

# Work Organization Supporting Resilient and Sustainable Production System

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**Abstract.** The aim of this paper is to focus on how work organization, founded on the resilience and sustainable production system, evolves from a strategic perspective. Disturbance and threats can occur at any time without any warning. Therefore, it is important that the work organization is sufficiently resistant to interference. This article is an integrative literature review. Currently, a gap has been identified and that is resilient is not part of the sustainable production system. This study examines how work organizations can support resilient and sustainable production. The result and the conclusion suggest that it is possible that the work organization can support this resilient and sustainable production system. However, two important changes are required, one is the organizational culture in which employees have the same shared assumptions, values, and beliefs, and the other is organization structure requires a job enlargement, employee contributions, and training to ensure a sustainable transition process towards having a resilient and sustainable production system.

**Keywords.** Resilient, Sustainable Production System, Work Organization

## 1. Introduction

Companies are forced to change towards sustainable production for various reasons, for example, competitors may have knowledge and experience with respect to sustainable production, which may result in a competitive advantage, or they must deal with international regulations on sustainable development [1]. A Sustainable manufacturing system is seen as a long-term goal and needs to consider both the economic and social constraints [2]. The industry is expecting to increase their goods and service and at the same time aim to achieve zero climate change emissions, zero waste, and use much lesser resources than they are doing today. According to Demartinia [3] reducing emissions and improving energy efficiency transitioning to the circular economy paradigm and adopting high-performance components, machines and robots require awareness and transformation of manufacturing processes to optimize material and energy consumption. The high level of digitalization forces the industrial production system to change, the seeding is done using intelligent, connected, and decentralized production. The fourth industrial revolution, which is also called Industry 4.0 (I4.0), is the contributing factor to the seeding's core idea of using emerging technologies in a way that business and engineering processes are deeply integrated making production operate in a flexible, efficient, and sustainable way with constantly high quality and low cost [4].

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The market's requirement is that the product and service must fulfill the purpose of sustainability, have a high quality, and it must be delivered in a fast and efficient manner. These requirements cause a complex relationship for the production system. In order to respond to the new market requirements companies, need to rethink their entire production process by implementing digital technologies [5]. The digital transformation will improve the competitiveness of industrial organizations while strengthening their ability to make optimal decisions. For production to be sustainable and effective, production should be either flexible or agile. The production needs to implement a new form of business with value creation to develop green products and processes in demand. The benefits of implementing sustainable production include improvement of efficiency and productivity, reduced use of hazardous materials, compliance with regulations, enhanced community relations. This system is based on 6R, which means to reduce, reuse, recycle, recover, redesign, and remanufacture [6].

Further, manufacturing paradigms are facing dramatic changes as a consequence of digital transformation. According to Cagliano [7], there is wide evidence that technological changes often fail due to organizational misalignment. Change is the central character of our time, as are organizations and organizing. In a modern economy, everything takes place in an organizational context. This goes for all levels of relationships, from the individual, to national, to global. Many organizations' efforts to survive in competitive marketplaces may have the unintended consequence of decreasing employee working conditions, resulting in vicious cycles of generating organizational settings that do not encourage a sustainable production system in relation to the efforts made [8]. The research presented in this paper aims at focusing on how work organization, founded on the resilience and sustainable production system, evolves from a strategic perspective. This is increasing the understanding of the challenges and opportunities that such a development is creating. In order to fulfill this objective, the following research question is formulated:

RQ1- How can a work organization support the company to have a secure and faster transition toward having a sustainable and resilient production system?

RQ2 - What critical features within the work organization needs to be developed to be able to achieve a resilient and sustainable production system?

## **2. Method**

This article is an integrative literature review [9]. To do this in a structured, accurate and credible way, two different methods have been applied, snowballing and Andrew Booth's [10] ten-step method. To give a clear overview of the implementation of the process see [Figure 1](#). The ten steps give the report a red structure while snowballing ensures that the

right articles are found to create credibility for this study. Further, the snowballing starts with selecting several articles that are relevant to the literature review, and to be able to do that snowballing has two different approaches, backward and forwards. The backward method has been applied. This means that the articles quoted are scanned based on the reference list in the originally selected articles.

