Chapter 16
Structures of Operational Excellence Initiatives

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What Is a Structure for?

Operational Excellence (OPEX) as a continuous pursuit of improvements in all dimensions (see Chap. 2) leads to changes in existing working environments. Improvements in processes, set-up times or layout as well as adaptions in decision-making or work organization lead to productivity optimizations, but these improvements don't come without the adaption of the existing organization. As a consequence, the sustainable implementation of OPEX in organizations requires the consideration and selection of a suitable organizational support structure. But what is a structure exactly for?

According to Mintzberg (1979), one of the great scholars of organizational science, every organized human activity is based on two fundamental and opposing requirements: the division of labor into various tasks, and the coordination of these tasks to accomplish the activity. Thus, the structure of an organization can be defined as the sum of the ways in which it divides its labor into tasks and then achieves coordination among these tasks (Mintzberg 1979). Structures do not emerge out of nothing, but require a goal-orientated configuration influenced by amongst other factors – the external environment (Lawrence and Lorsch 1967; Rüegg-Stürm 2005). While an organization is reacting to environmental changes and fulfilling the company's strategy, the organizational structure provides the framework for the social-operational-control system and is influencing individual and group behavior. One scholar addressing this issue formally was Chandler with his famous hypothesis that structure follows strategy (Chandler 1962).

Taking a look at the research on organizations, a variety of ways to structure organizations can be found. Here, our focus will not be on the overall organization of a global pharmaceutical company, but on the OPEX support structure.

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Nevertheless, we will first have to take a look at the general aspects of organizational structures. We start with differentiation and integration; Differentiation refers to the way in which an organization is divided into divisions and functions, and integration to the way in which the divisions and functions are then combined (Müller-Stewens and Lechner 2005). Together, these two perspectives determine how an organizational structure will operate (Hill and Jones 2001). The basic forms of organizational structures are the result of horizontal differentiation. The horizontal differentiation takes place according to execution (functions) or objects (products, regions, projects, processes). A function-oriented structure leads to a functional organization; an object-oriented structure to a divisional organization. Divisions may themselves be product-, region-, project-or process-oriented (Osterloh and Frost 2006). A functional structure is often used by smaller- to medium-sized organizations with limited product ranges. In a divisional structure, units are guided by a corporate-level strategy which outlines the desired results. A matrix structure consists of functional departments on one axis, while the vertical counterpart is based on differentiation by a product group (Avdelidou-Fischer 2006). Over the last years, a development away from self-contained organization designs to more horizontal organizations with team- and process-based emphasis could be observed, and more and more organizational boundaries are opening up (Anand and Daft 2007). This can be the effect of a search for excellence, which usually emphasizes a stronger process orientation.

With regards to the OPEX support structure, we have to scrutinize some of the specific requirements such a structure has to fulfill. What is the right structure to support an OPEX initiative? What structure is necessary at the beginning of an OPEX implementation? How does this structure develop over time? Given that OPEX is a long-term initiative with continuous improvement as key objective, how can people be structurally empowered and supported to participate in this continuous improvement process? There is no "one size fits all" solution to these questions. Drucker (1999) states that there are only organizations, each of which has distinct strengths, distinct limitations and specific applications and any given organization structure fits for a certain time (Drucker 1999). Therefore, every company ultimately needs its own specific organizational model and only basic types of organizations, together with criteria for adapting and evaluating the most appropriate one at a certain point of time, can be specified (Ulrich and Krieg 1972).

Figure 16.1 illustrates the problem practitioners are often faced with when implementing and sustainably embedding OPEX in their organization. There are a lack of evidence about the right structure and the right amount of trained people to successfully launch and maintain an excellence initiative. To determine what level of specification of different organizational structure dimensions is needed in order to derive the optimal corresponding structure, it is necessary to take a look at the characteristics of OPEX.

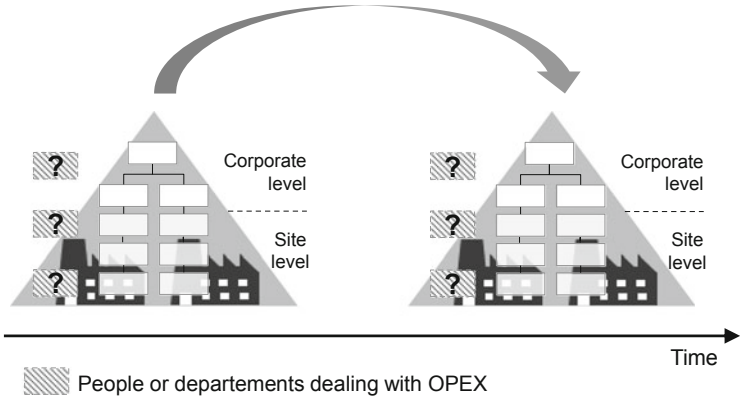

Fig. 16.1 Where to place OPEX in the organization?

What Are the Main Objectives an OPEX Structure Has to Fulfill?

