The previous two articles established the identity and requirements of an EWS, through literature review and then semi-structured interviews with experts.

In this article, the research focuses on the examination and selection of Controlling and Quality Management tools for EWSs in the food production industry, which are appropriate for recognising risk factors of company failure. The toolkit of CO and QM is very large and it was necessary, with the help of two CO and two QM experts, independent of companies involved in the research's case studies, to identify the most appropriate of these, measurable by the company value, including shareholder value, market value, customer value, people value and future value (Töpfer, 2000), for EWSs, which match the requirements previously identified by turnaround experts. A matrix of categories equal to those identified and defined was shown to informants before interview.

The selection criteria evaluated not only whether according to the established requirements, the tools are effective, but also whether the SMEs have the required resources and capabilities for their implementation (Rocha-Lona, Garza-Reyes, & Kumar, 2013). The CO and QM tools were explored with the help of the experts, and then defined and categorized in comparison with those identified in the literature.

Keywords: Early Warning System, Controlling , Quality Management System, Holistic Approach, Semi-structured Interview, Expert Interview

Acknowledgements

Prof. Dr. Brian Terry and Dr. Seema Sharma, of the University of Gloucester, who acted as doctoral advisors. Both guided me well through the research path over three to four years.

Special thanks to the members of the University of Gloucestershire, Dr. Philippa Ward, Dr. Barry Davies and Prof. Dr. Polke for their help in all matters of the doctoral study.

Funding:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Abbreviations

AR	Action Research
BSC	Balanced Scorecard
CO	Controlling
EWS	Early Warning System
FMEA	Failure Modes & Effects Analysis
HACCP	Hazard Analysis and Critical Control Point
ISO	International Organization for Standardization
QM	Quality Management
QMS	Quality Management System
SAP	Systems, Applications and Products
SME	Small and medium-sized enterprises
SWOT	Strengths, Weaknesses, Opportunities, Threats

1. Introduction

This research project was focused on the development of an effective, relevant and practical Early Warning System for SMEs in the German food industry. Two previous articles, “Crisis, what crisis?” and, “Can I ask you a question?” described the results from a critical analysis of the literature and confirmation of the essential factors from a series of semi-structured interviews with expert interviewees.
As a consequence, the objective of developing a holistic EWS, using a combination of Quality Management (QM) and Controlling (CO) tools was reinforced and the requirements confirmed.

2. Exploration of CO and QM tools according to Literature

Based on the findings of the Literature Review and for practicable development of the final EWS approach, with the help of CO and QM experts, best-practice CO and QM tools, appropriate for an EWS within the food production industry, were explored.

2.1 Methods for determination of context

From the literature, appropriate tools for determination of context are PESTLE, Cross-Impact-Analysis, SWOT-Analysis (Meier, 2007; Hopkin, 2013).

2.1.1 PESTLE

“The common qualitative approach is the PESTLE analysis that considers the political, economic, social, technological, legal and ethical (or environmental) risks faced by the organization” (Hopkin, 2013, p. 64). The PESTLE analysis is a model which adds to the environmental analysis (Breitkreuz & Lange, 2011). Allenspach (2006) states that it belongs more to the strategic work, where the main and sub aims will be analyzed.

2.1.2 Cross-Impact-Analysis

Cross-Impact-Analysis is a method used in forecasting exercises aimed at measuring the correlation between future events (variables) (Ferretti, 2016). It is a quantitative method, which shows the interdependency within a problem area and creates understanding of connections (Wirtschaftslexikon, 2016). CIA is in order to identify how developments in one area interact with those in another. It is able to show how one situation impacts another situation (Ferretti, 2016).

2.1.3 SWOT-Analysis

“The SWOT Analysis has the advantage is also being able to consider the rewards available to the organization from the opportunities in the external environment. One of the strengths of the SWOT analysis is that it can be linked to strategic and tactical decisions; a danger is that it is not a structured risk classification system and, therefore, there is a possibility that not all of the significant risks will be identified” (Hopkin, 2013, p. 64). SWOT analysis also includes the non-financial aims and can be used as qualitative tool (Allenspach, 2006).

Figure 1. SWOT Analysis

2.2. Methods for risk identification

The literature describes Check Sheets, Brainstorming, Brain writing, Portfolio-Analysis, Delphi-Method, Scenario, Diffusion theory, FMEA (Meier, 2007). Altenähr, Nguyen & Romeike (2009) add the Fault tree analysis and SWOT analysis, which were already explained during the methods for determination of context, as appropriate common tools for risk identification. Krystek (1987) states that Planning is also a tool which helps to identify risks.

2.2.1 Check Sheets

Evans (2014) explains that Check sheets are data collection forms that facilitate the interpretation of data of two general types – “attribute”, where data are obtained by counting from some type of visual inspection and “variable”, where data are collected by numerical measurement on a continuous scale. Ruderer (2009) states that Check sheets are mostly forms, standardised by the leadership, which have to be filled in by employees for review of criteria completeness in different areas. She adds that QM-Audit is also a part of Check Sheet, wherein the Auditor analyses if the audit criteria is fulfilled.

2.2.2 Turtle Diagram

Turtle Diagram is a useful tool for describing, understanding and analyzing processes. It utilizes four legs to represent four questions about a process (with whom, with what, how, how many); and, a head and tail to represent the questions about the process inputs (what should we receive) and the process outputs (what should we deliver to meet expectations); the shell of the turtle is used for the process name (Jaeger, 2016). It sensitizes people to interfaces, shows dependences, transparency and determines measurements (TÜV, 2013). The gathered data is useful for risk identification and for building the basis of a systematic risk management (Benes & Groh, 2014). The consolidation of all risks from all processes can be used as basis for a holistic risk management (TÜV, 2013). At the end is it appropriate to conduct a SWOT-Analysis for validation of the process, which will show at the same time the opportunities for improvement (Hallbauer, Weltring & Crezelius, 2015).

2.2.3 FMEA

Failure modes and effects analysis (FMEA), also known as failure modes, effects, and criticality analysis, is used to identify ways a process or product can fail to meet critical customer requirements (Foster, 2013). It is used to determine high-risk functions or product features based on the impact of a failure, where it systematically considers each component of a system: identifying, analyzing, and documenting the possible failure modes within a system and the effects of each failure on the system (Pyzdek & Keller, 2013).

FMEA is a preventative model, wherein it is important to recognize the failure as early as possible (Romeike & Hager, 2013).

2.2.4 HACCP

“Hazard Analysis and Critical Control Point (HACCP) has been recognized internationally as a logical tool used in the food industry to identify potential food safety hazards so that preventive actions can be taken to mitigate the potential risks. The system continues to be used at all stages of the food supply chain” (Reuvid, 2013, p. 151). Petersen & Nüssel (2013) describe HACCP as a QM method which consists of the following seven principles:

- Procedure of Hazard Analysis
- Determination of Critical Control Points

-Determination of Critical Limits
-Monitoring of Critical Control Points
-Determination of Corrective Actions
-Verification of the HACCP system
-Documentation

2.2.5 Fault Tree Analysis

The Fault Tree Analysis (FTA) is a top down, deductive failure analysis, which analyses all possible reasons of one undesired deviation (top event) which, by interrelation, cause the disruption (Ruderer, 2009). Allenspach (2006) states that the FTA has the advantage that it also considers 'soft facts', such as technology, people, etc. Ruderer (2009) adds that deviation from qualitative to quantitative is also possible in this method.

2.2.6 Brainstorming

Brainstorming is a method for stimulating creative thinking by collating general and spontaneous ideas of a chosen group of staff members. The aim is to develop as many ideas as possible to ease problem-solving (Nagel, 2013). It is a process with a purpose and/or anticipated outcome that is applied to relatively complex or unstructured ideas. (Watton, Collings, & Moon, 2001).

2.2.7 Brainwriting

In this tool, diversity of opinions becomes obvious as each participant writes down their ideas on cards, which are displayed on a pin board. This has a high degree of effectiveness, as it commits contributions from everyone and attempts to organise and structure possible solutions (Nagel, 2013).

2.2.8 Delphi-Method

This is a method of expert survey for creating quantitative forecasts, which has proven itself in the generation of forecast information and assessment of changed constellations and discontinuities. The basic concept refers to the overall better results in the structuring and analysing of problems by a group of experts compared with individual assumptions (Götze, 1993). The experts estimate anonymously, via standardised questionnaire, future developments both qualitatively and quantitatively. The consensus of opinion ultimately obtained then forms a basis for strategic planning (Koslowski, 1994).

2.2.9 Trend Landscape

One of the well-known instruments for early detection is the generation of trend landscapes. This is especially helpful in relation to the processing of the information obtained through scanning and monitoring. Herein, the development of discovered individual trends should be checked for correlations and thematically combined or aggregated to rectifiable trends (Schlüter, 2004).

