CHALLENGES IN GLOBAL QUALITY MANAGEMENT FOR MANUFACTURING NETWORKS

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1 ABSTRACT:

Purpose: The purpose of this paper is an exploratory research to identify cross-industrial challenges for the quality management of manufacturing networks.

Design/methodology/approach: The qualitative research design comprises several cross-industrial group interviews with quality managers of seven representative medium- and large-sized manufacturing networks. During several interview sessions findings were iteratively processed and developed with the interviewees.

Findings: In the paper six categories of typical challenges are identified, which represent common barriers for a successful global quality management (GQM) in seven international firms who participated in the research.

Research limitations: Due to the exploratory purpose and the qualitative research design the number of participants is rather small compared to quantitative research.

Practical implications: The findings provide a comprehensive cross-industrial overview of the most pressing challenges for the quality management of international firms.

Originality: The idea of an evolutionary leap in quality management has been discussed in literature before. However, the concept of global quality management is indistinct and has not been specified. Defining the current challenges lays out the foundation in order to develop a quality management system which is suitable in a globalized operation management environment.

Keywords: Global Quality Management, Contingency Theory, Quality Management Implementation Process, Global Manufacturing Networks

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2   INTRODUCTION

Quality is an indistinct and complex construct, which becomes increasingly important for international firms in the global market place (Parasuraman et al. 1985; Seghezzi et al. 2013; Schneider et al. 2015). As global competition intensifies companies are forced to maintain their competitive edge by evaluating how to respond to emerging challenges. In the past 5 decades, quality improvement has been an effective and popular way to cope with a highly competitive environment (Tan et al. 2000). However, within this period, the quality concepts have differed notably over time and have been influenced by a company's business environment.

By today, modern quality management in hindsight counts three major movements which evolved contingent on the specific requirements and business context of firms at the time (Saad, Siha 2000). The first quality approach, barely a quality management approach, was the period of the quality control, in which manufacturers exclusively inspected final products. The scope of this approach covered a rather statistical concept and was merely an engineering discipline concerned with product-oriented testing (Foster, Jonker 2007). This concept worked for manufacturing firms, since the customer orientation did not play a significant role, and production process complexity was manageable (Kim, Chang 1995).

Quality management as a comprehensive discipline was born in the 1980s with the ideas of W. Edwards Deming, Joseph Juran, Philip Crosby and Kaoru Ishikawa. The second motion of quality management, the total quality management (TQM) revolution, was considered seminal (Soltani 2005) and ascended to an all-pervasive management philosophy finding its way into most business sectors (Tan et al. 2000). The integrated approach gave rise to popular showcases like Toyota, Motorola, Xerox or Hewlett-Packard, which implemented successfully quality programs (Laree Jacques 1996). Fueled by these success stories, TQM gained momentum and became a management fad suffering half-hearted implementation efforts (Asif et al. 2009).

As a consequence, quality management implementation failures outnumber these success story. Some scholars show that implementation failures amount up to 80% (Tata et al. 1999; Taylor, Wright 2003; Cândido, Santos 2011).Kolesar (1995) predicts a very bearish future of TQM implementation. He presents various negative examples, based on his experience, where TQM implementations failed. The author calls on researchers to find out the reasons for the failure and what can be done against it.

Yet, TQM has provided successful approaches for more than 30 years. However, contextual changes and the impact of globalization require a reappraisal and proliferation of TQM practices. Foster, Jonker (2007) even believe that quality management research is entering a third generation in which responsibilities are being extended beyond the organizational realms comprising a wider societal and business context[1]. Already in 1995, Kim, Chang (1995) for the same reasons suggested a new concept called global quality management (GQM) which the authors define as:

"The strategic planning and integration of products and processes to achieve high customer acceptance and low organizational disfunctionality across country markets" Kim, Chang (1995)

The authors emphasize three dimensions within the concept in particular, which needs to be addressed more thoroughly in a global market place: global market orientation, worldwide production, and the formation of a global information system as well as technology network.