Over the last years, a search for excellence could be observed in most industries. Besides the introduced excellence models in Chap. 2, Peters and Waterman (1982) identified eight attributes that characterize excellent, innovative companies. Peters and Austin (1985) condensed these findings into four critical success factors: (1) people who practice; (2) care of customers; (3) constant innovation; and (4) leadership which binds together the first three factors by the attendance of management at all levels of an organization (Dahlgaard-Park and Dahlgaard 2007). These factors provide us with a basis, but conclusions regarding the organizational structure are hard to derive from these success factors alone. Therefore, we describe the characteristics of OPEX which allows us to derive the main objectives an OPEX structure has to fulfill.

OPEX characteristics. Beside the well-known technical aspects of OPEX, like Preventive Maintenance in TPM or the Pull System in JIT, the holistic St.Gallen understanding with its Effective Management System (see Chap. 2) also provides a social aspect. Specific characteristics like employee involvement, continuous improvement or qualification make OPEX work and enable a sustainable implementation. Most characteristics, technical and social, are interconnected. Based on Pettersen (2009) and our understanding, we take team organization, cross-functional training, employee involvement, continuous improvement and high qualification as key elements of an OPEX-orientated organization (Pettersen 2009; Doppler and Lauterburg 2008).

Team organization. The percentage of employees working in multifunctional teams is much higher in OPEX initiatives than in traditional work organizations. A multifunctional team is a group of employees who is able to perform many different tasks (Karlsson and Åhlström 1996). Total Productive Maintenance (TPM), Total Quality Management (TQM) and Just-in-Time (JIT) all require a strong focus on

teamwork. TPM does not only focus on technical aspects like reliability, but also on engaging all employees in maintenance-related activities. Similar to TQM at which every employee, throughout different departments and hierarchical levels, should be concerned with quality thinking. In a JIT system, a worker cannot produce another unit until the worker at the next station signals that this other unit is needed. The output of each worker is therefore -both in terms of volume and quality – strictly linked to the output of the other workers in the section. Workers have to act as a team, rather than as individuals (Forza 1996).

Cross-functional training. Employees are usually cross-trained to increase their understanding of a process in its entirety, and make them flexible with regards to the changing needs of customers (Nahm et al. 2003). In JIT, for example, each worker must be cross-trained to perform several tasks so that employees can work wherever they are needed (Forza 1996). As a consequence, employees become more self-managing than in a command-and-control environment. Each team is given the responsibility of performing all the tasks along this part of the product flow. This means that the number of tasks in the group increases. At the same time, the use of multifunctional teams decreases the number of job classifications. Instead of having different employees performing only a limited number of tasks, the aim is to have employees who are able to perform multiple tasks within a team (Karlsson and Åhlström 1996). This is only possible with a high level of qualification.

Qualification. To achieve multi-functionality, employees need to receive training in a bigger number of tasks than in traditional work organizations. Tasks previously performed by indirect departments are now the responsibility of a team. Therefore, training in areas such as maintenance and quality control becomes essential (Karlsson and Åhlström 1996).

Employee involvement and *active participation* are perhaps the most important aspects to get closer to OPEX. Involvement is especially demonstrated by each worker's commitment to a continuous improvement philosophy (Bonazzi 1995; Forza 1996). In an OPEX environment, multifunctional teams are expected to perform supervisory tasks. In its most elaborate form, this is done through rotating team leadership among employees especially trained for the task (Karlsson and Åhlström 1996).

Continuous improvement. Involving everyone in improvement efforts is often accomplished through quality circles. These are activities where operators gather in groups to come up with suggestions on possible improvements. Tied to this is an elaborate scheme for implementing suggestions, rewarding employees, and feeding back information on the status of the suggestions. This can be contrasted with the traditional suggestion scheme, where individual employees are encouraged to leave suggestions in a suggestion-box (Karlsson and Åhlström 1996).

Based on these characteristics of OPEX, we can thus derive the objectives for an OPEX structure. At least, it should be supportive of the following requirements:

1. Makes the priority on continuous improvement transparent for all employees
2. Helps to control and sustain a long-term initiative
3. Comes with sufficient resources and capabilities

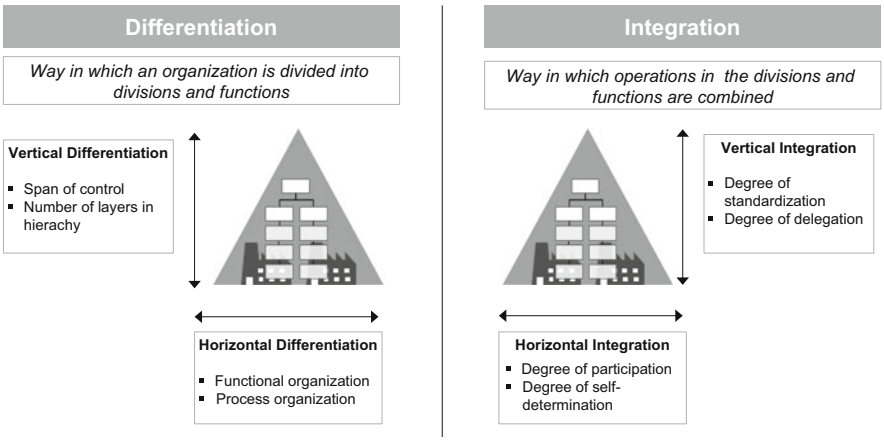

Fig. 16.2 Sub-dimensions of an organizational structure (Müller-Stewens and Lechner 2005, p. 446)

