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# Leading 20,000+ Employees with a Process-Oriented Management System: Insights into Process Management at Lufthansa Technik Group

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## Abstract

- (a) **Situation faced:** Structured documentation of an aviation company's processes is a prerequisite to gaining an authority's approval for aircraft maintenance, repair, and overhaul. Processes had been documented in a continuously growing number of PDF-based text documents, but the growing complexity of processes meant that this approach to process documentation no longer provided easy-to-understand work instructions for employees that fulfilled the authorities' requirements.
- (b) **Action taken:** Lufthansa Technik Group implemented a process-oriented management system called IQ MOVE, the goal of which is to provide concise, easy-to-read documentation of processes in the form of process maps and swim-lane-based process descriptions. The system is designed to ensure seamless integration of normative and legislative requirements into the processes to avoid cross-references and to separate process documentation into multiple points of view. Moreover, IQ MOVE applies the "Framework for Assignment of Responsibilities" (FAR+) to strengthen process-management roles and increase employees' acceptance of the system.
- (c) **Results achieved:** 20,000+ employees at Lufthansa Technik use IQ MOVE in their daily work. A periodically performed employee survey shows a

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high level of acceptance by the employees and increased awareness of the process-management roles (e.g., Process Owner, Process Architect, and Process Manager) based on the implementation of FAR+ and the integrated BPM Lifecycle approach.

- (d) **Lessons learned:** Key success factors of the system are the easy-to-understand process-modeling notation, the seamless integration of normative and legislative requirements into processes, the clearly defined process-management roles, the holistic process-modeling team, and the comprehensive process operations concept that Lufthansa Technik Group applied.

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## 1 Introduction

The Lufthansa Technik Group, the technical division of Lufthansa Group, provides aircraft maintenance, repair, and overhaul (MRO) services to about 800 customers around the world. At its 30 subsidiaries worldwide, more than 20,000 employees perform tasks like aircraft overhaul, component maintenance, and V.I.P. cabin completion. The basis for all aircraft-related tasks are the approvals of the respective aviation authorities from 69 countries. To gain these approvals, Lufthansa Technik must demonstrate to these regulatory authorities its compliance with international laws and standards. The company accomplishes this requirement based on the process-oriented management system called IQ MOVE.

IQ MOVE consists of a web application with two modules. In the background, “requirement management” covers all applicable legislative and normative requirements (e.g., EASA Part-145, EN 9110), which are interpreted and assigned to all processes to which they are relevant. At the front-end, these processes are presented to the users in the system’s process-management module, in which all relevant processes are mapped in concise and easy-to-read process-modeling language that is designed to fit to the employees’ needs.

Since the beginning of the IQ MOVE implementation in 2002, “Finding all relevant procedures quickly and easily” has been the guiding vision of the development and operation of the system. Its acceptance by the employees is the key indicator of the success of the IQ MOVE implementation.

Today, IQ MOVE covers a wide range of processes, from production to administration. In the beginning, the implementation project focused on modeling processes that are under regulatory supervision, but processes from areas like human resources, accounting, and innovation were also included. Regarding employees’ acceptance of the system, most of the efforts was directed toward production processes, particularly the repair and release-to-service of aircraft and aircraft parts processes, which are performed by about 12,000 mechanics all over the world.

An essential step in increasing employees’ acceptance was the introduction of a process-management role concept that facilitates clear assignment of management responsibilities to specific roles, such as Process Owner, Process Architect, and Process Manager (for process responsibility) and Line Manager (for disciplinary

responsibility). Intensive training and coaching for these roles has helped to improve the operation of processes by, for example, keeping processes up-to-date and providing process training to employees.

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## **2 Situation Faced**

Performing aircraft MRO requires the approval of the respective customer's aviation authority. For example, to provide aircraft maintenance to a customer with U.S. registered aircraft, approval by the Federal Aviation Administration (FAA) for performing the corresponding tasks is a prerequisite. To gain approval, the company has to prove its processes' conformity with the respective law in terms of both process documentation and the practical execution of processes.

Prior to the implementation of IQ MOVE, the company demonstrated its procedures' conformity with international laws and standards in a conventional way using more than 360 PDF documents issued by multiple departments and developed by about 250 employees across the company. These documents varied in length from 2 to 120 pages, contained a large number of cross-references, and described procedures from multiple points of view. For example, the process of "Creating quotations for the repair of aircraft components" was described from the workshop's point of view as well as from customer service's point of view. The two responsible departments issued separate procedure documentations that described the specifics of the process, often without matching the content.