But all of the authors remain vague and fall short of a concrete concept. They neither specify a firm's business environment, nor do they describe a conceptual framework as a guideline for companies. Thus, further research is required to build a solid foundation of the concept of global quality management. For that reason the exploratory study at hand sets out to examine the current challenges and contextual changes in the quality management of multinational companies and aims at answering the question:

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[1] Foster, Jonker 2007suggests that a third generation of quality management is entered, where transparency, accountability and (social) responsibility are blending into the body of knowledge regarding quality management.

What are the most relevant challenges for the quality management of global manufacturing networks to encounter a globalized environment?

The remainder of this paper is structured as follows. We start by describing the theoretical background of the study and the applied research methodology as well as the data collection method. Thence, we focus on the implications for quality management of manufacturing networks. The findings of the research are discussed in the context of existing quality management literature. The paper concludes with a research framework and suggestions for further research.

3   THEORETICAL BACKGROUND

A recent research stream ascribe failures of QM programs to the presumption of a universally applicable set of quality management practices (Nair, 2006; Sousa & Voss, 2002) and contest the notion of a universal QM orientation promoted by the so called QM gurus such as Deming, Ishikawa, or Crosby. This dissent can be traced back to a landmark special issues of the Academy of Management Review in 1994. The studies of this issue highlighted the theoretical void of the majority of QM literature at that time and thus lay the basis for a theoretical foundation in quality management (Dean & Bowen, 1994). Since then scholars try to reconcile theory and practice (Sousa & Voss, 2002) by situating quality management research into management theories. One popular theoretical approach attributes unsuccessful QM implementation to disregarding organizational contextual variables (Dean & Bowen, 1994; Jayaram, Ahire, & Dreyfus, 2010; Sousa & Voss, 2008; Spencer, 1994). Spencer (1994) summarizes

"*Some TQM proponents maintain that a common error in the implementation of TQM is the failure to recognize that every company, and every environment, is different […]. To be successful, say these critics, the implementation of TQM must be properly aligned with competitive environments and strategies […]*" (Spencer, 1994, p. 454).

This structural contingency theory approach (Drazin & Van de Ven, 1985) and the concept of fit at the very heart of it (Donaldson, 2001), according to which the organizational structures and processes must be adjusted to a firm's contextual variables, appears to be a popular explanation for unsuccessful quality management implementation. Sousa and Voss (2002) suggest contingency research as a promising avenue to overcome QM implementation issues. Thereby, researcher differentiate between two distinct types of implementation decisions, which can be influenced: The content of an implementation and the process of how QM practices are embedded in the organization (Benson, Saraph, & Schroeder, 1991; Reed, Lemak, & Montgomery, 1996). The content of QM implementation is widely researched and shows convergent validity, since there is substantial agreement about the key QM practices among the founders (Hackman & Wageman, 1995).

4   RESEARCH METHODOLOGY

As we mentioned in the previous section, the concept of global quality management is only vaguely defined in the literature and therefore requires an inductive approach to answer the research questions posited in this paper. Considering the exploratory purpose of our research and the complex matter of global challenges that we are trying to unravel, we decided to follow a qualitative research design.

The most common and suitable data collection method for exploratory research is the systematic analysis of the existing body of knowledge and conducting interviews. (Saunders, Saunders, Lewis, & Thornhill, 2011). However, the literature analysis in the previous section did not provide sufficient information to significantly develop existing theory. For that reason, we chose to design the research as an interview study (Kvale, Brinkmann 2009). Whereas some research designs, as for instance case study design or action research, use interviews amongst other data collection methods, an interview study relies predominantly on interviews as single data source (Kvale, Brinkmann 2009) Amongst the different interview modes, we selected focus group interviews which are most suitable in the context of such a novel, ill-defined subject (Rose et al. 2014).