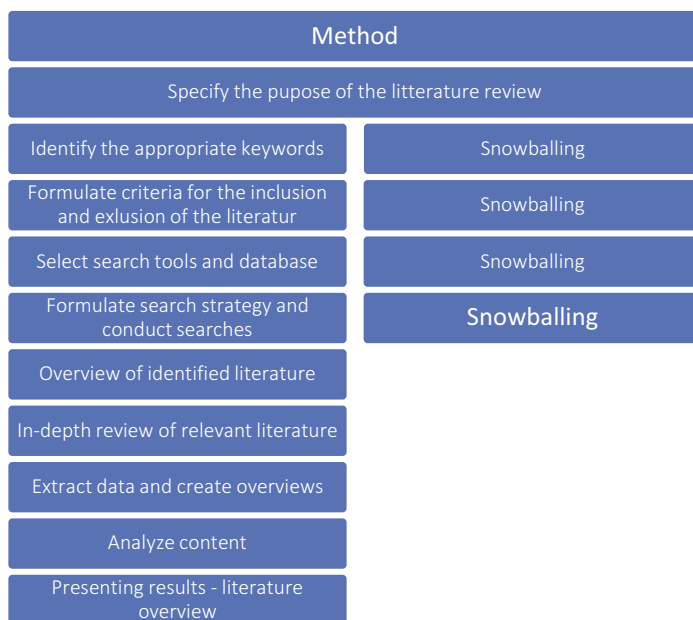


Figure 1 The method is based on two strategic approaches within this literature review. On the left side the ten-step model and on the right side is the snowballing. Snowballing is only applied on the 2-5 steps.

As the aim describes, identifies, and ensures important elements for how the organization can support resilient and sustainable production systems. To create a deeper understanding of how this is connected, keywords have been selected. The keywords are based on the purpose and are as follows, resilient, sustainable production system, and Work organization. The selection of the first articles together with keywords provided only an understanding of the multidisciplinary and multifaceted terms. To create a deeper understanding of how the terms can be integrated, keywords were combined.

Keywords	Resilient	Sustainable Production System	Work organization
Resilient	x		
Sustainable Production System		X	
Work organization			X

Figure 2- The table shows how a combination with different keywords results. Green is applicable, red is non-applicable.

A gap has been identified which is resilient in sustainable production systems. When searching only one keyword, for instance, resilient provides a large variety of items within several different areas. This suggests that resilience is not a new phenomenon, it has been applied in several other areas such as ecology, metallurgy, individual and organizational psychology. However, it has not been applied in combination with sustainable production systems. This is also shown in Figure 2. However, a combination of Resilient + work organization or work organization + sustainable production system gives a wide variety of articles. Although, combining these keywords did not provide an opportunity to answer the research questions. Therefore, this kind of combination doesn't meet the required criteria. As a larger perception of the subject has been created, some kinds of criteria have been created to distinguish non-relevant and relevant articles. The type of publication to start from were scientific articles and conference articles with the period from the 21st century until now, the language choice became English where most people apply and can relate to. Selected search engines became a mix of Google Scholars and Scopus. To answer the research question, this study required to focus on the words that have a relationship or a strong connection to the keyword. Those words can be found in Table 1. These words associated with the keywords provided a deeper understanding and a strong basis for credibility to answer the study's questions. This provided the opportunity to add a new perspective to what is required to achieve a resilient transition towards sustainable production systems. In order to analyze the content of the literature, different literature that was identified linked by forming a coherent and coherent argument based on the research questions.

Table 1- shows the associated words to the keywords.

<b>Resilient</b>	<b>Sustainable production system</b>	<b>Work organization</b>
Robust	Sustainable manufacturing system	Organization development
Agile	Industry 4.0	Organization change
Flexible	Industry 5.0	Organization culture

### 3. Theoretical background

#### 3.1. Resilience, adaptive capacity & vulnerability

The concept of resilience is closely related to the capability and ability of an element to return to a pre-disturbance state after a disruption. According to Guelfi [11], resilient in a business context is defined as “the capacity of a business process to recover and reinforce itself when facing changes”, another definition that can be applied in the context of resilience in business is “*the resilience as an ability of firms to change from failure to success*” [12]. Resilience is strongly linked to both vulnerabilities of systems and adaptive capacity [13]. Vulnerability is defined as “*the degree to which a system is likely to experience harm due to exposure to a threat or perturbation*” [14]. Within the context of disasters, vulnerability is inherently complex and is not a static entity. The second thing that is connected to resilience is adaptive capacity. On the authority of Gunderson [15], adaptive capacity is a system's robustness to alterations and changes in resilience. The term adaptive capacity is also a term that has emerged from several different disciplines and is defined as “*adaptive capacity reflects the ability of the system to respond to changes in its external environment, and to recover from damage to internal structures within the system that affect the ability to achieve its purpose*” [16].

