

A systematic review: Enhancing the understanding of the value of socio-technical systems design

by identifying which academic evidence is available regarding how adherence to socio-technical systems design principles affect quality of work



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Date

27-07-2021

Abstract

Purpose – This thesis aims to gain more insight into understanding the value of socio-technical systems design as a theory for organisational design. The theory was developed and seen as a theory that would revolutionise the way we live and work. The theory never became a popular management theory, and the theory has been in the background for a while. However, due to the rapid advance of technology, the comparatively slow advance of ideas about how to organise, and the importance of employment and innovation, there was and is a possibility of a resurgence of the socio-technical paradigm. This research attempts to contribute to the return of this paradigm by focusing on the quality of work.

Design/methodology/approach – Articles that met the eligibility criteria (published between 1981 and 2021, literature about the content of STSD, English literature, preferably peer-reviewed articles, articles describing how results are achieved, empirical/original studies) were included. Databases *Business Source Complete* and *Web of Science* were researched on 14 June 2021. *Microsoft Excel* and *Atlas.ti* were used to structure and analyse the data.

Findings – This systematic literature review consisted of the analysis of fourteen academic articles. There is found academic evidence of socio-technical systems design principles, mainly in the sense of self-regulation and parameters 1 (the degree of functional concentration), 2 (the degree of differentiation of operational activities), 3 (the degree of specialisation of operational activities) and 7 (the relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation) that have a connection with quality of work. More specific, health and wellbeing and competence development, as aspects of quality of work, are affected by self-regulation and parameters 1, 2, 3 and 7.

Practical implications – This research highlights the importance of the principles of socio-technical systems design and the need to use this design to improve the quality of work.

Originality/value – This paper confirms the importance of implementing socio-technical systems design principles to improve the quality of work. Furthermore, the systematic literature review is a valuable contribution, as it focuses on empirical research and gives an overview of the existing academic evidence of the design theory.

Limitations – A limitation was the credibility of the research. There was only one researcher, and no peer-reviews has been done. Triangulation of data collection/analysing is not applied.

Keywords – socio-technical systems design (STSD), quality of work, social innovation, workplace innovation.

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1. Introduction

1.1 Introduction of the topic

The importance of employment and innovation is emphasized to realise economic and societal benefits (The European Commission, 2013). However, work circumstances change, which is not just something from last year; how we work changes due to certain aspects of a changing environment, such as new technology, more flexible contracts, and a higher workload (Engbersen et al., 2020). In addition to these enormous changes, the coronavirus and measures against the coronavirus stress the need to focus on healthy working conditions, which should be the focus of the (Dutch) 2021 cabinet (CNV, 2020).

In this research, the focus is on both organisations and the quality of work. Good labour organisations, such as organisations that give employees certain freedom to do their job, are the key to improving the quality of work (Engbersen et al., 2020). To improve the quality of work, organisations should focus more on the workplace itself (Engbersen et al., 2020). *The Netherlands Scientific Council for Government Policy (WRR)* also states to focus on the workplace to improve the quality of work. Having good working conditions is essential for wider prosperity and could improve both the quality of an individual's life and the society in general, which is undervalued (Engbersen et al., 2020). A lasting relationship with your employer and being appreciated for your work appear to be very important (EenVandaag, 2021).

An important area of concern that receives little attention regards the role that organisational structure can play in bringing about quality of work. Already in 1981, De Sitter (as cited in Pot, 2019) emphasized the importance of organisational structuring in counteracting the decline in quality of work. Only paying attention to changes in management style was not the solution to improve work satisfaction and the quality of work; the more fundamental role played by the organisational structure should be explicitly recognised and addressed (Pot, 2019). Achterbergh & Vriens (2019) refer to a structure as 'the way tasks are defined and related into a network of tasks' (p. 46). They argue that a structure could help realise rich meaningful survival, a concept they use to refer to the positive societal contribution of an organisation (Achterbergh & Vriens, 2019). A poor design, on the other hand, Achterbergh & Vriens (2019) argue, will undermine an organisation's meaningful survival.

There are many different approaches to designing organisations and their structure. Examples include Mintzberg (1980), who identifies (a combination of) basic configurations in organisational structuring, the multi-contingency approach of Burton et al. (2011) that argues

that the design should be chosen based on a particular context, and also Lean thinking, which has a specific step-by-step plan that is sometimes seen as a design approach (Womack & Jones, 1996). Another approach is socio-technical systems design, which focuses on achieving both human and organisational objectives, called ‘functional demands’, through fundamental (re)design or adaptation (Van Eijnatten, 1991). Van Eijnatten (1991) refers to socio-technical systems design as it is seen as a process labelled as ‘action research’. The researcher’s role is no longer observant, but the researcher is involved and co-influences the situation (Van Eijnatten, 1991).

In this research, the focus is explicitly on socio-technical systems design, mainly because of the human aspect and the practical applicability of the design. After World War II, the theory was developed and seen as ‘a means for optimizing the intelligence and skills of human beings and associating these with new technologies that would revolutionize the way we live and work’ (Mumford, 2006, p. 320). The expectations were that this theory would become very well known, but it can be stated that the expectations of the 1980s are not met; the theory never became a popular management theory (Kuipers et al., 2010; Pot, 2019).

To see the quality of work in a broader perspective, social innovations can play a role. Quality of work could be seen as an outcome of innovations in organisations. Our economy is mainly based on human resources, and therefore crucial for our economy is to focus on social innovations (Engbersen et al., 2020). Social innovations can provide new and more efficient answers to growing social needs (European Commission, 2013). The importance of focusing on social innovations is also mentioned by *The Netherlands Scientific Council for Government Policy (WRR)*, which addressed social innovations as organising labour organisations in such a way that the organisation gets the best out of the people working in the organisation (Engbersen et al., 2020). There is a consensus among practitioners, policymakers and researchers that technological innovations alone are not enough to overcome the challenges in modern societies (Domanski et al., 2020). The importance of social innovations is recognised globally (Domanski et al., 2020). In contrast to technological innovations, social innovations are an elementary part of sociology and oriented toward social practice (Howaldt & Schwarz, 2010). Reflection on the social relationship structure is required in social innovations (Howaldt & Schwarz, 2010). In addition, social innovation is an often and in different ways defined concept. In European policies, the definition of the *British Young Foundation* is used (AWT, 2014). The definition of The Young Foundation (2012) is:

Social innovations are new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society's capacity to act. (p. 18).

The relation between social innovation and organisations is interesting in two ways: on the one hand, organisations are able via products and services to focus on innovations that are good for society. The first part of the definition of The Young Foundation (2012) mentions this. On the other hand, via internal innovations, organisations can realise the social goals of the employee and the organisation herself.

The field of social innovation is characterized in the literature by conceptual ambiguity and diversity of definitions (Van der Have & Rubalcaba, 2016). Besides that, some authors claim that the term social innovation is over-simplistic and is used as a buzzword (Moulaert et al., 2013). Examples of the many different approaches or instances of social innovation are social inclusion and workplace innovation (European Commission, 2013; Oeij et al., 2011). Although there are many different approaches, according to most definitions, what characterises social innovations is that they aim to contribute to the welfare of society and improve social capital (Dawson & Daniel, 2010). Oeij et al. (2011) state that whereas social innovation generally concerns the organisational and societal level, workplace innovation deals with the organisational and individual level. One of the outcomes of workplace innovation is the quality of work, which is further elaborated on in chapter two.

1.2 Problem framed in terms of academic literature

Social innovation, workplace innovation, quality of work and socio-technical systems design are all well-researched concepts. Although much research has already been done, Pot (2019) states that socio-technical systems design has not received the attention and recognition as was expected. Foroudi et al. (2021) state that the concept of social innovation, although extensively used, remains vague, and Anderson et al. (2015) mention the many different approaches and definitions of social innovation. Kuipers et al. (2010) mention that social innovation can be mainly sought after in labour organisations and, at least in Europe, Kuipers et al. (2010) state, the insight is widely accepted that the potential of technical innovation of

processes and products is limited if socio-organisational changes do not occur. Pasmore et al. (2019) confirm that the theory has been in the background for a while. Still, they state that ‘the rapid advance of technology and the comparatively slow advance of ideas about how to organise may portend a resurgence in the sociotechnical paradigm’ (p. 83). Thus, an attempt is made in this research to contribute to the return of the paradigm.

1.3 Objective and research question

1.3.1 Objective

The objective is to enhance the understanding of the value of socio-technical systems design as a theory for organisational design. In understanding the value of socio-technical systems design, quality of work is relevant as this is getting and should get more attention in theory and practice. This results in the following conceptual model:

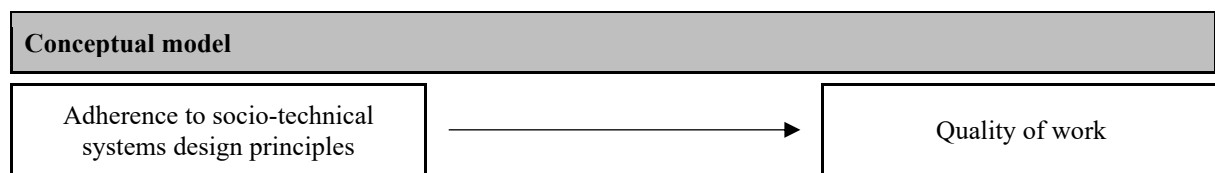


Figure 1: Conceptual model.

1.3.2 Research question

How can the understanding of the value of socio-technical systems design as a theory for organisational design be enhanced by identifying which academic evidence is available regarding how adherence to socio-technical systems design principles affect quality of work?

To answer the research question, the following sub-questions are formulated.

1. What is quality of work?
 - What is quality of work in general?
 - What are the characteristics of quality of work?
2. What is socio-technical systems design?
3. How does a conceptual literature analysis instrument look like to be able to find the connection between socio-technical systems design and quality of work?
4. How does, according to analysed literature, socio-technical systems design affect quality of work?

1.3.3 Approach

To reach the goal, existing academic literature is systematically reviewed. Literature is reviewed, which contains ‘published materials that provide an examination of recent or current literature’ (Grant & Booth, 2009, p. 94). A systematic review was chosen to get a more comprehensive and trustworthy impression of the field than possible when taking only individual research into account (Gough et al., 2012). This is further elaborated on in chapters two and three. A lot has already been written about the principles of socio-technical systems design; there is a rich database with articles about socio-technical systems principles. Existing literature is reviewed in combination with the term quality of work.

1.4 Research outline

This thesis is divided into several chapters, and the structure is as follows. In chapter two, the theoretical background of this research is presented; this is done to have a conceptual lens to be able to perform the analysis. The chapter explores definitions/characteristics of quality of work and socio-technical systems design and investigates how the relationship between socio-technical systems design and quality of work is conceived. Hereafter, in chapter three, the methodology of this research is presented. This chapter describes how the conceptual lens is applied in a systematic literature review. In this chapter, the research design, data collection approach, data analysis technique and additional methodology such as research ethics are elaborated. The fourth chapter presents the results of this research. Here the results of applying the conceptual lens to the existing body of knowledge are analysed and discussed. In chapter five, the conclusion is presented. After that, in chapter six, the research will be critically reviewed, and suggestions for further research are elaborated.

2. Theoretical background

In this chapter, the theoretical background of this study is presented in order to construct a conceptual lens to allow for the analysis presented in the first chapter. In the first part, quality of work is further explained. The second part discusses socio-technical systems design. After that, the third part describes a conceptual literature analysis instrument for finding the connection between socio-technical systems design and quality of work.

The starting point is workplace innovation, as which social innovation is seen in organisations (Oeij et al., 2011). It is an instance of social innovation and is meant as social innovation of the working environment inside organisations (Oeij et al., 2011). Workplace innovation is linked to improvement on the individual level, quality of working life for example, and an improvement at the organisational level (Oeij et al., 2011; Oeij et al., 2016). In its definition of workplace innovation, The European Commission (2013) emphasizes improving aspects of work organisation and the involvement of workers in introducing modern management techniques. There should be a participatory role for employees, which is mentioned in literature about workplace innovation (Oeij et al., 2017; The European Commission, 2013). Oeij et al. (2017) state that employees should pay attention to the process and not only to the content. This participative role contains, as an example and as a precondition, engagement involvement when designing and implementing interventions (Oeij et al., 2017). This is in line with the process of workplace innovation, which is a social process (Totterdill & Exton, 2014). To successfully innovate in the workplace, a self-sustaining process of reflection, learning and change is needed. Totterdill and Exton (2014) emphasize the required abilities to experiment. Different stakeholders, such as employees, managers, and customers, have a voice in creating new collaboration models and creating new social relationships (Totterdill et al., 2012).

The definition of workplace innovation of Oeij et al. (2017) is more comprehensive and specific:

An integral set of participative mechanisms for interventions relating structural (e.g., organisational design) and cultural aspects (e.g., leadership, coordination and organisational behaviour) of the organisation and its people with the objective to simultaneously improve the conditions for the performance (i.e., productivity,

innovation, quality) and quality of working life (i.e., wellbeing at work, competence development, employee engagement). (p. 66)

This definition contains three parts: an integral set of participative mechanisms for interventions relating structural and cultural aspects of the organisation and its people, an objective to improve the conditions of the performance and an objective to improve the conditions for the quality of working life. The two objectives could be seen as an ‘end’ and an integral set of participative mechanisms for interventions as a ‘means’. This thesis focuses on two of those parts: an integral set of participative mechanisms for interventions relating structural and cultural aspects of the organisation and its people, and an objective to improve the conditions for the quality of working life. Focusing on these two parts results from the importance and relevance of focusing on the quality of work, as was mentioned in the introduction.

Paragraph 2.1 deals with the objective to improve the conditions for the quality of working life. After that, paragraph 2.2 deals with an integral set of participative mechanisms for interventions relating structural and cultural aspects of the organisation and its people (structural aspects of the organisation are addressed by socio-technical systems design). Paragraph 2.3 deals with the connection between these two parts.

2.1 What is quality of work?

Two subsections look at the quality of work in more detail. First, 2.1.1 further elaborates on the quality of work in general. Then, in paragraph 2.1.2, the characteristics of quality of work are presented.

2.1.1 Quality of work in general

In this paragraph, the term quality of work, in general, is described and further elaborated. In the definition of workplace innovation, the objective to improve the conditions for the quality of working life is mentioned. Different terms in the literature that are related to work and quality are used. Such as ‘quality of work life’, ‘quality of working life’ and ‘quality of work’. These terms are sometimes used interchangeably. These terms are further elaborated.

First, quality of work life and quality of working life. An example of quality of work life is literature from Nadler and Lawler (1983), wherein different perspectives on quality of

work life are presented. They come to the following working definition of quality of work life: ‘quality of work life is a way of thinking about people, work and organizations’ (Nadler & Lawler, 1983, p. 26). As an addition to this definition, two elements are mentioned: ‘Its distinctive elements are (1) a concern about the impact of work on people as well as on organizational effectiveness, and (2) the idea of participation in organizational problem solving and decision making.’ (Nadler & Lawler, 1983, p. 26). This definition has some overlap with workplace innovation, as it is also focusing on both organisational performance and quality. Nadler and Lawler (1983) abbreviate quality of work life to QWL. In contrast to Nadler and Lawler (1983), Levine et al. (1984) are using QWL as an abbreviation of quality of working life. Levine et al. (1984) state that in 1973 the first annotated bibliography about the term quality of working life was already developed to define the term. Levine et al. (1984) present seven significant predictors of QWL. These are; the degree to which a supervisor treats an employee with respect and have confidence in their abilities, the variety in a daily work routine, the challenge in work, work at present leads to good future work opportunities, self-esteem, the extent to which life outside work affects life at work and the extent to which the work someone does contribute to society (Levine et al., 1984). Oeij et al. (2017) mention examples of quality of working life, such as wellbeing at work, competence development and employee engagement. In literature, it is mentioned that quality of working life differs from job satisfaction, as quality of working life is about the wellbeing of employees (Sirgy et al., 2001). Job satisfaction is one of the many outcomes of quality of working life (Sirgy et al., 2001).

Besides that, the term quality of work is mentioned in the literature (Evers et al., 2013). Evers et al. (2013) state the many different definitions of quality of work. For example, a distinction between the quality of work as a factor of the work situation and the worker is mentioned (Van Klaveren, 1994, in Evers et al., 2013). Evers et al. (2013) prefer another distinction, which is: ‘between a definition of the quality of work on the basis of the objective characteristics of the working situation and a view that takes the quality of work to be an effect of the relationship between work and worker’ (p. 107). A relationship between task and performer is also possible instead of work and worker (Evers et al., 2013). Judgements and perceptions of workers are often used as a point of departure in quality of work approaches (Evers et al., 2013).

Oeij and Wiezer (2002) are more specific in addressing quality of work, and they present some questions that are related to the quality of work:

How can workers be satisfied? How can the interests of workers be met? How can sick leave be restricted? Which terms of employment have an attracting and a binding effect on (potential) workers? How can an improvement of job contents be arrived at? How can employees combine working life with non-working life? (p. 12)

In conclusion, there is a focus on organisational performance and quality of working life in workplace innovation. In literature, different (interchangeably) terms that relate to work and quality are used, such as quality of work life, quality of working life and quality of work. In this research, there is chosen to use the term quality of work. The distinction of quality of work of Evers et al. (2013) is seen as most appropriate for this thesis, which is: ‘between a definition of the quality of work on the basis of the objective characteristics of the working situation and a view that takes the quality of work to be an effect of the relationship between work and worker’ (p. 107). In this distinction, there is ‘the objective characteristics of the working situation’ which can be seen as how the work is organised (such as having a structure that fits socio-technical systems design) and ‘the relationship between work and worker’ as how the employees experience the organised work. In section 2.1.2, there is further elaborated on the characteristics of quality of work.