The group size consisted of 14 interviewees from altogether seven companies (Table 1), which we split during the discussions in smaller breakout groups of four respondents. Thus, we wanted to address the different stances in the literature of an ideal group size (Sayre 2001; Barbour 2008): The advantage of a larger group size (ten to twelve respondents) allow to effectively use the dynamics of the respondents' group (Sayre 2001). By contrast, in smaller groups (four to six participants) interviewees are not pressurized expressing their point of view (Barbour 2008). Besides, with such a large group we wanted to assure the transferability of our results and through the involvement of both permanent and alternating researchers within the moderation process of the focus groups we could further ascertain the dependability of the research method.

The respondents were chosen according to the two criteria of contribution of expert knowledge and hierarchical level. All of the interviewees were quality manager with several years of experience in quality management. Furthermore, we included in most cases two representatives of one firm in the group interviews, from a different hierarchical level and from both a centralized and a decentralized quality department.

Table 1: Interviewees of the Focus Group

Focus Group Composition

Industry	Position	Company Name	Central/Divisional QM
Manufacturing and Materials	Quality and Supply-Chain Manager	Manufacturing Inc.	Central Quality Management
	Corporate Quality Manager		Central Quality Management
Food Packaging	Global Quality Manager	Food Packaging Inc.	Central Quality Management
	Quality Manager		Divisional Quality Management
Industrial Sensors	Management Board Corporate Quality & Operations	Sensor Inc.	Central Quality Management
	Head of Quality- and Environmental Management		Central Quality Management
	Head of Quality Management		Divisional Quality Management
Industrial Electronics	Divisional Head Quality Management & Environment	Electronic Inc.	Divisional Quality Management
	Director Quality Planning		Divisional Quality Management
Automotive	Quality Manager	Compact Car Inc.	Divisional Quality Management
	Quality Manager		Divisional Quality Management
Automotive	Quality Manager On-time-Delivery	Premium Car Inc.	Central Quality Management
Polymeric Processing	Head of Division Corporate Quality and Process Management	Supplier Inc.	Divisional Quality Management
	Corporate Quality Manager Supplier		Central Quality Management

Group interviews are considered as information rich and particularly effective when conducted three to four times (Krueger, Casey 2000). Therefore, the research process was organized in a 4 stage process. The first stage comprised a semi-structured mini survey for each firm in preparation for the first focus group discussion. The survey aimed at identifying firm-specific critical globalization drivers. Thus, we were able to provide input for the first group discussion in stage 2, to define the scope of the ensuing interviews as well as to create a common understanding of the research topic. Stage 2 comprised the first group discussion of 14 quality managers listed in Table 1 as well as breakout group discussions in order to address the previously mentioned shortcomings of each interview mode. The focus group discussions were enhanced by an initial presentation and centered on the question of current challenges for global quality management program implementation. The results of stage 2 were analyzed, synthesized, and summarized as preparation for stage 3. During this stage the same interview modes as in the previous stage 2 were conducted targeted in-depth discussions pivoting around the preliminary findings. During stage 4 we presented a list of challenges from the first two sessions which were complemented by the panel. Therewith, the last session served to ensure internal validity and the credibility of the research design.

5   RESULTS

Altogether consistent patterns of contextual factors and challenges were discussed during the four stages of our research. Whilst some experiences about the understanding of modern quality management requirements concerned only certain industries, cross-industrial commonalties prevailed. In the course

of the interviews the information provided by the company representatives were successively condensed and presented to the group. Their feedback was incorporated and eventually resulted in six clusters of challenges comprising several subcategories.[2] These challenges in quality management for global manufacturing networks are the coordination of a globally dispersed value chain, the increasing diversity of market requirements, an efficient degree of centralization of the firm's quality management, an efficient communication within the organization as well as knowledge transfer, the informatisation of production, and last the integration and alignment of quality management alongside other manufacturing initiatives. The challenges were obtained gradually as an aggregation of the discussions of specific impediments.

The following section is dedicated to specifying the challenges and its subcategories (impediments). The main categories are delineated briefly in each case, before the respective impediments are described. The latter are emphasized with questions been asked by the participants during the interview sessions in order to substantiate the trustworthiness of our findings.