Therefore, when an employee wanted to perform a specific activity, he or she had first to identify the relevant procedures and then to look up the relevant content. Because of the continuously growing number of documents written from multiple points of view and containing numerous cross-references, it was challenging to take all relevant procedures into account, and increasing numbers of inconsistencies caused coordination issues, not to mention irritation. As a consequence, the system had to be redesigned.

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## **3 Action Taken**

The core idea of the new system was to replace the existing documentation by means of a process-oriented, integrated management system that provides in one place all relevant information to performing an activity, taking all applicable norms, standards, and internal and external regulations into account. To implement this idea, a web-based application was developed in close cooperation with the future users of the system, particularly employees from production, such as aircraft mechanics and engineers.

This system was named IQ MOVE. "IQ" reflects the "integrated quality management" approach of combining several requirement disciplines in one system, while "MOVE" represents the flexibility and the ongoing development of the system and its content.

The overall target of the IQ MOVE implementation was—and is—to ensure the “safety first” principle by providing to employees around the world all of the information that is relevant to the safe execution of processes and informed decision-making.

### **3.1 Requirement and Process Management Form the Basis of IQ MOVE**

The IQ MOVE application consists of two major modules: A “Requirement Management” module and a “Process Management” module. The Requirement Management module is designed for the implementation of all requirements, such as EASA Part-145, EN 9110, and OHSAS 18001.<sup>1</sup> Target groups for this area are authorities, certification bodies, and customers’ auditors. To build the content of the requirement database, internal Requirement Managers interpret all applicable requirements into actionable tasks and document these tasks in the requirement database.

The Process Management module contains the organization’s processes. All processes are modeled so they are easy for employees to understand. Processes are stored in IQ MOVE’s Process and Document Database.

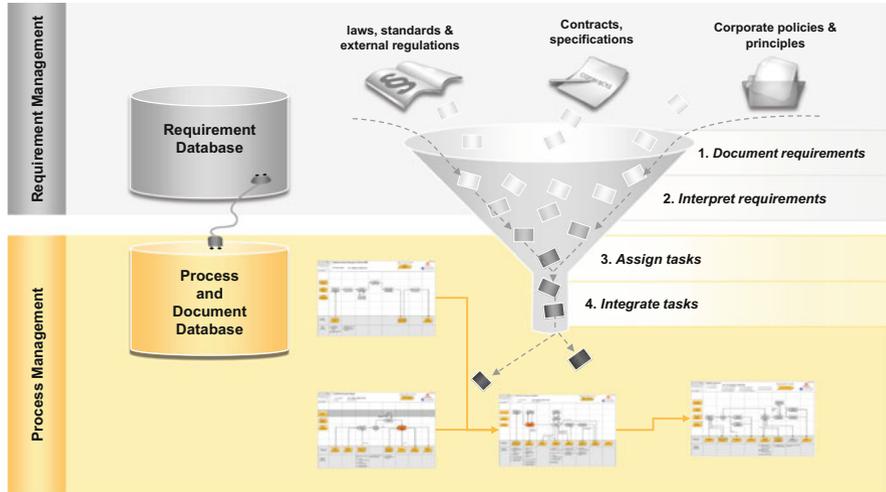
To connect requirement management and process management, tasks that result from requirements are assigned to processes in the course of the Requirement Manager’s “conformity check” and integrated into processes by process modeling teams before the processes are published. Figure 1 provides an overview of the connection between these two modules.

### **3.2 Process Modeling in IQ MOVE**

The integration of requirements into processes is enabled by the application of a concise process-modeling methodology that consists of multiple modeling levels with increasing levels of detail. The highest level of the “process world”—the level with the least detail—consists of “process maps” that structure processes from a process-oriented organizational perspective. This structure is detailed by several levels of process maps until the next-highest level, a “process display,” is reached. A process display consists of six swim lanes that contain the process’s roles and activities and provide an overview of the process flow and how the roles interact. Every activity in the process is further explained by “info boxes,” the third level, which present detailed information on how to perform the respective activity on

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<sup>1</sup>EASA Part-145 describes the requirements for achieving and maintaining the aviation authority’s approval as a maintenance organization for aircraft and aircraft components in the EU. EN 9110 describes the requirements for a quality-management system of the EN 9xxx family, with specific requirements for aviation and aerospace maintenance organizations. OHSAS 18001 describes requirements for an occupational health and safety management system to eliminate or minimize risks to employees.