2.1.2 Characteristics of quality of work

In this research, quality of work is seen as having work and working conditions organised in a particular way (namely, adhering to socio-technical systems design principles). To promote the quality of work and employment, *The European Foundation* proposed an analytical framework based on specific quality criteria: health and wellbeing, career and employment security, skills development and reconciliation of working and non-working life (European Foundation for the Improvement of Living and Working Conditions, 2002).

The *European Foundation* is also referred to in other literature (Oeij & Wiezer, 2002; Pena-Casas, 2009). Pena-Casas (2009) refers to this as the quality of work and employment (QWE), while Oeij and Wiezer (2002) use it as evaluation criteria of the objectives of quality of work. Oeij and Wiezer (2002, p. 15/16) address this: ‘quality of work is regarded as a characteristic of individuals, more specific, as an evaluation from employees of their working conditions in the pursuit of the following four objectives’. They mention four objectives based on the *European Foundation*: job security, health and wellbeing, competence development

and a good relation between work and non-working life. The four objectives are further and in more detail elaborated.

First of all, job security. Job security is seen as an effect of status, income, social protection and workers' rights (Oeij & Wiezer, 2002). Dhondt and Vaas (2008) emphasize the importance of job security; people should work at regular and acceptable working hours. Job security is an issue in recession, but for workers with a relatively weak position in the labour market it is always an issue (Oeij & Wiezer, 2002).

Secondly, health and wellbeing. This is seen as effects of occupational accidents and diseases and the exposure to risks (Oeij & Wiezer, 2002). Some researchers mention wellbeing as a term that concerns work engagement, happiness at work and job satisfaction (Oeij et al., 2017). Compared to job satisfaction, work engagement is a more comprehensive term to describe health and wellbeing (Bakker & Oerlemans, 2011). Work engagement could be seen as the core dimension of quality of working life (Oeij et al., 2017). Work engagement is feeling a sense of fulfilment, vigour, dedication and absorption with work. It has positive outcomes for workers and companies. Besides that, the effect of work method autonomy is statistically significant for work engagement (De Spiegelaere et al., 2016). Work method autonomy is seen as 'the degree of individual decision latitude concerning the procedures, methods, and ways in which the employee performs his work' (De Spiegelaere et al., 2016, p. 516).

Thirdly, competence development. This is seen as an effect of opportunities for training skills and career development (Oeij & Wiezer, 2002). In competence development, it is about what technological skills the workers have and getting more social and communicative skills. A shift is noticed from low-skill to high-skill work, and upskilling workers (also in manufacturing) is now more critical (Oeij & Wiezer, 2002).

As fourth, a good relation between work and non-working life. A good relation is seen as combining work and non-working life, as effects on time, equal opportunities, discrimination and social infrastructures (Oeij & Wiezer, 2002).

In conclusion, there are four objectives of quality of work: job security, health and wellbeing, competence development and a good relation between work and non-working life. These four objectives were elaborated on in more detail. Examples of quality of working life that was mentioned by Oeij et al. (2017) in the definition of workplace innovation were also part as characteristic or as the objective itself in the objectives of quality of work that was presented

above: the objectives contain wellbeing at work and employee engagement (in the objective of health and wellbeing) and competence development (as competence development is an objective itself).

2.2 What is socio-technical systems design?

An integral set of participative mechanisms is needed for interventions relating structural and cultural aspects of the organisation and its people (Oeij et al., 2017). An integral approach intends to combine structural change with cultural change (Oeij et al., 2017). Structural change contains the design of jobs and organisations, whereas cultural change contains leadership behaviour and honest and transparent communication. The organisation as a whole should be considered: the strategy, structure and culture of the organisation (Oeij et al., 2016). An example of such an integral set of participative mechanisms needed for interventions is related to socio-technical systems design as is further elaborated on in this paragraph.

As was mentioned in the introduction, the socio-technical systems design was developed after World War II (Mumford, 2006). Since then, the literature has become more extensive. Van Eijnatten (1991) describes the different phases in his *An Anthology of the Socio-Technical Systems Design (STSD) Paradigm: From Autonomous Work Groups to Democratic Dialogue and Integral Organisational Renewal*. These steps are presented in Figure 2 below.

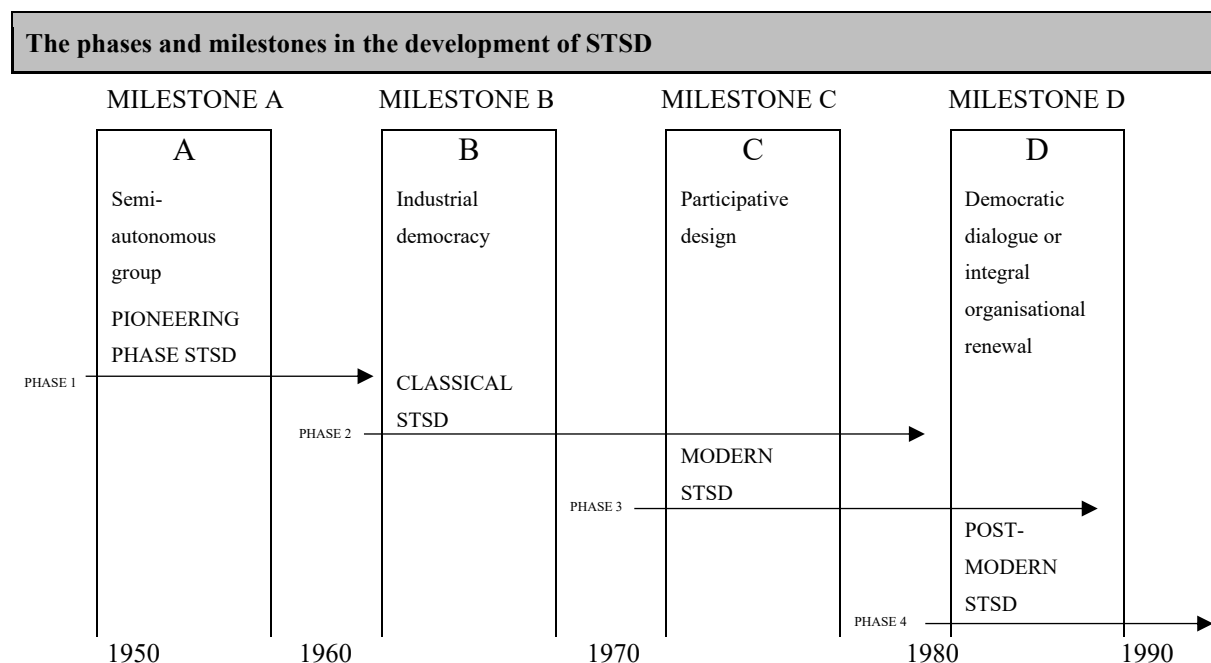


Figure 2: The phases and milestones in the development of STSD. Retrieved from/based on: Van Eijnatten (1991, p. 10).

The development of socio-technical systems design started by coincidence as a flexible form of work organisation in a British coal mine and was developed into an integral alternative to Taylorism (Van Eijnatten, 1991). The theory about socio-technical systems (design) provided a conceptual basis to recognise that dehumanising work needs to be avoided and work systems need to be built that are aligned with individual and social factors (Winter et al., 2014).

In general, there are some characteristics or key concepts that are specific to a socio-technical systems design. The two key concepts, neither related to a particular phase in socio-technical systems design but relevant in every phase, are the open system and self-regulation (Van Eijnatten, 1991). First of all, the open system characteristic. The open system means that it is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (Mumford, 2006). Mumford (2006) emphasizes that this could be, for example, other departments in a firm, but also the environment external to the firm. In the changing environment, high-performance levels are retained through ongoing changes in operational arrangements (Pasmore et al., 2019). Secondly, self-regulation. Self-regulation is preferred over supervision (Van Eijnatten, 1991). Small organisation units are preferred, with internal coordination and semi-autonomous control (Van Eijnatten, 1991). Another example, which is in line with the small organisation units, is self-regulation workgroups. In these groups, desired conditions are task differentiation, boundary control and task control (Cummings, 1978). When these conditions are met, the group can regulate itself.

Due to the goal of the thesis, as is to contribute to socio-technical systems design how it is used nowadays, especially the latter phase of STSD is further elaborated. The latter phase of socio-technical systems design, named post-modern STSD, is taking place from the end of the 1980s until now. In this phase, integral organisational renewal and democratic dialogue are key points. Integral organisational renewal is seen as ‘a fundamental shift from the old functional production concept to the new flow-oriented production concept’ (De Sitter, as cited in Van Eijnatten, 1991, p. 36). In addition to that, democratic dialogue is desired in post-modern STSD (Van Eijnatten, 1991). In the approach of the democratic dialogue, it is assumed that all interested parties can and should participate, which means democratisation of the working situation. Constructed organisational and human resource management practices are done, and these changes are collaboratively taken (Kalliola et al., 2019).

Another relevant development in the post-modern STSD is that the quality of work was now seen as an essential foundation for a flexible production organisation and no longer a luxury (Van Eijnatten, 1991). Van Eijnatten (1991) describes De Sitter as the first who put both quality of working life, efficiency and effectiveness, and social binding and cooperation in a model. This model distinguishes a control structure, grouping and coupling of regulative functions, and a production structure, grouping and coupling operational functions (Van Eijnatten, 1991). Later on, an information structure was added as well. A proper structure should help realise rich meaningful survival (Achterbergh & Vriens, 2019). Quality of work is, besides the quality of the organisation, part of this organisational contribution. De Sitter published in 1981 the book ‘Op weg naar nieuwe fabrieken en kantoren’ (in English: Towards new factories and offices), with which he brings his integral design approach to the attention of a broad audience (Pot, 2019).

The fundamental shift from the old functional production concept to the new flow-oriented production concept, which was described above, is visible in the parameters of De Sitter. In a descriptive and normative way, the parameters are used. In complex and dynamic environments, a combination of low-value parameters enhances the quality of the organisation, quality of work, and quality of labour relations (Christis & Soepenbergh, in Mohr & Amelsvoort, 2016). In general, a low parameter value structure (LPVS) will stand a better chance of realising quality of work, as it is assumed that there is a flow-oriented concept when the parameters have a low value. Achterbergh and Vriens (2019) present the parameters originally presented by De Sitter in more detail, and a distinction is made between the different parameters. The first three parameters are related to the production structure, the second three to the control structure, and the last parameter is related to both the production and control structure. This is presented in Figure 3. In this way, it is argued that a structure could help realise rich meaningful survival, a concept that is used to refer to the positive societal contribution of an organisation (Achterbergh and Vriens, 2019)

Production structure
1. The degree of functional concentration 2. The degree of differentiation of operational activities 3. The degree of specialisation of operational activities

Control structure
4. The degree of differentiation of regulatory activities into parts 5. The degree of differentiation of regulatory activities into aspects 6. The degree of specialisation of regulatory activities
Both production and control structure
7. The relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation

Figure 3: Parameters related to the production structure, control structure or both the production and control structure. Retrieved from/based on: Achterbergh and Vriens (2019, p, 54/55).

To have a low parameter value structure (LPVS) there is not much concentration, differentiation, specialisation, and separation. This is described below.

First of all, the production structure. The degree of functional concentration is low if: ‘operational tasks are (potentially) not related to all order types’ (Achterbergh & Vriens, 2019, p. 55). When there is an LPVS, the operational units such as functional departments have tasks that are not clustered on the similarity of activities, knowledge or skill. This means that there are relatively independent production flows, which are parallel to each other. The degree of differentiation of operational activities is low if: ‘operational tasks include production, preparation, and support activities’ (Achterbergh & Vriens, 2019, p. 58). Workers perform a task that includes, for example, some production activities, can make decisions for themselves and take care of daily maintenance of the equipment they use. The degree of specialisation of operational activities is low if: ‘operational tasks cover the complete operational process’ (Achterbergh & Vriens, 2019, p. 59). If there are many of sub-activities and these are allocated to separate tasks in the operational process, the degree of specialisation increases. It is not desirable that a worker only performs a sub-activity, which is however the case in functional- and line organisations.

Secondly, the control structure. There are three forms of regulation: ‘strategic regulation (setting and resetting goals), regulation by design (designing and redesigning the infrastructure), and operational regulation (dealing with day-to-day disturbances in operational processes given the existing goals and infrastructure)’ (Achterbergh & Vriens, 2019, p. 60). Regulatory activities, in general, consists of three sub-activities: monitoring, assessing and acting (Achterbergh & Vriens, 2019). The degree of differentiation of regulatory activities into parts is low if: ‘the sub-activities (monitoring, assessing and acting) are integrated into one task’ (Achterbergh & Vriens, 2019, p. 59). The degree of

differentiation of regulatory activities into aspects is low if: ‘the tasks contain all three forms of regulation (strategic regulation, regulation by design and operational regulation)’ (Achterbergh & Vriens, 2019, p. 60). The degree of specialisation of regulatory activities is low if: ‘regulatory tasks have a broader scope in terms of a larger part of the operational process or a larger number of regulators under supervision’ (Achterbergh & Vriens, 2019, p. 60).

Thirdly, the relation between operational and regulatory activities, and hence the relation between the production and control structure. The parameter that deals with the relationship between both production and control structure refer to whether operational and regulatory activities are assigned to different tasks (Achterbergh & Vriens, 2019). The degree of separation is low if: ‘there are tasks in which operational and regulatory activities are integrated as much as possible’.

In conclusion, in articles about socio-technical systems that are about socio-technical systems as a design, theory, or approach, there must be elaborated on the principles/characteristics of socio-technical systems design. Two characteristics that are related to all socio-technical systems design are the open system and self-regulation. Besides that, especially in post-modern STSD, there is a situation with low parameter value structures (and a flow-oriented production structure). When there is an LPVS, it is assumed that the chance is more significant to have a higher quality of work.

2.3 How does a conceptual literature analysis instrument look like to be able to find the connection between socio-technical systems design and quality of work?

To assess whether and how existing literature examines the relationship between adherence to socio-technical systems design principles and quality of work, a conceptual literature analysis instrument is needed. This conceptual literature analysis instrument is based on the literature presented in paragraphs 2.1 and 2.2.

Above, the term quality of work was elaborated. First, quality of work was explained in a broader sense and in general, which contains a greater view on workplace innovation. In workplace innovation, both organisational performance and quality of working life were seen as relevant. In this thesis was chosen to focus on two parts of workplace innovation: an integral set of participative mechanisms for interventions relating structural and cultural

aspects of the organisation and its people and an objective to improve the conditions for the quality of working life.

Different (interchangeably) terms that have a relation with work and quality were mentioned; quality of work life, quality of working life and quality of work. After that, quality of work, in general, was elaborated on, and the aspects of quality of work were presented. The described aspects of quality of work were: job security, health and wellbeing, competence development and a good relation between work and non-working life.

Oeij and Wiezer (2002) present an overview of different organisational concepts. Humanised flexibility, such as socio-technical systems design structures are, is most promising for active jobs and high job satisfaction. This is assumed because of attention on decentralisation and the human factor. On the basis of these organisational concepts, it is expected that some aspects of quality of work are more likely to be visible in theory about socio-technical systems design. Oeij and Wiezer (2002) mention the attention for health and wellbeing and competence development as ‘high’ in socio-technical systems design. Moreover, it is expected that job security is ‘moderate’ and ‘the relationship between working and non-working life’ is ‘neutral’.

The relevant aspects of quality of work are used as the main concepts to investigate in the reviewed articles. The focus is on health and wellbeing and competence development. Besides that, it is assumed that competence development is affected by design principles as well. The relationship between working and non-working life is not considered in this thesis, as this is seen as a more employment term, and previous research assumed the relation as ‘neutral’.

The articles that are reviewed are about socio-technical systems design and are related to work organisation. Work organisation is about the general principles of socio-technical systems design, such as the open system, self-regulation and an LPVS (which shows a flow-oriented production structure).

Table 1 presents the characteristics of socio-technical systems design and quality of work presented as a conceptual literature analysis instrument. The articles will be reviewed whether there is elaborated on the characteristics of socio-technical systems (design/theory/approach) and quality of work (working life/work life). In the rest of the thesis, the two aspects are mentioned as socio-technical systems design (or STSD) and quality of work (or QOW). The

characteristics of socio-technical systems design are the open system, self-regulation and an LPVS. The characteristics of quality of work are health and wellbeing, competence development and job security.

Conceptual literature analysis instrument		
Socio-technical systems / Socio-technical systems design / Socio-technical systems theory / Socio-technical systems approach	Open system	It is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (internal to the firm)
		It is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (external to the firm)
	Self-regulation	Small organisation units are preferred, with internal coordination and semi-autonomous control
	Low parameter value structure (LPVS)	The degree of functional concentration: operational tasks are (potentially) not related to all order types
		The degree of differentiation of operational activities: operational tasks include production, preparation, and support activities
		The degree of specialisation of operational activities: operational tasks cover the complete operational process
		The degree of differentiation of regulatory activities into parts: the sub-activities (monitoring, assessing and acting) are integrated into one task
		The degree of differentiation of regulatory activities into aspects: the tasks contain all three forms of regulation (strategic regulation, regulation by design and operational regulation)
		The degree of specialisation of regulatory activities: regulatory tasks have a broader scope in terms of a larger part of the operational process or a larger number of regulators under supervision
		The relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation: there are tasks in which operational and regulatory activities are integrated as much as possible
Quality of work / Quality of working life / Quality of work life	Health and wellbeing	Workers feel a sense of fulfilment, vigour, dedication and absorption
		There is work method autonomy
	Competence development	There are opportunities for training skills
		There are opportunities for career development
	Job security	Work is at regular basis
		Work is at acceptable working hours

Table 1: Conceptual literature analysis instrument with characteristics of socio-technical systems design and quality of work that are used as main concepts.