The conceptual linkages between vulnerability, resilience and adaptive capacity have been identified by Gallopín [13] that resilience is considered a subset or component of a system's capacity of response. A system's capacity of response relates to the ability of the system to adjust to a disturbance, moderate the effects, take advantage of any available opportunities and cope with the consequences of any system transformations. Operational and organizational robustness expresses the ability of a system to obtain its functionality even under fluctuating environmental conditions. Both aspects, robustness, and agility, must be considered in terms of a closed-loop control system as regards production systems. Minor perturbations endured by the robustness of the system differ from grave disturbances that require a rapid reconfiguration of the production system based on its agility property

### 3.2. Sustainable Production System

An integrated assessment of all activities engaged throughout the product's life cycle is required for sustainable production systems (SPS). One of the most effective ways for reducing environmental impact from the product is to create an SPS [17]. Without making extra investments, lean methods can be used inside a sustainable manufacturing system to improve system efficiency and productivity [18]. A sustainable manufacturing system may be defined as “*the creation of manufactured products using non-polluting, energy and natural resources conserving, and economically sound and safe processes*” [19].

The distinction between traditional manufacturing and an SPS is that SPS should adopt the closed-loop concept, incorporating the 6R concept (reuse, recycle, recover, redesign, remanufacturing, and reduce) [20]. Depending on the industry sector, the nature of sustainable production processes will differ. The following are some of the generic qualities that any sustainable manufacturing system should have:

- Environmental consciousness must pervade the culture of the whole organization.
- Make maximum use and re-use of recycled components and materials:
- Product life-cycle concepts must be applied to the whole manufacturing system.
- An organization must be lean as well as clean. [21]

### 3.3. Work Organization

Work organization thus refers to how work is planned, organized, and managed within companies and to choices on a range of aspects such as work processes, job design, responsibilities, task allocation, work schedule, work pace, rules and procedures, and decision-making processes. According to Cordery [22] work organization can be defined as “*the way tasks are organized and coordinated within the context of an overarching work system*”. Organizations tend to change primarily because of external pressure rather than an internal desire or need to change. A change in an organization refers to any alteration in activities or tasks. Change is defined as “*the process of analyzing the past to elicit the present actions required for the future*” [23]. A change can be distributed in two different ways, the first where strategy and culture, refocus or reorienting the large-scale part of the organization. The second level of change within the organization is fine-tuning, where the focus is to fix problems, adjust or even change routines that improve the organization's performance [24]. Organizational culture appeared to have

some influence on attitude towards organizational change. The organizational culture refers to a system of shared assumptions, values, and beliefs considered to be the appropriate way to think and act within an organization. Culture is a critical part of the organization that binds people together toward a common vision and goal [25].

#### 4. Findings and Analysis

##### *4.1. RQ1- How can a work organization support the company to have a secure and faster transition toward having a resilient and sustainable production system.*

An organization's ability to become resilient is dependent on the presence of organizational processes, practices, and procedures that enable it to overcome challenges [26]. Resilience in an organization is conceptualized as the ability to develop capabilities and capacities necessary to thrive despite challenges, as well as to bounce back from adverse situations [27]. An organization needs to develop principles, policies, and employee contributions that allow it to prepare for and recover from disasters, it is said to have organizational resilience. Principles serve as guideposts to align lower, less abstract policies and practices. For instance, and principle for decision-making would be sharing information as broadly as possible within the organization. Alternative approaches to achieving the guiding principles are reflected in policies. Furthermore, policies offer alternate methods for reaching specific sets of objectives that employees must meet. Desired employee contributions include a variety of employee attitudes, behaviors, and work-related outcomes that enable employees to contribute toward the implementation of strategic objectives. [28]

Organization awareness is also important prior knowledge that can facilitate the recognition and assimilation of new knowledge and the application of it to innovation outputs [29]. Organization awareness refers to knowledge of the organization as a whole, as well as other organizational units and different types of employees [7]. It refers to explicit information, such as organizational structures, practices, and procedures, as well as what is going on within the company, as well as tacit knowledge, such as cultural and dynamic knowledge in terms of cross-functional collaboration and the formation of relationships between functions [30]. Further, organization awareness contains social integration mechanism, meaning that it incorporates processes that reduce information exchange barriers within organizations and improve an individual's connections with the organization. The cross-functional collaboration shared decision-making, and a culture of knowledge sharing involved in organization awareness not only integrates and strengthens the social structure of an organization and its employees but also produces improved innovation performance. [31]