**Fig. 1** Processes and requirements are connected by tasks in IQ MOVE

responsible roles, applicable IT systems, and related documents. These “activity-related documents” are the lowest level of the documentation and provide the highest level of detail in terms of checklists, forms, examples, and so on (Fig. 2.).

A closer look at the design of process displays in IQ MOVE is shown in Fig. 3, which shows an example of a process display. A swim lane consists of nine cells. The first cell is reserved for the role that executes the activities and decisions placed within the remaining eight cells of the swim lane. Activities and decisions are connected by either the standard workflow or by optional (alternative or additional) connections. Roles, activities, decisions, and connections are the core elements of the modeling notation used in IQ MOVE. Two swim lanes at the bottom of the process refer to upstream and downstream processes for navigation between process displays and to activity-related documents for quick access to more detailed information. An end-to-end process initiated and ended by the customer (internal as well as external customers) can be modeled along several process displays.

The reduced modeling methodology IQ MOVE uses is the result of several workshops with about 100 employees during the design phase of the IQ MOVE development project. The goal of these workshops was to identify a way to do process modeling that employees can understand easily. As a consequence, more complex modeling elements, such as operators, events, and interfaces, were abandoned. Workshop participants evaluated notations like UML<sup>2</sup> activity diagrams and Event Driven Process Chains. (BPMN<sup>3</sup> was not available in 2002.)

Not only the process maps but also other paths enable the users of IQ MOVE to access the process world. Because of the assignment of roles to an organization’s

<sup>2</sup>UML = Unified Modeling Language.

<sup>3</sup>BPMN = Business Process Model and Notation.

