Operators' work situation - a key to successful lean organizations

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Abstract

The purpose is to explore operators' social and technical work situation, and how successful lean organizations fulfil operators' need for autonomy, competence, and relatedness. A framework of operators' work situation is structured into social and technical systems. A model is developed and extends the basic self-determination theory model by exploring and proposing how the technical dimensions directly and indirectly impact work performance and health. The findings show that the social dimensions have a strong impact on the work situation and thus, a key to succeed with lean organizations is to invest time in the social dimensions beyond the technical dimensions.

Keywords: Lean organizations, Self-determination theory, Job design theory

Introduction

The last two decades, there has been a large amount of research in lean production, most has focused on different types of wastes, tools and methods and most studies has been on conceptual level with few studies empirically grounded (e.g. Jasti and Kodali, 2015). This is not surprising, because most of the lean initiatives in Europe and USA, have primarily focused on improving operational excellence, often achieved through event-driven projects by experts, focusing on methods and tools (Jasti and Kodali, 2015). However, the success of Toyota is instead rooted in its culture of changing and improving both the social (i.e. human behavior) and technical system (i.e. organization and artifacts) as a base for long-term sustainability, meaning the huge investment in employees' development and product value streams (Liker and Hoseus, 2008). To be able to effectively satisfy customer needs a lot of effort is put on the shop floor design and operators, where value is created. Thus, it is essential to understand the operators' work situation and work content to create essential prerequisites for a successful lean organization.

Self-determination theory (SDT), a theory of human motivation, can be used, to understand operators' work situation and how this impact operational performance and health. Deci et al (2017) have developed the basic SDT model in the workplaces, which

consists of two independent variables, work context and individual differences, and two dependent variables, work performance and health, and two mediating variables, basic psychological needs (BPN) and motivations. The mediating effect of BPN and motivations has been shown by several authors (e.g. De Cooman et al, 2013; Trepanier et al, 2015). Consequently, operators' BPN (autonomy, competence and relatedness) satisfactions are essential, in order to achieve both operational performance and health. However, in the SDT basic model, the work situation is focused on the social system, in order to capture operators' complete work situation also technical system dimensions have to be considered. Therefore, the purpose is to explore operators' social and technical work situation, and how successful lean organizations fulfil operators' need for autonomy, competence, and relatedness. The scope of this paper is the operators' work situation in a lean organization and therefore, the individual differences variable, e.g. studied by employees' general causality orientations (Ryan and Deci, 2017), is outside the scope of this paper. The theoretical framework is cross disciplinary and based on SDT, job design theory (JDT) and socio-technical systems theory.

Theoretical framework

The past hundred years, there has been extensive research on work design, job design, job characteristics and the impact on performance (Parker et al, 2017). This interdisciplinary research approach (*organizational psychology, industrial engineering, human factors, and socio-technical*, see e.g. Campion, 1988; Edwards et al., 2000) together with SDT has been useful to conceptualize operators' work situation. The relevant dimensions of the technical system (designed beforehand, T1-T4), and the social system (human behavior and interactions, and culture, S1-S3), are presented below.

Operators' social and technical work situation dimensions

T1: Facilities set-up: Focus on capturing the ***facility layout*** and type of ***production flow*** and what ***equipment*** that is used to manage the work.

T2: Organizational design: The ***operating strategy*** (e.g. company x production system), the ***organizational structure*** (e.g. type of organization, hierarchy, span of control, chain of command, communication channels) and the ***management strategy*** (e.g. leadership ideals and leaders' decision authority) together with the ***human resource strategy*** (e.g. pay contingency, introducing processes, formal education and training) will all impact the work situation. The ***teams' structure and strategy***, in (e.g. size, composition, roles, decision authority, purpose/goals) and the ***support functions*** (e.g. industrial engineering, maintenance, etc) are also important for the work situation.

