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## Work Organisation and Innovation - Case Study: LHT, Germany

Birte Homann  
*Wilke, Maack & Partner*

Stefan Stracke  
*Willke, Maack & Partner*

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## Work Organisation and Innovation - Case Study: LHT, Germany

### Abstract

[Excerpt] Lufthansa Technik AG (LHT) provides aircraft-related technical services to a worldwide customer base comprising airlines, aircraft leasing companies, maintenance organisations, and operators of business and VIP aircrafts. Besides the maintenance, repair, and overhaul (MRO) services that form the organisation's core business, activities also include development and production activities, as well as logistics.

### Keywords

work organization, innovation, LHT

### Comments

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# Work organisation and innovation

## *Case study: LHT, Germany*

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# Background to the organisation

Lufthansa Technik AG (LHT) provides aircraft-related technical services to a worldwide customer base comprising airlines, aircraft leasing companies, maintenance organisations, and operators of business and VIP aircrafts.<sup>1</sup> Besides the maintenance, repair, and overhaul (MRO) services that form the organisation's core business, activities also include development and production activities, as well as logistics.

LHT developed in the mid-1990s when the Lufthansa Group was split into seven autonomously operating results-orientated businesses. Against the background of an increasingly challenging market, this action, together with other measures, was intended to secure Lufthansa's competitiveness. In 1994, Lufthansa's former technical division, with decades of experience in the aircraft MRO business, became the independent stock corporation 'Lufthansa Technik AG'. Deutsche Lufthansa AG has remained the sole shareholder of the company while the Lufthansa Group in general has remained its most important customer. Nevertheless, business with external customers has increased steadily compared to internal business<sup>2</sup> and now accounts for more than 50% of turnover.

When Lufthansa Technik was established, the strategic goals of the organisation were linked to actively shaping the market by introducing new products and achieving a closer relationship with its customers, both in terms of speed of response and geographic position (*Lufthansa Technik, The History*, 2005, p. 55).

In keeping with the internationalisation of the aviation industry, the organisation has created a global network with an international division of labour. Overall, LHT has direct and indirect equity investments in 56 companies worldwide. While its main focus is in Europe, the Group's network encompasses more than 30 technical maintenance operations in Asia and the USA. It employs around 26,000 people worldwide, of which 11,000 work in Germany. Of these, more than 50% are involved in productive activities. LHT's headquarters are in Hamburg with approximately 6,500 employees and 800 temporary workers. Frankfurt is the central maintenance location with almost 3,000 employees. Other important maintenance locations are Munich and Berlin airports, each employing over 400 people.<sup>3</sup>

In the five years up to 2011, total employment at the Lufthansa Technik Group was relatively stable. According to LHT's 2011 Annual Report, a slight decline in employment between 2010 (20,300) and 2011 (19,800) was partly attributable to employees moving from semi-retirement to full retirement. Furthermore, it reflected staff reductions following restructuring programmes at operations in Switzerland and Ireland, which were intended to secure the long-term competitiveness of these sites. However, at the same time LHT recruited more than 200 former temporary workers, in addition to 200 young people who started professional training with LHT (LHT Annual Report, 2011).

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<sup>1</sup> This case study focuses on Germany and in particular on LHT's headquarters in Hamburg and interviews conducted at the Hamburg site, although recently the Lean approach has also been transferred to facilities in other countries including Hungary, China and the Philippines. The case study is based on an analysis of company documents (annual reports, manuals, etc.) and interviews carried out in April and May 2012 with management (two interviews), works council representatives (two interviews), trade union representatives (one interview) and staff (focus group of two employees).

<sup>2</sup> Internal business refers to business with Lufthansa Group passenger airlines while external business covers all other customers not affiliated to the Lufthansa Group.

<sup>3</sup> Sources for all figures: <http://www.lufthansa-technik.com> (accessed May 2012), Lufthansa Technik Annual Reports 2009, 2010, 2011, interviews conducted at LHT in Hamburg in April and May 2012. Figures for temporary workers can vary.

LHT's business is currently divided into six product divisions (PD):

- Maintenance;
- Overhaul (e.g. the testing and repair of equipment, systems and cabin components, repainting of the aircraft);
- Engines (i.e. inspection and maintenance of aircraft engines);
- Components and logistics (i.e. global supply of spare parts and manufacturing of components);
- Landing Gear Services;
- VIP Aircraft (i.e. completion and technical support of VIP and executive jets including cabin upgrades, conversions, custom-tailored cabin interiors).

Most of the employees of LHT Group (about 4,000) are active in the maintenance division.

Market developments and competitive pressures differ considerably for each product division and have changed over time. Overall, LHT's business is largely dependent on both the development of airlines and on new global competitors. Recent developments in the aviation industry such as declining revenues for airlines, increasing fuel prices and airline insolvencies have impacted on the – generally growing – MRO market and have increased cost pressures. Demand for MRO services has currently stabilised at much lower price levels than in previous years. At the same time, global competition for new contracts has increased. LHT's competitors include aircraft and engine manufacturers, MRO operations owned by other airlines, and independent providers of MRO services and components. Companies compete mainly on price, turnaround times and costs. Further competitive advantages can be based on product quality, different business models, or an innovative product portfolio. For example, maintenance and overhaul services are very intense in terms of man hours and therefore very cost-dependent. Over the years some labour-intensive business activities have been outsourced to lower-cost locations, whereas core activities involving more qualified engineering, modifications or leading-edge technologies are still mostly handled in Germany. One current example of outsourcing is the closure of an aircraft painting hall in Hamburg. This will cause a loss of almost 60 workstations. However, all employees will be re-employed in the company.