The Johns Hopkins Resistance-Resilience-Recovery model is applicable to define resilience-building organizational interventions [32]. According to the Johns Hopkins model, resilience is a cyclical process that focuses not only on what happens immediately after a crisis or disaster (resilience) but also on what happens before the disaster (resistance) and during the period of returning to normalcy (recovery). The model provides an integrative and longitudinal view in understanding resilience and structuring catastrophe planning and response by bringing together the processes of resistance, resilience, and recovery. Further, in this model, resilience-building necessitates a series of interventions that promote immunity to disasters (resistance), the ability to bounce

back afterward (resilience), and the ability to re-establish and regain functioning (recovery).

As an organization goes through normal changes, its level of resilience will vary. Further, to achieve resilience within the organization, a paradox arises in the form that resilient systems are at the same time fragile and robust as well as vulnerable and adaptive. This implies that organizational resilience is achieved by maintaining a balance between opposing forces. For instance, maintain high-quality operations without spending too many resources. However, a major obstacle to achieving resilient organizations is rigidity. To counter rigidity, it is important to organize the change that will lead to organizational resilience. [30]

The dyadic process between organizational and employee has a major impact in achieving resilience [28]. Employees of resilient enterprises tend to be strongly committed to the organizational change needed for growth because these (improve employee motivation, morale, commitment, and loyalty) attributes to create a positive effect and encourage high-quality social-exchange relationships [32]. The main requirement is power distribution so that employees feel empowered to take responsibility and initiatives, but also that they feel trusted. However, one challenge that appears with a high degree of power distribution is maintaining a commitment to the organization rather than its parts [33]. To include and motivate workers requires a leadership style in the shape of translational leadership, which relates to the ability to knit different social networks together by creating complementary connections. It is founded on a sense of mutual respect and inclusion, which can then be used to guide action when a disruption occurs. [34]

#### *4.2. RQ2 - What critical features within the work organization need to be developed to be able to achieve a resilient and sustainable production system?*

Work organization is concerned with human integration in industrial production processes by skills distribution and coordination of work tasks. Employees within the work organization have a huge impact on the performance, and the performance of the organization is determined by the organization's culture [35].

Disruptions may appear benign enough in their early phases. However, predicting the size of a major disruption early on necessitates a mindset that constantly questions conventional thinking, as well as a culture that permits information to be heard, comprehended, and acted upon [34]. Organizations can face significant damages and losses just as their workers may experience negative outcomes to their productivity and well-being. Thus, resilience, or the ability to recover from adversity is important for both organizations and their members [36]. The failures of firms are due to their inability to perceive and respond swiftly enough to the ramifications of the changes occurring around them. It's crucial not to overlook the role of culture in an organization's adaptability and resilience. According to Abdul [23], organizational changes need to be accepted by the employees using organizational commitment, a harmonious industrial relations climate, education, job motivation, satisfaction, and security.

Seville [37] mentions the importance of implementing principles to be resilient within the organization. Perceive experiences constructively, the aim is to handle the experience causes of pain and try to find a positive perspective to move forward. Perform positive adaptive behaviors. Consider change as an opportunity rather than executing

ineffective scheduled replies, allowing responses to adapt to the needs of the circumstance. Expand decision-making boundaries, provide greater decision-making authority to support positive adaptive response and the use of resources to achieve the objective. Build virtual role systems, in a team, individuals have a shared understanding of the team's mission and can fill in wherever needed to ensure smooth functioning of the team.

Further, the structure of an organization needs to be developed. Current organizational structures often act as barriers against resilience. These structures were built when tight decision control was necessary [28]. Top management should think strategically, with input and participation from all levels of the organization, to design an organizational structure suited to the organization's strategy and operations [38]. Within the organization structure, the development of job enlargement is required. Job enlargement allows for the integration of values, responsibilities, and behaviors related to the new concept into the employees' jobs and day-to-day activities [39]. The development of an organizational culture that is sensitive and respectful of the concept fosters better performance [31].