2.2.10 Diffusion Theory

Due to uncertainties regarding existing paradigms and invariants of diffusion backing (Innovation Setting) the implementation of change is possible. The diffusion theory includes empirically more or less secure legalities for the dissemination of events, ideas, innovations. The contagion effects in the spread of new forms of behaviour are the focus of diffusion research, whose results are shown in structural curves (diffusion functions). They interpret distribution patterns derived from empirical studies (Krystek & Müller-Stewen, 1993). The detection of diffusion patterns is divided into three distinct types of infection. Innovations spread. Either by infection of a constant percentage of uninfected persons per unit of time, or by exponential infection, the new ideas are transmitted from subject to subject. Combinations of constant and exponential running expansions can also be observed (Hammer, 1998). The benefit of the practical application of diffusion functions as an early Enlightenment concept is found over time, which leads to a better adjustment to changes in the business environment.

2.2.11 Scenario Analysis / Technique

Scenario Analysis demonstrates alternative situations and assists in the decision-making process (Nagel, 2013). It is an EWS appropriate for the identification of strategic business units at risk (Kötzle, 1993). Reimer & Fiege (2009) add that Scenario Technique is one of the most significant tools for strategic management and strategic controlling. The aim of this method is to explore the future developments and possible solutions, wherein incorrect planning can be identified through five steps (Nagel, 2013). In the first phase the examined field is structured and the time-horizon defined (Reimer & Fiege, 2009). The second phase identifies and examines the areas of influence of the examined field with the appropriate key factors, followed by the selection of the scenario and projection of the current situation onto the desired panning horizon (Nagel, 2013). During the fourth phase the scenario is elaborated, which could be done by sensitivity analysis (Reimer & Fiege, 2009). The last phase, also known as scenario-transfer, deals with the establishment of acceptance packages and deduction of practical consequences (Nagel, 2013).

2.2.12 Planning

Planning helps, with the use of known planning techniques in the development of strategic treatment alternatives for the handling of imminent change (Hauff, 2010). Krystek (1987) adds that planning helps to rethink, in advance, all events / developments with crisis potential in order to react fast when a crisis occurs.

When planning, the organization should consider the issues and determine the risks and opportunities to avoid undesirable effects (Ohligschläger & Below, 2015). “A plan prepared to take advantage of, or to minimize the effect of an event which is considered to be unlikely to occur but, if it did, would have a considerable impact on the organization’s ability to achieve the objective” (Krystek, 1987, p. 132).

2.2.13 Portfolio Analysis

Figure 2. Portfolio-Analysis

Portfolio-Analysis of Boston Consulting Group is a systematic evaluation of company`s business units or their product lines by the two variables of Market Share and Market Growth based on the product life cycle. Depending on Growth and Share the graph shows Stars, Question Marks, Cash Cows and Poor Dogs (Fiedler, 2001). Nagel (2013) adds that the portfolio analysis is based upon the life cycle of products and services, where all products pass through different phases by showing the company if the product/service is balanced.

2.3 Methods for risk monitoring and review

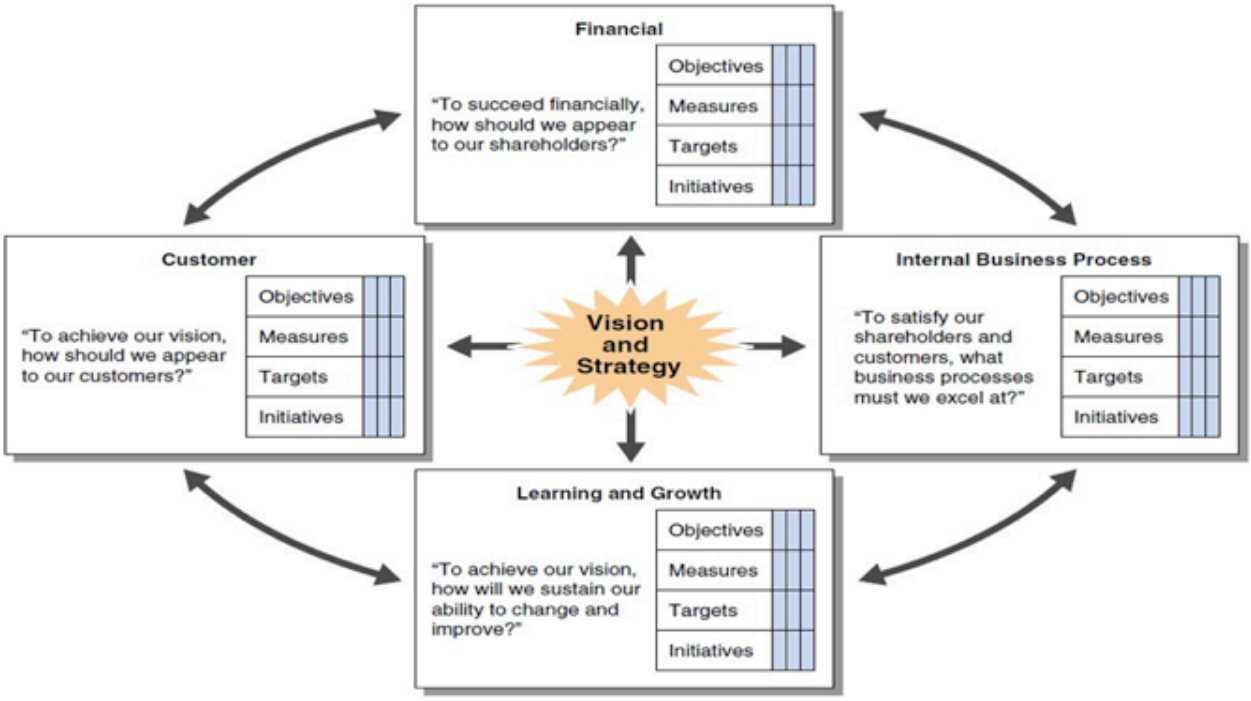
The literature describes the Balanced Scorecard as an appropriate tool for risk monitoring and review (Wolf, 2010; Brühwiler, 2003; Töpfer, 2000; Schröder, 2005).

2.3.1 Balanced Scorecard (BSC)

Balanced Scorecard is a strategic tool appropriate for designing the whole planning, monitoring and control process, which combines the key performance indicators from the past with future value drivers (Allenspach, 2006). Measurable by Company Value = Shareholder, Market, Customer, People, Future Value (Töpfer, 2000). Wolf (2010) describes BSC as a CO tool, which is appropriate for Risk Identification.

The BSC was developed by Kaplan and Norton in the 90s and moves away from the traditional one-dimensional structure by adding the Financial, Customer, Internal Business Process, as well as Learning and Growth, shown in the figure below, and combines Vision and Strategy with Objectives, Measures, Targets and Initiatives (Weber & Schäffel, 2011).

Figure 3. Balanced Scorecard



The BSC is a strategic tool appropriate for designing the whole planning, monitoring and control process, which combines the key performance indicators from the past with the future value drivers (Allenspach, 2006), measurable by company value = Shareholder, Market, Customer, People, Future Value (Töpfer, 2000). Schröder (2005) states that the BSC combines, in comparison to Du-Pont-KPI concept (focusing only on KPI's), aims and KPI's together. Wolf (2010) adds that the conventional KPI-systems are past and figure/quantitative oriented, where the relation to the success process and company strategy is missing and the BSC in contrast, can be described as link between strategy development and implementation in the operative business. In conclusion the BSC does not only focus on quantitative factors, but also on qualitative, as the four stages in the cause-and-effect networking as previous design area also have to include the qualitative aims (Töpfer, 2000).

3. Exploration of tools emerging from semi-structured interview (Phase II)

In addition to the tools above, from the literature, for the practical development of the final EWS approach, the tools used by interviewees from semi-structured interviews were considered as being particularly relevant for a practical EWS. The questions asked, independently focusing on both CO and QM tools in turn, were as follows:

1.Are early warning systems an issue in your practice?
2.The following requirements were listed for an early warning system by the restructuring consultants for the food industry (interview responses from previous stage). Do you agree with these?
-EWS should:
- help to identify risks in good time in order to be able to counteract them at an early stage.

-be comprehensive (strategic and operational) and practicableè not too complex.
-be future-oriented.
-consider quantitative (hard) and qualitative (soft) factors.
-record all business areas.
-take internal and external factors into account.
be a top management information system and monitored by senior management.
-be designed for all internal and external parties involved with different reports.
-be appropriate to the company's characteristics (culture, structure, size and management style).
-The management is responsible for the suitability of the EWS.
1.Which tools can you recommend as 'suitable tools' for this purpose, tailored to the requirements? What are they supposed to do?
2.Which of these would you classify as 'best practice elements'?
3.How can these be integrated into the company?
4.Is there suitable software for this?
5.Who should be responsible for the suitability of the tools?