The German locations in particular are under permanent pressure to optimise their cost structures through product innovation and process innovation. Innovation is important for LHT. It is one of the organisation's key values that determine the corporate culture and customer and company conduct. The guiding principles of company policy include continuous improvement, encouraging creative thinking and rewarding innovative ideas from the workforce. Additionally, there is an underlying commitment to the promotion of training and the provision of necessary tools and instruments. LHT's employees are expected to be 'conscientious, quality and performance-oriented' (LHT Integrated Management Manual, 2012, p. 25). These commitments reinforce the company's reputation for technical excellence, based on a highly skilled, experienced and innovative workforce, which is attributed to substantial efforts in people management.

LHT has managed to achieve continued growth for around 15 years. The number of companies in the LHT group multiplied, revenues and the number of customers grew, as did the number of aircraft types served. LHT's success story is linked to the growth and success of Lufthansa as its major customer but also to key strategic actions. First of all, the organisation is well positioned due to its broad product portfolio and its triple certification as a maintenance, design and production organisation. Furthermore, LHT has introduced several programmes aimed at making production capacities more flexible, reducing costs and increasing efficiency. For example, LHT's strategy of establishing an international network, largely through acquisitions in growth markets like Asia and South America, should ensure flexibility with

respect to customer needs as well as opportunities to benefit from differences in production costs. This in turn should promote growth and consequently the development of new products and services, whilst securing employment in Germany. LHT's strategic response to market developments and competitive challenges therefore is based, on the one hand, on product optimisations and innovations and, on the other hand, on rigorous cost and efficiency measures. Only during the last two to three years have operating results ceased to increase and external revenues declined in relation to internal business.

# Nature of the innovation

In the past 10 years, one major innovation in the field of work organisation at LHT has been the creation and implementation of a Lean Production System affecting all areas of the company. This involved not only starting a series of Lean projects but also investments in workforce qualification and equipment including the creation of a Lean department, a training academy and the continuous education of ‘Lean specialists’ from within the existing LHT workforce. The motivation behind this innovation was to increase efficiency and to reduce costs by minimising the wastage of time and resources and by optimising existing work processes and investments in people management.

It is important to note that LHT started to introduce the Lean Production System in times of economic growth, regarded as an essential precondition for the success of the Lean approach.

By 2002, the first systematic Lean activities had started with pilot projects – so-called ‘lighthouse’ projects – in production (repair and maintenance of aircraft). The activities were supported by external consultants and formed the basis for further projects and for the structured rollout of the Lean Production System across the company. Lean activities have also been extended to administrative areas and the use of external consultants has been replaced gradually through internal experts. The introduction of Lean into the organisation was in line with its strategic priorities, namely product and process optimisations and innovation, and in particular the introduction of cost and efficiency measures in order to be as cost effective and competitive as possible. These actions were expected to fulfil customers’ expectations (e.g. by reducing processing times) and to secure growth. Consequently, competitiveness and growth were supposed to secure employment in the long term.

The concept of Lean production derives its origins from mass production in Japan (Toyota). It aims at systematically optimising processes and efficiency through increasing resource efficiency and placing emphasis on quality and flexibility. Overall, Lean production relies on the introduction of innovative changes that lead to an increased share of value-adding activities in the production process. A core element of the Lean philosophy is the identification and elimination of waste and non-value-adding activities (e.g. waiting, transporting, or movement). This can include the reduction of inventories or overproduction, the reduction of lead times through just-in-time principles, or the reduction of underused production capacities. Production capacities released by Lean improvements can be available for new orders. Product quality can be improved by optimising processes in terms of permanent quality control, immediate rework of defective components and close cooperation with suppliers. Flexibility comprises the capability to produce a broad product portfolio in a cost and time efficient way – for example, by introducing more flexible working hours or more flexible production systems. Finally, the Lean philosophy focuses on striving for continuous improvement of all functions and processes by involving all employees within a so-called Continuous Improvement Process (CIP) (LHT Lean Production Manual, 2012; Drew et al, 2004).

A vital component and important objective of the Lean Production System is the change in employees’ behaviour and attitudes. All of the challenges regarding changes in processes or possible measures of job enrichment as well as the initiation of a process and company culture of continuous improvement at LHT required effective communication activities and concerted activities in individual and collective training and team-building processes.



# Process of implementing the innovation

Lufthansa Technik opted for an incremental but also a systematic approach towards the implementation of the Lean Production System. Starting with an experimental phase with selected pilot projects and supported by external consultants, it gradually developed a differentiated Lean structure covering numerous product divisions. LHT gave responsibility to managers on the shop floor and actively involved the employees affected. By the time LHT had set up a central Lean organisation it had developed a comprehensive Lean architecture and set up a core project team. This was complemented by the development and set-up of a large training programme on Lean techniques for employees and a 'Lean Academy' in order to anchor process knowledge within the company.

While the Lean methodology was introduced in a top-down approach, the major input of ideas is expected to come from the bottom-up realisation of Lean projects. These projects are based on ideas and improvement suggestions from the shop floor. Thus, the implementation of Lean on the shop floor is based on a high involvement of employees.