Training is essential for improving performance because it necessitates the acquisition of new skills [29]. Employees become more aware of idea needs, adaptability, and their ability to adjust because of training. It also motivates people to be more proactive in coming up with creative solutions to idea problems [40]. Furthermore, comprehensive training program creation qualifies employees to recognize not just significant idea issues but also the best strategy to handle them, resulting in improved performance. Increased training adoption boosts performance. Further, Training develops a skilled, ever-learning, and empowered workforce; it has a direct impact on employee engagement and satisfaction, increasing workforce competencies to the point where newly trained employees can advance to new roles both within the company and in the market [41]. Furthermore, training may aid in the development and integration of the skills required to produce a safer and higher-quality work environment [42].

## **5. Discussion**

Drawing upon the themes underlined in the previous sections, this section highlights the main characteristics needed on how a work organization can support the company to transition towards having a sustainable and resilient production system.

The literature on Resilient and sustainable production systems is very limited, but the literature on work organization and resilience has a larger outcome angle [see for example figure 2]. Based on the literature that has been applied and analyzed using Booth's [10] ten-step method and snowballing this research offers two important lessons. The first is the organizational culture and the second refers to the organizational structure. It is important to point out that both changes need to take place in order to create the conditions for achieving a resilient organization. As available literature mentions [27] [24] [37], a resilient organization absorbs shocks and prevents problems from escalating into full-scale crises by changing and developing the company's principles, policies and creating employee engagement. They also highlight the fact and weight of the right Organizational culture that refers to a system of shared assumptions, values, and beliefs.

This considers the appropriate way to think and act within an organization. Building a valuable organization's culture requires the right conditions. Literature [28] mentions a few principles such as perceiving experiences constructively, performing positive adaptive behaviors, expanding decision-making boundaries, and building virtual role systems. Another principle that can be added is adaptive capacity. Based on the definition of adaptability, this means responding to the degradation of its external environment and recovering from damage to internal structures within the system. Lessons learned that principles create motivation and engage the co-workers to dare to make their own decisions when disturbances occur within the organization. However, Literature [34] describe that current leader in organizations and industries are more of a manager than a leader. This can create a barrier to change, hence it is important to strive to have the right leadership style. The literature [34] suggests that translational leaders are most ultimatum because they can focus on partners and collaborate, make the organizational structure and culture interact, and establish measurable goals for success.

Further, the second necessary change to achieve a resilient and sustainable production system, the work organization requires change within the organizational structure. Essentially, literature [28] describes there are three important aspects to achieve when changing the structure, which are as follows, job enlargement, employee contributions, and training. Lesson learned that interaction between these three aspects creates the possibility of increased resilience within the organization. A monotonous task within an industry results in a reduced level of knowledge, reduces motivation daily, and creates tunnel vision. Further, literature [30] describes once a disturbance occurs within the organization and the employees have a monotint work. Lesson learned that it becomes extremely difficult for the employee to respond and recover against the disruption. Another lesson learned is that Job enlargement provides variety in employee responsibilities, which can help them to respond and recover from disturbance, job enlargements encourage employees to expand their talents beyond what they're used to at work.

Further, literature [40] mentions that employees' contributions connote the idea of allowing employees to participate in decisions that affect them, increasing their autonomy and control of their work results in them becoming more committed, motivated, and satisfied. Lesson learned that this would affect their employee attitudes, behaviors, and work-related outcomes. The main requirement is power distribution so that employees feel empowered to take responsibility and initiatives, but also that they feel trusted to contribute toward the implementation of strategic objectives.

Employees must acquire the requisite knowledge to be able to handle not just one but numerous phases of the production process in order to ensure that they do those jobs properly. To ensure that all employees understand their new tasks and the need for change, training is required. If you make such a big organizational change, there will be anxiety and fear, as well as misunderstandings and perceptions that do not quite fit in. Training makes sure to increase the level of knowledge in two different ways, one by getting a deeper understanding of the change but also the weight and need to increase the employees' skills within the organization. In addition, training contributes to increased skills and how an employee should make decisions that benefit the organization in a holistic way but also increase employee's security to take quick but also the right response for the organization to recover quickly and safely from disruption.

## 6. Conclusion

To conclude, that work organization supports the company in a fast way towards having a resilient and sustainable production system it requires two things, the first one is the right culture of an organization and the second is the right organization structure. The organization's cultures should be developed with the help of the principles so everyone within the organization has the same shared assumptions, values, and beliefs. An organization's structure requires job enlargement, employee contributions, and training to ensure a sustainable transition process towards having a resilient and sustainable production system. Proposals for further research are to analyze and evaluate current production and see if there are any production that fulfills the requirement within the work organization to support a resilient and sustainable production system.

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