The most important responses by the interviewees are as follows (in italics for clarity) together with reference to the relevant literature:

3.1 Early Warning Systems – a topic of CO and QM

-CO and QM deliver data which are very important for the decision maker. These data enable information-gathering at an early stage and risk-recognition in time and thus assist prevention of crisis.
-CO and QM help the managers study reports and compare them to the plans set earlier.
-Results that management receive help to rethink all events / developments with crisis potential in advance in order to react fast when a crisis occurs: which may motivate them to re-plan, to set new strategies, or to reshape organizational structure.

These responses are in line with the literature where Löhneysen (1982) describes the EWS as an information system designed to warn companies when problems arise where companies have to initiate counteractions (Götze & Mikus, 2000).
-All participants confirmed that EWSs are an important topic within the CO and QM area in the Food Production Industry.

3.2 Requirements (from Phase I of research) which an EWS in the Food Production industry has to fulfill

The requirements from Phase I, which an EWS in the Food Production Industry has to fulfill, were given by Turnaround Experts as reported in the second article of this series, “Can I ask you a Question?”.
These requirements were also confirmed by the CO and QM experts in Phase II

3.3 Tools confirmed as “best-practice elements” from the interviews.

-PESTLE
-SWOT
-Planning
-FMEA
-TURTLE
-HACCP
-Fault Tree Analysis
-Check Sheets
-Brainstorming
-Brainwriting

3.3. Integration in a company

-The beginning of early risk recognition lies, rather, in an attitude question and a question of open communication, of readiness to scrutinise existing things, and in the importance of critical discussion inside the company.
-Tools can only help to support when the company has an appropriate framework for them. The sixth interviewee stated that the employees must be sensitised to openness of critical discussion by cause-and-effect relationships.
-Employees continuously have to deal with changes occurring in the company environment. This all requires analysis or understanding of the new situation, and this knowledge, especially in SMEs, is often lacking.
-Companies should pay attention to communication and information policy, wherein the risk policy of the company should be written down.
-Tools can help identify, describe and control the risk, but the employees should be able to use the tools and to notice signs, coming from the company and environment.
-Whatever the tools of any system are, the company has to be able to tailor the framework to their own needs.
-The most important goal for this system should be an overview of the whole area.
-

3.4 Tool software appropriate for an EWS

-All interviewees agreed that a holistic standard tool or software for SMEs, according to the requirements and including the named tools, is not yet known - existing solutions are mostly self-made.
-

3.5 Persons who are responsible for the appropriateness of the CO and QM tools

-All participants indicated that the responsibility for the suitability of the CO and QM for an EWS is definitely a matter for Management and of the CO and QM employees.
-The fourth interviewee added that, if possible, it would make sense to involve IT experts, who can help to implement the tools and combine them appropriately.
-The fourth expert summed up by commenting that the recognition and monitoring of the relevant risks only works when the roles and responsibilities are clearly defined, and a workable framework exists.

4. A winning combination

It is clear that there exists between BSC and QM a strong relationship, where the information, according to the explanation of Seghezzi, Fahrni & Herrmann (2007), which comes from focusing on clients, processes and employees from the QMS, will also be found in the BSC. Töpfer (2000) states that QM and BSC are two sides of the same coin. The BSC displays the results of QM, which has is a tool that works to design and control the company (Töpfer, 2000). He adds that the measurement results and performance indicators from the Quality Management will be converted within the BSC into KPIs, which refer to all areas and enable the Quality Management to operationalize and make more useful than the score card.

The advantage of the combination of QM and BSC lies in a holistic system of process building and result control, enabling the company to measure much purposefully, to establish the control criteria more holistically making it possible to improve faster and more sustainably (Töpfer, 2000). The figures show the areas for improvement (Gehringer & Michel, 2000). The QM builds the infrastructure for the whole QMS and the BSC as a holistic Controlling, which focuses on strategy, planning figures and company development, subsequently translating the mostly qualitative information from QM into quantitative, meaning that the content result quality will be established and determined by BSC (Weber & Schäffel, 2011).

5. Summary

As shown above, the QM system in conjunction with BSC, fulfils the requirements of a holistic EWS by the inclusion of external and internal, strategic and operational, qualitative and quantitative, factors. The appropriacy of BSC, which was often criticized as too complex for SMEs, was analyzed in different studies and confirmed for the use of SMEs (Elshamly, 2013). BSC is an easily-manageable tool, which integrates tools available in the company (here: QMS) under the same roof to produce a holistic Management System (Töpfer, 2000). The steps of implementation will be summarized subsequently and the appropriacy for practice will be analysed through two Case Studies in the final article in this series, a “A Holistic Early Warning System”.

A Holistic Early Warning System. Final testing and verification of the design of a holistic Early Warning System for SMEs in the German food industry by using case studies.

Larissa Dell

"Learn how to see. Learn how to see that everything connects to everything else."
Leonardo Da Vinci

Abstract

An EWS can be defined as an information system designed to warn companies when problems arise (Löhneysen, 1982). Crönetz, Kögler, and Zimmert (2009) state that EWS success factors comprise issues related to: market, company background/ identity, continuous improvement, resources, structure, processes and competence – these factors are regulated in ISO 9001 (Hinsch, 2014) and can be monitored by a quality management system (QMS). However, additional factors that are related to corporate aims and strategy need to be included and can be monitored by a CO system.

This research therefore draws on the combination of an existing QMS approach (Foster, 2013), where the process is driven by customer expectation (Evans, 2014) alongside consideration and integration with a controlling system. QM and CO are taken together to form a more holistic EWS than if a single system were to be used in isolation.

This final article of four considers two case studies, used in Phase III of the research to confirm and refine best-practice elements in EWSs (Yin, 2014). The two studies were within two separate and independent medium-size companies. The first study was in a company, which is specialized in food production industry and the second study within company, which is also active in the food production industry. The studies involved three semi-structured interviews per study of the senior management of relevant functions: quality, controlling and the general management. A matrix of categories equal to those identified and defined in Phase II was used for comparing, validating or disconfirming elements and the final holistic EWS was confirmed.

Keywords: Early Warning System, Controlling, Quality Management System, Holistic Approach, Semi-structured Interview, Case Study

Acknowledgements
Prof. Dr. Brian Terry and Dr. Seema Sharma, who acted as doctoral advisors at the University of Gloucester. Both guided me well through the research path over three to four years.

Special thanks to the members of the University of Gloucestershire, Dr. Philippa Ward, Dr. Barry Davies and Prof. Dr. Polke for their help in all matters of the doctoral study.

Funding:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Abbreviations

AR	Action Research
BSC	Balanced Scorecard
CO	Controlling
EWS	Early Warning System
FMEA	Failure Modes & Effects Analysis
HACCP	Hazard Analysis and Critical Control Point
ISO	International Organization for Standardization
PDCA	Plan, Do, Check, Act
QM	Quality Management
QMS	Quality Management System
SAP	Systems, Applications and Products
SME	Small and medium-sized enterprises
SWOT	Strengths, Weaknesses, Opportunities, Threats

1. Introduction

Following a complete literature review, and an investigation by semi-structured interviews of both the requirements for an EWS and also the best-practice tools with which to achieve this, a case-study approach was used to test and verify these findings and lead to the development of a holistic EWS which is relevant, effective and practical.

2. Development of an EWS

Even with the final EWS approach it is possible to consider all details in advance. To Depré's (2011) observation that the beginning of early risk recognition lies rather in a question of attitude and of open communication, of a readiness to scrutinize existing things and of the importance of critical discussion throughout the company, Ruderer (2009) adds that a modern EWS should also include an entry point for critical discussion of cause and effect relationships, where the employees have continuously to deal with changes occurring in the company environment. "This requires some analysis or understanding of the new situation; it requires a background of knowledge or methods which can be readily utilized; and it also requires some facility in discerning the appropriate relations between previous experience and the new situation" (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956, p. 38).

Whatever the aim of the single system is, the company has to be able to tailor the framework to their own needs. The most important goal for this system should be to overview of the whole area as a combination and not as separate tools (Evans, 2014).

This EWS was tailored to the requirements explored and the tools identified by both reference to the literature and by semi-structured interviews with experts in order to

solve the central problem of this research: the development of a practical, relevant and holistic EWS.

The final development of the EWS used case study methodology to analyze its composition and verify its practical suitability.