In 2002, the maintenance division launched the 'LOS' programme ('Leistung Durch Ordnung und Sauberkeit' / 'Performance by Order and Cleanliness') based on the '5S'-measures in order to optimise processes.<sup>4</sup> In the following years, LHT started to optimise processes in all divisions. For example, in 2005 Lean projects were started in the engine maintenance division and 'LOS' activities were also expanded in this division. In 2007, the 'LIFT' project ('Lieferung In Fünf Tagen' / 'Delivery in Five Days') started in the components division. The aim of this project, which ran for three years, was to improve operational processes by reducing the average lead time for the repair of a component from 17 to five days. Other Lean projects were initiated in the overhaul division. In 2008, the project 'iDeliver' in the landing gear division and Lean projects in the VIP division begun. Finally, with the 'COMPASS' project the first Lean project in administration was launched. Currently, the project 'KICK15' ('Komponenten-Instandhaltung Clever und Kostengünstig' / 'Clever and Cost-effective Components Maintenance') is running.

Costs and revenues of the Lean programme are recorded within a comprehensive management reporting system. Since 2005 the company has spent around €5 million a year on the Lean Production System.<sup>5</sup> At the same time, Lean led to savings in the high double-digit million range.

LHT adopted a decentralised approach to implementation in the beginning, although all Lean projects were generally promoted in accordance with the principles of standardisation, continuous improvement, transparency, leadership, team spirit and wasteless processes. Without central coordination, each product division (and each repair shop respectively) developed their own approach to Lean as well as their own methodological and strategic priorities. Over time, it seemed natural to formalise the Lean process, the experiences and the internal project organisation in the company and to gradually reduce the use of external consultants. LHT was aiming for further diffusion of the Lean approach throughout the whole organisation with Lean intended to be integrated in the daily business and to become an accepted part of company culture.

At the beginning of 2008, LHT set up a central Lean organisation/department, reporting to the board member responsible for production, and organised regular Lean reviews which were introduced to track the implementation process for every Lean project. The Lean team introduced by management started to systematically gather information and experiences from every Lean project, to assess them and to collate them according to best practice criteria. Part of these efforts resulted in the publication of an internal manual called 'LHT Lean Production System'. This manual documents the organisation's experiences with Lean and LHT's approach to Lean, supplemented by some guidance documents.

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<sup>4</sup> 5S is a method for organising the workplace by Sorting, Straightening, Shining, Standardising, and Sustaining.

<sup>5</sup> There is no external funding.

As a global company, LHT offers a broad range of services to its customers related to a large number of processes. Those processes can be classified according to three substantially different operating types: production in the frame of projects, shop floor production, and operations dependent on airport timetables. The methodology used within Lean projects differs for processes in each of the three operating types and is described accordingly in the Lean manual. This classification should speed up the exchange of relevant experience as well as the definition of specific approaches for improvement.

Furthermore, LHT's Lean approach is based on the assumption that only the simultaneous and equal-ranking consideration of the technical system, the management infrastructure and the individual sphere (employees) produces the desired effect. It means in effect that all elements involved in value creation such as processes, resources, equipment on the one hand, organisational structures and tools in order to monitor the (resources of the) technical system (e.g. performance management, key performance indicators, production control) on the other hand and the attitudes and skills of the people involved are critical to the success of the LHT Lean system. Only the combination of changes and improvements in these three main dimensions can ensure sustainable results.

LHT has made major efforts to develop a uniform process model for the implementation of Lean initiatives in order to facilitate the transfer of Lean tools to other projects and divisions. At the same time, the process model has to be flexible enough to be implemented everywhere. Often, projects on the product division or repair shop level are geared to the following four steps or phases:

- Definition of mission and objectives (What are the objectives of the Lean project? / Create a so-called 'change story' (i.e. a brief employee handout emphasising the main objectives and the context of the project));
- Development of a programme architecture (including a diagnosis, description of the actual situation and targets, project plan);
- Start of transformation projects involving the phases of preparation, diagnosis, design, planning, implementation and stabilisation of the results achieved;
- Establishment of a continuous improvement process.

In practice, the programme architecture is developed on the basis of a clearly defined mission and the mid-term objectives (two to three years) for each product division. This includes a time schedule defining which project will be implemented at what time. At the same time, the planning illustrates which comprehensive or 'cross-divisional' issues such as training of project team members in Lean methods have to be taken into consideration. Then, concrete change processes and transformation projects begin.

Transformation projects are supported by workshops on specific issues if needed. Each transformation project run in a department or in a repair shop can be split into six clearly defined project phases with related quantitative and qualitative objectives.

The preparation phase (1) includes the set-up of the project team and the development and agreement of objectives with the responsible management. So-called 'change stories' summarise the current situation and the project objectives. They should provide for a consistent communication strategy and they should serve as an employee handout (of about five pages each) for the kick-off events in each project. They are usually written in a way that is 'easy to read' and are also illustrated.

The preparation phase is followed by the diagnosis (2) and the design (3) phases. Starting from an analysis of the actual situation and existing processes, these phases serve to identify optimisation potentials and the creation of hypotheses for solution approaches including trial and error, followed by a decision on an overall concept and the according decisive improvement levers.