T3: Task characteristics: Task characteristics are focused on "*how the work itself is accomplished and the range and nature of tasks associated with a particular job"* (Morgeson and Humphrey, 2006). JDT has been influenced by Hackman and Oldman (1976), in which they identify ***task variety*** (wide range of tasks), ***task identity*** (identifiable piece of work) and ***task significance*** (substantial impact on others), ***feedback of job*** (direct and clear information) and autonomy as important. The conceptualization of ***autonomy*** has expanded to include freedom in work scheduling, decision making and work methods (Morgeson and Humphrey, 2006). In the JDT, cognitive demand has been incooperated. Here, ***job complexity***, the extent to which the job is complex and difficult to perform (Campion, 1988), ***skill variety*** (the job require different skills and talents (e.g. Hackman and Oldman, 1976)) and ***specialization*** (deep knowledge in a specific area (e.g. Edwards et al., 1999) are included. Wall and Jackson (1995) found two aspects related to cognitive demand: active ***information processing*** (monitoring) and problem solving (job requires unique ideas/solutions and here using the term ***innovation***).

T4: Physical ergonomics and emotional demand: There can be more or less physical demands of a job such as ***physical ergonomics*** (appr. posture and movement) and work environment (physical health hazards) (e.g. Edwards et al., 1999). There is also job with more or less ***emotional demand*** impacting motivation (e.g. Sisley and Somllan, 2012).

S1: Leaders' behavior: Leaders can shape their subordinates' perception and impact their motivation (Fernet et al., 2015). Several studies have shown that ***transformational leadership*** promotes subordinates' BPN (e.g. Hetland et al., 2011). Transformational leaders have four types of behaviors: idealized influence (e.g. role model, trust, respect), inspirational motivation (e.g. vision, high expectations), intellectual stimulation (e.g. encouraging, reframe problems, find new ways, be creative), individually considerate (e.g. coaching, personal attention) (Bass, 1985; Judge and Piccolo, 2004; Tavelin, 2013). In contrast is the ***transactional leadership*** (contingent reward, management by exception (active and passive)) and the ***laissez-faire*** (absence of leadership) (Bass, 1985).

S2: Social aspects within teams and with others: Jungert et al. (2018) show that team members can play an important role in increasing autonomous motivation. In a team, there is ***interdependence***, meaning dependence of work output from others (received interdependence) and the extent others are affected by work output (initiated interdependence) (Kiggundu, 1981). Mullen and Cooper (1994) found in their meta-analysis of group cohesiveness that ***task cohesion*** was the critical component for performance of a team. The ***group collective efficacy***, meaning the group members' shared beliefs about general effectiveness across multiple tasks impact the group performance (e.g. Stajkovic et al, 2009). There is also ***psychological safety*** affecting the work in the group and which is defined as "*a shared belief that the team is safe for interpersonal risktaking"* (Edmondson, 1999). Finally, there can be ***social support*** in the team, meaning the *"extent to which a job provides opportunities for getting assistance and advice from either supervisors or coworkers" (Humphrey, et al., 2006).*

S3: Organizational culture: An organizational culture can be analyzed in three different levels (Schein and Schein, 2016). The surface level is artifacts and behavior (Schein and Schein, 2016), but both these aspects are handled in T2, S1 and S2. The second level is ***norms and values*** (Schein and Schein, 2016), e.g. openness for ideas and valuing differences. Finally, there is the level of ***underlying assumptions***, meaning "taken for granted" and little variation within the social unit (Schein and Schein, 2016).

Basic psychological needs (BPN) and motivations mediate work performance and health

Humans have three BPN, which has to be fulfilled, in order for a person to flourish and a failure to satisfy these needs will result in reduced growth, integrity and wellness (Ryan and Deci, 2017). However, there can also be need frustration and it is not the same as lack of need satisfaction, meaning that *"not feeling volitional, competent, and related"* is not the same as *"feeling oppressed, incapable, and isolated"* (Trépanier et al., 2015). The following definitions of the needs are used; *"**autonomy** or the need to self-regulate one's experience and actions", "**competence** refers to our basic need to feel effectance and mastery", "**relatedness** concerns feeling socially connected"* (Ryan and Deci, 2017).