The development was conducted in the following three steps by considering the requirements and best-practice tools from literature review and interview:

- Determination of context
- Methods for risk identification
- Methods for risk monitoring and review

2.1 General

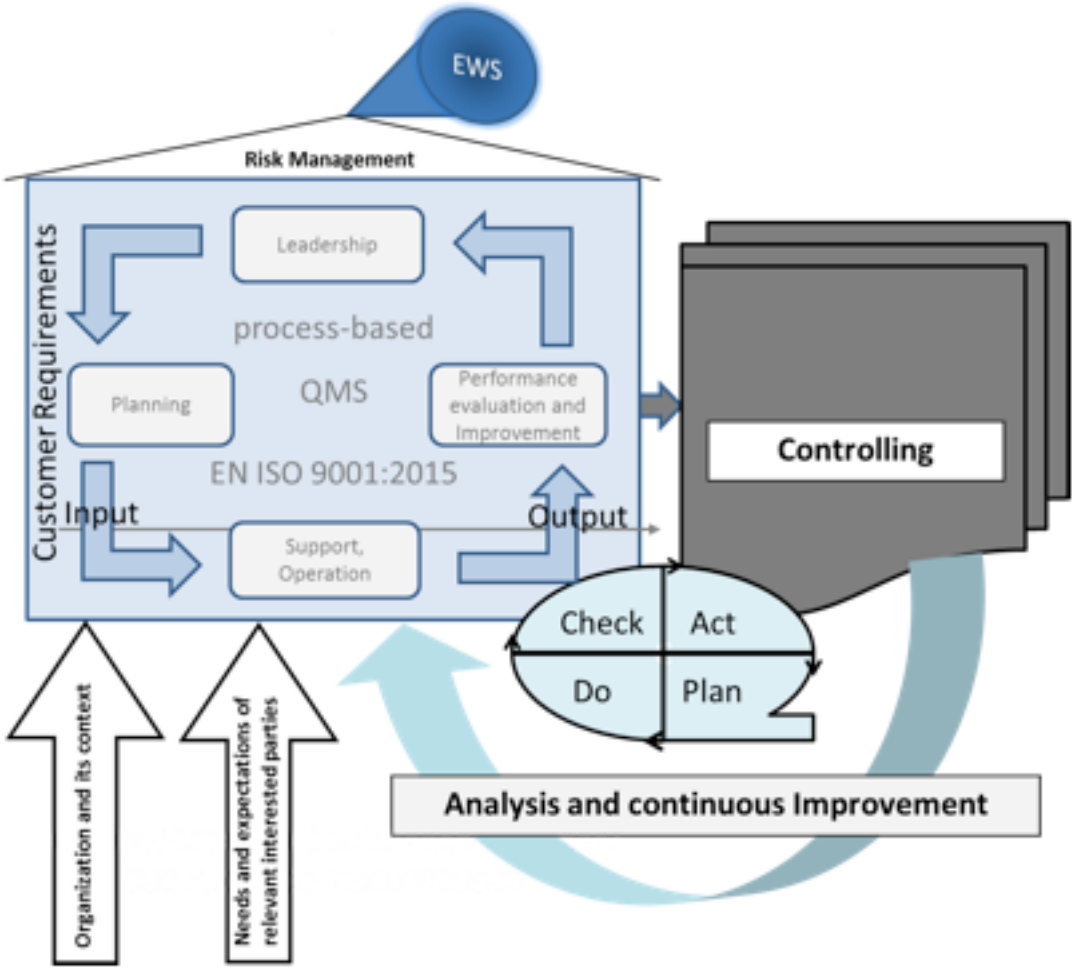
The companies within the food production industry have an absolute need for high quality as its lack can lead to serious problems (Petersen & Nüssel, 2013) and, for this purpose, most of them already have a quality management system (QMS), where the basis is ISO 9001 (Ruderer, 2009). QMS is a Management System for conduction and control of a company in terms of quality, which determines the policy and aims as well as the achievement of the aims (Giebel, 2011).

Crönetz, Kögler, and Zimmert (2009) cite EWS success factors comprising market, company background/identity, continuous improvement, resources, structure, processes and competence – these factors are regulated in ISO 9001 (Hinsch, 2014) and can be monitored by the QMS. ISO 9001 promotes the adoption of a process approach.

The process approach involves the systematic definition and management of processes, and their interactions, where any activity that receives inputs and converts them to outputs, so as to achieve the intended results, is in accordance with the quality policy and strategic direction of the organization (Tricker, 2014). Management of the processes and the system, as a whole, can be achieved using the PDCA cycle with an overall focus on risk-based thinking aimed at taking advantage of opportunities and preventing undesirable results, where often the output from one process becomes the input for another process (CEN, 2015).

However, the additional factors of aims and strategy need to be included and these can be monitored by the CO system (International Group of Controlling, 2002). Controlling supports Management with transparency, shows them potentials for cost cutting and measurements for increasing profitability, but the Managers claim that they communicate only the aim of cost cutting, without the recommendation of the possible way of reaching them (Belkin, 2011). As risk management takes place between the poles of customer requirements and customer satisfaction (Brühwiler, 2001), it was decided to use the existing QMS (Foster, 2013), where the process is driven by customer expectation (Evans, 2014) along with a Controlling System. Bruhn (2011) pointed out, that for efficiency of QMS, QM and CO belong together in a holistic EWS (cf. Figure 1). Weber (2011) adds that Controlling together with the Quality Management system is able to react in a very short time to cost cutting and cash generation by means of “Plan, Do, Check, Act”.

Figure 1 Holistic EWS



Source: own illustration, based on EN ISO 9001:2015

Controlling supports Quality Management with process costs information, which helps to identify and specify reasons for a problem and define the operative value driver. There should not only be a systematical combination, but also a personal one (Weber, 2011).

3. Phase III: Case study approach

The previous phases of the research, including a systematic literature review and semi-structured interviews, helped to identify best-practice elements for the development of an EWS. In Phase III two case studies were used in order to confirm or disconfirm the identified best-practice elements. The relevant findings were used as a template with which to confirm, disconfirm or refine the empirical results by the case studies.

The advantage of case study is that the researchers test or explore theories of real-life situations (Kumar, 2011). Gerring states that a natural advantage of a case study research is the exploratory nature, which “is all about ‘casing’ – defining the topic, including the hypothesis of primary interest, the outcome, and the set of cases that offer relevant information vis-à-vis the hypothesis” (Gerring, 2009, p. 41). “Gathering

information through face-to-face contact with individuals goes back many years" (Zikmund, 2010, p. 209), where a case study researcher should be able ask good questions, to be a good listener, adaptive, flexible, unbiased by preconceived notions, must have a firm grasp of the issues being studied and bring high ethical standards to the research (Yin, 2014).

"Listening, therefore, goes beyond mere hearing of spoken words and requires intuitive understanding of the interviewee`s actual meaning" (Ng & Coakes, 2014, p. 64). In sum, it is important to have enough theoretical knowledge and to be a good listener in order to be able to handle the challenge in a case study.

However, the bounding of the case, which is important to determine the scope of data collection (Quinlan, 2011), was realised by the knowledge-gain of two Food Production Companies. From this, answers to research questions were obtained from experts' practical experience for practical appropriateness.

3.1 Phase III : Case Studies

Two studies were used in Phase III to confirm and refine best-practice elements for EWSs (Yin, 2014). The two studies were within two separate and independent medium-sized companies. The first was in a company, which is specialized in food production industry for fruits and vegetables, and the second within an organization, which is active in milk products. The studies involved three semi-structured interviews per study of the senior management of relevant functions: quality, controlling and general management.

Table 1: Details of Experts and Companies in Case Studies

Date	Participant	Background
06.09.2016	Expert 8	Medium-size company in food production industry (Milk products). Interview of relevant function: GM
06.09.2016	Expert 9	Medium-size company in food production industry (Milk products). Interview of relevant function: CO
06.09.2016	Expert 10	Medium-size company in food production industry (Milk products). Interview of relevant function: QM
29.08.16	Expert 11	Medium-size company in food production industry (Fruits and vegetables). Interview of relevant function: GM
29.08.16	Expert 12	Medium-size company in food production industry (Fruits and vegetables). Interview of relevant function: CO
29.08.16	Expert 13	Medium-size company in food production industry (Fruits and vegetables). Interview of relevant function: QM

The EWS approach was developed during Phase II on the basis of literature/ interview, own logical approach and then validated by the informal exchange of ideas with experts. The developed model was shown to the companies with the aim of analyzing the appropriateness of implementation and use in SMEs of best-practice elements designed by experts and literature review.

3.2 Expert Interviews within the Case Study

The questions posed during the Case Studies were as follows:

1. Does your company have an early warning system?
2. Which 'tools' are used for this?
3. How satisfied are you with the current tools?
4. Which interfaces are particularly critical?
5. How is secure and efficient communication and cooperation created among those involved? Are tools of the CO / QM used for this, which are binding for everyone?
6. How is the obligation to collect information for corporate security ensured?
7. How is the obligation to provide information for external company security ensured?