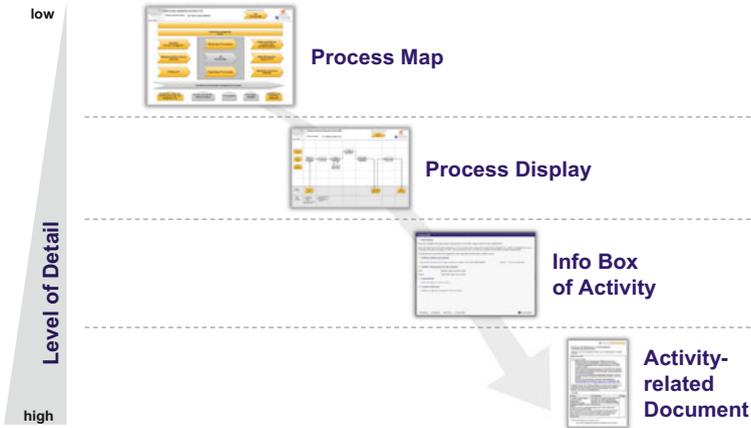


Fig. 2 Four levels of detail are used to describe processes in IQ MOVE

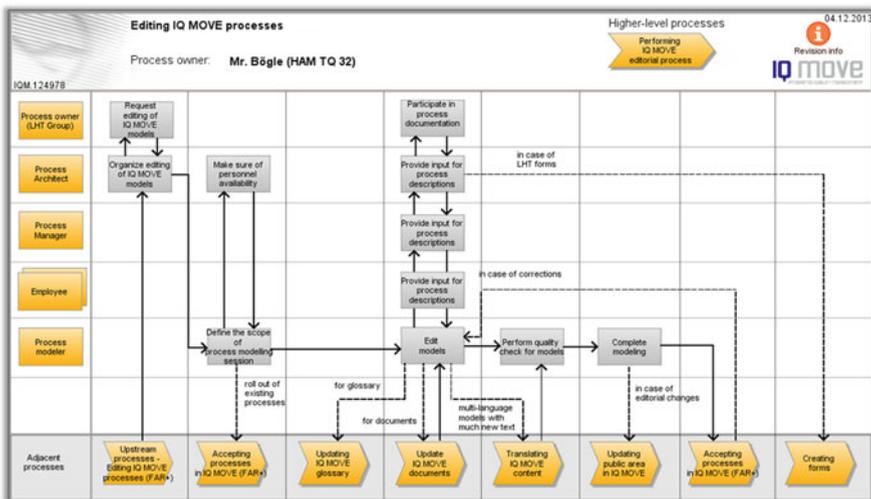
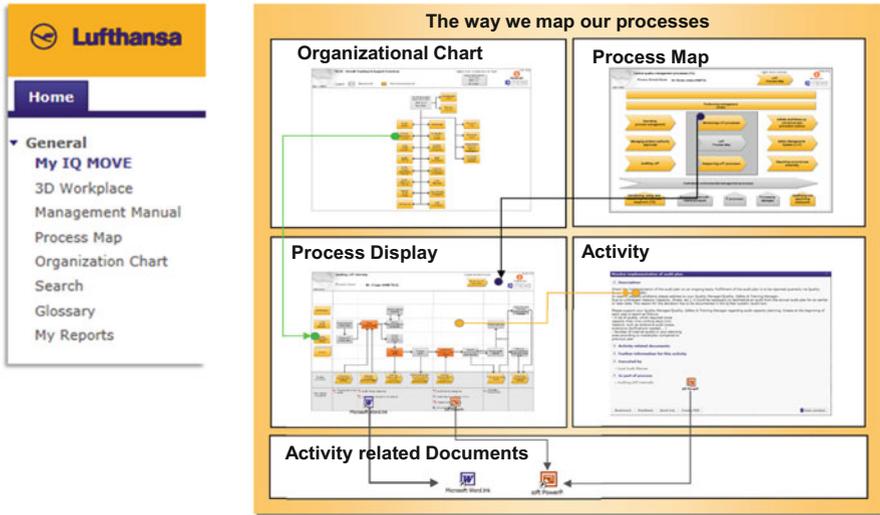


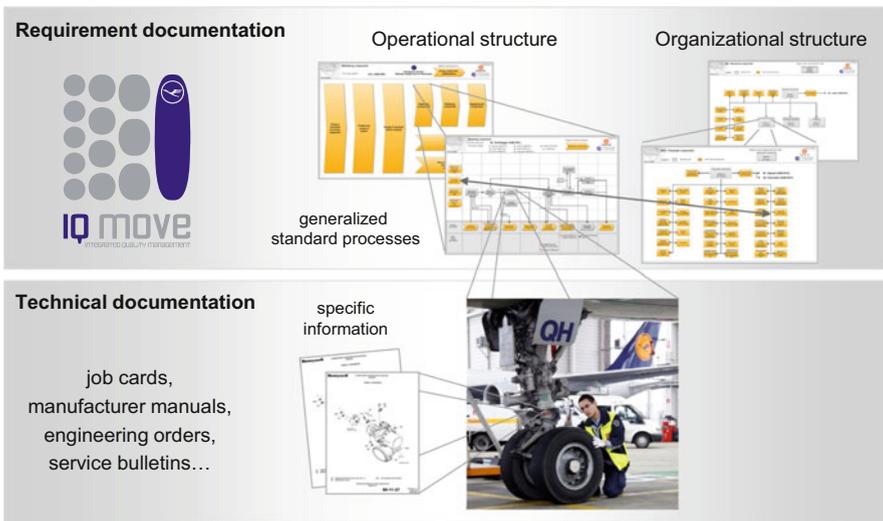
Fig. 3 Example of a process display in IQ MOVE

structure, visual organizational charts can be used to open up the processes that belong to specific roles. Personalized bookmarks also enable direct access to frequently used processes and documents, and a search function makes it possible to look up information throughout the whole process world. Based on the role-based modeling approach, it is possible to limit content (e.g., within search results) to processes in which a user is involved. Figure 4 shows the interconnections based on the integration of roles and activities into IQ MOVE’s process database.

To explain the difference between management system documentation and operational information, Fig. 5 presents the characteristics of both levels of



**Fig. 4** Interconnection of elements in IQ MOVE



**Fig. 5** Differentiation between management system and operational documentation

information. IQ MOVE focuses on generalized standard processes—that is, it avoids modeling product, customer, and location specifics. The specific information related to a process (e.g., detailed technical documentation for the maintenance of all of an aircraft’s components) is provided by operational systems (e.g., a

document management system called eDoc for the distribution of component maintenance manuals). Therefore, the detailed description of an activity contains a reference like “Please repair the component according to the applicable component maintenance manual in eDoc.”

### 3.3 The IQ MOVE Editorial Process

In addition to processes from production and administration, also the way how Lufthansa Technik creates its process documentation is modeled in IQ MOVE. Figure 6 presents the process map of the editorial process in IQ MOVE.