An important proposition in SDT is that extrinsic motivation vary from controlled to autonomous (Gagne et al., 2005). In controlled motivation (e.g. contingent rewards, lack of choice), employees carry out activities based on an extrinsic focus and this will have negative effect on work performance (Deci et al., 2017). Employees with autonomous motivation is, in contrast, engaged in activities with *"a full sense of willingness, volition, and choice"* (Deci et al., 2017). These motivations are along an autonomy continuum and goes from least to most autonomous being external, introjected, identified, integrated, and intrinsic (Gagne et al., 2005). Trépanier et al. (2015) show that when employees' needs

satisfaction is fulfilled, they can more fully internalize their work experience and become in line with their values and interests and thus predict autonomous motivation.

Work performance and health
According to Deci and Ryan (2000), in workplaces where psychological needs are supported and autonomous type of motivation facilitated, there is psychological and physical well-being together with improved work performance (especially on heuristics activities). Trépanier et al. (2015), autonomous motivation is only related to positive outcomes, e.g. work engagement and job performance, but controlled motivation limits the positive outcomes and promotes negative ones, e.g. psychological distress.

Methodology and empirical data
A retrospective case study has been performed at a plant producing a major automotive component. The study focuses on the years between 1999-2009, when a comprehensive transition of the production organisation and the leadership logic took place. Multiple data sources have been used. One of the authors worked in the studied part of the organization during the studied period. The analysis is based on a developed framework.

Until early 90s, the production organization was characterized by a hierarchical and "Tayloristic" organizational philosophy. The company was functionally divided with the engineering organization separated from the production organization with no explicit production strategy. The first line managers' span of control could be fifty operators. An intermittently moving assembly line formed the basis for production and the operators' task was to assemble components. The work content was limited, i.e. short-cycle, repetitive tasks, the physical workload and the work rate was generally high. Industrial engineers developed standardized work that operators were expected to follow. Improvement activities was normally performed by others than those who worked in the processes, e.g. industrial engineering department. This resulted in low productivity, poor product quality, poor ergonomics, and high sick leave absence. In the early 00s, a few leaders who saw the need to involve the operators in the improvement work started a fundamental change of the production organization. The new production organization and its performance is described below and structured according to the framework.

Operators' work situation and performance
T1: Facilities set-up
Facilities layout, production flow: Two intermittently moving assembly lines with no buffers between workstations for different models formed the base, operating single shifts

Equipment used: Operators had their own equipment and tools at each workstation. Most tasks were manual assembly with standard hand tools and fixtures were frequently used. Few assembly tasks and testing operations were automated.

T2: Organizational design

Operating strategy and organizational structure: The production strategy consisted of common values and principles. The first line managers span of control was two teams (≈20 operators). Daily meetings were held (3 levels) to follow up and visualize status and to be able to quickly act on deviations, unsolved problems escalated to the next level.

Management and human resource strategy: The leadership ideals were characterized by a positive outlook on human beings and a coaching approach. Company visons and goals was established in the teams by the first line manager. Team leaders facilitated the team's decision processes and were responsible for communicating with other teams.

Operators were not just hired to assemble, but also to work with improvement. There was a strategy to develop individual carrier paths for all employees within the company.

Team structure and strategy: Generally, a team consisted of ten operators with eight assembly positions within the line segment. Each team owned, had authority of and developed their line segment. Thus, eight operators assembled, and two operators worked with role tasks, but in case of absenteeism, one of these two operators needed to assemble. The role tasks were organized into different role areas; standardized work, quality, maintenance, production flow, work environment, product and engineering change, team leader and vice team leader. Each operator was appointed to one of these role areas. The team leader was responsible for the daily pulse meeting, visualizing status, identifying absenteeism and planning the assembly and role tasks. The first line manager facilitated a weekly improvement meeting (24 min), in order to keep the pulse on improvement, role tasks and ongoing and planned activities (demand driven, e.g. quality deviations). Each operator prepared to present ongoing/planned activities in their role area, but other team members could carry out activities outside their specific role area. Weekly, each operator had a role area meeting (24 min) together with operators from other teams working with the same role tasks (e.g. maintenance or quality control, etc). The aim was to discuss tasks, develop competence, feel ownership and promote learning between teams.