4. Supports the engagement of all management levels down to the shop floor
5. Fosters a direct and fast communication (important, for example, to create a sense of urgency for change)
6. Takes local adaptions into consideration
7. Helps to define and enforce standards also against resistance

Structural Variants for Operational Excellence

An organizational structure consists of different sub-dimensions (c.f. Fig. 16.2). Most relevant for the organizational structure of OPEX initiatives are in our opinion the following ones:

- Span of control and number of hierarchical levels
- Degree of standardization and delegation
- Degree of participation and self determination

Level of Horizontal and Vertical Differentiation

Horizontal differentiation refers to the way tasks are organized and distributed in an organization (Koufteros and Vonderembse 1998. Vertical differentiation refers to the number of hierarchical levels in organizations and separates work performance from its administration (Mintzberg 1979). As shown in Fig. 16.2, we take span of control and number of hierarchical layers as sub-dimensions to describe the vertical differentiation.

Level of span of control. Span of control refers to the number of subordinates reporting directly to a supervisor (Vickery et al. 1999). Fundamental to the span of control concept is a mathematical principle set forth by Graicunas (1933): as the number of positions reporting to a superior increases arithmetically, the number of possible interrelationships increases geometrically (Delbecq 1968). Proceeding from principle, the hypothesis has been generated that "No superior can supervise the work of more than five, or at most six, subordinates whose work interlocks" (Urwiek 1956, p. 34). The spans of control and levels in a chain of command (layers in hierarchy) may be visually ascertained from an organizational chart.

Number of layers in hierarchy. The "number of layers in hierarchy" is the degree to which an organization has many versus few levels of management. The greater the number of layers in the hierarchy of an organization the steeper the pyramid of an organization chart. There is a strong interdependence of hierarchical levels and communication channels and the degree to which vertical communication is slow, difficult, and limited versus fast, easy, and abundant (Nahm et al. 2003). It needs to be noted that span of control and layers of hierarchy are strongly connected and influence each other. The larger the span of control, the less hierarchical levels can be found in an organization.

Important for OPEX: Continuous improvement, the main philosophy of OPEX programs, requires shared tasks, empowerment, teamwork and a flat hierarchy with clear rules. As a consequence, the span of control should be higher and the number of layers in hierarchy should be less in an OPEX-supportive environment compared to traditional work organizations.

Level of Horizontal and Vertical Integration

The level of horizontal integration is the degree to which departments and workers are functionally specialized versus integrated in their work, skills, and training (Davenport and Nohria 1994; Nahm et al. 2003). As can be seen in Fig. 16.2, we use degree of standardization and delegation to describe the vertical integration. According to Müller-Stewens and Lechner (2005), horizontal integrations is described by the degree of participation and self-determination.

Degree of standardization. Standardization replaces occasional with general regulations in the form of a defined sequence of activities. Standards are important to achieve comparability of processes or areas. Further, standardization is a basis for the continuous improvement of processes. Standardization allows for a high degree of transparency, which enhances understanding among employees (VDI 2870). Standardization is strongly connected with formalization. The degree of formalization specifies the extent to which an organization uses rules and procedures to prescribe behavior (Hall 1977; Gupta et al. 1997). Thus, formalization specifies how, where and by whom tasks are to be performed. A high level of formalization eliminates dubiety, but it also limits organization

members' freedom of decision-making. To keep standards part of the daily work discipline is essential (Olivella et al. 2008).

Degree of delegation. Delegation stands for the process of transferring powers. It denotes the vertical transfer of powers and responsibilities to a subordinate hierarchical level or position (Osterloh and Frost 2006). The delegation of power enables people to make decisions, especially at lower organizational layers, and is therefore closely linked to empowerment (Malone 1997). Supervisors get relieved of workload and the professional competence of employees needs to be qualified because of rising performance requirements.

Degree of participation. Participation means the involvement of organizational members in decision-making. With an increasing degree of participation, employees are more involved in decision-making or might even make decisions jointly with supervisors. Direct employee participation can take place at different levels of an organization (Tonnessen 2005).

Degree of self-determination. To be self-determined means to experience a sense of choice in initiating and regulating one's own actions. The idea of managers supporting self-determination is conceptually and philosophically consistent with participative management and vertical job enlargement (Deci et al. 1989).

Important for OPEX: Standardization and formalization are crucial – especially for TQM. According to Kim (2007), a high level formalization is positively linked to good performance. Formalization enables an organization to use knowledge more efficient. This can be important for TQM as the analysis and evaluation of activities developed within the firm may generate a series of formal documents that lead to improved quality and to the avoidance of deviations from the established standards (Claver-Cortés et al. 2007). In addition, standards are important to achieve a high level of continuous improvement. Continuous improvement is based on active participation at all hierarchical levels, which requires delegation of power to employees(Olivella et al. 2008). The degree of delegation is closely linked to empowerment. Empowerment can be viewed as a comprehensive contemporary version of participation. It is a set of motivational techniques that is designed to improve employee performance through increased levels of employee participation and self-determination (Vecchio 1995).