Challenge 1: Globally dispersed value chain

One of the principal questions for the globally dispersed manufacturing firms in the group is how to enforce the same level of product and process quality throughout their network across functions, cultures, and markets. However, the sphere of influence is not supposed to be exclusively limited to their internal supply chain. According to the interviewees, it must be extended to joint ventures, partners and suppliers, where there is often only restricted or no authority. The group of respondents ascribed 5 specific impediments for the challenge of a globally dispersed value chain that are presented in the following.

> Impediment: Reach and enforcement -"How can we guarantee the same level of process and product quality throughout the internal and external, globally dispersed value chain?"- *Management Board Corporate Quality & Operations, Sensor Inc.*

The reach and enforcement of a common corporate quality management approach within an organization was identified as a key problem. Ideally, all departments and production units are equally informed about the corporate quality approach so as to act in concert. However, in a complex organization with dispersed locations information asymmetries occur and the enforcement of a common quality management approach is complicated.

> Impediment: Culture - "How can we ascertain a common quality culture across the entire network and within our decentralized organization?" - *Quality Manager On-time-Delivery, Premium Car Inc.*

The group agreed, that not only the geographical locations account for difficulties in realizing a consistent corporate quality management, but also culture complicates it significantly. Realizing a competitive quality requires an action-driven culture in which all employees share the same understanding of certain underlying values towards customer and workflows. According to the respondents, on a global scale of a global manufacturing networks, where this understanding is not limited to employees of one production unit but rather to all internal employees as well as external partners, this becomes immensely delicate.

> Impediment: Internal partnerships - "How do you create an internal 'customer relationship' and how does this relationship improves quality and affects quality management?" - *Global Quality Manager, Food Packaging Inc.*

Partially dependent on this very culture, the internal partnerships for the bigger part of the involved firms proved to be more critical than external partnerships to supplier and customers in the wake of global complex organizational structures. Often, internal relationships are not cultivated with the same

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[2] In some cases the subcategories were not assigned exclusively to one cluster. Contingent on the researchers' discretion and based on current research, the subcategories were allocated to one category.

diligence as supplier-customer relationships. As a consequence, inferior parts or delayed deliveries are shipped entailing further problems in the production process.

> Impediment: Supplier quality – "How do successful companies impose a zero-defect philosophy on their n-tier supplier?" - *Quality Manager On-time-Delivery, Premium Car Inc.*

But also external supplier quality is a critical matter in quality management and even becomes more critical in a global context. Since quality of a product can only be as good as the quality of the supplied parts, it is inevitable that the supplier follows the same quality philosophy. However, in the wake of the sheer number of an international firm's suppliers which have different strengths, originalities, and cultures their coordination and development is evidently difficult. Additionally, a manufacturer has only very limited scope of influence on the processes and the quality management, particularly soft quality factors such as employee training, of its suppliers.

> Impediment: Responsibility – "Which topics are components of a firm's comprehensive quality initiative and who is in charge of reviewing and auditing these initiatives?" *Head of Division Corporate Quality and Process Management, Supplier Inc.*

All of the mentioned impediments represented clear challenges for the involved companies. However, the mere identification of those shortcomings is not sufficient to overcome them. Particularly, the topic of responsibilities reoccurred in all sessions. The interviewees agreed on the difficulties of identifying functions or departments which are in charge of developing shortcomings and conceptualizing the corporate quality management topics such as quality visions and lean audit systems. Furthermore, the specification and extend of this responsibilities vary greatly on the context of the firm.

Challenge 2: Diversity of market requirements

Besides the coordination of a globally dispersed value chain, the diversity of market requirements was identified as additional complexity for international firms' quality management during the interviews. In a globalized manufacturing environment, the participating managers argued that firms have to process a myriad of different customer requirements for products which become technologically more sophisticated over time. Naturally, companies respond with more variants fulfilling these customer requirements. According to the interviewees this leads to more complicated production processes, but it also requires a more elaborated quality management to identify the root of potential customer complaints and to forward information to the concerned production units.