Support functions: Support functions tasks were distributed to the teams and instead support functions spend time on more advanced tasks. Specialists from support functions also led role teams and contributed with deep knowledge in the area and acted as a mentor.

T3: Task characteristics

Task variety and skill variety: The assembly work had standardized work procedures with low task variation, but there was job rotation between stations. Here, the operator's talents were not used, but the role tasks involved different aspects of their talents. These role tasks accomplishment was necessary to carry out the assembly and develop the process.

Task significance and task identity: The assembly work and role tasks had no substantial impact on others, but activities were arranged to make the operators aware of customer needs. The assembly work was not contributing to a whole and identifiable piece of work. The assembly sequence was designed based on what components were closest to each other rather than a logical sequence. Training sessions were arranged to learn about the products. The role tasks contained identifiable and whole tasks where the operators were responsible for planning, doing, and reflecting on results.

Feedback from job: The operators got direct feedback from work since deviations were visualised at the source. There was also information of the number of approved products.

Autonomy: The assembly work had no freedom in work scheduling, decision making or work methods. In the role tasks, the operators had the possibility to influence work scheduling to some extent and work methods by handling improvement activities.

Job complexity and information processing: The need to process information during assembly was low and the work could be learnt in weeks, meaning that the job complexity was low. Role tasks varied in complexity and the need for information processing.

Innovation and specialization: The assembly work did not give rise to innovation or the possibility of building deeper knowledge. However, the role tasks enabled the development of deeper knowledge and expertise.

T4: Physical ergonomics and emotional demand

The operators assembled heavy products with weighty components and endured some physical demands and challenging postures, but there were a focus work conditions, prioritising safety at daily pulse meetings. There were no specific emotional demands.

S1: Leaders' behaviour

Transformational leadership: The leadership logic was characterized by a humanistic view. Instead of deciding, first line managers focused on training and developing the operators and establishing a culture and structure that improvement work requires. Great emphasis was placed on creating trust and a relationship with each operator, spending the first hour every shift focusing on the persons and not the tasks. They also strived to provide ongoing feedback and demanded commitment. The first line managers created a desirable mental image of a future state together with each operator and tried to match each operator's talent and interests with the dedicated role tasks, to create development paths. You were not allowed to be leader of someone you did not believe in. First line managers spent a lot of time to understand the team dynamics (group dynamic result analysis) and weekly, met with the team leaders to discuss the team situation. They worked actively with the values and norms in the team, especially with those individuals who had a strong impact on the culture. They also worked together in their improvement team to develop their leadership skills, spending 50% of their time at the shop floor.

Transactional leadership and Laissez-faire: The first line managers behaviour did not match the characteristics of transactional or laissez-faire leadership.

S2: Social aspects within teams and with others

Interdependence: The assembly work did not involve task interdependence between the operators, each worked by themselves. The role tasks were interdependence, since they impacted all the workstations. The team had a joint responsibility for their performance.

Task cohesion: The joint responsibility contributed to task cohesion along with the team meetings that made the team's shared tasks visible. The role teams exchanged experiences and developed knowledge together which created task cohesion.

Group collective efficacy: Through the responsibilities and activities, the teams developed confidence regarding their ability to solve problems and run their line segment.

Psychological safety: The operators supported each other, and the top management stated that “we love deviations”. When deviations occurred, it was an opportunity to improve methods and processes and no interest of looking for scapegoats.

Social support: There were challenges in finding specialists to lead the role teams, because the specialists had an engineering background and did not have the training in coaching. Those who succeeded with their mentorship often had their own experience of working at the assembly line and then had very positive impact on the operators.