Level of Centralization Versus Decentralization

Talking about global companies, the level of centralization has also to be taken into account. It reflects the degree to which decisions are made higher versus lower in the global organizational hierarchy. We call an organizational structure decentralized when decision-making has been disaggregated into a number of subunits, each making its own decisions. In contrast, an organizational structure is called centralized when decisions are made only at the corporate level of firms as a whole (Nahm et al. 2003). With the centralization of decision-making, it is important to distinguish between two kinds of decisions: work-related decisions and strategic decisions (Aiken and Hage 1968). The first refers to the amount of

participation and the autonomy workers have in making decisions about their environment, e.g., the speed of the assembly line. The second concerns "real" power or the responsibility for setting strategic direction (Koufteros and Vonderembse 1998). Decentralization allows for the interplay between a variety of perspectives and leads to a rich internal network of diverse knowledge resources (Claver-Cortés et al. 2007).

Important for OPEX: Teamwork and problem solving at a lower hierarchical level allow decision-making to be decentralized, and therefore variance and uncertainty can be managed more easily (Flynn et al. 1994). Thus, the more individuals become involved in the decision-making process, the more variety and more ideas will arise to improve differentiation strategies. As company size increases, however, decentralized structures may cause coordination problems (Avdelidou-Fischer 2006). Especially in an OPEX-driven organization that is active worldwide and therefore requiring global standards and global practices, there has to be a centralized part counterbalancing some of the local freedom.

In the following section we combine the content of the previous section – the characteristics of OPEX and the different sub-dimensions of an organizational structure – with the objective to derive an ideal OPEX support structure from the different specifications of each organizational sub-dimension.

The Ideal Operational Excellence Support Structure

Today, most pharmaceutical companies are organized according to a matrix structure. Especially big global pharmaceutical companies like GSK, Roche or Novartis are mostly following this kind of setting. Novartis' businesses, for example, are organized into six global operating divisions that report results in the five segments Pharmaceuticals, Alcon, Sandoz, Vaccines and Diagnostics, over-the-counter medicines and Animal Health (Novartis 2013). It has to be kept in mind that a given organization structure fits for a certain time and striving for OPEX, in the sense of continuous improvement, is an on-going process. Still, OPEX needs to be implemented in a structured manner and an OPEX support structure has to fulfill defined requirements. And yet, there is almost no available knowledge about meaningful sub-dimensions to discuss this support structure that has to have the right impact on the main structure of the organization. We take a look at the automotive (Mercedes-Benz) and engineering (TRUMPF) industry to learn from experiences in other industries.

What Can We Learn from Other Industries?

The Mercedes-Benz Production System (MPS) is a unified, company-wide production system that resulted from the merger of Daimler-Benz and Chrysler in 1998. Its basis is the TPS, but it has been heavily modified and structured to fit Mercedes-

Benz requirements (Clarke 2003). It has three main levels with three subsystems (work structures and workgroup, standardization, quality and robust principles, Just-in-Time, continuous improvement), 15 production principles (e.g., Participation and employee development, standardization methods and processes, pull production) and 92 methods (e.g., continuous improvement workshop, 5-S-method) (Oeltjenbruns 2000). A separate MPS organization has been established that deals with the methodologically basis of the implementation process, and supports and control it. This organization can be broken down into central, site and center levels (Clarke 2003). There is one central MPS office with an MPS office in production planning, and MPS offices in the production network on site level. All are supported by MPS experts and continuous improvement managers that are decentralized. The central MPS team on corporate level is responsible for a consistent, company-wide implementation of the MPS, as well as supporting and coordinating plants' activities. It is part of the planning department to report directly to the production board. Part of the MPS central team is responsible for the concept, the continuous evolution and the controlling of MPS. The other part of the team is composed of production system specialists in charge of training MPS trainers and preparing the implementation MPS elements. On plant level, individual MPS (project) plant teams are accountable for MPS implementation and give functional directives. Together with the central MPS team, they design work packages that cover methods and topics such as communication concepts. Individual plant level project teams are supported by the core team representing the main production centers and functioning as a facilitator for the information flow between the centrally organized MPS team and individual centers. MPS trainers also support the plant level teams; in 2003, for every 1,000 employee at each site-center, one MPS trainer with a high level of qualification (skilled worker or supervisor) was chosen. These trainers, who are accountable to the MPS center coordinator, received an intensive MPS training, including a visit to MPS best practice sites. MPS trainers have a dual function, supporting the implementation process at the shop floor level and contributing to the MPS plant team's daily work. On center level, implementation organization is broken down into three levels: the MPS steering committee at the management level, sub projects at interdepartmental levels and working groups within each department. The MPS steering committee adapts MPS standards to fit the center's particular production needs. Sub-projects refer to teams, each specializing in one of the five subsystems of the MPS. The center level implementation structure tries to assure that the MPS is adjusted to fit the context of each center (Clarke 2003).