After a detailed planning phase (4) including an action plan and the definition of responsibilities and key performance indicators (KPIs), a well-controlled implementation (5) is initiated. This phase includes the monitoring of the results achieved. It is followed by the stabilisation phase (6) securing the handover of the project to the production line.

Finally, all change projects finish with the introduction of measures aimed at ensuring the sustainability and continuous improvement of the outcomes. Controlling and monitoring activities should ensure that qualitative and quantitative objectives have been achieved. For example, they assess if lead times could be reduced or if cost efficiencies have been generated. In this context, an essential tool is the structural development of a performance dialogue between managers and foremen and employees (at product division or repair shop level). Performance dialogues serve as an instrument for a 'daily positioning' and a personal exchange on specific KPIs. Actual status and targets of these KPIs (e.g. lead times for components) are discussed: What is the current state? Which goals have already been achieved? Which operational factors have prevented the team / group from achieving their goals?

It is important to stress that the project objectives, for example the reduction of the average lead time for the repair of a component from 17 to five days (LIFT), are set by the company management. Senior managers, line managers and foremen are responsible for the implementation of the process improvements in their product divisions and repair shops. The development of suggestions for improvements in the workplace with the direct support of the employees (workshops) and the realisation of concrete proposals is a fundamental part of the implementation process, which typically takes 12 to 16 weeks, including weekly information feedback rounds and biweekly review boards. Specially trained LHT Lean experts / advisers direct (e.g. in the case of value stream analyses) and moderate the process at the product division and repair shop level. HR managers mainly support the internal Lean training process.

In order to facilitate the all-encompassing and quick implementation of Lean projects in the organisation, LHT has set up an internal training institute: the 'Lufthansa Technik Lean Academy'. The academy offers in-house training and its curriculum covers basic and specific modules. It is open to all employees. The academy provides specific demand-driven training as well as large-scale training for all employees. The training modules are also used in the transformation projects. The academy makes use of a variety of methods such as theoretical introduction, case studies, practical examples, workshops, simulation games or benchmark tours to other companies applying Lean methods. One exceptional feature of the academy is that it only rarely uses external teachers. Internal Lean experts and specialists teach at the academy and transfer their knowledge to their colleagues.

LHT's internal qualification for Lean projects comprises a career path with different levels as a 'Lean expert' acknowledged through the award of a Lean training certificate, the so-called 'Lean stars'. The organisation distinguishes between practitioner, moderator, specialist and expert degrees and each level is linked to defined experiences, competences and responsibilities. The certification should ensure quality on the one hand and motivation on the other hand. Employees' participation in the academy can be either voluntary or compulsory (if required by their superior or if they take up a role within a Lean project). In general, some divisions or departments push their employees into the academy while on the other hand some people would like to participate but cannot because the courses are booked up.

Finally, there is considerable works council involvement. For example, the works council participates in each of the steering committees (review boards) put in place for Lean projects. The works council has created its own internal working group to deal with the large number of Lean projects that have been systematically implemented by the

company and in order to ensure an exchange of experiences. Members of the works council have been delegated to participate in the Lean reviews of the projects. At the Hamburg location, the works council has furthermore developed a checklist that should enable all works councils to actively support the projects and participate in the review boards. Furthermore, a central IT filing system for all documents from review boards was created for the works council. This structure was complemented by agreements on information exchange with the Lean department and reporting requirements on important Lean projects in the works committee or works council.

Since the working structure was introduced, the works council has attempted to reach agreement with the employer on procedures, information obligations, and, if necessary, mechanisms to protect the employees affected by Lean projects. This was based on the assumption that, from the organisation's point of view, the successful implementation of Lean projects can have three essential consequences on workflow processes and workload:

- An increased efficiency in processes, which can lead to an intensification of work and increased performance;
- An increased transparency of work products and partly an increased measurement of performance;
- A noticeable reduction of the necessary working time and the number of employees needed.

Therefore, the works council has produced a draft for company agreements relating to Lean projects, including the right of employees to have a say in change processes as well as mechanisms to protect affected employees. These agreements cover, above all, the exclusion of individual performance measurements, securing jobs, and the right for the works councils to claim qualification and training measures of the workforce if the employee representatives think it is needed. The design and the conclusion of the agreements between management and works council have not been controversial. It is striking that since the agreements were signed there have been no infringements. In addition to the first company agreement, one agreement on project-related feedback and one agreement on collective performance and success management have been concluded. The first agreement describes the procedure for conducting regular project feedback on the shop floor. The second agreement sets up rules to ensure that performance measurements are not extended into individual control mechanisms.

# Reactions and challenges

The reactions to the introduction of Lean methods in the organisation varied from enthusiasm to outright rejection. The reasons behind the reactions also differed. In general, changes often provoke covert or overt resistance. At LHT, reactions were sometimes based on personal experiences, sometimes based on experiences with former projects or with one specific Lean project, and in some cases related to the objectives of one specific project or to the project team. Most commonly, as confirmed by all interviewees, it was a combination of all of these.

According to the management representatives interviewed, in the beginning, in some cases they had to face traditional stereotypes and prejudices linked to experiences from previous change projects. In the specific case of the LIFT project, aimed at reducing lead time to five days, for example, more than 90% of the staff affected thought that this lead time reduction (LTR) would be impossible. Some thought that a reduction to 15 or 12 days would be more realistic. Since employees had serious reservations and doubts and due to the criticism management had to face, LHT thought hard about how to begin the project in an appropriate way.