S3: Organizational design

Norms and values: The norms and values were that safety always comes first and to respect the individuals. You should have the possibility to develop through work and everyone was expected to participate in improvement work. The leader’s mission was to secure that the team had the best conditions to plan, produce and develop themselves.

Underlying assumptions: The leadership was characterized by a humanistic view, intending of filling basic human needs. An assumption was that everyone could contribute and develop under the right conditions and that the persons working in the processes are the experts in the best position to discover problems and potentials for improvement.

Dependent variable: Operational performance and health

The transition of the production organization had a strong impact on work performance and health. Between the years of 2001 and 2005, the running time of the assembly line increased from 65% to 88%, productivity increased by 50%, sick leave absence decreased with 80% and the number of workstations with poor ergonomics decrease with 80%.

Analysis of operators' work situation impact on performance and discussion

This section presents the analysis based on the theoretical framework and generates three sets of propositions. A model is developed and extends the basic SDT model by exploring and proposing how the technical system directly and indirectly relate to work performance and health. Figure 3 shows the extended model and propositions (P1-P3).

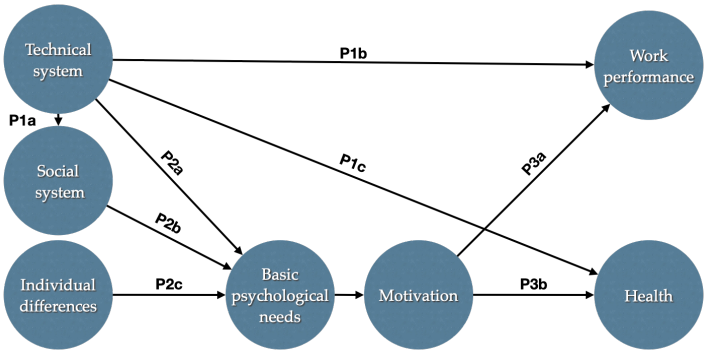

Figure 3: Work situation direct and in-direct impact on work performance and health

Technical system direct and in-direct impact on operators' work performance and health

It is important to consider the technical system, in order to get a comprehensive view of how the work situation impact work performance and health. The design of the technical system directly impacts work performance, e.g. Kovács (2020) suggest a methodology for layout design and lean tools application to attain performance improvements. In serial flow different inefficiencies are incurred, system losses are often, caused by the chosen system design, (Wild 1975). Further, it is well-known from many studies that physically poor working conditions has bad impact on health (causing musculoskeletal disorders) (e.g. Punnett and Wegman 2004). Especially repetitive work motions, occurring in short cycle work at assembly lines, cause musculoskeletal disorders (Ranney et al., 1995).

A first line manager's span of control was set to be approx. 20 operators, equal two teams and the manager had an expectation to co-create the teams' as well as individual goals in relation to the company's overall vision and goals. 50% of the planned work, for the first line manager, was to be at the shop floor supporting the teams and the operators in their development. The organizational design and work content set the boundaries and facilitated goal of transformational leadership. The organizational design and task characteristics with the decision authority to solve problems together in the teams (e.g. absenteeism, rebalancing the line, etc) is a base for task cohesion as well as creating group efficacy (e.g. believing in solving a rebalancing problem).

Proposition 1a: The technical system (T1, T2, T3, T4) has a moderating impact on operators' social system.
Proposition 1b: The technical system (T1, T2, T3, T4) has a direct impact on operators' work performance.
Proposition 1c: The technical system (T1, T4) has a direct impact on operators' health

The work situation impact on operators' BPN

The assembly line with no buffers created a high workload, limited work content and the operators' assembly work were controlled by the technical system (e.g no work schedule or work method autonomy). This had a strongly negative impact on the operators' BPN, especially autonomy. On the other hand, each operator was responsible for one role area. These tasks included job complexity, information processing, innovation and specialization. The organization design with teams and role teams had strongly positive impact on all three BPN, meaning the operator's had choices, increased their capability and worked together with others. How different aspects of the operators' technical work context affect BPN are presented in table 1.