> Impediment: Capturing (subjective) customer satisfaction – "How do you measure customer satisfaction, subjective quality perception and translate customer experience which is the key to sustainable success?" *Quality Manager, Food Packaging Inc.*

Although using KPIs sheds light on different aspects of customer satisfaction, they only tell half of the story. For instance, the respondents find it difficult to compare the net promoter score across different markets with a distinct inclination to recommend products and services (cf. Reichheld 2003). Beyond this fact, the other half of the story is undisclosed in subjective customer satisfaction criteria which barely can be captured with KPIs.

> Impediment: Customer complaint management – "How do we effectively route market feedback to the concerned parties and plants within our network?" – *Quality and Supply-Chain Manager, Manufacturing Inc.*

The interviewees perceived customer complaints as a chance to improve processes and thus products and services. Customer data provide valuable external insights of how to lever quality and gain competitive edge. However, the captured customer information in any form available needs to be routed to the concerned unit in the firm, which then can ameliorate existing processes. In practice, in a complex organization structure, where customer data are collected centrally and away from any value creation process, this mechanism is challenging and information is likely to be lost or distorted underway.

Challenge 3: Centralization of quality management

A very controversial issue amongst the firm representatives is to which extent the quality management should be centralized. They argued that centralization brings about the advantage of common and standardized approaches and thus assures a consistent level of quality throughout the whole firm. In contrast, the central quality management cannot understand local circumstances on site level as good as the production site itself. During the interviews a trade-off between globally valid standards and local agility and responsiveness came to light.

> Impediment: Global standards – "How do you find the right level of standardization?" *Corporate Quality Manager Supplier, Supplier Inc.*

The advantage of standards is for the interviewed managers to provide guidance and tools to achieve an equal level of quality and to delimit the source of defects (DIN EN ISO 9000). If, on the contrary, standards are too specific they cause certain drawbacks. The respondents believe that by neglecting local site-specific conditions, they restrict the responsiveness as well as agility to efficiently encounter quality incidents. Consequently, corporate quality standards must fulfil their guiding function to guarantee a certain quality level without cutting back innovative and efficient approaches of concerned units.

> Impediment: Local flexibility - "How can we manage the trade-off between standardization and localization?"- *Quality Manager, Compact Car Inc.*

As we mentioned before, individual and isolated approaches of production units were discussed equally controversial during the interviews. Interviewees perceive site-specific approaches to a certain degree an opposite pole to corporate quality standards. These approaches comprise solutions to quality related matters or process improvements which can evolve to new better standards or solutions and are more suitable in a site-specific context. The superiority of locally developed approaches is explained by interviewees through the proximity to the value creation process and the ability to better assess local conditions. However, leaving space for processes which are not in line with corporate quality standards is believed to compromise the reputation of the entire organization in the worst case.

> Impediment: Central quality responsibilities - "How do Successful Practices lead local organizations via global functions?" – *Global Quality Manager, Food Packaging Inc.*

Between those conflicting priorities the interviewees believe to identify the responsibilities and roles of a central quality department. On the one hand, the development of corporate quality standards is considered a crucial function which requires the involvement of a central unit. On the other hand, the central quality unit is assumed to be responsible for supporting decentralized production sites if they face quality related challenges. During the interviews this gave rise to the question which authority needs to be assigned to a central quality department. According to the discussions the authority can range from mere administration and coordination at one end of the spectrum to directing and controlling at the other end. Furthermore, there are various quality tasks, such as resource allocation, auditing, or the development of lean audit system, which commonly require the involvement of central quality employees.