What can we learn from Mercedes Benz? Mercedes Benz, as a global company, has full-time OPEX-responsible persons at both a corporate and site level, which together are in charge of a company-wide MPS implementation. This kind of structure shows that a central planning institution drives the institutionalization process and that the MPS central team functions as top management's extension in terms of authority and power. The central team is in charge of the company-wide implementation and together with production system specialists responsible for qualifying MPS trainers and preparing MPS implementation at site level. Training by well-experienced specialists is of high importance in the MPS, at both corporate

and site level. The local teams at site level are responsible for the local adaptability. Furthermore, we can find a high level of standardization and formalization to ensure a company-wide implementation and to control the initiatives.

TRUMPF is a German high-technology company focused on manufacturing, laser and medical technology. TRUMPF has taken a leading role in OPEX in the manufacturing industry and has been able to benefit greatly from the implementation of their production system, Synchro. According to Synchro, people in charge of the implementation first of all need committed people at all levels and in all areas. TRUMPF is involving people from all hierarchical levels. The production staff works together with "their" Synchro specialists on practical solutions. The Synchro Specialists are trained in the use of Synchro production system elements and methods. Together with managers, they appoint objectives for their production area and implement them together with the employees. The middle management is very important at this stage, as it takes on innovative solutions and makes them available across different locations. Basic teams take care of the further development of the Synchro system, and new topics are developed and provided to the staff and Synchro specialists. A supreme committee is the core team, which sets the Synchro guidelines, abuts new issues and coordinates the implementation of Synchro at the sites and reports to the production chief officer. Members are the site manager of the largest sites, the head of the Synchro Consult, the head of quality management, the purchasing manager and the works council chairman (Trumpf 2013).

What can we learn from TRUMPF? Like at the MPS, production staff and specialists are dedicated full-time to OPEX principles and tools. Further, we can find committed people at all levels and in all areas. Reporting systems with involvement of different departments, such as Synchro specialist, quality, and purchasing coming from a high hierarchical level, ensures the implementation and shows the commitment to Synchro. Cross-functional team work is empowered by authority and similar to the MPS, training has a high importance in the sustainable implementation of Synchro.

Is There Anything Like a Lifecycle Model for an OPEX Structure?

The described structures from Mercedes-Benz and TRUMPF have a high maturity level as these companies have been on their journey towards an excellence organization for many years. The organizational structure of MPS and Synchro, too, developed over time. References that structures adapt over time can also be found in previous literature. The contingency model proposed by Lawrence and Lorsch (1967) states that there is not a best way of organizing; instead, there are appropriate organizational structures for specific situations.

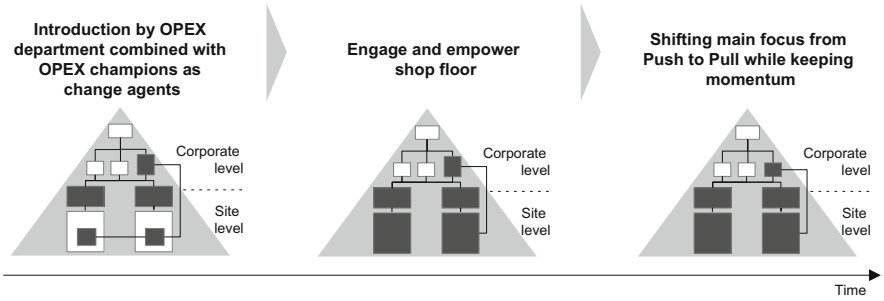

Fig. 16.3 Change of OPEX structures over time

When organizations first launch OPEX, they often start from a rather hierarchical structure, well suited for the conduction of routine operations. Such structures tend to have a high number of hierarchical levels with a low span of control. Furthermore, they show a high level of centralization and a large number of narrowly defined job classifications (high specialization). Forza(1996) showed the differences between such structures and lean organizations, and pointed out that lean production sites seem to make more use of teams when it comes to problem solving, and employees' suggestions are taken more seriously. In addition, lean organizations rely more heavily on quality feedback both from workers and supervisors, document production procedures more carefully and their employees are able to perform a greater variety of tasks including statistical process control (Forza 1996). However, launching OPEX, it is not possible to build on such an ideal organization right away. The changes from a traditional work organization to an OPEX environment require different roles for the OPEX support organization over time. That is, there is indeed something like a lifecycle model for OPEX structures. Figure 16.3 shows different variants of OPEX structures over time, which are described in the following section.

Organizational Structure for Operational Excellence

We first focus on the optimal launch phase of OPEX and then continue to describe the specifications of the introduced sub-dimensions over the lifecycle, from the introduction to a high maturity level of OPEX.