The beginning of the process reflects the two areas of IQ MOVE: The process “Editing regulations in IQ MOVE” explains how to update the requirement database by registering and revising all relevant requirements as the basis for the subsequent conformity check. In parallel, the process documentation is created as described in the two processes “Editing IQ MOVE processes” and “Accepting processes in IQ MOVE.”

Before they are published, all new processes and selected updated processes have to pass a conformity check to ensure compliance with all applicable norms and laws. The conformity check is split into an internal check and an external check. The internal conformity check is performed by the internal Requirement Managers, who specialize in interpreting and company-specific implementation of laws and standards. To demonstrate compliance, tasks that were initially created in the

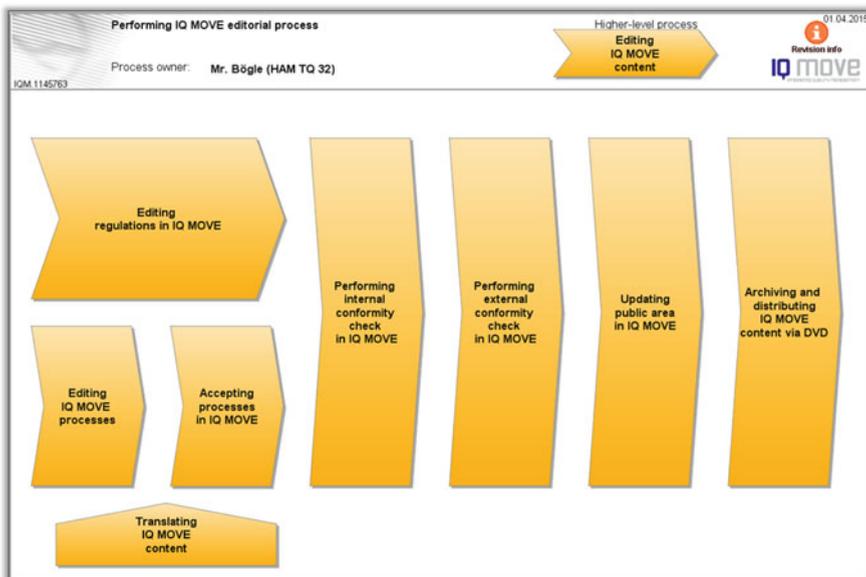


Fig. 6 Process map of the editorial process in IQ MOVE

process “Editing regulations in IQ MOVE” are assigned to all relevant processes, content is integrated into the process models, and a “conformity confirmed” or “adjustment necessary” status is set. Only with a confirmed conformity check can a process proceed in the editorial process.

Most processes will be published right after successful completion of the conformity check, but some processes require an external conformity check by a supervisory authority, such as the Luftfahrt-Bundesamt, the German aviation authority.

The process “Updating public area in IQ MOVE” explains the weekly and monthly activities for publishing processes in IQ MOVE. Finally, all IQ MOVE revisions are archived for later reference.

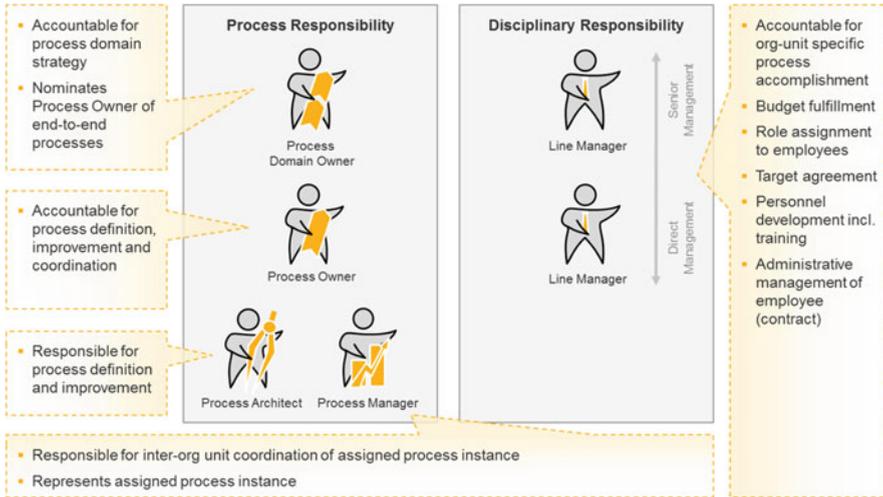
The process map of the IQ MOVE editorial process is completed by means of a support process for translating processes. The goal of this part of the editorial process is to ensure that all processes provide their information in English and any other languages made mandatory by the respective authorities. Mandatory languages are defined for each legal entity according to local requirements. For example, Lufthansa Technik AERO Alzey GmbH provides processes only in English, but Lufthansa Technik AG provides processes in both English and German as a result of coordination with the worker’s council.