Table 1: The technical (T1, T2, T3, T4) and the social (S1, S2, S3) system's direct impact on BPN (strongly positive ++, positive +, neutral 0, negative -, strongly negative --)

	The technical system's impact on operators' work situation	**Au**	**Co**	**Re**
T1	• The assembly line with no buffers resulted in limited work content and operators were controlled by the technical system and the workload high.	--	-	--
T2	• The team was process owner, problem owner and decision forum, and thus had authority of their line segment	+	+	+
T2	• A team consisted of ten operators	0	0	+
T2	• A first line manager was responsible for two teams	0	0	+
T2	• Each operator was appointed to one "role area" and "role team", who met every week	+	++	+
T2	• A role specialist contributed with deep knowledge and acted as a coach for the operators	0	++	+
T2	• The team had a short pulse-meeting each working shift and one longer weekly improvement meeting	+	+	+
T2 T2	• Company visons and goals should be established in the teams based on company operations strategy that included, values, principles, methods, resources, strategies	0	0	+
T2	• The teams established their own goals based on their situation and company vision and goals	+	0	+
T2	• Individual carrier paths for all employees within the company	0	+	0
T3	• The operators' autonomy of the assembly work was limited	--	0	0
T3	• The operators' autonomy of the role tasks was high	++	0	0
T3	• The operators' task significance for the assembly work was limited	0	0	-
T3	• Task identity, the assembly work did not contribute to a whole and identifiable piece of work	0	0	-
T3	• The team had daily product quality feedback from customers at the pulse-meeting	0	0	+
T3	• The role tasks and improvement work contained identifiable and whole tasks were the operators could be responsible for planning, doing and reflecting on results.	++	++	0
T3	• Task variety were present in terms of job rotation between assembly station and within role tasks	-	+	0
T3	• Skill variety were high, included assembly work, improvement work, role tasks	++	++	0
T3	• The role tasks included job complexity, information processing, innovation and specialization	++	++	0
T3	• The assembly line tight control of operators involved direct identification of deviations	0	+	0
T4	• The assembly work was physically demanding	0	0	0
	The social system's impact on operators' work situation	**Au**	**Co**	**Re**
S1	• First line managers worked to get deep knowledge of their employees, to match each employee's talent and interest with appropriate role task.	0	++	++
S1	• Through dialogue with each operator, the first line managers developed career paths for the operators to develop within the organization.	+	++	++
S1	• First line managers believed in and supported their employees and consequently, had high expectations.	+	+	++
S1	• First line managers gave informative feedback on work performance.	0	+	0
S1	• First line managers required full commitment in assembly and role tasks from their operators.	0	0	+
S1	• At the start of each working shift, the managers spent one hour for individual dialogue with each employee, primary discussing private matters, but sometimes also work-related matters.	0	0	++
S1	• First line managers coached each employee to develop his/her own mental picture of the desired future situation. This led to meaningful mental models for each employee and shared mental models in the organization.	+	0	++
S1	• First line managers focused on training and developing the employees, not primarily in the art of performing the work itself but establishing the culture and structure that improvement work requires.	0	+	+
S1	• The first line managers spent a lot of time to see and understand the processes in the teams.	0	0	+
S1	• First line managers intention was to understand each operator's specific situation and develop the individuals based on their own preconditions.	0	++	++
S1	• The first line manager discusses explicit norms and rules for the team with the operators	+	0	+
S2	• The assembly work did not involve task interdependence between the operators.	0	0	-
S2	• Relating to the outcome of products from the team line segment, the team had a joint responsibility for their performance, delivered products.	0	0	+
S2	• The role tasks implied interconnections among operators in the team.	0	0	++
S2	• The team worked together with their improvement list and decided on what new activities to initiate.	+	0	++
S2	• Teams developed confidence regarding their capability as a group to solve problem.	0	+	+
S2	• The top management encouraged positive use of deviations. When deviations occurred, it was an opportunity to improve methods and processes and no interest of looking for scapegoats.	0	+	+
S2	• Role experts supported operators' conducting role tasks.	0	+	+
S3	• Values included a positive outlook on people and that safety always comes first.	0	0	+
S3	• Group activities were arranged after working hours to create a positive team climate and to develop the relationships in the teams.	0	0	+
S3	• All operators participated in role team and improvement activities.	+	+	+