At this point, the interview partner was introduced to the developed EWS and the following questions were discussed.

1. What are your critical comments on the developed early warning system?
2. What other requirements would you place on the developed early warning system, taking into account the requirements of the restructuring advisors?
3. In which situation do you see this system most likely to be implemented in practice?
4. What are measurable risk criteria that should be integrated into this system?
5. What added value could this early warning system achieve for the company?
6. What additional effort would the parties involved have to make for the system?
7. What are the aspects that would make the system more difficult to use in practice?
8. In your opinion, can this system increase the company's livelihood?

The following are the main results for the practical use of an EWS in the Food Production Industry, given by the CO, QM and General Managers. Interviewees' responses are given in italics for clarity and then compared with the literature.

3.3 EWS already existing in the company

-All interviewees agreed that EWSs are definitely important in the Food Production Industry. Several regulations of the European Food Safety Authority on areas such as normal conditions of use, health effects, toxicity, children, microbiological factors, hygiene and even animal feed build the framework for the evaluation of food and further proceeding during a company's Crisis Management. All participants confirmed that Crisis Prevention occurs by fundamentals of HACCP, where all manufacturing processes are regularly verified.

-An EWS helps to prevent large scale disease by the improvement of information on, and thus prevention of, health hazards that are causally attributable to food consumption. To be able, in both a timely and complete way, to protect the health of consumers, the company has to get warnings on prominent food and possibly product recalls of dangerous food. Reuvid (2013, p. 151) agrees with this opinion, as shown by the statement “HACCP has been recognized internationally as a logical tool used in the food industry to identify potential food safety hazards so that preventive actions can be taken to mitigate the potential risks. The system continues to be used at all stages of the food supply chain”.

3.3.1 Tools use for EWS in the Case companies

-HACCP, Planning, ERP were named by the ninth, tenth and thirteenth participant.

3.3.2 Satisfaction with current tools

- All interviewees agreed that EWSs should be holistic (strategic and operational) and practicable – the current tools focusing either on QM or to CO. It was added that the system could bring together more additional information, such as market information, which would help to check the direction in which the values go for a quick response.

3.3.3 Critical interfaces

-All participants confirmed that a standard tool or software for SMEs does not exist and so this obliges companies to utilize self-made solutions. They added that the company has to bring the strategy, performance and operational financial economic area more closely together, to be more future-oriented, which is sometimes not easy.

3.3.4 Tools used for communication and cooperation of involved parties

-All interviewees agreed that Meetings, E-Mail and Phone is used for communication with reference to this topic.

3.4 Medium for obtaining of information for the company’s protection

-Articles and Meeting were named as an appropriate medium for the obtaining of information for the company. The literature review names journals, books, radio, TV, Internet, blogs or social media as the source for the location and recognition of relatively weak signs (Trustorff, 2012).

3.5 Information process provided for the company’s external protection

-The Crisis Management System describes the process of communication. The EWS is designed for internal and external stakeholders with different reports, based on central systems. Hauser (1989) shares this view and states that the company has to fix both the external and internal areas of monitoring and, for each area, there should be developed an indicator that send a signal every time access changes. The twelfth interviewee added that some processes are

extended to external suppliers and their value-added processes; other risks, barriers to trade or from natural disasters are checked and adapted if necessary.
-Data is prepared in accordance with demand, especially in small businesses. Top management is interested on liquidity figures, etc. This generally corresponds to the literature review, where Bedenik, Drilo, & Labaš (2012) point out that the participation of employees is also important in EWSs, as the system needs to match the characteristics of the company (structure, culture, size and type of management).
-

At this point the developed EWS proposed was presented

3.6 Critical comments on the developed EWS

-All interviewees agreed that EWSs should be not too complex. This matches the statement of Kelders (1996) that the information search process of a company has to be realistic, clear and simple.

-It was added that the EWS has to fulfill the claim of providing the possibility of reacting to information quickly, which means that the analysis of the information should be easy to handle. It was mentioned that some tools demonstrated require a certain knowledge, which is often not available in SMEs. This is in line with the literature review where Rocha-Lona, Garze-Reyes & Kumar (2013) recommend during the selection criteria process not only to evaluate whether the selected tools are needed, but also whether the SMEs have the required resources and capabilities for the implementation.

3.6 Realization of this system in praxis

-All interviewees indicated that all business areas have to be monitored. The literature reveals that the Scanning and Monitoring should include the micro and macro environment (Trustorff, 2012).

- The necessary risk indicators must be identified, properly selected and analysed, which could be done by an integrated financial Controlling system. Krystek & Moldenhauer (2007) explain that early warning indicators have to fulfill some demand and demonstrate the following attributes: singularity, completeness, timely availability of information and economic justification.

-The internal and external risks for all business processes and relevant support processes must be considered, which could be done by QM and GM. However, the whole thing will need effective and efficient communication to internal and external areas. This generally corresponds to the literature review, that especially during the SMEs, the management has to start with the company policy and strategic plan, reducing complexity, so that the exploration of information could be found close to the symptoms, without an endless search for alternative problems (Kelders, 1996).

3.7 Measurable risk criteria which should be integrated in this system

-All participants agreed that all risks, which could be of danger for the company should be included. This is in line with the literature review by Schmidt (2015) that

the risk identification should include all risks which need to be considered during the decision-making process by management.

3.8 Additional benefits for the company from the use of EWS

The perceived benefits of use can be summarized as follows:

-helps recognise risks in a timely fashion and prevent them at an early stage
-holistic (strategic and operational) and practicable
-future-oriented
-includes quantitative (hard) and qualitative (soft) factors
-all business areas could be monitored
-internal and external factors could be considered
-it could be designed for internal and external stakeholders with different reports.
-

This is in line with the literature review.

3.9 Additional effort, which participants have to make for the system's use

-All participants agreed that the management should take the responsibility for the use and suitability of an EWS. Kurschus, Cvilikas & Sarapovas (2015) share this view with the statement that "In the SME sector the company's crisis identification is specific because of the nature of SME business management which creates the strong dependability of business results on human resources and environmental factors".

-It was indicated that some additional education of some users will be needed. This is in line with the literature review, that often SMEs lack of sufficient technological and human resources, in comparison to big companies (Schlüter, 2004).

-It should be a top management information system – monitored by management. The literature indicates that the CEO has to set up appropriate reporting obligations for the responsible division (Schmidt, 2015).

3.10 Aspects which could make the use of this system difficult in praxis

-It was pointed out that the beginning of early risk recognition lies rather in an attitude question and a question of open communication, of a readiness to scrutinize existing things of the importance of critical discussion throughout the company, which is often missing, especially in SMEs. This generally corresponds to the literature review by Ruderer (2009) that a modern EWS does not only predict as early as possible the future development but is also an entry point for critical discussion of cause-and-effect relationships, where the employees have continuously to deal with changes occurring in the company environment.

-The developed EWS requires a background of knowledge or methods, where the responsibility for the suitability of an EWS is definitely a management matter, which is often questionable. The literature reveals that "Board members, CEOs, and divisional directors are the main users of early warning systems, while the lack of experts for gathering and analysis of indicators, as well as the absence of

management initiatives are the crucial reasons for deficiency in early warning systems implementation" (Bedenik, Drilo, & Labaš, 2012, p. 672).

3.11 Increase assurance of the company survival

-All participants claimed that the (working) world is becoming increasingly complex: inconstant, uncertain, ambiguous and complex environment and the only way to respond to such developments in good time, without trying to dominate the uncertainty, is to recognize risks in a timely fashion and prevent them at an early stage. The literature review indicates that these are the measures which, after surpassing certain previously set boundary, indicate the occurrence of change and development of new trend; they represent signals of possible upcoming crisis but cannot predict the magnitude and time of indicator materialization and impact on the firm (Bedenik, Drilo & Labaš, 2012).

-All agreed that EWSs help to detect crises and counter them in order to control early, which increases the possibility of protecting assets and, in the end, of securing jobs. This is in line with the literature review and Best`s review (June 2009) where he states that good risk information can be used to develop early warning systems that alert an organization to potentially dangerous situations.

-It was indicated that EWSs have to meet the requirements of risk management and help to connect to the future through information sampling. This view is also shared by Bedenik, Drilo & Labaš (2012, p. 672) in the explanation that „Indicators and EWSs are becoming more important as they can predict possible future changes in their early stages and thereby reduce the time needed to make adequate decisions.

The interviewees of the last validation turn confirmed that the developed EWS approach is appropriate as a holistic model by including qualitative and quantitative tools, for risk / crisis identification, as well as for monitoring and review of them. The interviewees recognized that this EWS could lead to better communication and, in the end, help to connect to the future through information sampling, which helps recognize risks/crises earlier.