### 3.4 BPM Governance Based on the Framework for Assignment of Responsibilities (FAR+)

An adapted version of the Framework for Assignment of Responsibilities (FAR+) was implemented in 2014 as the basis for the operation and improvement of processes (Kettenbohrer et al. 2013, 2014) to enforce process governance. The underlying idea of the FAR+ concept is the split of managerial responsibility into “process responsibility,” which defines *how* employees are supposed to perform processes, and “disciplinary responsibility,” which defines *what* employees are supposed to do. Both responsibilities must be defined for every position.

The core role in process responsibility is that of the Process Owner. According to a RACI classification<sup>4</sup> (Loshin 2008), the Process Owner is accountable for defining, improving, and coordinating the process on the level of detailed processes described by one or more process displays. The Process Architect role is assigned to specialized employees who are responsible for defining and improving the process. The Process Manager role is assigned to persons who are responsible for coordinating process execution inter-organizationally in the various process instances (e.g., location-specific, customer-specific, product-specific process execution). The fourth role in the realm of process responsibility is that of the Process

<sup>4</sup>R = the role is responsible for an activity; that is, the role performs an activity. A = The role is accountable for an activity; that is, the role is ultimately liable for an activity. C = The role has to be consulted. I = The role has to be informed. Only R and A are applied in this example.



**Fig. 7** Roles of the Framework for Assignment of Responsibilities (FAR+) (Kettenbohrer et al. 2013, 2014)

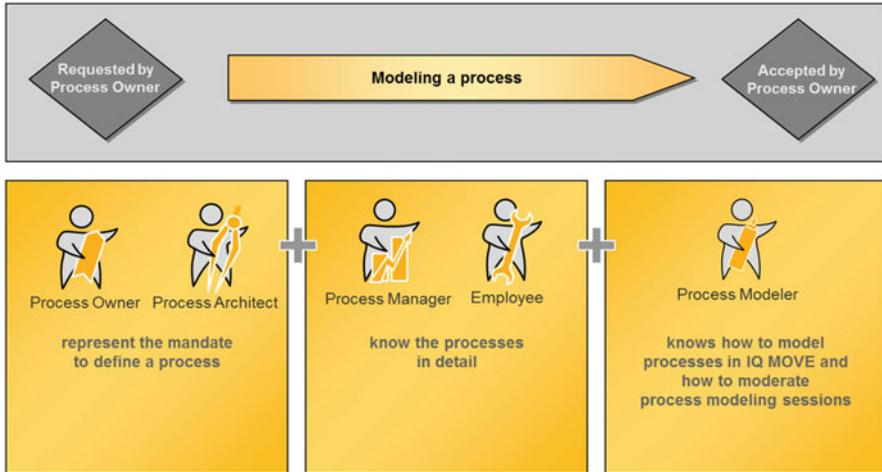
Domain Owner, who is accountable for the strategic direction of the processes and sub-domains in the respective process domain.

In the realm of disciplinary responsibility, the Line Manager is accountable and responsible for the assigned organizational unit's accomplishing the process, including organizational-unit-specific budget fulfillment, assignment of roles to employees in the organizational unit, coordination of target agreements, and personnel development (Kettenbohrer et al. 2013, 2014). In contrast to the theoretical FAR+ concept, Lufthansa Technik did not implement a separate role for the administrative management of employees (e.g., signing of work contract) but integrated this responsibility into to the Line Manager's role for the time being. The Line Manager role is assigned to managers of organizational units on all hierarchical levels. Figure 7 provides an overview of the roles.

In addition to the roles, structured communication flows between the roles ensure the smooth operation of processes, provide a platform for decision-making, avoid unstructured escalation in case of a dispute, and align process strategy (assigned to process responsibility) with business strategy (assigned to disciplinary responsibility).