First line managers had a central role in operators' social work situation, because they spent a lot of time to attain deep knowledge of their employees e.g. matching each operator's talent and interest with appropriate role task. The first line managers had to trust, respect, support and have high expectations of their subordinates, otherwise they would have to shift team. This is clearly a description of a transformational leadership and this had strongly positive impact on operators' BPN. The team was given opportunities to solve all types of upcoming problems and this led to high task cohesion

and high group efficacy, both will have positive impact on operators' BPN. How different aspects of the operators' social work situation impact BPN are presented in table 1.

Individual differences are outside the scope in this study, but earlier research has shown that general causality orientations, life goals or aspirations can be used for predicting outcomes in various domains (Ryan and Deci, 2017).

Proposition 2a: The technical system (T1, T2, T3, T4) has a direct impact on operators' BPN
Proposition 2b: The social system (S1, S2, S3) has a direct impact on operators' BPN
Proposition 2c: Operators' individual differences have a direct impact on operators' BPN

BPN and motivation as mediating variables

In the findings, it is shown that the case company managed to design a technical and a social system that fulfilled operators' BPN. It is also described how the case company, manage to increase their production output and improve health. These findings support earlier studies indicating BPN as mediating variable (e.g. Baard et al. 2004). Motivation (autonomous and/or controlled) has also been shown by earlier studies to have a mediating effect (e.g., Fernet et al, 2015).

Proposition 3a: BPN and motivation are mediating variables between operators' work situation and work performance
Proposition 3b: BPN and motivation are mediating variables between operators' work situation and health

The importance of the operators' work situation in lean organizations

In the case company, the technical system (e.g. designed values, principles, methods and processes) was quite ordinary from a lean perspective. What made the case company unique was the social system together with an appropriate organizational design for developing and supporting people. They succeeded to create an environment where operators got their BPN satisfied, despite using an assembly line. This was done through a humanistic leadership model and decentralization of engineering tasks and improvement work to the operators, which resulted in increased autonomy, competence and relatedness. Each operator worked in a team, where approx. eight operators assembled and two worked with role tasks at a specific time. The team had authority over their process and all ten operators had different role areas, leading to interdependence as well as team efficacy, which strongly impacted the operators' BPN for relatedness and competence. Each operator role area was matched on talent and interest and also belonged to a role team and was coached by an expert (e.g. maintenance engineer), leading to knowledge and personal growth, and fulfilling the BPN of competence. There was high autonomy when working with the role tasks. The organization with both team and role team created a width and depth in knowledge and was accordingly a good base for organizational learning. The leaders played a central role in their support for their subordinates' BPN satisfaction, e.g. starting one hour each shift for individual dialogue, discussing matters of work as well as their life situation. The intention was to understand each operator's specific situation and develop the individuals based on their own preconditions and consequently, operators' BPN for relatedness was high. A key learning point is that to succeed with lean, you need to consider both the social and technical dimensions of a work situation to achieve high work performance and health. Because, in the case company, when the social system aspects where given the same dedication as the technical system aspects considerable improvements were made possible.

Conclusion

The findings show that the social dimensions have a strong impact on the work situation and thus, a key to succeed with lean organizations is to invest time in social dimensions. Consequently, to understand a production situation you need to analyze both the social and technical system. The case showed the possibility to create a good working

environment, despite using an assembly line. The theoretical contribution of this study is the extension of the basic SDT model, in workplaces, by adding and operationalizing social and technical dimensions. The developed model points out how social and technical systems separately and in relation to each other impact on operators' BPN. The managerial implication is to use the model to analyze and understand operators' work situation, by using the operationalized dimensions. The model can be used as an input to increase operators' work performance and health.

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