The gain of internal and external information was named by interviewees as confirmation of the suitability of daily use for this EWS. The demonstrated tools of the EWS were also confirmed, except for a few comments, as appropriate for practical use during this topic.

4.Phase IV: confirmation/refining

The research had previously identified the following best practice elements and aspects in the respective industry, and these were confirmed by the case studies:

-PESTLE
-Cross Impact Analysis (CIA)
-SWOT
-Scenario technique
-Planning
-FMEA
-HACCP
-Turtle-Diagram

-Fault Tree Analysis (FTA)
-Creativity methods
-Balanced Scorecard (BSC)

Yin (2009) recommends further investigation and refinement of best practices accordingly. Subsequently, after confirming / refining, the aggregated results of the interviews were integrated in the developed mode. Further analysis of the theoretical basis and recognition with the statements from the practice were considered alongside the technical, financial, organizational, technical and operational viewpoints. This approach enabled the verification of a practical EWS, which was compared, validated and refined appropriately, and could finally be examined for implications.

5. Implications from the case studies for the development of an EWS

5.1 Practical appropriateness from a technical point of view

For the practical use of the EWS it is necessary to fulfil some technical requirements. The use of the tools is Microsoft-based, where an interface to the company software/ ERP and to internet is necessary, which should be no problem nowadays. All participants should have access to the system. Besides the technical restrictions, is it important that the participants are motivated for open and cooperative teamwork.

5.2 Practical appropriateness from an organisational point of view

It is fundamental that an interface to QM and CO systems exist. For the introduction of the EWS in a company it is important to consider the company culture and a common understanding. In summary, according to the interviews, the appropriateness from an organisational point of view can be confirmed.

5.3 Operational capability of the tools

In general, it can be said that the developed tools are appropriate as best-practice for use during the EWS.

5.4 Practical appropriateness from a financial point of view

As the EWS is Microsoft-Office based, it is assumed that most companies already fulfil the requirements for it and that no further investment would be necessary.
The developed EWS could not, due to the time constraints, be tried/implemented in practice. For this reason, it is not possible to say with 100% guarantee, whether the approach is workable in practice. From the literature and interviews it was possible to ensure the practical basis of the EWS approach, and this can be used for further research of validation. The possibility of new factors arising cannot be excluded and, in this case, those new factors should be taken into account by modification of the approach.

6. Summary and Conclusion

The aim of this research was to develop a holistic EWS approach for the food production industry. It started with the literature review and four research questions were deduced.
To answer these research questions an empirical analysis was conducted, where the research was split into 4 phases, developed sequentially. Each phase however used semi-structured interviews as its core data generation mechanism. Such an approach to interviewing enabled the complexities of the topic to be addressed through conversations with experts and at the end reach the objectives. The research questions were answered as follows:

1.What are the requirements for a successful early warning system (EWS) with respect to company crisis in SMEs within the food production industry, as identified by turnaround / interim managers?
Besides the requirements found during the literature review, which also formed the structure of the interviews (turnaround experts), the results from both sources were defined and categorized, leading to the development of the following unified listing.
EWSs should:

-help recognize risks in a timely fashion and prevent them at an early stage
-be holistic (strategic and operational) and practicable, so not too complex
-be future-oriented
-include quantitative (hard) and qualitative (soft) factors
-monitor all business areas
-consider internal and external factors
-be a top management information system – monitored by management
-be designed for internal and external stakeholders with different reports
-match characteristics of the company (culture, structure, size and type of management)
-be under the responsibility of the management with reference to its suitability

1.Which controlling (CO) and quality management (QM) tools are appropriate for a successful EWS for SMEs in the food production industry?
The toolkit of CO and QM is very large and it was necessary, with the help of two CO and QM experts, to identify these tools most appropriate for EWSs, which match the requirements identified by turnaround/interim management experts and literature review.

The beginning of early risk recognition lies rather in an attitude question and a question of open communication, of readiness to scrutinize existing things, and in the importance of critical discussion inside the company. The tools can only help to support when the company has an appropriate framework for them.
As a result, the following tools were classified as ‘best-practice-elements’ by the interview of CO & QM experts.

-PESTLE
-SWOT
-Planning
-FMEA
-TURTLE
-HACCP
-Fault Tree Analysis
-Check Sheets or creativity methods, such as Brainstorming or Brainwriting
-BSC

The interviewees also pointed out that

-In the end, the CEO must have a Management Cockpit, which delivers to him an overview of the whole company, where environment information is included and enables him to make appropriate decisions as well as react to changes in time. The internal and external risks for all business processes and relevant support processes must be taken into account and efficient communication to internal and external areas should be ensured.

The interviewees of the last validation turn confirmed that the developed EWS approach is appropriate as a holistic model by including qualitative and quantitative tools, for risk/crisis identification, as well as for monitoring and review of them.
However, the following comment from the interviewees should be taken into consideration:

Whatever the tools of any system are, the company has to be able to tailor the framework to their own needs. The most important goal for this system should be an overview of the whole area.

1.Which tools can be used to anticipate and define a potential company crisis in SMEs in the food production industry?

To obtain an answer to the last question, the developed EWS approach, which was validated by two case studies, identified PESTLE, CIA, SWOT, Scenario technique, Planning, FMEA, HACCP, Turtle-Diagram, FTA, Creativity methods and BSC as best practice elements and aspects in the respective industry.

Finally, after confirmation for practical appropriateness of the developed EWS approach by case studies, the model was refined and a recommendation for implementation was described. The recommended implementation takes into consideration the financial, organizational, operational and technical aspects.

Implications for Practice

The success of EWS is of essential importance for organizations and companies should consider Early Warning information throughout the whole company. The companies should consider company structure, try to implement the EWS in an already existing system (here: QMS), analyze the practicability and avoid complexity. For the success of the EWS it is not only important to look at appropriate structure and suitable processes, but more important is the culture of the company, the qualification of employees and the communication process. To secure the workability of the EWS the commitment of CEOs, as well as the acceptance from the employees, who have to handle them, is of great significance.

EWS does not prevent failure, but it helps to recognize risks/crises at an early stage before it is too late. Most business failures happen as a knock-on effect from outside or inside a company (Ropega, 2011). “… in today`s world, it is not a question of if or whether an organization will experience crisis; it is only a matter of what type of crisis will occur, what form it will take, and when it will happen” (Roselieb & Dreher, 2008, p. 135).

Companies should try to use external, personal as well as internal, impersonal sources more to get data about future trends. They should try to scan with broader scope, interpret the information during an open communication and analyze the variables further if necessary. Only companies, which are able to identify, monitor and handle risks/crises, as well as opportunities at an early stage, will be able to survive.

References

Ackemann, H. (1986). Frühwarn- und Früherkennungssysteme zur Beurteilung von Unternehmenskrisen in Bauindustriellen Unternehmen, p. 28. Göttingen: Georg-August-Universität.

Aguilar, F. (1967). Scanning the business environment. New York: Macmillan.

Allenspach, M. (2006). Beratung in integriertem Risiko-Management. Gossau: Cavelti. Allenspach, M. (2006). Beratung in integriertem Risiko-Management. Gossau: Cavelti.

Altenähr, V., Nguyen, T., & Romeike, F. (2009). Risikomanagement kompakt. Karlsruhe: VVW.

Altman, E. (1968, September). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. Journal of Banking & Finance, pp. 589-609.

Ansoff, H. (1976). Managing Surprise and Discontinuity - Strategic Response to Weak Signals. Zeitschrift für betriebswirtschaftliche Forschung, pp. 129-152.

Argenti, J. (1976). Corporate Collapse: The Causes and Symptoms. New York: McGraw-Hill.

Arlinghaus, O. (2007). Praxishandbuch Turnaround Management. Wiesbaden: Gabler.

Battelle-Institut. (1980). Frühwarnsystem für die Strategische Unternehmensführung. Ein Radar zur Erkennung von technologischen, wirtschaftlichen, politischen und sozialen Veränderungen im Umfeld der Unternehmen. Frankfurt: Battelle Institut.

Beaver, W. (1966). Financial ratios as predictors of failures. Journal of Accounting Research, pp. 71-111.

Bedenik, N., Drilo, D., & Labaš, D. (2012). Early Warning System - Theoretiical and empirical analysis. International Conference of the Faculty of Economics , (pp. 672-684). Srajevo.

Belkin, V. (2011). Multikriterielles Controlling von Geschäftsprozessen. Köln: JOSEF EUL VERLAG.

Bloom, B., Engelhart, M., Furst, E., Hill, W., & Krathwohl, D. (1956). The categories of the cognitive domain are referred to as Bloom's Taxonomy of Learning. New York: McKay.