When in socio-technical systems design literature, the characteristics of the design and the characteristics for quality of work are met, quality of work is likely achieved on the organisational level. Chapter two resulted in a basis for the methodology, which is elaborated in chapter three.

3. Methodology

This chapter presents the methodology of this research. It describes how the conceptual lens is applied in a systematic literature review. In paragraph 3.1, the research design is elaborated. After that, in paragraph 3.2, the data collection approach is presented; it describes how the articles are selected. In paragraph 3.3, the data analysis technique is presented; it describes how the articles are analysed. Finally, paragraph 3.4 discusses additional methodology, such as research quality and ethics.

3.1 Research design

This research is a systematic literature review, taking the conceptual lens from chapter two as starting point. Table 2 presents how the conceptual lens is used as a starting point. To select the articles for the systematic review, there is focused on socio-technical systems, socio-technical systems design, socio-technical systems theory, socio-technical systems approach, quality of work, quality of working life, quality of work life, health and wellbeing, competence development and job security. This is presented below in grey on the left of the table. To analyse the articles, there is focused on an open system, self-regulation, LPVS, quality of work, quality of working life, quality of work life, health and wellbeing, competence development and job security. This is presented below in grey on the right of the table.

Conceptual lens used for data selection (left) and analysing (right)			
Socio-technical systems / Socio-technical systems design / Socio-technical systems theory / Socio-technical systems approach	Open system	Socio-technical systems / Socio-technical systems design / Socio-technical systems theory / Socio-technical systems approach	Open system
	Self-regulation		Self-regulation
	Low parameter value structure (LPVS)		Low parameter value structure (LPVS)
Quality of work / Quality of working life / Quality of work life	Health and wellbeing	Quality of work / Quality of working life / Quality of work life	Health and wellbeing
	Competence development		Competence development
	Job security		Job security

Table 2: Conceptual lens used for data selection and analysis

This distinction in selecting and analysing is a choice made by the author of this thesis. The articles are selected in a general way with a focus on the quality of work and their dimensions, and a relationship with socio-technical aspects. In analysis, the articles are already about socio-technical aspects. Thus, the term socio-technical is less relevant; the focus should be on the dimensions and the content of socio-technical aspects.

As was mentioned in the introduction, a systematic review is chosen to get a more comprehensive and trustworthy impression of the field than is possible when taking only individual pieces of research into account (Gough et al., 2012). Besides that, in the methodology part, the *Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)* checklist is followed. This is done to be as transparent as possible about why the review is done, what steps are taken and what is found (Page et al., 2021).

3.2 Data collection approach

This part describes how the articles are selected, and elaborates on the eligibility criteria, information sources, search strategy, selection process, data collection process, data items and study risk of bias assessment.

Eligibility criteria

This section takes a detailed look at the inclusion and exclusion criteria and how the studies are grouped for syntheses. As in all research, decisions have to be made about which information or ideas are considered when addressing the research question (Gough et al., 2012). The University of Melbourne (2021) mentioned eight common inclusion and exclusion criteria. The criteria are first explained and elaborated; whereafter, it is visualised in Table 3.

Date: The concepts of post-modern STSD were found in the 1980s. In 1981 De Sitter published the book ‘Op weg naar nieuwe fabrieken en kantoren’ (in English: Towards new factories and offices), with which he brings his integral design approach to the attention of a broad audience (Pot, 2019). This research tries to increase the value of the theory for contemporary usages, therefore articles from 1981 are included and articles before 1981 are excluded.

Exposure of interest: Literature about the content of STSD theory is included, whereas literature only mentioning the concept of STSD is excluded.

Geographic location of study: At first hand, there is no decision made in the geographic location of study to include or exclude literature.

Language: English articles are included due to practical reasons of legibility. All other languages are excluded.

Participants: There is no distinction made in participants, as this research concerns articles and not participants.

Peer review: It is preferred to use only peer-reviewed articles. This criterion is met when it is possible to select peer-reviewed articles in the search systems.

Reported outcomes: In the article, it should be described how the results were achieved.

Setting: There is no distinction made in the setting.

Study design: To make the review more applicable to the research question, there is a distinction made in study design. Empirical studies are included, and others (such as conceptual studies) are excluded.

Type of publication: Original articles are included. Reviews, editorials and letters are excluded.

Inclusion criteria	Exclusion criteria
- Published between 1981 and 2021. - Literature about the content of STSD - English literature. - Preferably peer-reviewed articles. - Articles describing how results are achieved. - Empirical studies. - Original articles.	- Published before 1981. - Literature wherein the concept of STSD is only mentioned. - Other languages than English. - Articles that are not describing how results are achieved. - Other study designs than empirical studies. - Reviews, editorials and letters.

Table 3: Inclusion and exclusion criteria elaborated.

Information sources

The databases *Business Source Complete* from *EBSCOhost* and *Web of Science* from *Clarivate Analytics* are used for the literature search. Access, the license to use the database, was given by *Radboud University*. The date when the databases were researched is 14 June 2021.

Search strategy

Searching via *Business Source Complete* and *Web of Science* in different combinations on: ‘Socio-technical systems’ or ‘sociotechnical systems’, ‘socio-technical systems design’ or ‘sociotechnical systems design’, ‘socio-technical systems theory’ or ‘sociotechnical systems

theory’, ‘socio-technical systems approach’ or ‘sociotechnical systems approach’, ‘quality of work’, ‘quality of working life’, ‘quality of work life’, ‘job security’, ‘health’, ‘wellbeing’ and ‘competence development’.

In the section ‘Data items’, the results of different search tests are presented. After searching, different filters are set. These filters are date between 1981 and 2021, only English, only peer-reviewed (when it is possible to select on this criterion) and empirical articles. These filters are based on the eligibility criteria.

Selection process

There is one researcher that screened each record and retrieved each report. The researcher worked independently. An assigned supervisor by *Radboud University* was available to provide feedback. There were no automation tools used in the process, but *Microsoft Excel* was used to overview the exported information about the articles, such as title and author(s).

Data collection process

The method used to collect data from reports is manual. One researcher collected data from each report and worked independently. An assigned supervisor by *Radboud University* was available to provide feedback. There were no automation tools used in the process, but to report the data *Microsoft Excel* was used: the articles that were included on the basis of the eligibility criteria were exported to *Microsoft Excel*.

Data items

Table 4 presents the complete overview of the outcome for which data was sought on 14 June 2021.

Test	String	Business Source Complete (hits)	Web of Science (hits)
1	(socio-technical systems OR sociotechnical systems) AND quality of work	26	238
2	(socio-technical systems design OR sociotechnical systems design) AND quality of work	7	132

3	(socio-technical systems theory OR sociotechnical systems theory) AND quality of work	5	50
4	(socio-technical systems approach OR sociotechnical systems approach) AND quality of work	3	103
5	(socio-technical systems OR sociotechnical systems) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)	157	1074
6	(socio-technical systems design OR sociotechnical systems design) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)	24	533
7	(socio-technical systems theory OR sociotechnical systems theory) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)	14	202
8	(socio-technical systems approach OR sociotechnical systems approach) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)	15	451

Table 4: Data items complete overview

Test 1: searching via *Business Source Complete* on ‘(socio-technical systems OR sociotechnical systems) AND quality of work’. There were no optional fields selected, and the total was 26 hits. Next, searching via *Web of Science* on ‘(socio-technical systems OR sociotechnical systems) AND quality of work’. Again, no fields were selected, and the automatic field of ‘topic’ resulted in 238 hits.

Test 2: searching via *Business Source Complete* on ‘(socio-technical systems design OR sociotechnical systems design) AND quality of work’. There were no optional fields selected, and the total was seven hits. Next, searching via *Web of Science* on ‘(socio-technical systems design OR sociotechnical systems design) AND quality of work’. Again, no fields were selected, and the automatic field of ‘topic’ resulted in 132 hits.

Test 3: searching via *Business Source Complete* on ‘(socio-technical systems theory OR sociotechnical systems theory) AND quality of work’. There were no optional fields selected, and the total was five hits. Next, searching via *Web of Science* on ‘(socio-technical systems

theory OR sociotechnical systems theory) AND quality of work'. Again, no fields were selected, and the automatic field of 'topic' resulted in 50 hits.

Test 4: searching via *Business Source Complete* on '(socio-technical systems approach OR sociotechnical systems approach) AND quality of work'. There were no optional fields selected, and the total was three hits. Next, searching via *Web of Science* on '(socio-technical systems approach OR sociotechnical systems approach) AND quality of work'. Again, no fields were selected, and the automatic field of 'topic' resulted in 103 hits.

Test 5: searching via *Business Source Complete* on '(socio-technical systems OR sociotechnical systems) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)'. There were no optional fields selected, and the total was 157 hits. Next, searching via *Web of Science* on '(socio-technical systems OR sociotechnical systems) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)'. Again, no fields were selected, and the automatic field of 'topic' resulted in 1074 hits.

Test 6: searching via *Business Source Complete* on '(socio-technical systems design OR sociotechnical systems design) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)'. There were no optional fields selected, and the total was 24 hits. Next, searching via *Web of Science* on '(socio-technical systems design OR sociotechnical systems design) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)'. Again, no fields were selected, and the automatic field of 'topic' resulted in 533 hits.

Test 7: searching via *Business Source Complete* on '(socio-technical systems theory OR sociotechnical systems theory) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)'. There were no optional fields selected, and the total was 14 hits. Next, searching via *Web of Science* on '(socio-technical systems theory OR sociotechnical systems theory) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing

OR competence development)’. Again, no fields were selected, and the automatic field of ‘topic’ resulted in 202 hits.

Test 8: searching via *Business Source Complete* on ‘(socio-technical systems approach OR sociotechnical systems approach) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)’. There were no optional fields selected, and the total was 15 hits. Next, searching via *Web of Science* on ‘(socio-technical systems approach OR sociotechnical systems approach) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)’. Again, no fields were selected, and the automatic field of ‘topic’ resulted in 451 hits.

The term socio-technical system(s) is used in different ways. On the one hand, it is used as a keyword for articles about organisations seen as complex socio-technical systems (Malatji et al., 2019). In these complex systems, organisations focus on software, hardware, people, physical objects and geographic areas. On the other hand, it is used as an organisation design approach to achieve both human and organisational objectives (Van Eijnatten, 1991). The literature described both approaches; therefore, the search terms of test 5 is chosen. These terms are more general and lead to more results, after which it is still possible to reduce the number of articles. In this way, there is less chance that important articles are missed. However, the filters still need to be applied, so the assumption is that there are enough hits that lead to specific articles that meet the selection criteria. The results of test 5 are presented in Table 5.

Test	String	Business Source Complete (hits)	Web of Science (hits)
5	(socio-technical systems OR sociotechnical systems) AND (quality of work OR quality of working life OR quality of work life OR job security OR health OR wellbeing OR competence development)	157	1074

Table 5: Search term test 5.

When looking at *Business Source Complete* with the search terms of test 5, there were 157 initial hits. After filtering on the date (1981-2021), there were 146 hits left. Other hits than

English were excluded which resulted in 141 hits left. After that, other than peer-reviewed scholarly journals were excluded, which resulted in 131 articles.

When looking at *Web of Science* with the search terms of test 5, there were 1074 initial hits. After filtering on the date (1981-2021), there were still 1074 hits left. Other hits than English were excluded which resulted in 1054 hits left. The filter of peer-reviewed articles is not possible in *Web of Science*. Applying the filter article as document type resulted in 742 hits. From these 742, there were many articles in different fields (such as 187 in medical informatics and 161 in health care sciences services). In this thesis, the focus is on organisations (and their structure). Chosen is to filter on 'management'. Besides the practical reason of reducing the number of articles, it was assumed that this contributes to remove the articles that do not meet the eligibility criteria 'literature about the content of STSD'. This resulted in having 68 articles left.

In total, 199 ($131 + 68 = 199$) articles were selected in the identification phase and need to be specified further in-depth in the screening phase.

In the screening phase, the aim was to exclude articles based on the content that is not relevant to keep included in the research. As there were no automation tools used, the duplicates were left out in the screening phase.

First, the articles of *Web of Science* were screened. There were steps followed. The first step was whether it is possible to see/download the article. When it was possible to see/download the article, the abstract was read, and it was tried to answer the following questions. When it was not possible to make a choice based on the abstract, the methods and rest of the article were scanned. The other steps were: is the article about socio-technical systems, is the article about socio-technical systems as is meant in this thesis (as design) and whether the article is empirical.

Secondly, the articles of *Business Source Complete* were screened. The same steps as in *Web of Science* were followed, but before following the steps, the question was answered whether the article was a duplicate. The questions and labels to screen the articles are presented in Appendix A.

Study risk of bias assessment

This research is a master thesis written and conducted by one researcher. Therefore, there is a risk of bias in decisions about which studies to include; there is a study risk of bias. To make the risk as low as possible, when a step is taken, it was written down. The articles were

screened in a systematic way; by following a step-to-step plan of questions. This is done to minimise the risk of bias and be transparent in decisions made.

A screenshot of all the labelled articles from *Web of Science* is presented in Appendix B and from *Business Source Complete* in Appendix C. In addition, the *Microsoft Excel* document with all the information is available on request by the author of the thesis. As a result of the identification and screening phase there are 14 articles included in the review for analysis, these are presented in Appendix D. The flow-diagram of identification of studies via databases is presented below in Figure 4.

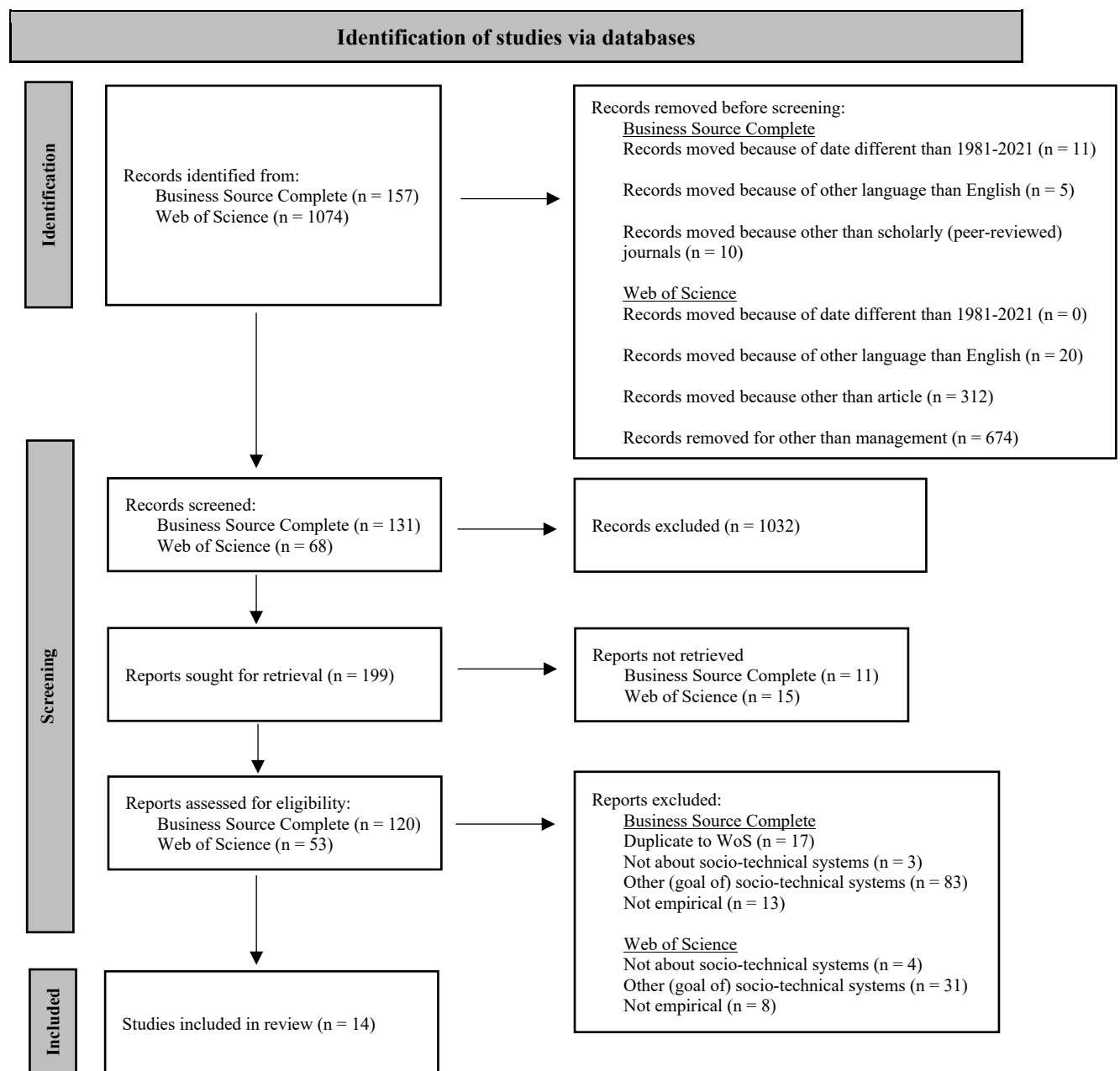


Figure 4: Identification of studies via databases. Retrieved from PRISMA (2020).