Challenge 4: Communication and knowledge transfer across network

Creating an effective inter-network system of knowledge transfer can help to gain productivity advantages and to encounter tougher competition as well as shifting customer preferences (Garvin 1984). The quality experts interviewed explained that by sharing or diffusing knowledge throughout a network productivity can be increased and thus enhance a high level of quality. Knowledge-transfer has been extensively discussed in the two strands of literature of quality management (Dyer, Nobeoka 2000) and knowledge diffusion in global manufacturing networks (Ernst, Kim 2002). However, the challenges discussed in the group interviews did not pivot around the routines, as for instance effectively develop, store, assimilate, and apply new knowledge (Dyer, Nobeoka 2000), the challenges rather involved the efficiency of methodologies and techniques.

> Impediment: Communication methodologies – "Which methodology is most efficient for a global communication of standards, structures, contents?" - *Head of Quality and Environmental Management, Sensor Inc.*

The interview partners considered two opposing stances of communication, bilateral fast communication channels between two production units or periodic institutionalized meetings. Whilst the respondents consider a bilateral exchange very purposeful for the involved parties, they criticized that exchanged content is not documented and disclosed for other parties in a network. In contrast, recurring executive meetings are time consuming and barely as targeted as bilateral meetings.

> Impediment: Knowledge transfer techniques – "How do GPN most efficiently design knowledge transfer and information exchange with respect to global quality management topics?" - *Quality Manager, Food Packaging Inc.*

Similarly to the communication methodologies two techniques were discussed which are not necessarily exclusive. A personalized knowledge transfer on one hand or a technological and documented supported exchange on the other hand. The benefits of a personal knowledge transfer, for instance realized as site-visits, are found to be easy to gasp and provide the chance to understand the context and prevailing culture. By contrast, the respondents considered a technological-supported form of knowledge transfer, for example via a database, by far less time consuming but criticize the substantially higher maintenance efforts.

Challenge 5: Informatisation

In general the interview experts associate the informatisation of operations and the availability of data with upsides such as the analysis of processes in real time as well as the opportunity to intervene when product or process quality is affected. However, the increasing availability of data which grew exponentially in recent years (James Manyika et al. 2011), confronts quality managers with excess data and the challenge of focusing on crucial, critical information.

> Impediment: Critical KPIs - "How can we find the right KPIs and how do we prioritize those?"- *Corporate Quality Manager, Manufacturing Inc.*

Hence, the interviewees regularly have to process a great capacity of performance indicators but cannot easily identify relevant key performance indicators. The simplicity of obtaining data leads them to an unmanageable amount of information which is barely provided to the right functions of quality management. In terms of common structured quality problem solving procedures, such as the DMAIC approach, the measure and analyses phase is believed to be antedated before they can actually define the problem. Consequently, they cannot interpret these performance data without further ado.

> Impediment: Systems-"What customer-orientated KPIs can be used and how can they be integrated in the target system of the company?" – *Quality Manager On-time-Delivery, Premium Car Inc.*

In order to manage the information overload, the experts demand a deliberate analysis system which requires underlying use cases being aligned with a firm's respective quality strategy. Thus, corporate performance data shall be linked with site-specific KPIs and form a holistic performance measurement system. Given the complexity of such as system, the respondents' firms rely on a supportive IT-infrastructure. However, interviewees indicate a differing acceptance among networks and the use of redundant and historically developed systems. Moreover, such a system only works if the data entered are measured uniformly across the network.

> Impediment: Social media – "Is there any value adding use case for social media for manufacturing firms? - *Director Quality Planning, Electronic Inc.*

One reoccurring question pivoted around the reasonable use of social media to serve the quality management of a firm. Certainly, interview partners of firms which produce for private customers could easily identify use cases for valuable customer information in social media. In contrast, supplier or engineering companies had difficulties to include social media for their own purpose.

Challenge 6: Integration of initiatives

Quality management concepts such as total quality management, or six sigma are strategic concepts. Among practitioner and scholars likewise, these concepts are known to be resource consuming but at

the same time powerful strategies. However, slack implementations are bound to be ineffective, since they lack employee support, compete with other programs and consequently fail in practice. However, the group interviews disclosed that within their firms programs were not aligned or even organizationally segregated to related programs.