Introduction with OPEX Department Combined with Champions as Change Agents

At the beginning of each OPEX program, existing organizational structures are company-specific, with different specifications of each sub-dimension. This structure mostly will have historically grown. Wildemann and Baumgärtner (2006)

suggested different introduction variants of an integrated production system, depending on the maturity level of an organization. In addition, we segmented in corporate and site level, and derived an introduction variant that is a combination of their variants: The "Introduction with OPEX department combined with champions as change agents". Based on insights from other industries and our own experience in pharmaceutical OPEX, we suggest an implementation by a dedicated OPEX department. An independent organizational unit in charge of the OPEX introduction is established at the corporate level. The responsible person for OPEX at a global level should be a direct report to the head of global production. As OPEX should be launched as a long-term program, the unit remains permanently in the organization. OPEX is at global and at site level an interface function leading to a matrix form, which will be complemented by OPEX champions at site level. Champions are employees from the operative site level with a high technical qualification, good leadership skills and high acceptance among the employees, who are instructed by a central administrative staff unit. The OPEX champions remain in their respective reporting lines. The champion acts in his task as a change agent, consistently promoting the OPEX program and doing so in a socially responsible manner (Doppler and Lauterburg 2008). As an OPEX initiative's basic architecture must be constructed according to a company's specific initial situation and as the starting point usually is a rather strong hierarchy, the launch of OPEX should be supported by a convincing push from the corporate unit but also from the site leadership level. Therefore, the plant leaders are seen as crucial change agents, too, and have to be prepared for their role in the launch of the program.

All this results in the following specifications of the introduced sub-dimensions: As consequence of a push orientation, a vertically structured rather than centralized OPEX support structure is beneficial. Integration is reflected by a high degree of standardization and formalization. This enables a high level of control during the OPEX initiative. The involvement of more people is prepared for by establishing carefully selected change agents including the plant leaders.

Providing resources, capabilities and tools for continuous improvements is key to get closer to a continuous improvement philosophy in an organization. Furthermore, engaging and empowering employees at all management levels, down to the shop floor, is crucial. We focus on these objectives in the "Engage and empower the shopfloor" phase.

Engage and Empower the Shopfloor

According to Peters and Austin (1985), it is practicing people who are a critical success factor in achieving an excellent organization. Based on their research and the experience from other industries one can conclude that a further key factor of the OPEX journey is qualification. The qualification of employees, like the OPEX initiative in general, should take place at all levels of an organization: at the shopfloor and the organizational level, but also at the individual level. Our St.Gallen

OPEX benchmarking shows that the importance of training days as number of yearly training days per employee (all training off- and on the job) rose over the last 10 years in the pharmaceutical industry. Between 2003 and 2012, the score has more than doubled; from 3 days/year per employee in 2003 to 7.7 days/year in 2012 (c.f. Chap. 4).

To achieve more teamwork of multifunctionally qualified employees, the number of tasks in which employees receive training increases. The central OPEX department should therefore provide training, knowledge and information exchange, assessments and individual coaching, and establish a mechanism to constantly re-adjust invent the program by adding new priorities. OPEX uses a variety of improvement specialists to achieve its goals, often referred to as Black Belts, Master Black Belts, Green Belts, Project Champions or lean experts. Full-time Black Belts often lead improvement projects, while Master Black Belts generally serve as trainers and internal consultants. Green Belts are part-time improvement specialists who have received less training and take on supporting roles in improvement projects. Lean experts are specialized in value stream mapping and other typical lean tools (c.f. Chap. 18). Project champions identify strategically important projects to improve teams and provide resources. They typically receive an introduction about OPEX rather than detailed training. Intensive and differentiated training evidently is an integral part of the OPEX approach.

Adapting the organizational structure over time is necessary to provide the right resources and capabilities and to ensure lasting acceptance of the program. A higher level of qualification normally leads to a higher degree of delegation. With more qualification, the vertical transfer of powers and responsibilities to subordinate hierarchical levels or positions is possible. A higher qualification enables the delegation of power especially to the shopfloor, where decisions can be made directly. A rising degree of delegation in order to gradually empower people leads to a higher importance of horizontal integration with more participation and self-determination. To reach a high level of continuous improvement, this higher level of horizontal integration is crucial.

Shifting Main Focus from Push to Pull While Keeping Momentum

Up to this point, a high level of centralization and push from corporate level has been beneficial. With a rising empowerment and participation of employees a pull-orientated organization with a higher level of horizontal differentiation is desirable. A lower number of hierarchical levels and a higher span of control enables a more pull-orientated procedure and a more direct and faster communication. The flatter organization goes hand in hand with a higher vertical integration, described by standardization and degree of delegation. A high level of standards enables a company-wide controlling of the OPEX initiative and a high degree of delegation

empowers employees. The horizontal integration should also be higher as participation is the basis for continuous improvement in the daily work. But to develop an organizational structure towards this specifications, a high level of qualification is needed. All sub-dimension are strongly interrelated; they depend on and influence each other. For example, well-trained workers will be more productive when they are more directly involved in the decision-making process rather than being closely supervised by many layers of management. The shift from push to pull facilitates a higher degree of decentralization. This is necessary as more decentralization enables the consideration of local adaptions. The man-power at the corporate OPEX department should decrease and be partly shifted to site level where OPEX specialists concentrate on the work together with multifunctional teams. This leads to decentralized responsibilities and more easily allows for local adaptions. However, the central department will remain in place and will still be an important part of the further development of OPEX, as without a steady central push each program will lose speed and momentum over time.