Benes, G., & Groh, P. (2014). Grundlagen des Qualitätsmanagements. München: Hanser.

Bertram, U. (1993). Früherkennungsorientierte Steuerung: theoretische Grundlagen und Anwendungen für Versicherungsunternehmungen. Hannover: Univ. Diss.

Bratschitsch, R. (1981). Unternehmenskrisen - Ursachen, Frühwarnung, Bewältigung. Stuttgart: C. E. Poeschel Verlag.

Breitkreuz, G., & Lange, B. (2011). Controlling - Kompakt. Aacheen: Shaker

Bretz, A., & Kobuss, J. (2012). Erfolgreich als Designer - Designbusiness gründen und entwickeln. Basel: De Gruyter.

Brockhoff, K. (1999). Forschung und Entwicklung: Planung und Kontrolle. München: Oldenburg.

Brüggemann, H., & Bremer, P. (2012). Grundlagen Qualitätsmanagement. Wiesbaden: Springer Vieweg.

Bruhn, M. (2011). Qualitätsmanagement für Dienstleistungen. Heidelberg: Springer

Brühwiler, B. (2001). Unternehmensweites Risk Management als Frühwarnsystem. Bern: Paul Haupt.

Brühwiler, B. (2003). Risk Management als Führungsaufgabe. Bern: Haupt.

Business Failure. (2008). Retrieved from http://www.accaglobal.com

Commission. (2017, 01 22). Europäische Kommission. Retrieved from eu.europa.eu/growth/smes/buusiness-friendly-environment/sme-definition_de

Crone, A., & Werner, H. (2012). Modernes Sanierungsmanagement. München: Verlag Vahlen.

Crönetz, O., Kögler, P., & Zimmert, O. (2009). Früherkennung von Erfolgsfaktoren. Sternenfels: Wissenschaft & Praxis.

Deppe, D. (1992). Dynamische Ertrags- und Finanzplanung zur Früherkennung und Abwehr von Unternehmenskrisen in Mittelständischen Unternehmen. Köln: Josef Eul.

Depré, P. (2011). Praxis-Handbuch Compliance. Regensburg: Walhalla.

DIN Deutsches Institut für Normung e.V. (1997). DIN EN ISO 9000 ff/ÖÖNORM EN ISO 9000 ff/SN EN ISO 900 ff für kleine und mittelständische Unternehmen (KMU). Berlin, Wien, Zürich: Beuth.

Eidleman, G. (1995). Z scores - A Guide to Failure Prediction. The CPA Journal, pp. 52-53.

Elshamly, A. (2013, Jun). Developing a strategic framework in SMEs. Developing a strategic framework in SMEs. UK: University of Gloucestershire.

Evans, R. (2014). Quality and Performance Excellence. USA: Cengage.

Ferretti, J. (2016, March). Liaise Kit. Retrieved from http://www.liaise-kit.eu/ia-method/cross-impact-analysis

Fiedler, R. (2001). Einführung in das Controlling. München: Oldenbourg Wissenschaftsverlag.

Flick, U. (2010). An Introduction to Qualitative Research. London: Sage.

Foster, T. (2013). Managing Quality. Harlow: Pearson Education.

Frontiera, J., & Leidl, D. (2012). Team Turnarounds: A Playbook for Transforming Underperforming Teams. Oxford: Wiley.

Fulmer, J., Moon, J., Gavin, T., & Erwin, M. (1984, July). A bankruptcy classification model for small firms. Journal of Commercial Bank Lending, pp. 25-37.

Gehringer, M., & Michel, W. (2000). Frühwarnsystem Balanced Scorecard. Düsseldorf: Metropolitan.

Geissler, H. (1995). Organisationslernen und Weiterbilduung: die strategische Antwort auf die Herausforderungen der Zukunft. Neuwied: Luchterhand.

Gerring, J. (2009). Case Study Research. New York: Cambridge University Press.

Giebel, M. (2011). Wertsteigerung durch Qualitätsmanagement: Entwicklung eines Modells zur Beschreibung der Wirkmechanismen und eines Vorgehenskonzepts zu dessen Eiinführung. Kassel: Kassel Univ. Press.

Gleißner, W., & Meier, G. (2001). Wertorientiertes Risiko-Management für Indusrie und Handel. Wiesbaden: Gabler.

Götze, U. (1993). Szenario-Technik in der strategischen Unternehmensplanung. Göttingen: Univ. Diss.

Götze, U., & Mikus, B. (2000). Zeitgerechtes Controlling. Wiesbaden: Gabler.

Gruhler, W. (1994). Wirttschaftsfaktor Mittelstand: Wesenselement der Marktwirtschaft in West und Ost. Köln: Deutsches Instituts-Verlag.

Hahn, D. (1979). Frühwarnsysteme, Krisenmanagement und Unternehmensplanung. Zeitschrift für Betriebswirtschaft, pp. 25- Hallbauer, M., Weltring, R., & Crezelius, S. (2015, November). Instrument Turtle-Methode. Retrieved from https://www.inf.uni-hamburg.de/de/inst/ab/itmc/research/completed/promidis/instrumente/turtle-methode

Hallbauer, M., Weltring, R., & Crezelius, S. (2015, November). Instrument Turtle-Methode. Retrieved from https://www.inf.uni-hamburg.de/de/inst/ab/itmc/research/completed/promidis/instrumente/turtle-methode

Hammer, R. (1998). Strategische Planung und Frühaufklärung. München: Oldenburg.

Hauff, S. (2010). Früherkennung im Human Resouurce Management Sozio-kulturelle Entwicklungen und die Antizipierbarkeit von Personalrisiken. Mering: Rainer Hampp.

Hauschildt, J., & Leker, J. (2000). Krisendiagnose durch Bilanzanalyse. Köln: Dr. Otto Schmidt.

Hauser, M. (1989). Früherkennung von Krisen Industrieller Unternehmungen durch Portfolio-Analyse. Freiburg: Hochschul Verlag.

Hillebrand, W. (2005). Das Früherkennungs- und Überwachungssystem bei Kapitalgesellschaften. Düsseldorf: IDW.

Hinsch, M. (2014). Die neue ISO 9001:2015 - Status, Neuerungen und Perspektiven. Heidelberg: Springer.

Hohlberger, H., & Damlachi, H. (2010). Sanierung im Mittalstand. Marburg: Tectum.

Hopkin, P. (2013). Risk Management. London: Kogan Page

Hornstein, J. (2009). Modellgestützte Optimierung des Führungsstils während eines Turnarounds. Wiesbaden: Gabler.

Horváth, P., & Gleich, R. (2012). Controlling umsetzen. Stuttgart: Schäffer-Poeschel Verlag für Wirtschaft.

IfM. (2016). Institut für Mittelstandsforschung. Retrieved from www.ifm-bonn.org

IGC. (2013). International Group of Controlling. Retrieved from https://www.igc-controlling.org

ISO. (2009). ISO 31000:2009. Geneva: ISO copyright office.

Jaeger, M. (2016, March 23). Haeger-Holland, Inc. - a Leading Provider of Management Consulting and Educational Services. Retrieved from www.jhoti.com/turtle_diagram.asp

Kästner, M. (2012). Risikomanagement im deutschen Mittelstand. Lohmar: Eul Verlag.

Kautt, G. (2013, May). Prepare your firm for success. Financial Planning, p. 37.

Kelders, C. (1996). Unterstützung strategischer Entscheidungsprrozesse. Stuttgart: M & P.

Kirsch, W., & Trux, W. (1979). Strategische Frühaufklärung und Portfolioanalyse. Zeitschrift für Betriebswirtschaft, pp. 47-69.

Kirschkamp, A. (2007). A Contingency-Based View of Chief Executive Officers Early Warning Behavior. Wiesbaden: Gabler.

Klausmann, W. (1983). Entwicklung der Unternehmungsplanung. Giessen: Univ. Diss.

Kloss, U. (1984). Ein Frühwarnsysteem als Instrument zur Überwachuung der strategischen und operattiven Umsetzung und Realisierung der Unternehmenspolitik. St. Gallen: D-Druck-Spescha.

Koch, H. (1996). Theorie des Gewinnvorbehalts. Wiesbaden: Gabler.

Koslowski, F. (1994). Konzeption einer personalbezogenen Frühaufklärung in Management und Controlling. Göttingen: Univ. Diss.

Kötzle, A. (1993). Die Identifikation strategisch gefährdeter Geschäftseinheiten. Berlin: Duncker & Humblot.

Krystek, U. (1987). Unternehmungskrisen. Wiesbaden: Gabler.