3.3 Data analysis technique

After selecting the articles, by means of the *Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)* checklist, they have been analysed.

The analysis is on the basis of the operationalisation, which fits the coding scheme.

Operationalisation means the perceptibility of a characteristic for a certain phenomenon (Verschuren & Doorewaard, 2015). In this research, the interest is in socio-technical systems design and quality of work. The concepts, dimensions and indicators help assess to what extent the design principles of socio-technical systems design connect with the quality of work. The coding scheme with concepts, dimensions and indicators is visually presented in Appendix E.

The concept of socio-technical systems design has been operationalised as a theory consisting of an open system, self-regulation, and an LPVS. The open system, self-regulation and parameters of an LPVS are dimensions of socio-technical systems design. The characteristics of these dimensions are used as indicators of socio-technical systems design. The characteristics are: it is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (internal to the firm), it is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (external to the firm), small organisation units are preferred, with internal coordination and semi-autonomous control, the degree of functional concentration, the degree of differentiation of operational activities, the degree of specialisation of operational activities, the degree of differentiation of regulatory activities into parts, the degree of differentiation of regulatory activities into aspects, the degree of specialisation of regulatory activities and the relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation.

The concept of quality of work is operationalised as a term that consists of health and wellbeing, competence development and job security. The characteristics of these dimensions are used as indicators of quality of work. The characteristics are: workers feel a sense of fulfilment, vigour, dedication and absorption, there is work method autonomy, there are opportunities for training skills, there are opportunities for career development, work is at regular basis, and work is at acceptable working hours.

Besides the dimensions that are mentioned above, two dimensions are named ‘other’. First, the dimension ‘STSD, other but relevant’ with the indicators ‘Different when compared to STSD principles’ and ‘Other’ (which means: aspects of STSD are mentioned, but they are

different from other indicators). Secondly, 'QOW, other but relevant'. The indicator 'Other' (which means: quotations are related to the dimension health and wellbeing, competence development or job security, but there is no empirical evidence or the aspects are different from other indicators).

First, the included articles were read. Then, the data of the article was written down in a *Microsoft Excel* sheet. The sheet includes information such as the title, author(s) and year, journal, purpose, and findings of the article. Besides that, there was shown how the data was gathered (the empirical aspect of the methodology). A summary of the information is presented in Appendix F. The information, in the summary, comes from the articles. Some of the articles present an overview, including purpose and findings, when this overview was present this is copied into this summary. When there was not such an overview in the article, the information in the table is filled in by the author of this thesis.

After reading and/or scanning all the articles for the first time, the articles were analysed. This was done on the basis of the operationalisation information. All the documents were exported to *Atlas.ti*. The eight dimensions were the basis for the 'code groups', and the nineteen indicators were used as the basis for the 'codes'. First, there was researched how many times the word quality of work and synonyms directly were addressed. This means the number of times the term of quality of work and synonyms appeared directly in the articles. The procedure to check this was pressing 'CTRL+F' on the keyboard and type the term.

After that, every document was read (again), and codes were assigned to the relevant quotations. The focus was on the two dimensions, socio-technical systems design and quality of work, and the thought when reading was whether there are aspects of socio-technical systems design (dimensions: open system, self-regulation, an LPVS or other relevant STSD aspects) and quality of work (dimensions: health and wellbeing, competence development, job security and other relevant QOW aspects). The entire text, except for any abstract present, is analysed. In addressing the content of the articles, the focus is on addressing and analysing empirical data. The document with all the information about all articles, and the *Atlas.ti* file with all assigned labels to quotations is available on request by the author of the thesis.

To present the findings of the analysis, first, it is mentioned which terms or synonyms of quality of work are directly mentioned (as described above). After that, there is described how many times the labels of the dimensions or indicators of QOW and STSD are assigned to

quotations. This is assisted with examples of quotations and comments. In the conclusion of the analysis, it is mentioned which aspect(s) of QOW is most noticed and whether all of the indicators of STSD were assigned to quotations. It is assumed that the label of STSD that is assigned mostly (or frequent) to quotations could be related to (aspects of) QOW; the quotations should confirm this. If there is a relationship, but it is not clear which aspects of STSD show to be related to aspects of QOW, it describes a general relationship.

Reporting bias and certainty assessment

Because there is only one researcher in this systematic literature review, it is challenging to make sure there is no reporting bias. Every step taken is written down, which makes the reporting bias as low as possible. In addition, there is no interest in a particular result of the analysis. The researcher is objective. Besides that, the certainty assessment is addressed. During and after the analysis, the differences in results and overlap between them are addressed. Chapter four (results) addresses whether and to what extent there is certainty and/or confidence in the body of evidence for an outcome.

3.4 Additional methodology

Research quality

The quality of the research is enhanced by following step-by-step approaches to make the reporting of choices more transparent and reliable. As an example, experts in the field are mentioned, and attention is paid to conflicting theories to meet critical readers' requirements (Limerick Institute of Technology, 2021). Another example of transparency is the *Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)*. This is followed to appraise the quality and relevance of the selected articles, which ensures that the articles are as appropriate, trustworthy, and relevant as possible to make better conclusions in the review (Gough et al., 2012). This is also beneficial for the internal validity of the research because it is better that the researcher imposes limitations on the size of the research than others later questioning the research results (Verschuren & Doorewaard, 2015).

Research ethics

In this systematic literature review, there are no direct interviews or answers or information from participants that must be handled carefully. The treatment of participants during the research is not very relevant for systematic literature review (as there are no participants). Nevertheless, the research is based on existing articles for which the authors should receive

credits. The term ‘transparency’ is essential. To give authors credit for their view or knowledge it is noted whether the text in this study is based on someone’s else view or knowledge. This is mainly done via referring to this knowledge via the 7th *Edition of the American Psychological Association (APA)*. Another term that is relevant is ‘objectivity’. The researcher in this thesis tries to be as objective as possible. There is no connection with the authors of the articles that are included and there is no certain interest in whether to find academic evidence in the articles or not. In this thesis it is tried to be as transparent and objective as possible.

4. Results

In this chapter, the results of the analysis are presented. It describes the results of the data collection. To present the findings of the analysis, the instructions mentioned in chapter three are followed. This means attention is paid to the terms or synonyms of quality of work that are directly mentioned in the articles. Besides that, there is elaborated on the assigned labels to quotations, based on the concepts, dimensions and indicators. First, the main results of every single reviewed article (case) are presented in paragraph 4.1 (with further details in Appendix G), followed by the results of the variables and their relationships in paragraph 4.2 (and in an elaborated form in Appendix H). Between the square brackets, the articles are mentioned.

4.1 Results per article

First, the results per article (case) are presented. For a complete overview of these results, see Appendix G. In Table 6 below an overview of the results per article is presented.

In the conclusion of the analysis, as was prescribed in chapter three, it is mentioned which aspect(s) of QOW is most noticed and whether all of the indicators of STSD were assigned to quotations. It was assumed that the label of STSD that is assigned mostly (or frequent) to quotations could be related to (aspects of) QOW; the quotations of the analysis should confirm this. If there is a relationship, but it is not clear which aspects of STSD show to be related to aspects of QOW, it describes a general relationship.

Article	Conclusion of the analysis
1	Aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and almost all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation is most noticeable in the article. Self-regulation (in the article, it is very explicit mentioned as high road teamworking) shows to be related to health and wellbeing (there is work method autonomy).
2	Aspects of QOW (mainly health and wellbeing) are mentioned in this article, and all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation in combination with parameter 7 is most noticeable in the article and shows to be related to health and wellbeing.
3	Aspects of QOW (mainly health and wellbeing and competence development) are mentioned in this article, and all the indicators of STSD are labelled. The dimension of self-regulation in combination with parameters 1, 2, 3 and 7 is most noticeable in the article and shows to be related to health and wellbeing and competence development.

4	Aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation in combination with parameters 4, 5, 6 and 7 is most noticeable in the article and shows to be related to health and wellbeing (there is work method autonomy).
5	Aspects of QOW are not mentioned in this article, and not all the indicators of the dimensions of STSD are (often) labelled. A conclusion of this article was that planning tasks are more visible in group structures, but a lot of links are missing, and in labelling the quotations these are not linked to aspects of QOW. This research shows no relationship between adhering to STSD principles and QOW.
6	Aspects of QOW (only health and wellbeing) are mentioned in this article, and almost all the indicators of the dimensions of STSD are labelled. Although self-regulation and aspects of an LPVS structure are mentioned, decision latitude was more important than job autonomy and it is not very clear which aspects of STSD result in which aspects of QOW. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.
7	Aspects of QOW (mainly health and wellbeing) are mentioned in this article, and all the indicators of the dimensions of STSD are labelled. The dimensions of open system and self-regulation are most noticeable in the article and shows to be related to health and wellbeing. However, the article is mainly about perceived team climate and the aspects of an LPVS are not often mentioned and linked to QOW. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.
8	Aspects of QOW (health and wellbeing; workers feel a sense of fulfilment, vigour, dedication and absorption, and competence development; there are opportunities for training skills) are mentioned in this article, and almost all the indicators of the dimensions of STSD are labelled. Especially, in this article and related to cellular manufacturing, the parameters 1, 2 and 3 are noticeable and shows to be related to health and wellbeing (workers feel a sense of fulfilment, vigour, dedication and absorption) and competence development (there are opportunities for training skills).
9	Aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and not all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation is most noticeable in the article. However, the authors of the article state that a direct test of STSD theory was not possible and the suggestion was that the theory need more attention. This is in line with the results of the labels that were assigned to quotations. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.
10	Aspects of QOW (health and wellbeing, competence development and especially job security) are mentioned in this article, and all the indicators of the dimensions of STSD were labelled. The parameters 1, 2 and 3 are most noticeable in the article and shows to be related to health and wellbeing, competence development and job security.
11	Not many and not often are aspects of QOW (only health and wellbeing) mentioned in this article, and the indicators of the dimensions of STSD are not often labelled. The few labelled quotations show no clear support for (aspects of) quality of work. This research shows no relationship between adhering to STSD principles and QOW.

12	Aspects of QOW (health and wellbeing and competence development) are mentioned in this article, and most of the indicators of the dimensions of STSD are labelled. It is mentioned in the article that especially autonomy, learning and commitment is high in STSD. The dimension of self-regulation is most noticeable in the article and shows to be related to health and wellbeing and competence development.
13	Aspects of QOW are mentioned in this article but they are not directly related to the dimensions. All the indicators of the dimensions of STSD are labelled. The dimension of open system is most noticeable in the article. It could be stated that there shows to be a relation between work design and quality of work. In the results section of the article not many labels of QOW and only labels that are considered as 'QOW, other but relevant' were assigned to quotations, but the authors of the article state that work design and organisational practices are significant and positive in this research. The difference in analysing the assigned labels and the conclusion of the article might rely on the other aspects of the article that are about lean manufacturing and the just-in-time principle. It is not very clear which aspects of STSD result in which aspects of QOW. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.
14	Aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and almost all the indicators of the dimensions of STSD are labelled. The parameters 1, 2 and 3 are most noticeable in the article and shows to be related to health and wellbeing (there is work method autonomy).

Table 6: Overview results per article.

Of the reviewed articles, in two articles [5/11] there is no clear connection between socio-technical systems design principles and (dimensions of) quality of work. In four articles [6,7,9,13] there are socio-technical systems design principles that have some effect on certain aspects of quality of work, and there is a certain relationship, but which aspects of socio-technical systems design and quality of work the relationship contains is not very clear. In eight articles [1-4,8,10,12,14] adhering to socio-technical systems design principles is positively related with quality of work, and which principles of socio-technical systems design and quality of work the relationship contains is clear.

In conclusion, it could be stated that 12 articles offer evidence for a positive relationship between adhering to socio-technical systems design principles and quality of work. Of these 12 articles that offer evidence, it is clear that eight articles offer evidence related to a specific principle of socio-technical systems design and a specific dimension/indicator of quality of work. The other four articles offer evidence for a general relationship. There is further elaborated on the results of the concepts, dimensions, and indicators in paragraph 4.2.

4.2 Results per variable

This section focuses on the connection between the variables ‘adherence to socio-technical systems design principles’ and ‘quality of work’. As was mentioned before, to analyse the articles, attention was paid to quality of work (and quality of working life, quality of work life), health and wellbeing, competence development, job security, open system, self-regulation and LPVS. In Appendix H an overview is presented with results per variable. Below there is further elaborated on this.

First, quality of work and/or synonyms were directly addressed in the articles. This means, as was explained in chapter three, the number of times the term appeared directly. The term quality of work is in total 6 times mentioned in the articles, the term quality of working life 37 times and quality of work life 3 times. The terms are not mentioned very often in the articles.

Besides that, via the concepts, dimensions and indicators quality of work was addressed. There were certain relationships possible. The open system (with two indicators), self-regulation (with one indicator), and an LPVS (with seven indicators) could be related to health and wellbeing (with two indicators), competence development (with two indicators) and job security (with two indicators). In this way, it was possible to have 60 relationships (10x6). Besides that, a general relationship between aspects of socio-technical systems design and quality of work is possible, which makes a possibility of 61 total relationships in this research. In total, there is attention paid to 30 from the 61 possible relationships.

First of all, health and wellbeing. In total, 34 times health and wellbeing show to be affected by aspects of STSD. These 34 times are all part of the 13 out of the 20 possible relationships. Self-regulation [2,3,12], parameters 1, 2 and 3 [3,10] and parameter 7 [2,3] were most frequently related to both dimensions of health and wellbeing. Besides that, there were other relationships as well, but then the STSD indicators were only related to one dimension of health and wellbeing. This was the case when in a relationship with self-regulation only was focused on work method autonomy [1,4]. In addition to that, parameters 1, 2 and 3 were related to health and wellbeing, but only to feeling a sense of fulfilment, vigour, dedication and absorption [8] or the three parameters of the production structure were only related to work method autonomy [14]. Another example is the relationship between parameters 4, 5, 6 and 7 that were only related to work method autonomy [4]. Secondly, competence development. In total, it shows to be that competence development was affected by aspects of STSD 21 times. These 21 times are all part of the 10 out of 20 possible

relationships. Self-regulation [3,12], parameters 1, 2 and 3 [3,10] and parameter 7 [3] were most frequently related to both dimensions of competence development. Besides that, there were other relationships, but then the STSD indicators were only related to one dimension of competence development. This was the case when in a relationship, parameters 1, 2 and 3 were only focused on opportunities for training skills [8]. Thirdly, job security. In total, it shows to be that job security was affected by aspects of STSD six times. These six times were all part of the six out of 20 possible relationships. Both dimensions of job security were affected by parameters 1, 2 and 3 [10]. Lastly, quality of work in general. In total, it shows to be that quality of work in general was affected by aspects of STSD four times [6,7,9,13]. This was the case when it was assumed there is a relationship, but it was not very clear which specific relationship. Examples of this; aspects of self-regulation and LPVS that were related to decision latitude [6], self-regulation and the open system shows a relationship with health and wellbeing, but there was mainly focused on team climate in the article [7], self-regulation and health and wellbeing that were described in general, but there was no direct evidence [9], or there were a lot of labelled quotations in the category ‘other’ [13].

As was mentioned above, the analysis of the collective articles confirms that health and wellbeing and competence development are affected by STSD principles. Self-regulation and parameters 1, 2, 3 and 7 were most frequently mentioned. This is not an unexpected result, as there were seven articles [1,2,3,4,7,9,12] that mention teamwork in the purpose of their research (see Appendix F). Besides that, parameters 1, 2 and 3 are related and form together the production structure, as was mentioned in chapter two. These parameters are, for example, mentioned in articles that are about a call centre [3], cellular manufacturing [8] and a footwear company [10] where the focus is on the work floor. This might be a declaration for the often-mentioned parameters of the production structure. The emphasis on parameter 7 is a typical combination of production and control structure and fits one of the general principles of STSD: the relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation: there are tasks in which operational and regulatory activities are integrated as much as possible.

In summary, academic evidence has been found in the literature that adhering to socio-technical systems design principles (in the sense of self-regulation and parameters 1, 2, 3 and 7) is positively related with health and wellbeing and competence development. More specific, health and wellbeing in the sense of; feeling a sense of fulfilment, vigour, dedication

and absorption and work method autonomy, and competence development in the sense of; opportunities for training skills and career development. The evidence found confirms the direction of the arrow as was proposed in the conceptual model.

5. Conclusion

The goal of this thesis was to answer the following main question:

‘How can the understanding of the value of socio-technical systems design as a theory for organisational design be enhanced by identifying which academic evidence is available regarding how adherence to socio-technical systems design principles affect quality of work?’

This systematic literature review was conducted to gain academic evidence regarding how adherence to socio-technical systems design principles affect quality of work. From a literature study, the expectations were that health and wellbeing, competence development and job security are positively affected by socio-technical systems design: as stated in other literature, the attention for health and wellbeing and competence development was proposed to be high, and it was expected that the relationship with job security would be less potent. The results section of this thesis provides evidence that is roughly consistent with what has been said. There is much attention for health and wellbeing and competence development. The most convincing evidence supports the attention for health and wellbeing (feeling a sense of fulfilment, vigour, dedication and absorption and work method autonomy) and competence development (opportunities for training skills and career development). Job security is visible, but not often.