A management representative of the internal Lean team stressed the importance of trust whilst implementing Lean. Like a 'Robin Hood of the shop floor', they were aiming at a situation where shop floor staff and top management met on an equal footing.

Another management representative referred to the variety of reactions expressed by a workforce of almost 12,000 people. According to him, on the one hand, some people were happy that finally LHT was implementing initiatives they had pressed for for many years. Others stressed that it was important to change things and to improve processes regardless of whether the approach used was following a Lean philosophy or any other methodology. Some approved of the Lean methodology and thought that it helped them to see new things in the company or to see them from another perspective. On the other hand, some employees compared Lean to former projects and adopted a wait-and-see attitude. At the extreme, feelings of uncertainty grew. Those were not necessarily related to job insecurity but related to significant changes of working conditions such as organisational changes (a new team) or new tasks, as some processes were to be eliminated.

In order to allay employees' fears and educate them about the Lean methodology, the LEAN team jointly developed a 'change story' which offered a direction and a vision of what the company was proposing to do. This practice was received well by the staff because the story provided clarity on the project objectives.

LHT's works council has kept a critical eye on the Lean activities but has supported them overall, as far as they were combined with the participation of the affected employees, growth prospects and a growing number of jobs at LHT.

According to the works council, employee representatives participated continuously in the Lean review boards. There were fewer conflicts than anticipated by the works council, which only had to intervene officially in a few cases. Overall, during the early years of Lean projects there were very few employee complaints or obvious infringements against existing agreements by managerial staff. According to the works council, in the case of two Lean projects in the administrative section, a potential 10% job reduction as well as work intensification was on the cards. In both projects, job cuts could be compensated by internal solutions (e.g. the retirement of employees because they reached pensionable age, transfer to another department with similar tasks etc.). Due to the intervention of the works council the problems were satisfactorily resolved.

Sometimes, problems arose when people were not fully prepared for the introduction of such a project. One employee interviewed for this case study recalled that there were quite a few concerns and much discussion among the shop floor staff. Because of the programme's strong performance orientation, people were concerned that they would have to work faster although the shop floor management had explained to them that the objective was not to work faster but to

optimise processes by changing processes, shortening distances, improving tools, eliminating unnecessary things, etc. In view of these challenges, it was important for management to communicate directly with groups of employees in order to reduce worries and in order to create trust.

Further challenges are related to the issue of cross-qualification (multi-skilling) and internal know-how transfer. The objective behind the promotion of cross-qualifications was that individual workers acquire new competences and exchange knowledge. This should enable them to be more flexible, for example replacing a colleague in another team or taking on new tasks. Apparently, this also created many doubts. Some people were not used to continuous learning processes or situations where they had to assume responsibilities for processes or machines relatively new to them.

Another employee said that he did not worry about anything concerning the implementation of Lean projects. According to this employee, this positive attitude was based on the related communication. LHT started to implement Lean in times of economic growth. Lean should optimise processes and secure this growth in the long term. He never thought that Lean was aimed at reducing jobs. In fact, he was highly motivated to participate in the project. In his view, motivation increases as soon as it is evident that things are changing and improving.

A further motivating aspect of Lean approaches might be related to the fact that LHT was ready to invest in people and tools. For example, analysis of the actual situation and processes on the shop floor made it clear where tools were missing or outdated, where distances between individual workstations or processes were too long or too time-consuming, etc. The management immediately reacted and ordered the missing tools or components. According to employees, this had a very positive impact. Furthermore, the progress of the Lean process showed in many cases that employee satisfaction increased as soon as improvements in the workplace were visible or as soon as people saw that the situation and the work environment had improved.



# Impact on employees

The introduction of Lean had an impact on employees, their behaviours and their working conditions. Naturally, opinions differ between employees and management in particular on how certain impacts are to be interpreted. It is clear that not all effects can be quantifiably measured and it is often difficult to prove a direct and causal relation between Lean and changes in attitudes or working conditions. The statements of the interviewees reported below mainly refer to the LIFT project which ran from 2007 to 2009 and covered all repair shops for aircraft equipment maintenance in Frankfurt and Hamburg with several hundred employees.

Within each Lean project, changes in performance and efficiency on the shop floor or throughout individual work processes are constantly measured by means of concrete KPIs. It is important to note – and this was emphasised by the works council – that this measurement is not person-specific and not aimed at measuring the individual performance of employees. Therefore, the overall (performance) impact of Lean projects on staff has not been measured in a systematic way. But, according to one of the managers interviewed, there is an evaluation of indirect parameters based on questions such as: ‘How do I experience leadership?’, ‘Can I talk openly to my superior?’ or ‘Are people listening to my ideas?’ During projects on the shop floor (e.g. in a product division or a repair shop) small surveys are often conducted both at the beginning of a transformation project and at the end in order to measure probable changes or developments.

Many of the interviewees emphasised positive impacts of Lean projects on staff attitudes and behaviours as well as on employee job satisfaction and engagement. However, there are no actual statistics illustrating these outcomes. There is also no analysis showing impacts on the organisational commitment.