### 3.5 The Procedure of Process Modeling in IQ MOVE

To ensure the applicability of process documentations, modeling of the processes in IQ MOVE is performed by three parties in joint process modeling sessions, based on the FAR+ concept. As the first party, the Process Owner and Process Architect represent the mandate of defining a process. As the second party, Process Managers



**Fig. 8** Three parties participate in IQ MOVE process-modeling sessions

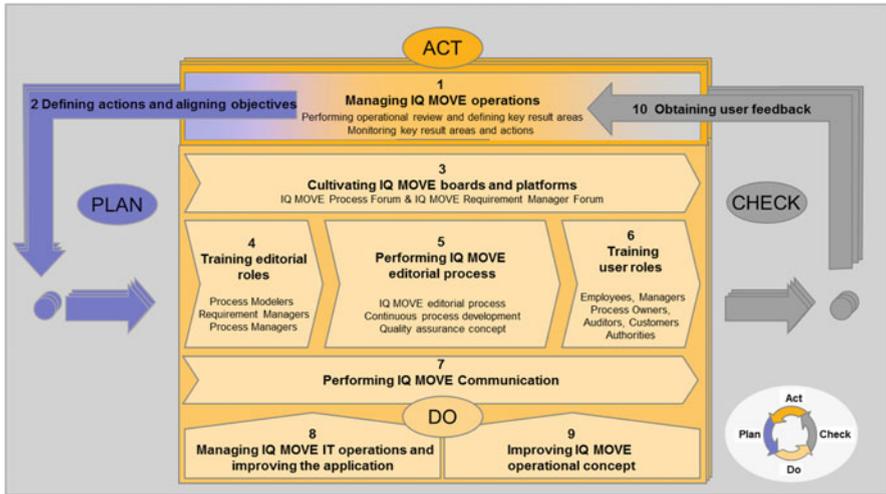
and/or employees participate in process-modeling sessions to bring in the detailed expertise of real-life process execution. As the third party, a Process Modeler moderates the process modeling session and handles the actual documentation in the system. The Process Modeler is experienced in Lufthansa Technik’s process-modeling methodology and has completed moderator training (Fig. 8).

Process modeling itself is initialized by the Process Owner, who contacts the Process Modeler to request a process modeling session. The Process Owner (supported by Process Architect) and the Process Modeler agree on the scope, timeframe, and participants of a process-modeling session. During the meeting, the process is modeled live in the system, although several sessions are often required. In the end, the Process Owner is asked to accept the new process within a workflow in IQ MOVE.

### 3.6 IQ MOVE’s Operational Concept

To protect the investment in IQ MOVE and to improve the system, at the end of the project the project’s review board requested a concept for the system’s operations. As a result, the IQ MOVE’s Operational Concept shown in Fig. 9 was developed. Then operation of the system and the editorial process were handed over to the Process Owner of IQ MOVE’s editorial process.

The concept is structured as a Plan-Do-Check-Act cycle. The core of the “Do” phase is the process “Performing IQ MOVE editorial process”, which summarizes all processes that relate to the editing of content in IQ MOVE. To fuel this process, those who hold the editorial roles of the system (e.g., Process Modelers, Requirement Managers) must be trained, while user roles like those of employees, Line



**Fig. 9** IQ MOVE's operational concept

Managers, Process Owners, and External Auditors have to be trained in the use of IQ MOVE. In parallel to these core processes, the Process Owner of the IQ MOVE editorial process cultivates the IQ MOVE community by facilitating the exchange of experiences by those who hold the roles involved. For example, all Process Modelers are invited to a yearly “IQ MOVE Process Forum,” the goal of which is facilitate their getting to know their colleagues, to train Process Modelers on changes in the editorial process, and to identify ideas for improving the system. The “Do” phase is completed by undertaking processes to define activities for internal and external communication related to IQ MOVE and processes to improve the IQ MOVE IT application and the IQ MOVE Operational Concept itself.

Every 2 years, as part of the “Check” phase, all users of the system—that is, participants in the IQ MOVE editorial process, such as employees, Process Owners, Line Managers, and Process Modelers—provide feedback concerning IQ MOVE's strengths and weaknesses. Based on this IQ MOVE user feedback, key result areas for improving the system are identified and measures for implementing these improvements are developed. The IQ MOVE user feedback is also used to evaluate the system's acceptance by the users with regard to the system's vision of “finding all relevant procedures quickly and easily.”