> Impediment: Competing initiatives - What is an efficient depth of integration of QM in an organization? - *Head of Division Corporate Quality and Process Management, Supplier Inc.*

Hence, it is the respondents' business reality that targets of quality management initiatives compete with other manufacturing programs. This complicates their goal attainment and aggravates the already high resource consumption of each program. A prominent example was the rivalry of procurement and quality initiatives. Whereas the first types of initiatives rather emphasize costs, the latter are more concerned with consistent quality of raw materials. But even related programs such as quality management and lean programs are assigned to different departments.

> Impediment: Local initiatives – "How do we treat best branch-specific management systems which are required by single subsidiaries?" - *Head of Quality Management, Sensor Inc.*

Beside competing corporate initiatives the interviewees reported a potential area of conflict between site-specific and global initiatives. Often, the development of corporate initiatives requires time so as to incorporate the needs of versatile requirements. In contrast, local initiatives evolve faster and are tailored to site-specific context. Yet, often these initiatives do not blend in with their corporate counterpart and partially contradict the overall quality strategy.

The results of the previous discussions are summarized in Table 2.

Table 2: Six Main Challenges and the Respective Impediments for Quality Management in Manufacturing Networks

1. Globally Dispersed Value Chain	2. Diversity of Global Market Requirements	3. Degree of Centralization
Reach and Enforcement	Measuring Customer Satisfaction	Global Standardization
Culture	Customer Complaint Management	Local Flexibility
Internal Partnerships		Centralized Quality
Supplier Quality		
Responsibilities		
4. Knowledge Exchange	**5. Informatisation of Production**	**6. Integration**
Communication Methodologies	Critical KPIs	Competing Programmes
Knowledge Transfer Techniques	Systems	Local Initiatives
	Social Media	

6   DISUCSSION AND FURTHER RESEARCH

Globalization of markets and production brings about an unprecedented degree of complexity to the quality management of international firms. For a considerable time, practitioners and researchers have been encouraging a new era of quality management (Seghezzi et al. 2013; Kim, Chang 1995). As a first step of this new era, this paper set out to examine quality management related implications imposed by globalization and thus building the foundation to develop this pervasive quality management concept.

In the course of the focus group sessions, quality management in an increasingly globalized production environment was discussed. The interview participants supported the hypothesis of Mangelsdorf (1999), Kim, Chang (1995), as well as Das et al. (2000) that quality management is becoming a complex task in the wake of a highly competitive market place. Also, the underlying drivers which have been discussed in Section 2 such as more sophisticated and diversified customer demands or increasing competition were confirmed by the respondents (global market orientation). As a result of the interview study we propose six main challenges of international manufacturing firms. These challenges are the coordination of a globally dispersed value chain, the increasing diversity of market requirements, finding an efficient degree of centralization of the firm's quality management, an efficient communication within the organization as well as knowledge transfer, the informatisation of production, and last the integration and alignment of quality management alongside other manufacturing initiatives.

Clearly, a proportion of the six challenges have not emerged entirely anew. Addressing customer requirements, knowledge exchange, and an integrative quality management were crucial elements of

quality management programs in previous quality concepts (Flynn et al. 1994). However, globalization complicates matters significantly, so that these challenges have to be given special attention. By contrast, the informatisation of production, the coordination of a globally dispersed value chain, and finding an efficient degree of centralization of the firm's quality management are rather newly emerged problems since the last development of a comprehensive quality management concept.

The results presented in the paper provide a comprehensive cross-industrial overview of the most pressing challenges for a successful quality management implementation of global manufacturing networks. Thus, the study builds the foundation to further explore global quality management theory by discussion all relevant research streams.