Krystek, U., & Fiege, S. (2015, 11 22). Risikomanagement. Retrieved from http://wirtschaftslexikon.gabler.de/Arrchiv/7669/risikomanagement-v10.html

Krystek, U., Moldehauer, R., & Angster, E. (2007). Handbuch Krisen- und Restrukturierungsmanagement. Stuttgart: Kohlhammer.

Krystek, U., & Müller-Stewens, W. (1993). Frühaufklärung für Unternehmen. Stuttgart: Schäffer-Poeschel Verlag.

Kumar, V. (2011). Research Methodology. London: Sage.

Kunze, C. (2000). Competitive Intelligence. Aachen: Shaker.

Küppler, H. et al. (2013). Controlling. Stuttgart: Schäffel-Pöschel.

Kurschus, R., Cvilikas, A., & Sarapovas, T. (2015). The criteria to identify company`s crisis in SME sector. Retrieved from Inzinerine Ekonomika-Engineering Economics, 2015, 26(2), 152-158: http://dx.doi.org/10.5755/j01.ee.26.28779

Law. (2012). InsolvenzO (InsO). München: Deutscher Taschenbuch.

Leker, J. (1993). Fraktionierende Frühdiagnose von Unternehmenskrisen. Köln: Dr. Otto Schmidt.

Löbig, M. (2010, January). Controlling & Management. p. 64.

Löhneysen, U. (1982). Die Rechtzeitige Erkennung von Unternehmungskrisen mit Hilfe von Frühwarnsystemen. 47. Göttingen: Dissertation der Georg-August-Universität zu Göttingen.

Marshall, J. (2012). WMG. Retrieved from www2.warwick.ac.uk

März, T. (1983). Interdependenzen in einem Kennzahlensyste. München: VVF Verlag V. Florentz.

Meier, P. (2007). Risikomanagement. Frankfurt: DGQ.

Müller, G., & Zeiser, B. (1980). Zufallsbereiche zur Beurteilung frühaufklärender Signale. Zeitschrift für Betriebswirtschaft, pp. 605-619.

Müller, R. (1986). Krisenmanagement in der Unternehmung. Frankfurt: Peter Lang.

Müller-Merbach, H. (1977). Frühwarnsysteme zur betrieblichen Krisenerkennung und Modelle zur Beurteilung von Krisenabwehrmaßnahmen. In H. Plötzender, Computergestützte unternehmensplanung (pp. 419-438). Stuttgart: Oldenbourg.

Nagel, K., Faix, W., Keck, G., Sailer, J., Djalali, A., Horne, A., & Kisgen, S. (2013). General Management Tools. Stuttgart: Steinbeis-Edition.

Nerb, M. (2001). Customer Service Management als Basis für interorganisationales Dienstmanagement. München: Techn. Univ.

Ng, W., & Coakes, E. (2014). Business Research. London: Kogan Page.

Nunes, P., & Breene, T. (2011, January-February). Reinvent Your Business before It`s Too Late. Harvard Business Review.

Ohligschläger, J., & Below, F. (2015). Die ISO 9001:2015. Köln: TÜV Media.

Petersen, B., & Nüssel, M. (2013). Qualitätsmanagement in der Agrar- und Ernäherungswirtschaft. Düsseldorf: Symposion.

Pocalyko, M. (2011, June/July). The Turnaround Director. NACD Directorship, p. 1.

Purvinis, O., Sukys, P., & Virbickaite, R. (2005). Research of Possibility of Bankruptcy Diagnostics Applying Neutral Network. Engineering Economics, pp. 16-22.

Pyzdek, T., & Keller, P. (2013). The Handbook for Quality Management. New York: McGraw-Hill.

Quinlan, C. (2011). Business Research Methods. Hampshire: Cengage.

Reimer, M., & Fiege, S. (2009). Perspektiven des Strategischen Controllings. Wiesbaden: Gabler.

Reineke, W. (1997). Krisenmanagement. Essen: Stamm.

Reuvid, J. (2013). Managing Business Risk. London: Kogan Page

Rieser, I. (1980). Frühwarnsysteme für die Unternehmungspraxis. München: VVF.

Rocha-Lona, L., Garza-Reyes, J., & Kumar, V. (2013). Building Quality Management Systems. Boca Raton: CRC.

Romeike, F., & Hager, P. (2013). Erfolgsfaktor Risiko - Management 3.0. Wiesbaden: Springer.

Ropega, J. (2011, July 20). The Reasons and Symptoms of Failure in SME. International Atlantic Economic Societa. Springer.

Roselieb, F. (2008). Krisenmanagement in der Praxis: von erfolgreichen Krisenmanagern lernen. Berlin: Schmidt.

Ruderer, C. (2009). Unternehmensweites Risikomanagement in milchverarbeitenden Unternehmen. Hamburg: Dr. Kovač.

Schaper, C. (2010). Strategisches Management in der Landwirtschaft. Göttingen: Cuvillier.

Schlüter, C. (2004). Strategische Frühinformationssysteme für KMU. Aachen: Shaker.

Schmidt, V. (2015). Compliance-Funktin nach MaRisk. Heidelberg: FCH.

Schneider, S. (1997). Interpretation in Organizations: Sensemaking and Strategy. European Journal of Work and Organizational Psychology, pp. 93-102.

Schönwald, S. (2011). Fallsammlung Körperschaftsteuer. Herne: NWB.

Schröder, R. (2005). Risikoaggregation unter Beachtung der Abhängigkeiten zwischen Risiken. Baden-Baden: Nomos.

Seghezzi, H., Fahrni, F., & Herrmann, F. (2007). Integriertes Qualitätsmanagement. München: Carl Hanser.

Springate, G. (1978). Predicting the possibility of failure in a Canadian firm. Burnaby: Simon Fraser University.

Taffler, R., & Tisshaw, H. (1977). Going, going, gone - Four factors which predict. Accountancy, pp. 50-54.

Töpfer, A. (1999). Plötzliche Unternehmenskrisen - Gefahr oder Chance? Neuwied: Luchterhand.

Töpfer, A. (2000). Das Managemrnt der Werttreiber: Die Balanced Score Card für die Wertorientierte Unternehemenssteuerung. Frankfurt: Frankfurter Allgemeine Zeitung.

Tricker, R. (2014). ISO 9001:2008 for Small Businesses. New York: Routledge.

Trustorff, J. (2012). Risikoorientierte Unternehmensführung. Saarbrücken: Akademikerverlag.

TÜV. (2013, February). Prozessanalyse anhand des Turtle-Modells. Retrieved from http://www.tuev-sued.de/uploads/images/1362664470097634950080/28432-broschuere-prozessanalyse-weboptimiert.pdf

Voigt, K., & Saatmann, M. (2005, 01). Begriffsbestimmung Flexibilität und Adaptivität. FlexLog-Arbeitspapier.

Wagner, K., & Käfer, R. (2010). PQM Prozessorientiertes Qualitäts-Management. München: Carl Hanser.

Watton, P., Collings, J., & Moon, J. (2001, 04). Reflective Writing. Retrieved from www.exeter.ac.uk/fch/work-experience/reflective-writing-guidance.pdf

Weber, H. (1995). Die IBM - Kultur. München: Computerwoche Verlag GmbH.

Weber, J., & Janke, R. (2013). Controlling in Zahlen. Weinheim: WILEY-VCH Verlag.

Weber, J., & Schäffler, U. (2008). Introduction to Controlling. Stuttgart: Schäffer-Pöschel Verlag für Wirtschaft.

Weber, J., & Schäffler, U. (2011). Einführulng in das Controlling. Stuttgart: Schäffer-Poeschel.

Weber, J., Vater, H., Scmidt, W., & Reinhard, H. (2011). Turnaround - Navigation in stürmischen Zeiten. Weinheim: Wiley-VCH. Yin, R. (2009). Case Study Research. California: Sage.

Welsch, C. (2010). Organisationale Trägheit und ihre Wirkung auf die strategische Früherkennung von Unternehmenskrisen. Wiesbaden: Gabler.

Wiedmann, K. (1984). Frühwarnung, Früherkennung, Frühaufklärung. Mannheim: Institut für Marketing, Universität Mannheim.

Wirtschaftslexikon. (2016, March). Cross-Impact-Analysis. Retrieved from http:/ wittschaftslexikon.gabler.de/Definition/cross-impact-analyse.html#definition

Woll, A. (2007). Vokswirtschaftslehre. München: Wahlen

Woll, R. (2007, October 16). Von Risikomanagement - Aufgabe für das Qualitätswesen in KMU? Retrieved from BTU Lehrstuhl Qualitätsmanagement: www.tu-cottbus.de

Wolf, R. (2010). Risikoorientiertes Netzwerkcontrolling. Lohmar: EUL.

Yin, R. (2009). Case Study Research. California: Sage.

Yin, R. (2014). Case Study Research. California: Sage.