Academic evidence of the effects of socio-technical systems design principles was found in the sense of self-regulation, parameter 1 (the degree of functional concentration), parameter 2 (the degree of differentiation of operational activities), parameter 3 (the degree of specialisation of operational activities) and parameter 7 (the relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation). It shows to be that there is a relation between these socio-technical systems design principles and quality of work.

Job security was found in the results, but not often. Besides that, the indicators of the open system dimension and parameters 4, 5, and 6 offer no convincing academic evidence for a relationship with quality of work. Possible explanations for this are explained in the discussion of this thesis.

6. Discussion

In this chapter, the discussion of the thesis is presented. First, in paragraph 6.1, there are some notes in the interpretation of the results. Subsequently, the contribution to the knowledge is discussed in more detail in 6.2. In paragraph 6.3, the practical and managerial implications of this thesis are presented. In 6.4 a critical reflection on the limitations of the research is elaborated, and in paragraph 6.5 directions for further research are given.

6.1 The interpretation of the results

When interpreting the results, a number of important aspects must be taken into account. First of all, there is elaborated on the open system dimension and parameters 4, 5, and 6 as these did not have convincing academic evidence for the relationship with quality of work. Besides that, there is described which choice is made in analysing the articles, and whereafter there is elaborated on the difficulties in assigning labels to the text.

First, for the indicators of the open system dimension and parameters 4, 5, and 6, convincing academic evidence for a relationship with quality of work was not found. The open system was operationalised as: ‘it is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (internal/external to the firm)’. In articles, the indicators of the open system were assigned to quotations and the open system characteristic/concept is specific to socio-technical systems design. However, it is hard to link this dimension to quality of work as it is not very practical. The open system is not something you see directly as a worker (in contrast to self-regulation, for example). In addition, for parameters 4, 5, and 6 it is more challenging to notice why there is no convincing academic evidence. A possible explanation for this is parameter 7, which focuses on the relationship between operational and regulatory activities. In the articles, parameter 7 is more often assigned to quotations than the parameters of the control structure, which could mean that the empirical results in the text are more general than specific. However, this assumption is not based on evidence.

Secondly, whether the articles being assessed were empirical or not was part of the eligibility criteria; empirical articles were included in the review and non-empirical articles were left out. In the operationalisation (and coding scheme) in chapter three, there was attention paid to the distinction between labelling outcomes of empirical data or literature presented in the empirical article. The analysis tried to make it as straightforward as possible

that empirical data from the articles is more valuable than authors referring to other literature studies. However, aspects of health and wellbeing are sometimes mentioned in the text, and the author or authors of these articles want to highlight potential benefits or refer to other literature. In that case, there is no empirical evidence for health and wellbeing, then the label ‘QOW, other but relevant 1: Other’ was assigned to the quotation as was prescribed in the operationalisation scheme (quotations are related to the dimension health and wellbeing, competence development or job security, but there is no empirical evidence, or the aspects are different from other indicators). Nevertheless, sometimes it was difficult to decide which label to assign to a quotation. An example of this is the quotation (from article 2): *“However, with establishing non-routine double-loop learning, these routines are removed and professionals are questioned. When these improvements continue to occur, the learning circle is complete.”* The article shows that this text refers to another research, but empirically it is not proven in the reviewed article itself. This shows one of the situations in which the research material (the articles) cannot be unambiguously classified with the used literature analysis instrument. It is necessary to mention this, and readers of this thesis should be aware of this point.

Thirdly, and beside the point mentioned earlier, there were some difficulties in labelling the text. In some articles, there were quotations that were related to ‘self-regulation’. It was difficult when making the decision whether the quotations should also be labelled as LPVS or only. An example of this is the quotation (from article 12): *“As teamwork implies the formation of more ‘whole’ jobs, one can expect both team systems will lie between these two extremes with respect to complexity.”* After reading the literature about low parameter value structures, it sometimes seems unclear whether the parameters have a low value or self-regulation is the case (or a combination of both). However, in analysing the text, sometimes it was very hard to make it clear and traceable which parameter belongs to the quotation. This might be because the reviewed articles all have different research questions and are not specifically focused on, for example, the parameters. Therefore, to be as transparent as possible, the document with all the information about all articles and the *Atlas.ti* file with all assigned labels to quotations is available on request by the author of the thesis.

6.2 The contribution to the knowledge

It is noteworthy in this thesis that only fourteen articles are included, while there is a massive number of articles related to socio-technical systems. As was noticed in chapter three, a lot of articles were not about design. This thesis made clear that although socio-technical systems have been written about, socio-technical systems design did not get the attention as was

expected. It can be concluded that there are not many empirical articles about socio-technical systems design. However, the result of the analysis can make socio-technical systems design of value.

6.3 The practical and managerial implications

From this theory-oriented research, it is possible to give some practical starting points. This thesis showed an emphasis on self-regulation, the production structure, and the relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation. To improve health and wellbeing and competence development, it makes sense for managers to incorporate socio-technical systems design principles into their organisation, mainly focusing on the principles that provided convincing evidence from the reviewed articles. However, which principles are most relevant is case-specific. From a literature perspective, an integral approach in focusing on socio-technical systems design is desirable to improve the quality of work. The results of this thesis emphasize the before mentioned aspects.

6.4 Critical reflection on the limitations of the research

There are some limitations in this study; this part critically reflects on these limitations. Since the data is analysed qualitatively, four constructs are addressed. These criteria are best known for assessing the research and are formulated by Guba and Lincoln (as cited in Shenton, 2004; Symon & Cassel, 2017). The constructs are credibility, transferability, dependability and confirmability (Shenton, 2004).

First, credibility, to be sure that the study measures/tests what is actually intended (Shenton, 2004). An aspect of credibility is triangulation. In this thesis, academic articles are reviewed by only one researcher. Normally, in a systematic review, more researchers and triangulation of data collection/analysing are applied. The credibility of this research is assumed to be reasonable but could be higher if triangulation of data collection/analysing was applied.

Secondly, transferability, which has to do with to what extent the findings of the study can be applied to other situations (Shenton, 2004). The number of databases used was mentioned (two, *Business Source Complete* and *Web of Science*). It was also mentioned from which organisations they are (*Business Source Complete* from *EBSCOhost* and *Web of Science* from *Clarivate Analytics*). The methodology is described very extensive in chapter three, such as the data collection approach. In addition, it is stated which date the databases

were examined (14 June 2021). In this way, it could be assumed that the transferability is sufficient.

Thirdly, dependability. It states whether the same results are obtained when the research is repeated and whether the context, methods and participants are the same (Shenton, 2004). On the one hand, it is evident what has been done in this research, and this is noted via the *Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)* checklist. On the other hand, different interpretations are possible, as mentioned in the interpretation of the results section. Every effort has been made to write down each step as clearly as possible, but it is advisable to read this thesis critically. The dependability of this research could have been increased by, for example, paying more attention to writing comments when coding.

Fourth, confirmability, which contains the steps that must be taken to make sure that the findings are not the characteristics and preferences of the researcher, but a result of the data (Shenton, 2004). Chapter three in the section ‘reporting bias and certainty assessment’ elaborated on the interest in a particular outcome of the analysis. The researcher has no interest in a specific result of the data analysis. Meanwhile, the organisational design theory socio-technical systems design is chosen as a key concept in this thesis and has overlap with some of the researcher’s thoughts. While there is not a certain interest, there are expectations and views of the researcher considering the theory (such as the human aspect that seems of value to the researcher). An attempt has been made to separate this view from the data and to collect, analyse and present the data as objectively as possible.

6.5 Directions for further research

This is a systematic literature review in which the data is analysed qualitatively. In further research, it may be interesting to see a relationship between socio-technical systems design principles and quality of work in a quantitative way. As qualitative research, in general, is done to check whether there is a relationship, quantitative research is done to test the relationship and the strongness of the relationship. How strong the relationship between socio-technical systems design principles and quality of work is, would be very interesting to investigate.

Another interesting direction for further research could be to empirically test socio-technical systems design and focus on the quality of work (that research is specifically set up to test this). Of the reviewed articles in this thesis, only six (out of fourteen) articles are published in or after 2012 (see Appendix D). In recent years, not many articles have been published that empirically test socio-technical systems design (concerning the quality of

work). In modern times, as described in chapter one, the theory can count on a possible resurgence; therefore, it could be exciting to have more recent empirical research on socio-technical systems design related to the quality of work.

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Appendix

Appendix A: Screening process articles

1. Is it possible to see/download the article?	
Yes -> Go to question 2	
No -> Use label 1	
<i>Reading abstract and trying to answer next questions</i>	
<i>Not possible by only reading abstract? Scan methods and rest of article</i>	
2. Is the article about socio-technical systems?	
Yes -> Go to question 3	
No -> Use label 2	
3. Is the article about socio-technical systems as is meant in this thesis? (as design)	
Yes -> Go to question 4	
No -> Use label 3	
4. Is the article empirical?	
Yes -> Use label 5	
No -> Use label 4	

Figure 1: Questions for screening articles.

0. Duplicate
1. Not available
2. Not about socio-technical systems
3. Other (goal of) socio-technical systems
4. Not empirical
5. Worth analysing

Figure 2: Labels for screening articles.

Appendix B: Articles Web of Science

Usefulness label	Article Title	Authors
3. Other (goal of) socio-technical systems	The lean-performance relationship in services: a theoretical model	Hadid, W; Mansouri, SA
3. Other (goal of) socio-technical systems	Team leader experience in improvement teams: A social networks perspective	Easton, GS; Rosenzweig, J
3. Other (goal of) socio-technical systems	The influence of challenging goals and structured method on Six Sigma performance	Arumugam, V; Antony, J; L
3. Other (goal of) socio-technical systems	Rate or Trade? Identifying Winning Ideas in Open Idea Sourcing	Blohm, I; Riedl, C; Fuller, J
4. Not empirical	The effectiveness of teams in organizations: a meta-analysis	Richter, AW; Dawson, JF; V
3. Other (goal of) socio-technical systems	25 Years of MCDA in nuclear emergency management	Papamichail, KN; French, S
3. Other (goal of) socio-technical systems	Cognitive big data: survey and review on big data research and its implications	Lugmayr, A; Stockleben, B
5. Worth analysing	The impact of autonomy and task uncertainty on team performance: A longitudinal study	Cordery, JL; Morrison, D; W
3. Other (goal of) socio-technical systems	An empirical evaluation of existing IS change theories for the case of IOIS	Reimers, K; Johnston, RB; J
3. Other (goal of) socio-technical systems	Predicting safe employee behavior in the steel industry: Development and validation	Brown, KA; Willis, PG; Prus
3. Other (goal of) socio-technical systems	Design for social media engagement: Insights from elderly care assistants	Spagnoletti, P; Resca, A; S
3. Other (goal of) socio-technical systems	Making norms to tackle global challenges: The role of Intergovernmental Organizations	Nilsson, A
3. Other (goal of) socio-technical systems	A knowledge-based innovation assessment system for small- and medium-sized enterprises	Grillo, C; Ferreira, FAF; Mar
4. Not empirical	Sociotechnical systems: towards an organizational learning approach	Molleman, E; Broekhuis, M
3. Other (goal of) socio-technical systems	A computer scientist's reactions to NPIT	Randell, B
1. Not available	Complex adaptive information flow and search transfer analysis	Feczak, S; Hossain, L; Carl
3. Other (goal of) socio-technical systems	Converging production models: the STS versus lean production debate re-examined	Dabhilkar, M; Ahlstrom, P
3. Other (goal of) socio-technical systems	How Integrating Organizational Theory With Systems Psychodynamics Can Improve Design	Neumann, JE
4. Not empirical	Lean production: Denial, confirmation or extension of sociotechnical systems?	Dankbaar, B
2. Not about socio-technical systems	THE CARE THEORY OF DIGNITY AMID PERSONAL DATA DIGITALIZATION	Leidner, DE; Tona, O
1. Not available	Enabling integrated knowledge acquisition and management in health care	Pentland, D; Forsyth, K; Mc
3. Other (goal of) socio-technical systems	Local sociotechnical system development in the NHS National Programme for IT	Eason, K
5. Worth analysing	Work systems, quality of working life and attitudes of workers: an empirical study	Steijn, B
3. Other (goal of) socio-technical systems	Pandemic's effect on the relationship between lean implementation and social sustainability	Tortorella, G; Narayanamur
2. Not about socio-technical systems	Scaling of HIS in a global context: Same, same, but different	Sahay, S; Saebo, J; Braa, A
5. Worth analysing	High road and low road teamworking: Perceptions of management rationales	Bacon, N; Blyton, P
3. Other (goal of) socio-technical systems	A quality system's impact on the service experience	Smith, J; Anderson, S; Fox
5. Worth analysing	Teamworking and performance: the extent and intensity of teamworking in the workplace	Procter, S; Burridge, M
4. Not empirical	The socio-technical approach to work organisation. An essential element	Prida, B; Grijalvo, M
1. Not available	Opportunities for improving construction health and safety using real-time monitoring	Yang, RJ; Gunaratna, CL
1. Not available	The drivers of product innovations in pulse-based foods: insights from case studies	Lascialfari, M; Magrini, MB
3. Other (goal of) socio-technical systems	Digital Sociotechnical System Design	Winby, S; Mohman, SA
3. Other (goal of) socio-technical systems	The political lacuna in participatory systems design	Saravanamuthu, K
4. Not empirical	TECHNOLOGICAL INNOVATION AND THE DEVELOPMENT OF MANAGEMENT	LARSEN, HH; ODRISCOLL, J
4. Not empirical	Reflections: Sociotechnical Systems Design and Organization Change	Pasmore, W; Winby, S; Mol
3. Other (goal of) socio-technical systems	Who is telecareing whom? Exploring the total social organisation of care with technology	Wilson, R; Baines, S; Martin
4. Not empirical	A Comparison between New Ways of Working and Sociotechnical Systems	Blok, M; van der Meulen, F
5. Worth analysing	Improving the primary task Effects of implementation intensity on employee performance	Sorensen, OH
3. Other (goal of) socio-technical systems	Sociotechnical systems design: coordination of virtual teamwork in innovation	Painter, G; Posey, P; Austr
5. Worth analysing	Missing links - Production structures and quality of working life in the clothing industry	Dhondt, S; Benders, J
3. Other (goal of) socio-technical systems	DEVELOPMENTAL DIFFERENCES BETWEEN DISTRIBUTED AND FACE-TO-FACE COLLABORATION	BURKE, K; CHIDAMBARAM, V
1. Not available	TPM leading to Total Production Management	Kamath, HN; Rodrigues, LL
2. Not about socio-technical systems	Factors impacting the adoption decision of health data standards in tertiary hospitals	Alkrajji, Al; Jackson, T; Mur
3. Other (goal of) socio-technical systems	To improve quality in R&D, improve the team work process	Spain, DR
1. Not available	Application of a Confrontation Matrix in Project Teams Quality Management	Jenco, M; Cemak, I
5. Worth analysing	Putting a band-aid on a wooden leg A sociotechnical view on the success of telemedicine	Vermeerbergen, L; Van Ho
3. Other (goal of) socio-technical systems	The needle and the damage done: Research, action research, and the opportunity	Cullen, J
4. Not empirical	A REVIEW OF APPLICATIONS OF THE SOCIOTECHNICAL SYSTEMS-ANALYSIS	CHISHOLM, RF; ZIEGENFUS, J
1. Not available	Management Engineering: A New Perspective on the Integration of Engineering and Management	Elia, G; Margherita, A; Pas
3. Other (goal of) socio-technical systems	Lean production myths: an exploratory study	Saurin, TA; Tortorella, GL; J
3. Other (goal of) socio-technical systems	A Systemic Organizational Change Model in Occupational Health Management	Montano, D
1. Not available	NEW PERSPECTIVE IN THE DESIGN OF QUALITY MANAGEMENT SYSTEMS	Vargas-Hernandez, JG; Ca
3. Other (goal of) socio-technical systems	Sustainable Lean in psychiatry? Assessment through socio-technical principles	Lindskog, P; Vanje, A; Tor
2. Not about socio-technical systems	Implementing Marketization in Public Healthcare Systems: Performing Reforms	Mason, K; Araujo, L
1. Not available	Using Technology to Enhance PD Performance: A Comparative Case Study	Pereira, R; Liker, J
1. Not available	Intelligent Systems in Health Care: A Socio-Technical View	Obreja, AR; Ross, P; Bedn
1. Not available	Continuous Technology Implementation and Sustainability of Sociotechnical Systems	Carayon, P; Wettemeck, T
3. Other (goal of) socio-technical systems	Lessons for systems engineering from the Segura River reclamation project	Rodenas, MA; Jackson, MC
1. Not available	On Using Organizational Knowledge Capabilities to Assist Organizational Change	Yang, CY; Chen, LC
1. Not available	Can Soft Systems Methodology Identify Socio-Technical Barriers to Knowledge	Gillies, AC; Galloway, J
3. Other (goal of) socio-technical systems	Field of dreams: team implementations and greenfields	Becker, WS
5. Worth analysing	Characteristics of work organization in UK and Philippine call centres	Clark, EE
5. Worth analysing	Leadership, perceived team climate and process improvement in municipal government	Howard, LW; Foster, ST; S
3. Other (goal of) socio-technical systems	SOCIOTECHNICAL SYSTEMS IN HEALTH-CARE - A FIELD EXPERIMENT	PASMORE, W; PETEE, J; I
3. Other (goal of) socio-technical systems	Innovating for improved healthcare: Sociotechnical and innovation systems	Marjanovic, S; Altenhofer, I
5. Worth analysing	Multidisciplinary teamwork is an important issue to healthcare professionals	Bitter, J; van Veen-Berkx, E
1. Not available	USER PERSPECTIVES ON THE MINNESOTA INTERORGANIZATIONAL COOPERATION	Schooley, BL; Horan, TA; M
1. Not available	INFORMATION TECHNOLOGY INVESTMENT PLANNING Anticipating Scenarios	Ryan, SD
Label	Amount	
1. Not available	15	
2. Not about socio-technical systems	4	
3. Other (goal of) socio-technical systems	31	
4. Not empirical	8	
5. Worth analysing	10	
Total	68	