For future research we propose a heuristic framework, which involved the relevant research currents which have been revealed in this study. The aim of such a framework is to provide a prior view on the involved research fields being studied. Thus, the unit of analysis can be delineated from other related research and the relevant research fields as well as their relationships are brought together (Miles & Huberman, 1994). The heuristic framework include the theoretical basis in the form of contingency theory, quality management implementation, and a manufacturing network's perspective. The following considerations regarding the three areas are incorporated in the heuristic research framework:

Contingency research: A currently widespread assumption is that successful quality management implementation in firms is contingent on a firm's external context (Sousa & Voss, 2002) and that the organization's structure and processes tie in with this context. Within the research framework we mainly focus on contextual factors which were tacit elements of the six challenges. The fit of a quality organization, within a network varies between companies, since there is no ideal structure (Friedli, 2006, cf. Chapter 1.2). For that reason, we incorporate the concept of Equifinality, according to which there are in an organization equally effective designs of internal structures matched to an external configuration of contingencies (Doty, Glick, & Huber, 1993; Sousa & Voss, 2008).

Quality management implementation: Critical quality management practices and quality management systems have been researched by various scholars (Ahire, Landeros, & Golhar, 1995; Sila & Ebrahimpour, 2002). In order to strengthen the foundation of this research, we focus on the implementation process as suggested by Sousa and Voss (2002), rather than the implementation content. The basic assumption of implementation is, that it is a process which begins with the adoption of an idea and ends when it becomes routine or is abandoned (Linton, 2002). However, considering a dynamic market environment for QM (Kim & Chang, 1995) in liaison with the system understanding according to Ulrich (1985) and Rüegg-Stürm (2005), the QM implementation process comprises two potential states. First, the QM implementation is considered a failure and stops, or second, the QM organization is considered a system in a dynamic context and needs similar to a cybernetic system a control loop which continuously recalibrate the system. In the latter case, the implementation process is an infinite process.

Manufacturing network perspective: The heuristic framework in this study takes into account that quality management in international firms is neither an isolated activity limited to one manufacturing site, nor is it an activity which is executed by one centralized department. Rather quality management is considered as interplay of processes and organizational units within one network. This study ties in with existing literature in the global manufacturing network research stream to analyze contingencies on networks and analyze the interaction between manufacturing and other supportive functions, such as quality management, in internationalization (Cheng et al., 2015). Therefore, the research frameworks mainly targets the coordination layer in the network architecture, since the configuration layer is determined to a great extent by the manufacturing footprint strategy.

Figure 1 presents the heuristic framework, which is the basis for future research and will be analyzed by the authors.[3]

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[3] The research presented in this paper overlaps with the dissertation related research of one of the authors and will be constituting part of the thesis. The challenges identified are refined to contextual factors and the heuristic
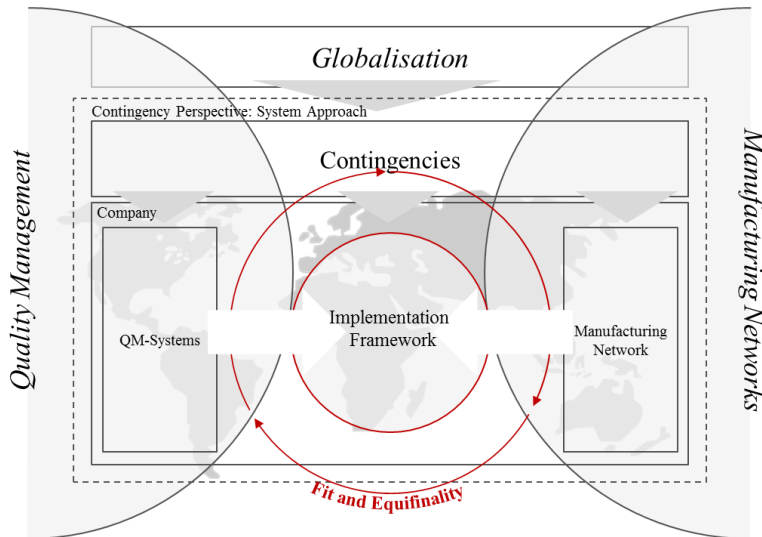
Figure 1: Heuristic Framework for Global Quality Management Implementation

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framework is extended to a conceptual framework. Theoretical background, results, and the heuristic framework can therefore be studied in depth in the corresponding document.

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