## Training

In summary, it can be said that the introduction of Lean processes can have a positive impact on individual employees in terms of their personal development and their motivation, giving them many opportunities to acquire new skills to perform new tasks and to assume more responsibility. Indeed, shop floor staff as well as management representatives recognised this impact of Lean. For example, some foremen on the shop floor involved in Lean projects enjoyed the project work so much that they started to teach courses at the Lean Academy. The company offered them training as teachers and now they are passing their experience on to colleagues and people from other departments and product divisions.

In general, career development, succession planning and the promotion of new opportunities for employees are important foundations of the Lean approach at LHT. Since 2009, a large number of LHT employees have participated in courses offered by the Lean Academy (around 1,600 training days per year, i.e. about 400–500 employees in total). The academy is open to all employees and roughly 70–80% of participants are managers, specialised technicians or people with project responsibilities.<sup>6</sup>

Lean also offered new opportunities for cross-qualification and internal know-how transfer. Typically, most of the staff at LHT are specialised. Within the Lean process, borders between product divisions, repair shops or individual workplaces were often softened and the knowledge transfer between the different organisational units as well as among staff was further promoted. Instruments included for example paired work, exchanges of specialised employees and other forms of collective learning and training that were introduced in the frame of Lean projects. According to some of the interviewees, the introduction of cross-qualifications further promoted mutual understanding, cooperation and transparency.

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<sup>6</sup> This broadly reflects the employment structure on the production shop floor.

In some cases, training was necessary because Lean projects had changed processes and responsibilities which led to new qualification requirements. In general, LHT systematically assesses the qualifications of staff, e.g. on a specific shop floor or within a Lean project, and sets up mid-term strategies on how to develop the staff. If for example, in the frame of a Lean project, components should be transferred from one shop floor to another, the following questions are asked: What are the preconditions for the transfer of components? What are the prerequisites for transferring employees between shop floors? Which qualifications do they need to have by which date? How can processes be designed so that employees from other departments or workshops can adapt quickly?

### Communication

In general, it seems that communication and mutual learning among employees have improved and that traditional hierarchies have been partly changed. Management, as well as employee representatives at LHT, stressed the impact of Lean projects on communication and dialogue. Communication has improved and transparency has increased. Reporting, which in many cases had been rather top-down before the implementation of Lean has now changed, with respect to KPIs. Through daily performance dialogues, introduced under the frame of Lean projects, shop floor staff report to the foreman, who then reports to the team leader, who reports to the Head of department who regularly reports to the Head of division and above. Thus, reporting is now a more bottom-up process and feedback has gained importance. This in turn also promotes responsibility. According to a manager interviewed, employees are feeling more personally responsible for the product they are working on and for their area of operations than before Lean. They are also increasingly managing their workload themselves, including work-time planning.

In the view of one employee interviewee there is now greater dialogue on professional topics. Employees more often ask their colleagues questions, exchange views and work together on a problem or a product instead of handling it alone. Another employee said that team-working within the organisation has improved due to project work, but even more due to the new approach towards communication, dialogue and problem-solving. Processes and objectives are seen to be clearer now.

A management representative stressed the role of communication and of the participation of employees as critical factors in order to spread Lean within the company. It was very important to LHT to explain to employees why changes were necessary, to explain the market situation, and to inform on short-term and mid-term company objectives. Employees interviewed mentioned that in their opinion open dialogue was more important for the success of Lean projects than staff training in specific Lean methods.

### Working conditions

Although initially there was concern that Lean would result in an intensification of work, the interviewees mentioned positive overall impacts from Lean. One of the management representatives interviewed stated that, from an employee's perspective, the major overall impact of Lean was that, despite a challenging market situation, competitiveness and employment had been secured. This seemed to be due to improvements in efficiency with a corresponding reduction of operating costs and also to the job security agreement. One of the employees interviewed believed that the quantity of work has remained more or less stable while the quality of work has improved significantly under Lean.

According to most of the interviewees, the Lean approach has contributed to an increased quality of work, for example by reducing time-wasting operations, better organisation of working processes and more team-working. Within Lean projects, changes were introduced to the production process that included changes of individual workstations. These changes ranged from those requiring large investments in new tools to changes which introduce a new work flow for a single repair task. Additionally, the availability of materials was improved. In comparison to the conditions before Lean



most of the working places are much less cluttered. Occupational health and safety measures (e.g. the ergonomic design of working places) have also led to a better working environment, as stated by management representatives and confirmed by employees.

One example of a practical improvement is the invention of a special transport vehicle (supporting carriage) for the process of exchanging business class seats for economy seats in the aircraft. This invention brought a reduction in lead time of 50%. At the same time, it reduced the physical load for the employees significantly. Another example relates to better hangar utilisation. Some jobs have to be done inside the hangar, while others can be done outside. By improving the concept of hangar utilisation, the company is able to have more aircraft inside the hangar at the same time. This modification had a positive impact on working conditions (e.g. light, temperature, availability of tools, reduction of distances covered).

Overall, a direct relationship between Lean and employees' health is rather difficult to state and there is no statistical analysis on this. On the one hand, improvements like the ones described above could have a positive effect on employee's physical health because, for example, back injuries decrease. On the other hand, changes in working processes and new requirements could cause psychological stress for some employees and therefore could have a negative impact on employees' health. Depending on individual employees' working situation, there are probably both positive as well as negative impacts on employees' physical and mental health.