Table 1: Articles Web of Science

Appendix C: Articles Business Source Complete

Usefulness label	Article Title, Author, Journal Title, ISSN, ISBN, Publication Date, Volume, Issue, First Page, Page Count, Accession Number, DOI, Publisher, Docty	
3. Other (goal of) socio-technical systems	A framework for resilience assessment in process systems using a fuzzy hybrid MCDM model., "Zarei, Esmaeil	Ramavandi, Bahman
4. Not empirical	A Lifetime of Theory and Action on the Ethical Use of Computers: A Dialogue with Enid Mumford., "Porra, Jaana	Hirschheim, Rudy", "Joi
3. Other (goal of) socio-technical systems	A Mixed-Method Study of Practitioners' Perspectives on Issues Related to EHR Medication Reconciliation at a He	Dellsperger, Kevin C.
3. Other (goal of) socio-technical systems	A multi-criteria analysis of coal-based power generation in Bangladesh., "Zaman, Rafia	Brudermann, Thomas
3. Other (goal of) socio-technical systems	A new structure of sociotechnical system processes using resilience engineering., "Said, Saloua	Bouloiz, Hafida
0. Duplicate	A quality system's impact on the service experience., "Smith, Jeffery	Anderson, Sidney
3. Other (goal of) socio-technical systems	A Socio-Technical Accounting Approach to the Evaluation of Job Performance., "Globerson, Shlomo	Salvendy, Gavriel", "Int
2. Not about socio-technical systems	A Socio-Technical Analysis of Access to Mental Health Services by Older Adults in Rural Communities., "Joseph, F	Offices of Mental Heal
5. Worth analysing	A socio-technical approach for improving a Brazilian shoe manufacturing system., "Renner, J.S.	de M. Guimarães, L.B.
1. Not available	A socio-technical systems approach to understanding and enhancing the reliability of interdependent infrastru	Capital investments
3. Other (goal of) socio-technical systems	A systematic review of the safety climate intervention literature: Past trends and future directions., "Jin Lee	Yung-hsiang Huang
3. Other (goal of) socio-technical systems	A Systemic Organizational Change Model in Occupational Health Management., "Montano, Diego", "Journal of Cl	Industrial hygiene
3. Other (goal of) socio-technical systems	A test of Rasmussen's risk management framework in the food safety domain: BSE in the UK., "Cassano-Piche, J	Vicente, K. J.
3. Other (goal of) socio-technical systems	Advocating for Action Design Research on IT Value Creation in Healthcare., "Sherer, Susan A.", "Journal of the As	Information technolog
3. Other (goal of) socio-technical systems	An empirical investigation on association between human factors, ergonomics and lean manufacturing., "Sakthi	Jeyapaul, R.", "Producti
3. Other (goal of) socio-technical systems	An empirically grounded sociotechnical perspective on designing virtual agents for older adults., "Sin, Jaisie	Munteanu, Cosmin", "H
3. Other (goal of) socio-technical systems	Appreciating the Contribution of Broadband ICT With Rural and Remote Communities: Stepping Stones Toward	Information & commu
4. Not empirical	Assessing the Effectiveness of Sociotechnical Interventions: Antidote or Fad?, "Beekun, Rafik I.", "Human Relatio	Organizational effectiv
3. Other (goal of) socio-technical systems	Assessment and monitoring of mental workload in subway train operations using physiological, subjective, and	Zaeri, Farid
1. Not available	Author response., "Watson, Judy	Lacey, David
3. Other (goal of) socio-technical systems	CAN AMERICA MEET FOREIGN COMPETITION? A TREATISE ON PRODUCTIVITY., "Kohl, Russell	Benedict, Gary C.
3. Other (goal of) socio-technical systems	Challenges And Opportunities For Improving Patient Safety Through Human Factors And Systems Engineering., "	Wooldridge, Abigail
3. Other (goal of) socio-technical systems	Change is Afoot: Applying Change Management Theories to Self-Organizing Socio-Technical Systems., "Steghofe	Sociotechnical system
3. Other (goal of) socio-technical systems	Closing Pandora's Box: adapting a systems ergonomics methodology for better understanding the ecological cor	Salmon, P. M.
0. Duplicate	Cognitive big data: survey and review on big data research and its implications. What is really "new" in big data	Stockleben, Björn
3. Other (goal of) socio-technical systems	Cognitive ergonomics, socio-technical systems, and the impact of healthcare information technologies., "Lawler,	Hedge, Alan
3. Other (goal of) socio-technical systems	Collective Dimensions of Reliability: Some Lines of Research., "Leplat, Jacques", "European Work & Organizati	Human Resources Con
3. Other (goal of) socio-technical systems	Consumer Health Informatics Interventions Must Support User Workflows, Be Easy-To-Use, and Improve Cogniti	Marquard, Jenna L.
3. Other (goal of) socio-technical systems	Contextual assessment of working practices in changing work., "Nuutinen, Maaria", "International Journal of Indu	Power resources
3. Other (goal of) socio-technical systems	Continuance in online participation following the compromise of older adults' identity information: a literature r	Salmon, Paul M.
3. Other (goal of) socio-technical systems	Contributions from cognitive engineering to requirements specifications for complex sociotechnical systems: A c	da Cunha, Amauri M.
3. Other (goal of) socio-technical systems	Data for outcome payments or information for care? A sociotechnical analysis of the management informatio	Wilson, Rob
3. Other (goal of) socio-technical systems	Deep transitions: Emergence, acceleration, stabilization and directionality., "Schot, Johan	Kanger, Laur", "Resear
3. Other (goal of) socio-technical systems	Defining Quality of Working Life., "Levine, Mark F.	Taylor, James C.
3. Other (goal of) socio-technical systems	Design of Blockchain-based Precision Health-Care Using Soft Systems Methodology., "Sharma, Ravi	Zhang, Charcy
2. Not about socio-technical systems	Design trade-offs in cultures of participation: empowering end users to improve their quality of life., "Fischer, G	Fogli, Daniela
3. Other (goal of) socio-technical systems	Designed to travel? Transition management encounters environmental and innovation policy histories in Finlan	Kivisaari, Sirku
3. Other (goal of) socio-technical systems	Development of a framework for resilience measurement: Suggestion of fuzzy Resilience Grade (RG) and fuzzy	Mazloumi, Adel
0. Duplicate	Digital Sociotechnical System Design., "Winby, Stu	Mohrman, Susan Alber
2. Not about socio-technical systems	Do inter-continental playing styles exist? Using social network analysis to compare goals from the 2016 EURO a	Salmon, Paul M.
3. Other (goal of) socio-technical systems	Embracing complexity: a sociotechnical systems approach for the design and evaluation of higher education lea	Bowles, Graeme
1. Not available	Enabling better management of patients: discrete event simulation combined with the STAR approach., "Demir,	Southern, David", "Jour
3. Other (goal of) socio-technical systems	Ergonomic considerations for a systemic approach: the millenium maize mills project in northern Mozambique.,	Ferrara, Patricia
3. Other (goal of) socio-technical systems	Ergonomics issues in sport and outdoor recreation., "Salmon, Paul M.", "Theoretical Issues in Ergonomics Science	Systems theory
3. Other (goal of) socio-technical systems	Errors and Failures: Towards a New Safety Paradigm., "Gilbert, Claude	Amalberti, Rene
3. Other (goal of) socio-technical systems	Explicit or implicit situation awareness? Measuring the situation awareness of train traffic controllers., "Lo, Julie	Sehic, Emdaz
3. Other (goal of) socio-technical systems	Exploring product-service systems in the digital era: a socio-technical systems perspective., "Li, Ai Qiang	Rich, Nicholas
3. Other (goal of) socio-technical systems	Extending Digital Infrastructures: A Typology of Growth Tactics., "Koutsikouri, Dina	Lindgren, Rikard
1. Not available	Full Information Product Pricing: An Information Strategy for Harnessing Consumer Choice to Create a More Sus	Jing Zhang
3. Other (goal of) socio-technical systems	Global energy politics., "Lyra, Rodrigo", "International Affairs", "00205850", "Mar2021", "97", "2", "579", "2", "14	International relations
1. Not available	Government inter-organizational information sharing initiatives: Understanding the main determinants of succe	Sayogo, Djoko Sigit", "C
3. Other (goal of) socio-technical systems	Grafting: Balancing Control and Cultivation in Information Infrastructure Innovation., "Sanner, Terje Aksel	Manda, Tiwonge Davis
3. Other (goal of) socio-technical systems	How (not) to talk about the uncertain: siting geological disposal for highly radioactive waste in the Czech Repub	Sociotechnical system
4. Not empirical	Human Resouce Issues in Cellular Manufacturing: A Sociotechnical Analysis., "Huber, Vandra L.	Brown, Karen A.", "Joui
3. Other (goal of) socio-technical systems	In regulation we trust., "Wiig, Siri	Tharaldsen, Jorunn Elis
3. Other (goal of) socio-technical systems	Instrumentalized rationality, cross-cultural mediators, and civil epistemologies of late colonialism., "Kusiak, Paul	West Africa
3. Other (goal of) socio-technical systems	Introduction to designing information and organizations with a positive lens., "Avital, Michel	Boland, Richard J.
3. Other (goal of) socio-technical systems	Is Human Performance Technology at the End of an Era? A Response to Nickols(HRDQ 1:2), "Englehaupt, William	Employees
1. Not available	Job design and technology: a sociotechnical systems perspective., "Pierce, Jon L.", "Journal of Occupational Behav	Employees
0. Duplicate	Lean Production: Denial, Confirmation or Extension of Sociotechnical Systems Design?, "Dankbaar, Ben", "Human	Mass production
0. Duplicate	Lessons for systems engineering from the Segura River reclamation project: A critical systems thinking analysis.	Jackson, Michael C.", "S
0. Duplicate	Local sociotechnical system development in the NHS National Programme for Information Technology., "Ken KE	Systems design
3. Other (goal of) socio-technical systems	Maintenance: organizational modes, activities and health and safety. Use of a French national survey and in-situ	Work-related injuries
0. Duplicate	Making norms to tackle global challenges: The role of Intergovernmental Organisations., "Nilsson, Adriana", "Res	Intellectual property
4. Not empirical	Making Sense of Quality of Work Life Programs., "Gadon, Herman", "Business Horizons", "00076813", "Jan/Feb	Quality circles
0. Duplicate	Management Engineering: A New Perspective on the Integration of Engineering and Management Knowledge., "	Margherita, Alessandr
3. Other (goal of) socio-technical systems	Medical record keeping systems in Malawi., "Tough, Alistair George	Lihoma, Paul", "Record
3. Other (goal of) socio-technical systems	Micro- and macroergonomic changes in mental workload and medication safety following the implementation o	Brown, Roger L.
0. Duplicate	Missing links., "Dhondt, Steven	Benders, Jos", "Intern

Table 2: Articles Business Source Complete 1/2

0. Duplicate	Multidisciplinary teamwork is an important issue to healthcare professionals., "Bitter, Justin	van Veen-Berk, Elizab
3. Other (goal of) socio-technical systems	On Quality and Communication: The Relevance of Critical Theory to Health Informatics., "Shaw, Mark Christophe	Stahl, Bernd Carsten",
3. Other (goal of) socio-technical systems	Open plan offices as sociotechnical systems: What matters and to whom?, "Smith-Jackson, Tonya	Middlebrooks, Rodney
3. Other (goal of) socio-technical systems	Organizational simulation in support of global manufacturing enterprises., "Kessler, W.	McGinnis, L.
3. Other (goal of) socio-technical systems	Organizational Sociotechnical Diagnosis of Managerial Retention : SAP -- LAP Framework., "Ghosh, Koustab	Sahney, Sangeeta", "Gi
3. Other (goal of) socio-technical systems	Organizational-Historical Analysis of the "Failure to Respond to Alarm" Problems., "Yan Xiao	Seagull, F. Jacob
3. Other (goal of) socio-technical systems	Ossified materialism: introduction to the special volume on absolute reductions in materials throughput and em	Bengtsson, Magnus
4. Not empirical	Overcoming the Roadblocks in Work-Restructuring Efforts., "Pasmore, William A.", "Organizational Dynamics", =	Personnel manager
3. Other (goal of) socio-technical systems	Overview of Human Factors and Ergonomics in the OR, with an Emphasis on Minimally Invasive Surgeries., "Low	Hallbeck, M. Susan", "H
4. Not empirical	Parallel Organizations in Unionized Settings: Implications for Organizational Research., "Herrick, Neal Q.", "Hum	Organizational behavi
3. Other (goal of) socio-technical systems	Personality Characteristics of MIS Project Teams: An Empirical Study and Action-Research Design., "Kaiser, Kate	Bostrom, Robert P.", "H
3. Other (goal of) socio-technical systems	Perspectives on the Organizational Context of Frontlines: A Commentary., "Schneider, Benjamin	Bowen, David E.", "Jou
3. Other (goal of) socio-technical systems	Process-oriented knowledge system for health professionals as a tool for transition to hospital process orientati	Hospital costs
1. Not available	Provider perspectives of telemedicine encounter quality., "LeRouge, Cynthia	Garfield, Monica J.
3. Other (goal of) socio-technical systems	Putting the humanity into inhuman systems: How human factors and ergonomics can be used to manage the ris	Carden, Tony
3. Other (goal of) socio-technical systems	Quality systems in health care: a sociotechnical approach, "Harteloh, P.P.M.", "Health Policy", = "01688510", = "Jun	Medical care", "Inform
4. Not empirical	QWL Improves Worksite Quality: Success Rates in a Large Pool of Studies., "Golembiewski, Robert T.	Ben-chu Sun", "Human
3. Other (goal of) socio-technical systems	RE-ENGINEERING TQM AND WORK REDESIGN: AN INTEGRATIVE APPROACH TO CONTINUOUS ORGANIZATION	Feller, Richard", "Publi
0. Duplicate	Reflections: Sociotechnical Systems Design and Organization Change., "Pasmore, William	Winby, Stu
3. Other (goal of) socio-technical systems	Seeing power with a flashlight: DIY thermal sensing technology in the classroom., "Kenny, Catherine	Liboiron, Max
4. Not empirical	Self-managed Work Teams: TQM Technology at the Employee Level., "Carol Sexton", "Journal of Organizational	Organizational structur
3. Other (goal of) socio-technical systems	Shift work - problems and its impact on female nurses in Udaipur, Rajasthan India., "Rathore, H.	Shukla, K.
3. Other (goal of) socio-technical systems	Smart industry and the pathways to HRM 4.0: implications for SCM., "Liboni, Lara Bartocci	Cezarino, Luciana Orar
3. Other (goal of) socio-technical systems	Social and personal normative influences on healthcare professionals to use information technology: towards a	Communication
3. Other (goal of) socio-technical systems	Social media use in local government: Linkage of technology, task, and organizational context., "Maultasch Olive	Welch, Eric W.", "Gove
1. Not available	Socio Technical Systems of a Company: The Dimensionality of Socio Technical Systems., "Botla, Lakshmaiah	Kondur, Harigopal", "Pu
1. Not available	SOCIO-TECHNICAL INTEGRATION RESEARCH IN AN EASTERN EUROPEAN SETTING: DISTINCT FEATURES, CHALL	FISHER, ERIK", "Society
3. Other (goal of) socio-technical systems	Sociotechnical systems approach to healthcare quality and patient safety., "Carayon, Pascale", "Work", = "105198:	Information technolog
4. Not empirical	Sociotechnical Systems: A North American Reflection on Empirical Studies of the Seventies., "Pasmore, William	Francis, Carole
3. Other (goal of) socio-technical systems	Socio-Technical Transitions and Institutional Change., "Kemper, Joya A.	Ballantine, Paul W.", "J
3. Other (goal of) socio-technical systems	Structure Underlies Other Organizational Determinants of Mental Health: Recent Results Confirm Early Sociotec	Merrelyn Emery
3. Other (goal of) socio-technical systems	Sustainability in Healthcare: Combining Organizational and Architectural Levers., "Pinzone, Marta	Lettieri, Emanuele
1. Not available	System-wide lean implementation in health care: A multiple case study., "Centauri, Federica	Mazzocato, Pamela
0. Duplicate	Teamworking and performance: the extent and intensity of teamworking in the 1998 UK Workplace Employee R	Burridge, M.", "Interna
3. Other (goal of) socio-technical systems	"Technology enabled Health" - Insights from twitter analytics with a socio-technical perspective., "Grover, Purva	Kar, Arpan Kumar
3. Other (goal of) socio-technical systems	TECHNOLOGY FOR THE HUMDRUM: TRAJECTORIES, INTERACTIONAL NEEDS AND A CARE SETTING., "Graham, C	Cheverst, Keith
4. Not empirical	The Design and Activation of Self-Regulating Work Groups., "Pearce, Il, John A.	Rawlin, Elizabeth C.", "f
0. Duplicate	The effectiveness of teams in organizations: a meta-analysis., "Richter, A.W.	Dawson, J.F.
5. Worth analysing	The impact of management and employees on cellular manufacturing implementation., "Olorunniwo, Festus	Udo, Godwin", "Interna
3. Other (goal of) socio-technical systems	The impact of quality practices and employee empowerment in the performance of hospital units., "Metcalf, Asl	Habermann, Marco
5. Worth analysing	The importance of organizational level decision latitude for well-being and organizational commitment., "Dhond	Pot, Frank Delano
3. Other (goal of) socio-technical systems	THE LEARNING ORGANIZATION., "Antonoaie, N.	Antonoaie, C.", "Bulle
5. Worth analysing	The moderating role of just-in-time on sociotechnical practices' effect over quality and workers' health., "Tortore	Fettermann, Diego C.
0. Duplicate	The Needle and the Damage Done: Research, Action Research, and the Organizational and Social Construction c	Medical care
3. Other (goal of) socio-technical systems	The next generation of macroergonomics: Integrating safety climate., "Murphy, Lauren A.	Robertson, Michelle M
3. Other (goal of) socio-technical systems	The reflexive engineer: perceptions of integrated development., "Robbins, Peter T.", "Journal of International Dev	Decision making
3. Other (goal of) socio-technical systems	The Role of Information and Communication Technology in Self-Management of Chronic Diseases: An Empirical	Joshi, K. D.", "Journal o
4. Not empirical	The Role of Management in Production Units with Autonomous Work Groups., "Rubenowitz, Sigvard", "Internatic	Leadership
1. Not available	THE SI* MODELING FRAMEWORK: METAMODEL AND APPLICATIONS., "ZANNONE, NICOLA", "International Jour	Information technolog
0. Duplicate	The socio-technical approach to work organisation. An essential element in Quality Management Systems., "Pric	Grijalvo, Mercedes", "T
3. Other (goal of) socio-technical systems	The Walkerton E. coli outbreak: a test of Rasmussen's framework for risk management in a dynamic society., "V	Christoffersen, Klaus",
3. Other (goal of) socio-technical systems	Towards safe information technology in health care., "Rouse, W.B.	Boff, K.R.
3. Other (goal of) socio-technical systems	Transforming urban waste into sustainable material and energy usage: the case of Greater Manchester (UK)., "L	Gee, Sally", "Journal of
4. Not empirical	Uncertainty and Resourcefulness in Performance Environments: A Theoretical Note., "Smith, Lawrence	Davids, Keith", "Europe
3. Other (goal of) socio-technical systems	Understanding change in complex socio-technical systems., "Rouse, W.B.	Boff, K.R.
3. Other (goal of) socio-technical systems	Urban Food Security and Landscape Change: A Demand-side Approach., "Brunori, Gianluca	Di Iacovo, Francesco",
3. Other (goal of) socio-technical systems	Using cognitive work analysis to compare complex system domains*, "D. St-Maurice, Justin	M. Burns, Catherine", "
3. Other (goal of) socio-technical systems	Using FRAM beyond safety: a case study to explore how sociotechnical systems can flourish or stall., "Furniss, Di	Curzon, Paul
3. Other (goal of) socio-technical systems	Using HIT to deliver integrated care for the frail elderly in the UK: current barriers and future challenges., "Wate	Eason, Ken
0. Duplicate	Using Technology to Enhance PD Performance: A Comparative Case Study 3-D Scanning Technology Deployment	Liker, Jeff", "Engineerir
0. Duplicate	Who is telecaring whom? Exploring the total social organisation of care work in an Italian municipality., "Wilson	Baines, Sue
4. Not empirical	Work design theory: A review and critique with implications for human resource development., "Torraco, Richar	Job analysis
0. Duplicate		
Label	Amount	
0. Duplicate	17	
1. Not available	11	
2. Not about socio-technical systems	3	
3. Other (goal of) socio-technical systems	83	
4. Not empirical	13	
5. Worth analysing	4	
Total	131	