Finally, in the “Act” phase, the developed measures are presented to the Process Domain Owner and the process participants' senior management (i.e., the Lufthansa Technik Board) for approval. Based on this committee's decision, measures are implemented in the “Plan” phase.

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## 4 Results Achieved

Results of the biannual IQ MOVE user feedback (according to the IQ MOVE Operational Concept) indicate a constant level of acceptance by the employees, but ensuring the IQ MOVE vision of “finding all relevant procedures quickly and easily” is met in daily work remains a challenge.

In general, the results of IQ MOVE user feedbacks confirm that the implemented process modeling methodology, with its varying levels of detail (i.e., process maps, process displays, info-boxes of activities, and activity-related documents) and reduced number of process modeling objects (i.e., roles, activities, and decisions), is easily understood and simple to use. However, because of the complexity of the real-life processes, the complexity of process documentation increases over time, and Process Owners, Process Architects, and Process Modelers must work to keep documentation as concise as possible.

The development and implementation of FAR+ was initialized as result of IQ MOVE’s 2011 user feedback to strengthen the role of the Process Owner, facilitate continuous process improvement, ensure proper accomplishment of processes at all locations, and provide comprehensive training of process participants. First results of the evaluation of the FAR+ implementation confirm that the concept helps to improve the system in these ways, but it is clear that the assignment of the FAR+ roles alone does not fully enable all employees to perform their roles. As a result, additional workshop series have been started, especially to support Process Owners and Process Architects by offering a structured process-operation concept. This concept was developed based on the generalized IQ MOVE operational concept, and training will be offered to all Process Owners in the near future. The core of this generalized process operations approach is a simplified BPM lifecycle based on Dumas et al.’s (2013) BPM Lifecycle, which is supported by BPM tools and methodologies. To apply this concept to the individual processes, the workshop series will guide Process Owners and Process Architects through the individual setup of operational concepts. For example, it will provide tools and methodologies with which to develop a process strategy based on the corporate strategy, to innovate processes, to implement process changes, to steer processes based on indicators, and so on.

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## 5 Lessons Learned

Even after 10 years of BPM at Lufthansa Technik, the vision of “finding all relevant procedures quickly and easily” still drives all BPM activities. Along the journey to fulfilling this vision, key factors to increase the system’s acceptance by the employees were identified.

How process modeling is done in IQ MOVE is a core element of the project’s success. The four modeling levels (i.e., process maps, process displays, info-boxes, and activity-related documents) offer a flexible approach to mapping processes and provide easy access to the documentation, while the concise process-modeling

language for process displays (i.e., swim lanes with roles, activities, and decisions only) increases the readability and usability of the process documentation in IQ MOVE. Both of these aspects of the system positively influence its acceptance.

The seamless integration of legislative and normative requirements into process descriptions also helps to increase employees' acceptance of the system because it reduces the complexity of process documentation. In the IQ MOVE editorial process, specialized experts check all process models for compliance before publication and ensure that all requirements are integrated into the process descriptions. Therefore, employees can work according to the process descriptions without worrying about all the requirements in the background.

In addition, the clear definition of process-management roles (i.e., Process Domain Owner, Process Owner, Process Architect, and Process Manager) increases employees' awareness of process management and facilitates the precise assignment of process-management activities to positions. In particular, the differentiation of roles related to process responsibility vs. disciplinary responsibility according to FAR+ was a major step in promoting process management and strengthening the role of the Process Owner. In an additional step, the introduction of BPM role-oriented training modules contributed to the professionalization of process management in the organization by providing tools and methodologies along the process lifecycle.

The role concept also helps to improve process modeling by bringing the right parties together: Process Owners and Process Architects represent the mandate to define the process and drive process improvement, while Process Managers and employees bring practical experience into process modeling. The Process Modeler has the expertise to moderate process modeling sessions and to map processes in an easy-to-understand way.

Finally, the key to keeping the process management system on track is the IQ MOVE operational concept, which is the basis for the system's continuous improvement and that helps to structure and steer its global operation. The underlying Plan-Do-Check-Act cycle collects the users' feedback and integrates their needs into the system's development. In addition, the integration of top management into the system's development is ensured by regular reporting to and discussion with the organization's senior line managers.

These key factors, which enabled Lufthansa Technik Group to implement a stable and robust process-oriented management system that is used by 20,000+ employees and managers around the world, may also help other organizations to strengthen their process management systems.

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