## Unanticipated consequences

Not all comments on the lean implementation were positive. One employee interviewee mentioned that in one department employees felt they were under surveillance; of being controlled and monitored excessively due to changes in the working and reporting process to the superior. Before starting the Lean process the employees worked, in their opinion, rather independently.

Beside the improvement of employees' skills, working on general attitudes is an integral part of LHT's Lean approach. The idea was that Lean could support a change in employees' attitudes and behaviour. However, opinions diverge on whether Lean has fuelled creativity or the willingness to innovate. Even before Lean, LHT had a highly developed company suggestion scheme. According to one manager, the number of employee suggestions within the 'Impulse' suggestion scheme increased during recent years, but it is not clear if this is a result of Lean or because processes within the company suggestion scheme itself had improved.

Further impacts of Lean on staff pay levels, systems or structures, staff recruitment or selection processes as well as on employee work-life balance, staff turnover, and staff grievances/disciplinary cases were not mentioned by the interviewees.

# Impact on the organisation

Views on the overall impact of Lean on the organisation differ. Frequently, managers and employees referred to the impact on team work, cooperation and trust. According to one employee interviewed, processes have been professionalised through Lean and at the same time a better understanding of working together within departments has evolved. This in turn has facilitated better team work, better results and openness for innovation. In this context, management representatives stressed the importance of communication and feedback and the instrument of performance dialogues. In some cases, before the introduction of Lean, such regular dialogue and exchange of information and views between employees and foremen did not occur.

In many cases the form of communication has changed. On the shop floor, people talk more systematically about challenges, technical problems, or the availability of human resources. The management interviewees in particular highlighted this point. Teams determine their objectives and discuss what 'being successful' means for the work processes. In case of problems, the foreman talks to his superior and asks for help. The superior in turn might escalate the request for support whilst also reporting on results already achieved. Hence the performance dialogue on the shop floor often has a rather informal character. It is perceived more like a normal shop floor conversation as opposed to a formally organised meeting.

For LHT, on-time performance, lead times and efficiency are key figures used to measure performance. The KPIs in each category are systematically measured, monitored and communicated in the product division or at repair shop level by means of performance boards set up in the division or the repair shop. The information is updated daily by the Lean team and the responsible management or foreman. Audits, specific KPIs, related tools and regular performance dialogues are the most important instruments to measure changes and improvements within Lean projects over time.

With regard to technical and quantitative improvements there are several success stories where the results are easy to measure and therefore visible. For example, the LIFT project (2007–2009) was aimed at reducing the average lead time for the repair of a component from 17 to five days. At the same time, the intention was to increase delivery reliability significantly to an average of more than 90% in order to generate a competitive advantage and to increase market attractiveness. According to the interviewees, LHT succeeded in achieving the project targets by reducing average lead times significantly within a few years and by improving their delivery reliability. In many divisions and repair shops the average lead time could be reduced to nearly five days. In a similar way, other projects aimed at reducing lead times or increasing on-time performance,<sup>7</sup> were achieving the project targets.

There are many other reports of changes in small teams or cultural changes which are visible to LHT staff, but which are not quantifiable. In particular with regard to the LIFT project, interviewees were quite sure that it has affected the organisational culture and their way of working. According to a shop floor worker, there is now better discipline in the team (e.g. in terms of punctuality, reliability, cooperation) and better dialogue. Therefore, it can be said that in line with changes in the working environment, the culture has changed in many product divisions and repair shops.

One management representative mentioned the term 'performance fun' that had been created in order to emphasise that performance can be fun and that the two words are not mutually exclusive. The creation of the term was based on his experience in some project teams. The manager wanted to stress that the cooperation and team-working in some project teams was good and conducive to achieving their performance goals. Employees who have been part of these teams were not interviewed.

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<sup>7</sup> On-time performance refers to success in sticking to the time schedule agreed with a customer for the provision of a service.

Finally, the Lean approach included an agreement between works council and management on job security. According to a management representative, it is extremely difficult to promise employment security over a long period of time because the economic environment is continually changing. However, so far there have been no job cuts based on Lean projects.<sup>8</sup>

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<sup>8</sup> Staff numbers have changed slightly during the last two years – which was not traced back to Lean activities – and some people have been redeployed, but the company had a comparatively high number of temporary workers and short-term contracts. This offered some inherent flexibility without the need to reduce the number of permanent employees.

# Lessons learnt and future plans

The overall outcome is that the Lean process at LHT has led to improved performance which in turn contributes to stabilising the competitive position of the company, meeting changing customer expectations, optimising the working environment for employees as well as securing employment at the Hamburg site and limiting temporary work. However, one should not disregard the different ‘adjustment speeds’ of individual employees in connection with changes in processes and increases in efficiency which might be perceived as work intensification.

With reference to the management point of view, one of the main lessons the company has learned from the Lean Production System approach is the awareness that it is possible to reach a goal of performance improvement that initially seems to be very ambitious. A crucial factor for the success of a change project is to have a clear definition of the vision and the objectives of a project or approach. Essentially, guiding principles have to be understood as indicators of an achievable and desirable future state. The guiding principle has to be a clearly structured vision and the strategy to reach the company’s goals has to be clear. In this context, it was very important to all interviewees that the company communicated that Lean results would not lead to job cuts, as this generates confidence.