Table 3: Articles Business Source Complete 2/2

Appendix D: Articles included in review

Articles included in review
Article 1: High road and low road teamworking: Perceptions of management rationales and organizational and human resource outcomes Bacon, N., & Blyton, P. (2000). High road and low road teamworking: Perceptions of management rationales and organizational and human resource outcomes. <i>Human Relations</i>, 53(11), 1425–1458. https://doi.org/10.1177/00187267005311002
Article 2: Multidisciplinary teamwork is an important issue to healthcare professionals Bitter, J., Van Veen-Berkx, E., Gooszen, H. G., & Van Amelsvoort, P. (2013). Multidisciplinary teamwork is an important issue to healthcare professionals. <i>Team Performance Management</i>, 19(5-6), 263–278. https://doi.org/10.1108/TPM-11-2012-0041
Article 3: Characteristics of work organization in UK and Philippine call centres Clark, E. E. (2007). Characteristics of work organization in UK and Philippine call centres. <i>Team Performance Management</i>, 13(7-8), 227–243. https://www.doi.org/10.1108/13527590710842547
Article 4: The impact of autonomy and task uncertainty on team performance: A longitudinal field study Cordery, J. L., Morrison, D., Wright, B. M., & Wall, T. D. (2010). The impact of autonomy and task uncertainty on team performance: A longitudinal field study. <i>Journal of Organizational Behavior</i>, 31(2-3), 240–258. https://doi.org/10.1002/job.657
Article 5: Missing links: Production structures and quality of working life in the clothing industry Dhondt, S., & Benders, J. (1998). Missing links: Production structures and quality of working life in the clothing industry. <i>International Journal of Operations & Production Management</i>, 18(12), 1189–1204. https://doi.org/10.1108/01443579810236629
Article 6: The importance of organizational level decision latitude for well-being and organizational commitment. Dhondt, S., Pot, F. D., & Kraan, K. O. (2014). The importance of organizational level decision latitude for well-being and organizational commitment. <i>Team Performance Management</i>, 20(7-8), 307–327. https://doi.org/10.1108/TPM-03-2014-0025
Article 7: Leadership, perceived team climate and process improvement in municipal government Howard, L. W., Foster, S. T., & Shannon, P. (2005). Leadership, perceived team climate and process improvement in municipal government. <i>International Journal of Quality & Reliability Management</i>, 22(8), 769–795. https://doi.org/10.1108/02656710510617229
Article 8: The impact of management and employees on cellular manufacturing implementation Olorunniwo, F., & Udo, G. (2002). The impact of management and employees on cellular manufacturing implementation. <i>International Journal of Production Economics</i>, 76(1), 27–38. https://doi.org/10.1016/S0925-5273(01)00155-4

Article 9: Teamworking and performance: the extent and intensity of teamworking in the 1998 UK Workplace Employee Relations Survey (WERS98) Procter, S., & Burridge, M. (2008). Teamworking and performance: the extent and intensity of teamworking in the 1998 UK Workplace Employee Relations Survey (WERS98). <i>The International Journal of Human Resource Management</i>, 19(1), 153–168. https://doi.org/10.1080/09585190701764097
Article 10: A socio-technical approach for improving a Brazilian shoe manufacturing system. Renner, J. S., De M. Guimarães, L. B., & De Oliveira, P. A. B. (2012). A socio-technical approach for improving a Brazilian shoe manufacturing system. <i>Work</i>, 41, 1743–1750. https://doi.org/10.3233/wor-2012-0379-1743
Article 11: Improving the primary task: Effects of implementation intensity on employee health and organizational performance Sorensen, O. H. (2016). Improving the primary task: Effects of implementation intensity on employee health and organizational performance. <i>Journal of Organizational Effectiveness</i>, 3(4), 343–359. https://doi.org/10.1108/JOEPP-02-2016-0017
Article 12: Work systems, quality of working life and attitudes of workers: an empirical study towards the effects of team and non-teamwork Steijn, B. (2001). Work systems, quality of working life and attitudes of workers: an empirical study towards the effects of team and non-teamwork. <i>New Technology, Work and Employment</i>, 16(3), 191-203. https://doi.org/10.1111/1468-005X.00088
Article 13: The moderating role of just-in-time on sociotechnical practices' effect over quality and workers' health. Tortorella, G. L., Fettermann, D. C., Piñeres, A., & Gaiardelli, P. (2019). The moderating role of just-in-time on sociotechnical practices' effect over quality and workers' health. <i>Human Factors & Ergonomics in Manufacturing & Service Industries</i>, 29(3), 210-223. https://www.doi.org/10.1002/hfm.20776
Article 14: Putting a band-aid on a wooden leg: A sociotechnical view on the success of decentralisation attempts to increase job autonomy Vermeerbergen, L., Van Hootegeem, G., & Benders, J. (2016). Putting a band-aid on a wooden leg: A sociotechnical view on the success of decentralisation attempts to increase job autonomy. <i>Team Performance Management</i>, 22(7-8), 383–398. https://doi.org/10.1108/TPM-03-2015-0013

Table 4: Included articles

Appendix E: Coding scheme

Concepts	Dimensions	Indicators	Quotation
Socio-technical systems design (STSD)	Open system	Open system characteristic 1: Internal environment: it is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (internal to the firm)	
		Open system characteristic 2: External environment: it is recognised that every socio-technical system is embedded in an environment that influences the way it behaves (external to the firm)	
	Self-regulation	Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control.	
	Low parameter value structure (LPVS)	Parameter 1: The degree of functional concentration: operational tasks are (potentially) not related to all order types	
		Parameter 2: The degree of differentiation of operational activities: operational tasks include production, preparation, and support activities	
		Parameter 3: The degree of specialisation of operational activities: operational tasks cover the complete operational process	
		Parameter 4: The degree of differentiation of regulatory activities into parts: the sub-activities (monitoring, assessing and acting) are integrated into one task	
		Parameter 5: The degree of differentiation of regulatory activities into aspects: the tasks contain all three forms of regulation (strategic regulation, regulation by design and operational regulation)	
		Parameter 6: The degree of specialisation of regulatory activities: regulatory tasks have a broader scope in terms of a larger part of the operational process or a larger number of regulators under supervision	
		Parameter 7: The relation between operational and regulatory activities, and hence the relation between the production and control structure – the degree of separation: there are tasks in which operational and regulatory activities are integrated as much as possible	
	STSD, other but relevant	STSD, other but relevant 1: Different when compared to STSD principles	
		STSD, other but relevant 2: Other: aspects of STSD are mentioned, but they are different from other indicators.	
Quality of work (QOW)	Health and wellbeing	Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption	
		Health and wellbeing characteristic 2: There is work method autonomy	
	Competence development	Competence development characteristic 1: There are opportunities for training skills	
		Competence development characteristic 2: There are opportunities for career development	
	Job security	Job security characteristic 1: Work is at regular basis	
		Job security characteristic 2: Work is at acceptable working hours	
	QOW, other but relevant	QOW, other but relevant 1: Other: quotations are related to the dimension health and wellbeing, competence development or job security, but there is no empirical evidence or the aspects are different from other indicators.	

Table 5: Coding scheme

Appendix F: Summary of the articles

Article	Author/Year	Journal	Purpose	Findings	Methodology
Article 1: High road and low road teamworking: Perceptions of management rationales and organizational and human resource outcomes	Bacon & Blyton (2000)	Human Relations	Exploring relationship between two types of teamworking, perceptions of management rationales for introducing teamworking and organizational and human resource outcomes	High road teamworking is associated with broader management rationales, and is perceived to have a greater positive impact upon both organizational performance and human resource outcomes	Survey in iron and steel sector. Send to 300 workplace representatives of Iron and Steel Trades Confederation (ISTC). 157 were returned. Response rate of 52%
Article 2: Multidisciplinary teamwork is an important issue to healthcare professionals	Bitter, Van Veen-Berkx, Gooszen & Van Amelsvoort (2013)	Team Performance Management	To describe the factors that contribute to understanding how collaboration improves performance in operating rooms (ORs) after introducing the concept of cross-functional OR scheduling teams	The qualitative findings revealed that high-performing teams were able to identify bottlenecks in order to improve continuity of care. Cross-functional teams learned how to address interferences and improve their quality of service through improved collaboration and the improved use of control mechanisms	Observing team meetings, available data and documentation, and 13 semi-structured interviews with team members for collecting additional data at Radboud University Nijmegen Medical Center
Article 3: Characteristics of work organization in UK and Philippine call centres	Clark (2007)	Team Performance Management	To describe the characteristics of the team designs in a call centre in the United Kingdom (UK) and The Philippines (RP). As the design of teams is influenced mainly by sociotechnical system theory and lean production, these are used as landmarks in the comparison	The case studies exhibit the characteristics of diverse production models in service firms. The UK case study was approaching the STS model whereas the RP case study was approaching the LP model but veering more to the mass production model of service firms	Recorded interviews with team members and their supervisors and observation of team operations. Outgoing personnel were also interviewed. Actual day-to-day operation of the teams was observed
Article 4: The impact of autonomy and task uncertainty on team performance: A longitudinal field study	Cordery, Morrison, Wright & Wall (2010)	Journal of Organizational Behavior	To account for modest and inconsistent empirical support for a positive relationship between team autonomy and team performance by proposing that team task uncertainty impacts on team performance and moderates the impact of increased autonomy	Higher levels of task uncertainty were initially associated with reduced performance, assessed in terms of the quality of treated effluent produced by the teams. An intervention designed to enhance team autonomy led to general improvements in team performance, though moderated by team task uncertainty. Under conditions of enhanced team autonomy, a positive relationship emerged between task uncertainty and team performance	A longitudinal field study of 17 wastewater treatment teams
Article 5: Missing links: Production structures and quality of working life in the clothing industry	Dhondt & Benders (1998)	International Journal of Operations & Production Management	Examining empirically two propositions which are derived from modern sociotechnology: Product-oriented structures are more likely than machine-oriented and line structures to have decentralized control structures and product-oriented structures are more likely than functional and line structures to have a high quality of working life	Neither one of the propositions was supported by the empirical material presented. The links are missing	Secondary analysis on survey data. According to official data, the Dutch clothing industry consisted of 186 companies. Of these, 96 were approached, and 40 replies were received
Article 6: The importance of organizational level decision latitude for well-being and organizational commitment	Dhondt, Pot, & Kraan (2014)	Team Performance Management	To focus on participation in the workplace and examining the relative importance of different dimensions of job control in relation to subjective well-being and organizational commitment	Functional support and organizational level decision latitude relate positively to subjective well-being and organizational commitment and seem to be even more important than job autonomy	Secondary data of European Working Conditions Survey (EWCS) 2010. Workers were interviewed face-to-face in their homes using a structured questionnaire on their employment situation and working conditions. Sample of 2048 employees
Article 7: Leadership, perceived team climate and process improvement in municipal government	Howard, Foster, & Shannon (2005)	International Journal of Quality & Reliability Management	Examining the role of perceived team climate in facilitating leadership and sociotechnical optimization to affect quality related outcomes in a municipal government	Institution-level communications and department-level leadership had the greatest effects in shaping perceptions of team climate. Perceived team climate predicted process improvement, customer satisfaction, and employee satisfaction. Perceived team climate also substantially mediated relationships between leadership support for teamwork and technical components with these outcomes	A survey was administered to employees working in a municipal government in the northwestern USA. Of the 1205 employees, 666 full-time employees representing 11 departmental units participated
Article 8: The impact of management and employees on cellular manufacturing implementation	Olorunniwo & Udo (2002)	International Journal of Production Economics	Using sociotechnical system (STS) principles to identify three major categories of variables that are likely to impact CM implementation namely top management role, job design for operators, and cross training	CM implementation seems to be more successful if top management initiates the CM project, and if employees are cross-trained to run various machines and read blue prints. In addition, CM success seems to be enhanced if jobs are scheduled and tracked within the cells	Survey of U.S. organizations which implemented CM. The initial pool consisted of 556 companies. A total of 57 usable questionnaires were returned

Article 9: Teamworking and performance: the extent and intensity of teamworking in the 1998 UK Workplace Employee Relations Survey (WERS98)	Procter & Burridge (2008)	The International Journal of Human Resource Management	Examining whether a relationship between teamworking and performance can be said to exist; and, if it can, how that relationship might be explained	Extent of teamworking within an establishment is found to be positively and significantly related to productivity and financial performance. The key factor in performance is the degree of teams' decision-making autonomy. This is done by constructing a measure of teamworking intensity which is found to be positively and significantly associated with productivity and quality levels	Secondary data of the 1998 UK Workplace Employee Relations Survey
Article 10: A socio-technical approach for improving a Brazilian shoe manufacturing system	Renner, De M. Guimarães & De Oliveira (2012)	Work	Presenting a macroergonomic intervention in a footwear company in Rio Grande do Sul, Brazil, to improve both the quality of life of the employees and productivity by optimizing the traditional Taylor/Ford work organization	A reduction in human and material resource costs and a consequent improvement in health and workers quality of life	Intervention conducted in one of the eight plants (the Paranhana Valley plant) of the sixth largest footwear company in Brazil. One hundred workers volunteered to engage in the project and were trained to work under the new socio-technical work design in a pilot line while the others eight lines continue working under the traditional Taylor/Ford model
Article 11: Improving the primary task: Effects of implementation intensity on employee health and organizational performance	Sorensen (2016)	Journal of Organizational Effectiveness	To document and discuss the effects of a participatory intervention in preschools focussing upon improving the performance of the primary task on employee health and organizational effectiveness	Preschools with higher implementation intensity have stronger effects on employee health and organizational effectiveness than preschools with lower implementation intensity. The differences indicate that the main intervention component, improving performance of the central work tasks through collaborative, participatory workplace activities, had effects on both health and effectiveness and that workplace and employee engagement in the intervention is crucial to its success	A longitudinal, participatory intervention study of 62 preschools involving approximately 1800 employees
Article 12: Work systems, quality of working life and attitudes of workers: an empirical study towards the effects of team and non-teamwork	Steijn (2001)	New Technology, Work and Employment	Distinguishes between four categories of work systems: the traditional Tayloristic system, 'lean' team work, 'sociotechnical' teamwork and the professional work system	In most cases the overall explained variance is quite low. Only with respect to autonomy, complexity and to a lesser extent learning is a more substantial part of the variance in the dependent variables explained	A Telepanel survey of over 800 Dutch workers
Article 13: The moderating role of just-in-time on sociotechnical practices' effect over quality and workers' health	Tortorella, Fettermann, Piñeres & Gaiardelli (2019)	Human Factors & Ergonomics in Manufacturing & Service Industries	Verifying the moderating effect of just-in-time (JIT) practices on the relationship between ST practices and the performance of quality and workers' health	ST practices have a positive significant relationship with such performance, and the concurrent adoption of JIT does not undermine quality and workers' health	Survey with 144 different companies from Southern Brazil that are undergoing a lean implementation
Article 14: Putting a band-aid on a wooden leg: A sociotechnical view on the success of decentralisation attempts to increase job autonomy	Vermeerbergen, Van Hootegem & Benders (2016)	Team Performance Management	Decentralisation attempts that aim to increase job autonomy do not always succeed. This paper aims to study to what extent the tendency to maintain existing operational task divisions is an important explanation for this lack of success	Although decentralisation attempts seemed important for increasing job autonomy, the way in which the operational tasks were divided and even changed, was at least as important for a successful decentralisation process	A cross-sectional intervention study wherein 456 employees in 25 organisations participated

Table 6: Summary of the articles

Appendix G: Overview results per article

The numbers, comments, conclusions and relationship(s) are per article described. At the end of Appendix G, an overview from *Atlas.ti* with numbers from the articles and indicators is presented.