Conclusions

It is reasonable to assume that the pharmaceutical industry is at its beginning to consider organizational structures as key success factor of OPEX, therefore increasingly putting emphasis on having the "right" structure in place. The term "organizational structure" refers to the way responsibility and power are allocated, and how work procedures are carried out among organizational members. As a systematic OPEX strategy leads to improvements in quality, cost, and delivery performance, an organization has to undergo changes in organizational structure. Based on the characteristics of OPEX we could derive the following focus points:

- Create structures to get the right information at the right time, and to provide the right information at the right time to the right people
- Choose the right level of standardization and formalization
- Choose the right level of participation
- Define centralized/decentralized roles and responsibilities
- Clarify decision-making responsibilities

Practitioners should consider the following sub-dimensions of an organizational structure when thinking about these challenges and implementing OPEX: Span of control, number of hierarchical levels, degree of standardization, degree of delegation, degree of participation, degree of self-determination and degree of centralization. Every company needs to define its own, specific organizational model and structures, which ensure a reasonable division of labor (differentiation) and to enable efficiency and productivity gains. In a divisional labor process, produced single solutions need to be coordinated and effectively brought back to an integrated whole. Differentiation thus serves primarily to establish cost-optimized production processes with the goal of efficiency. Integration, however, primarily is

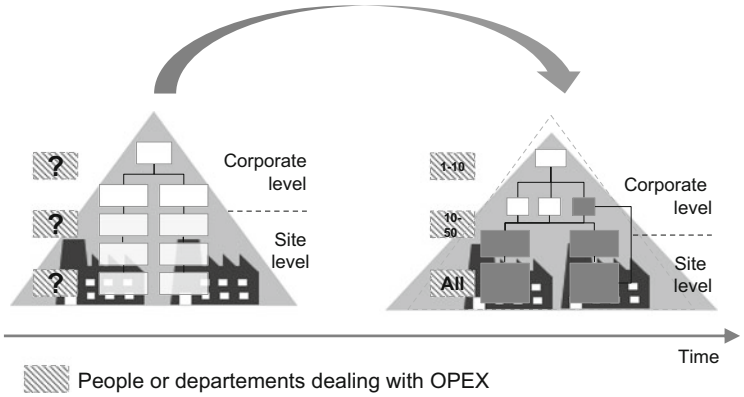

Fig 16.4 Thinking about an ideal OPEX structure

the generation of the greatest customer benefit with the aim of effectiveness. Structures are in this sense an expression of order and organization (Rüegg-Stürm 2005).

An OPEX organizational structure has to develop over time, adjust organizational sub-dimensions at the right time and accelerate the sustainable implementation of OPEX. During the whole journey of OPEX, qualification is of high importance. At a certain point in time, all employees at shopfloor level should be trained in basic OPEX methods and tools (see Chap. 18). As middle management is highly represented in the pharmaceutical industry, the involvement and qualification of this hierarchical level is necessary. Houborg (2010) analyzed Lundbeck's success in launching an OPEX program and mentions: "...the success of the program was due to all leaders from all levels participating in it together; sharing views, sharing knowledge and learning together"(Houborg 2010. Figure 16.4 illustrates the effects of adapting an organizational structure over time.

While a company's organizational structure provides the "hardware", the design of the "software" is just as important. While Chandler's (1962) principle "structure follows strategy" is omnipresent in management literature, the concept of "culture follows strategy" is still often neglected. Organizational culture is the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaption and internal integration, and that have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems (Schein 1984). Further, the role of leaders is substantially different in organizations on their way to OPEX than it is in traditional ones, as leaders at corporate and site level have to act as facilitators. In addition to their functions of control, they also have to create a climate that encourages participation and improvement.

References

Aiken M, Hage J (1968) Organizational interdependence and intra-organizational structure. Am Sociol Rev 33:912–930

Anand N, Daft RL (2007) What is the right organization design? Organ Dyn 36(4):329–344

Avdelidou-Fischer N (2006) The relationship between organizational structures and performance: the case of the fortune 500. Int Financ Rev 7:169–206

Bonazzi G (1995) A gentler way to total quality?: the case of the "integrated factory" at Fiat Auto; background: is there a western way to lean production? In: Cross cultural perspectives of automation: the impact on organizational and workforce management practices. Edition Sigma, Berlin, pp 125–168

Chandler AD (1962) Strategy and structure: chapters in the history of the American industrial enterprise. MIT Press, Cambridge, MA

Clarke C (2003) Forms and functions of standardization in production systems of the automotive industry: the case of Mercedes-Benz. Doctoral dissertation, FreieUniversität, Berlin. http://www.diss.fu-berlin.de/diss/receive/FUDISS_thesis_000000001108. Retrieved 23 Nov 2012