In addition, another crucial factor is to create awareness of the necessity for change. According to the management representatives interviewed, middle and lower management are the main drivers of change, because they are responsible for the realisation of the project goals on the shop floor and the involvement of affected employees. Lean management requires managers to ask questions in continuous improvement cycles rather than giving instructions like ‘do it my way’; in other words, Lean requires managers to provide help and ask the right questions. On the middle and lower management level, a participation-oriented leadership culture must be the basis for daily interaction between superior and employee. One of the biggest challenges for the future will be to establish a permanent culture of Lean. According to the interviewees, Lean or change projects will continue. The challenge for management is to encourage the perception that Lean is not threatening.

Thus, communication is an important factor. Essentially, Lean projects need a clear information and participation strategy. Employees have to be involved in the process of development and implementation. Communicating information to all affected employees prior to starting a Lean project is as important as providing opportunity for questions and trials. The depth of information required has to be defined individually for each staff level. According to the managers interviewed, the following aspects are conducive to achieving successful employee involvement and persuasive communications:

- information desks and boards, e.g. at the entrance to the canteen;
- newsletter – also via e-mail, but better printed;
- internal Lean newspaper;
- courses and training for employees and key players in the project;
- workshops in production and administration – to guarantee participation and the generation of ideas for improvement by employees in their place of work.

Additionally, careful observation and open communication are key elements required to gauge reactions and monitor consequences among staff.

Finally, an appropriate toolbox of Lean methods to run the Lean process must exist. The establishment of a permanent Lean culture with its own personnel and training capacities is another decisive factor. Two important instruments in ensuring the success of the LHT Lean project are the ‘LHT Lean Production System’ manual and the training programme. The manual lists the guiding principles of the company’s Lean approach and the basic information on Lean

architecture and tools. The establishment and development of a major training programme on Lean techniques for employees and the implementation of the Lean Academy in order to stabilise the Lean process through internal training of managers, experts, specialists and multipliers in all divisions, is a very important factor.

As regards the works council's point of view, the assessment of the experiences so far is not at first sight negative. Two factors are central to this evaluation: Firstly, so far Lean projects have not caused staff reductions. Secondly, the direct involvement of employees in the internally managed Lean projects has not led to extensive negative reactions among employees. Due to the permanent involvement of the works council in the daily routine of Lean projects, there have been no serious complaints from employees and no major infringements by superiors or project managers against the rules agreed in the implementation of projects. Potential smaller conflicts were alleviated in discussions or quickly resolved on site. According to the works council members interviewed, the information flow in Lean projects and Lean reviews has generally been good. Transparency in procedures and measures has been high in almost every case so far.

Despite an overall positive assessment, the works council currently indicates growing difficulties and problems with the overall philosophy of workers' participation that calls for a review of the approach. Primarily, these are the following:

- An increasingly complex economic environment with economic growth problems for the company which may erode the basic agreement that there will be no job losses. LHT has announced (as part of a large Lufthansa restructuring programme) that there might be job reductions in the near future.
- The works council has to spend increasing amounts of personal time on the participation in all Lean reviews, the Lean working group and additional appointments for individual Lean projects in the workers' committee. In view of a parallel rollout of several Lean projects and LHT's growing capacities to increase the number of projects (a result of the internal training of more Lean 'experts'), it is becoming more complicated for the works council to assess all information received and to participate in all projects.
- The opportunities for the works council to contribute its own ideas to Lean reviews are often relatively limited. Only in a few cases are there real points of intervention (in cases of working time regulations, individual performance measurement etc.).
- In administration in particular, it is becoming increasingly apparent that staff will be reduced in the medium term.

It can be argued that the conflicts that have appeared so far through the implementation of Lean projects, in terms of performance measurement, working time regulations, etc., could be handled in an appropriate way with the regulations already agreed. Therefore, the works council's participation in Lean projects has not been criticised by the employees.

# Conclusions

LHT's process model and the specific experiences of implementing Lean methods in a company characterised by job shop production and an extensive and detailed knowledge can be exemplary when analysing innovations in people management including process improvements.

Three aspects in particular are essential for the innovative approach practised at LHT:

- the establishment of a permanent Lean culture with its own personnel and training capacities (with internal certificates, etc.);
- the company commitment that Lean results will not lead to job cuts;
- the implementation of a Lean philosophy in an environment of individual manufacturing and services.

The LHT case shows that top-down objectives are connected and 'fed with' bottom-up ideas of the workforce, as well as the idea of co-determination in projects and on the shop floor. The works council is closely involved in the process, including safeguarding by company agreements provided that the company's growth compensates for potential negative effects on employment, primarily a reduction in the number of jobs. The peculiarity of the German co-determination system is fundamental to the realisation of the approach.

It is becoming increasingly clear that the framework conditions for Lean are changing. In Hamburg, LHT will possibly face a longer period without considerable growth. Against increasing international competition, LHT is likely to be forced to provide more cost-effective services and Lean is a tried and tested way of achieving this objective. The experience over the last decade with constant economic growth has shown that Lean leads to visible and measurable improvements which the company and the employees can benefit from. However, the Lean agreements between management and the works council have to prove their worth in the rougher economic climate. Employees then might fear that their own suggestions for improvement and innovation will 'saw off the branch they are sitting on'.

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**Birte Homann** and **Stefan Stracke**, Wilke, Maack & Partner

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