Claver-Cortés E, Zaragoza-Sáez P, Pertusa-Ortega E (2007) Organizational structure features supporting knowledge management processes. J Knowl Manag 11(4):45–57

Dahlgaard-Park S-M, Dahlgaard J (2007) Excellence – 25 years evolution. J Manag 13 (4):371–393

Davenport TH, Nohria N (1994) Case management and the integration of labor. Sloan Manage Rev (Winter) 11–23

Deci EL, Connell JE, Ryan RM (1989) Self-determination in a work organization. J Appl Psychol 74(4):580–590, American Psychological Association, Inc

Delbecq AL (1968) The world within the span of control. Bus Horiz 11(4):47–56

Doppler K, Lauterburg C (2008) Change Management. Campus Verlag, Frankfurt

Drucker PF (1999) Management challenges for 21st century. HarperBusiness, New York

Flynn BB, Schroeder RG, Sakakibara S (1994) A framework for quality management research and associated measurement instrument. J Oper Manag 11(4):339–366

Forza C (1996) Work organization in lean production and traditional plants: what are the differences? Int J Oper Prod Manag 16(2):42–62

Graicunas VA (1933) Relationship in organization. Bull Int Manag Inst 7:39–42

Gupta A, Chen IJ, Chiang D (1997) Determining organizational structure choices in advanced manufacturing technology management. Omega 25(5):511–521

Hall RH (1977) Organizations: structure and process. Prentice-Hall, Englewood Cliffs

Hill CWL, Jones GR (2001) Strategic management theory: an integrated approach, 5th edn. Houghton Mifflin, Boston

Houborg C (2010) Implementing a successful lean program: where do you begin? Pharmaceut Tech Eur 22 (9). http://www.pharmtech.com/pharmtech/article/articleDetail.jsp?id=685046&pageID=1&sk=&date=. Retrieved 3 Nov 2012

Karlsson C, Ahlström P (1996) Assessing changes towards lean production. Int J Oper Prod Manag 16(2):24–41

Kim SW (2007) Organizational structures and the performance of supply chain management. Int J Prod Econ 106(2):323–345

Koufteros X, Vonderembse M (1998) The impact of organizational structure on the level of JIT attainment: towards theory development. Int J Prod Res 36(10):2863–2878

Lawrence PL, Lorsch JW (1967) Organization and environment: managing differentiation and integration. Harvard University, Graduate School of Business Administration, Boston

Malone TW (1997) Is "empowerment" just a Fad? Control, decision-making, and information technology. Sloan Manage Rev 38(2):23–35

Mintzberg H (1979) The structuring of organizations. Prentice-Hall, London

Müller-Stewens G, Lechner C (2005) Strategisches Management: Wie strategische Initiativen zum wandel führen, vol 3. Schäffer-Poeschel, Auflage, Stuttgart

Nahm AY, Vonderembse MA, Koufteros XA (2003) The impact of organizational structure on time-based manufacturing and plant performance. J Oper Manag 21:281–306
Novartis (2013) Novartis organizational structure. http://www.novartis.com/downloads/about-novartis/people/novartis-org-chart.pdf. Retrieved 3 Mar 2013
Oeltjenbruns H (2000) Organisation der Produktion nach dem Vorbild Toyota, Dissertation TU Clausthal
Olivella J, Cuatrecasas L, Gavilan N (2008) Work organisation practices for lean production. J Manuf Technol Manag 19(7):798–811
Osterloh M, Frost J (2006) Prozessmanagement als Kernkompetenz: Wie Sie Business Reengineering strategisch nutzen können. GablerVerlag; Auflage: 5.,überarb. Aufl
Peters TJ, Austin N (1985) A passion for excellence – the leadership difference. HarperCollins, London
Peters TJ, Waterman RH (1982) In search of excellence – lessons from America's best-run companies. HarperCollins, London
Pettersen J (2009) Defining lean production: some conceptual and practical issues. TQM J 21 (2):127–142
Rüegg-Stürm J (2005) Das neue St.Gallen Management and Model. Haupt, Berne
Schein EH (1984) Coming to a new awareness of organizational culture. Sloan Manage Rev 25 (2):3–16
Tonnessen T (2005) Continuous innovation through company wide employee participation. TQM Mag 17(2):195–208
TRUMPF (2013) SYNCHRO – innovative in Prozessen. http://www.trumpf.com/innovation/synchro.html. Retrieved 11 Mar 2013
Ulrich H, Krieg WK (1972) Das St.Gallen Management Model. Haupt, Bern
Urwiek LF (1956) The manager's span of control. Harv Bus Rev 39–47
VDI 2870 Part 1 (2012) Lean production systems. Basic principles, introduction, and review
Vecchio RP (1995) Organizational behaviour, 3rd edn. The Dryden Press, Forth Worth
Vickery S, Dröge C, Germain R (1999) The relationship between product customization and organizational structure. J Oper Manag 17:377–391
Wildemann H, Baumgärtner G (2006) Suche nach dem eigenen Weg: individuelle einführungskonzepte für schlanke produktionssysteme. ZWF 10(2006):546–552