Article 1: High road and low road teamworking: Perceptions of management rationales and organizational and human resource outcomes. Bacon & Blyton (2000).

Numbers

There is not much direct attention for quality of work. The term quality of working life is 1 time mentioned in this article, but the terms quality of work and quality of work life are both not mentioned.

First, QOW. Of this concept an indicator of 'Health and wellbeing' is 1 time assigned to a quotation. The indicators of 'Competence development' and 'Job security' are both not assigned. Moreover, the indicator of 'QOW, other but relevant' is 6 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are not assigned to quotations, the indicator of 'Self-regulation' is 17 times assigned and the indicators of an 'LPVS' 30 times. In addition, the indicators of 'STSD, other but relevant' are 10 time assigned.

Comments

An example of a labelled quotation of 'Health and wellbeing' is: *"The powerful effect reported by layering management with the introduction of teamworking supports the view that decentralizing some decision-making power to teams (Dunphy & Bryant, 1996) may be the most important factor associated with high road teamworking in this industry."* (Health and wellbeing characteristic 2: There is work method autonomy, Parameter 4 up to and including 7 and Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control).

Besides that, there is mentioned: *"The relationship we discovered between management rationales, the type of teamworking and outcomes supports research that indicates the*

importance of the link between HR policies and broader business strategies.” (STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

In general, the article is about high road teamworking, a quotation that was labelled as ‘Self-regulation’ is seen as relevant: *“High road according to six dimensions: variety of tasks in teams; identification with team tasks; expertise in teams; stability and belief in teams; power to make decisions; and rewards. These dimensions relate to broader literature: first, sociotechnical systems theory and work design, and second, participative management explanations of effective teams.”* (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and Parameter 1 up to and including 7). In addition to that, the quotation was labelled: *“Reducing the number of management layers with the introduction of teamworking was associated with managers pursuing social and cultural rationales for introducing teams, all three measures of organizational performance (plant competitiveness, customer care and product quality), all three measures of worker responses (motivation, interest in and enjoyment of the job), the quality of training, several aspects of communication and co-operation, and three aspects of health and safety improvements.”* (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control, STSD, other but relevant 2: Other, QOW, other but relevant 1: Other).

Conclusions

As a conclusion, aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and almost all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation is most noticeable in the article. Self-regulation (in the article, it is very explicit mentioned as high road teamworking) shows to be related to health and wellbeing (there is work method autonomy).

Relationship(s)

Self-regulation -> health and wellbeing (there is work method autonomy)

Article 2: Multidisciplinary teamwork is an important issue to healthcare professionals. Bitter, Van Veen-Berkx, Gooszen & Van Amelsvoort (2013).

Numbers

There is not much direct attention for quality of work. The term quality of working life is 2 times mentioned in this article, but the terms quality of work and quality of work life are both not mentioned.

First, QOW. Of this concept the indicators of 'Health and wellbeing' are 5 times assigned to quotations. An indicator of 'Competence development' is 1 time assigned and the indicators of 'Job security' are not assigned at all. Moreover, the indicator of 'QOW, other but relevant' is 8 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are 9 times assigned to quotations, the indicator of 'Self-regulation' is 15 times assigned and the indicators of an 'LPVS' 42 times. In addition, an indicator of 'STSD, other but relevant' is 1 time assigned.

Comments

An example of a labelled quotation of 'Health and wellbeing' is: *"The cross-functional teams act primarily as well-informed, professional organisations, although frustrations remain and must be addressed. The participants are given the opportunity to be honest and have discussions regarding the organisation, processes, attitudes, and behaviour in a safe environment."* (Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption).

Besides that, the indicator 'Parameter 7' is often noticed, an example of this is: *"The underlying goal of forming multidisciplinary teams is to break the silo organisation (a silo is a tall, narrow structure, indicating that the organisation was too vertical (hierarchical) organisation) and focus on self-interest."* (Parameter 1 up to and including 7 and Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control) and *"CFTs are responsible for the planning, results, and organisation of the specific OR facilities and its patients."* (Parameter 7).

In general, a quotation that was labelled as other relevant information was: *"With its socio-technical design, a hospital's cross-functional OR scheduling team is better prepared to address over-utilisation, under-utilisation, and schedule deviations and, thereby preventing cancellations. With higher employee satisfaction and an increase in the number of patients administered, the facility's scarce resources can be optimally utilised. Consequently, control*

options play an essential role in collaboration within a cross-functional OR schedule team.”
(STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

Conclusions

As a conclusion, aspects of QOW (mainly health and wellbeing) are mentioned in this article, and all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation in combination with parameter 7 is most noticeable in the article and shows to be related to health and wellbeing.

Relationship(s)

Self-regulation -> health and wellbeing

Parameter 7 -> health and wellbeing

Article 3: Characteristics of work organization in UK and Philippine call centres. Clark (2007).

Numbers

There is not much direct attention for quality of work. The terms quality of work, quality of working life and quality of work life are not mentioned in the article.

First, QOW. Of this concept the indicators of ‘Health and wellbeing’ are 8 times assigned to quotations. The indicators of ‘Competence development’ are 6 times assigned and an indicator of ‘Job security’ is 1 time assigned. Moreover, the indicator of ‘QOW, other but relevant’ is 5 times assigned.

Besides that, of the concept STSD the indicators of ‘Open system’ are 6 times assigned to quotations, the indicator of ‘Self-regulation’ is 13 times assigned and the indicators of an ‘LPVS’ 35 times. In addition, the indicators of ‘STSD, other but relevant’ are 18 times assigned.

Comments

Example of a labelled quotation of ‘Health and wellbeing’ are: *“The agents are motivated as they are constantly involved in improving their skills and the performance of the team.”*

(Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption) and *“The agent is given autonomy in the pace he converses with the clients,*

particularly when trying to close the deal. He can devise and pursue different sales strategies to convince the client that his interests are being served to the utmost” (Health and wellbeing characteristic 2: There is work method autonomy). An example of ‘Competence development’ is: *“Another way by which interdependence is exhibited in this case is through on-the-job learning from experienced peers, who are an important source of tacit knowledge.”* (Competence development characteristic 1: There are opportunities for training skills) and *“The agents are multifunctional”* (Competence development characteristic 1: There are opportunities for training skills and Competence development characteristic 2: There are opportunities for career development).

Besides that, self-regulation and the parameters 1, 2, 3 and 7 are often noticed: *“The teams are self-managing in the sense that the team members are given leeway in almost every aspect of job improvement.”* (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and Health and wellbeing characteristic 2: There is work method autonomy), *“The sales agents in the UK case study have standardized skills. Each of them could perform the whole task from interviewing of incoming callers, data entry of the required information on the computer, to obtaining payment and closing the sale.”* (Parameter 1 up to and including 3) and *“The team leader acts more as a facilitator than a hierarchical supervisor.”* (Parameter 7).

In general, in the article there are two cases, which are related to socio-technical systems design and lean production. The parts that are only about lean production are not relevant for this thesis and therefore were often not labelled or labelled as ‘STSD, other but relevant 1: Different when compared to STSD principles’. In the RP case study, there are only labels named ‘STSD, other but relevant’. Examples of this are *“The agent has no control over elements of his work”* (STSD, other but relevant 1: Different when compared to STSD principles) and *“Based on an analysis of the data, the UK case study has shown a stronger affinity to the STS model while the RP case study has shown a greater affinity to the LP model”* (STSD, other but relevant 2: Other). This latter quotation is in line with the assigned labels, in the UK case study there are labels that are related to socio-technical systems design.

Conclusions

As a conclusion, aspects of QOW (mainly health and wellbeing and competence development) are mentioned in this article, and all the indicators of STSD are labelled. The

dimension of self-regulation in combination with parameters 1, 2, 3 and 7 is most noticeable in the article and shows to be related to health and wellbeing and competence development.

Relationship(s)

Self-regulation -> health and wellbeing

Parameter 1 -> health and wellbeing

Parameter 2 -> health and wellbeing

Parameter 3 -> health and wellbeing

Parameter 7 -> health and wellbeing

Self-regulation -> competence development

Parameter 1 -> competence development

Parameter 2 -> competence development

Parameter 3 -> competence development

Parameter 7 -> competence development

Article 4: The impact of autonomy and task uncertainty on team performance: A longitudinal field study. Cordery, Morrison, Wright & Wall (2010).

Numbers

There is not much direct attention for quality of work. The terms quality of work, quality of working life and quality of work life are not mentioned in the article.

First, QOW. Of this concept an indicator of 'Health and wellbeing' is 5 times assigned to quotations. The indicators of 'Competence development' and 'Job security' are not assigned at all. Moreover, the indicator of 'QOW, other but relevant' is 13 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are 4 times assigned to quotations, the indicator of 'Self-regulation' is 18 times assigned and the indicators of an 'LPVS' 39 times. In addition, an indicator of 'STSD, other but relevant' is 3 times assigned.

Comments

An example of a labelled quotation of 'Health and wellbeing' is: *"Overall, increased team autonomy generated proportionately greater improvements in this key aspect of performance for work teams scoring higher on the measure of task uncertainty"* (Health and wellbeing

characteristic 2: There is work method autonomy and Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control).

Besides that, the parameters 4, 5, 6 and 7 are often noticed, an example of this is: “*The roles of the previous first- and second-level management were simply subsumed in the team’s role.*” (Parameter 1 up to and including 7)

In general, a quotation that was labelled as other relevant information was: “*this study provides clear empirical evidence that the level of task uncertainty experienced by a team can influence team performance and also moderate the impact of team-based work design interventions on performance.*” (STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

Conclusions

As a conclusion, aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation in combination with parameters 4, 5, 6 and 7 is most noticeable in the article and shows to be related to health and wellbeing (there is work method autonomy).

Relationship(s)

Self-regulation -> health and wellbeing (there is work method autonomy)

Parameter 4 -> health and wellbeing (there is work method autonomy)

Parameter 5 -> health and wellbeing (there is work method autonomy)

Parameter 6 -> health and wellbeing (there is work method autonomy)

Parameter 7 -> health and wellbeing (there is work method autonomy)

Article 5: Missing links: Production structures and quality of working life in the clothing industry. Dhondt & Benders (1998).

Numbers

There is much direct attention for quality of work. The term quality of working life is 20 times mentioned in this article, the term quality of work 4 times and the term quality of work life is not mentioned.

First, QOW. Of this concept the indicators of ‘Health and wellbeing’, ‘Competence development’ and ‘Job security’ are not assigned at all. Moreover, the indicator of ‘QOW, other but relevant’ is 9 times assigned.

Besides that, of the concept STSD the indicators of ‘Open system’ are not assigned to quotations, the indicator of ‘Self-regulation’ is 4 times assigned and the indicators of an ‘LPVS’ 9 times. In addition, the indicators of ‘STSD, other but relevant’ are 22 times assigned.

Comments

Examples of labelled quotations of ‘QOW, other but relevant’ and ‘STSD, other but relevant 2: Other’ are: *“The good news about the loose coupling between production structure and the quality of working life would be that functional and line-oriented structures do not necessarily lead to a low quality of working life. The bad news, however, is that the options offered by a group structure are not always used in organizational practice.”* (QOW, other but relevant 1: Other and STSD, other but relevant 2: Other) and *“The article set out to test two propositions: P1: Product-oriented structures are more likely than machine-oriented and line structures to have decentralized control structures. P2: Product-oriented structures are more likely than functional and line structures to have a high quality of working life. Neither one of these was supported by the empirical material presented above. The links are missing.”* (QOW, other but relevant 1: Other and STSD, other but relevant 2: Other).

In general, in the results section there is elaborated on three structures; line-oriented production structure, machine-oriented production structure and product-oriented production structure, which is a declaration of the often-used label ‘STSD, other but relevant 1: Different when compared to STSD principles’. In the part about line-oriented production structure this labelled quotation is noticed: *“Planning, division of tasks and organizing tasks are the sole responsibility of supervisory personnel in these companies. This result reinforces the image presented earlier that most of these companies are quite centralized and therefore still possess a strongly divided work division”* (STSD, other but relevant 1: Different when compared to STSD principles). This is also the case in the part noticed in the machine-oriented production structure: *“Job rotation is quite common in these companies, teamwork is not. These companies have an even more divided work organization than line-oriented companies”* (STSD, other but relevant 1: Different when compared to STSD principles). In

contrast to that a quotation from the product-oriented production structure part: *“In product-oriented companies, corrective repair by seamstresses is less frequent and seamstresses have slightly more possibilities to shape their own working environment. But in most companies, it is the supervisor who takes care of the co-ordination and support of all activities.”* (Parameter 1 up to and including 7, Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and STSD, other but relevant 1: Different when compared to STSD principles). It was noticed that: *“seamstresses working in a group structure perform more planning tasks than their counterparts in functional or line-oriented structures. However, this only holds for planning tasks.”* (Parameter 5 and 7) and *“For all other categories, either the score is equal, or the functional and line-oriented structure score even higher than the group structure”* (STSD, other but relevant 1: Different when compared to STSD principles).

Conclusions

As a conclusion, aspects of QOW are not mentioned in this article, and not all the indicators of the dimensions of STSD are (often) labelled. A conclusion of this article was that planning tasks are more visible in group structures, but a lot of links are missing, and in labelling the quotations these are not linked to aspects of QOW. This research shows no relationship between adhering to STSD principles and QOW.

Relationship(s)

No.

Article 6: The importance of organizational level decision latitude for well-being and organizational commitment. Dhondt, Pot, & Kraan (2014).

Numbers

There is not much direct attention for quality of work. The term quality of working life is 4 times mentioned and the terms quality of work and quality of work life are both not mentioned in the article.

First, QOW. Of this concept the indicators of ‘Health and wellbeing’ are 11 times assigned to quotations. The indicators of ‘Competence development’ and ‘Job security’ are not assigned at all. Moreover, the indicator of ‘QOW, other but relevant’ is 19 times assigned.

Besides that, of the concept STSD an indicator of 'Open system' is 9 times assigned to quotations, the indicator of 'Self-regulation' is 13 times assigned and the indicators of an 'LPVS' 71 times. In addition, an indicator of 'STSD, other but relevant' is 12 times assigned.

Comments

Example of labelled quotations of 'Health and wellbeing' are: *"Functional support and organizational level decision latitude relate positively to subjective well-being and organizational commitment and seem to be even more important than job autonomy. Job autonomy only relates positively to organizational commitment"* (Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption, Health and wellbeing characteristic 2: There is work method autonomy, Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and Parameter 1 up to and including 7) and *"This study showed that high job autonomy related only weakly to high organizational commitment. Autonomy related to subjective well-being only in combination with organizational level decision latitude and did so ambiguously."* (Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption and Health, wellbeing characteristic 2: There is work method autonomy, Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and Parameter 1 up to and including 7).

Besides that, the indicators of an 'LPVS' is often noticed, an example of this is: *"For organizational policy, the recommendation obviously is to create job control opportunities at the three levels of job autonomy, functional support and organizational level decision latitude to enhance organizational commitment and employee well-being."* (Parameter 1 up to and including 7, Open system characteristic 1: Internal environment, Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control).

In general, a quotation that was labelled as other relevant information was: *"The results also show that the three dimensions of job control – job autonomy, functional support and organizational level decision latitude – are necessary requirements for better workplaces. This shows the importance of an integral approach to redesign workplaces, rather than partial redesign."* (Open system characteristic 1: Internal environment, Parameter 1 up to and including 7, Self-regulation characteristic 1: Small units, internal coordination and semi-

autonomous control and STSD, other but relevant 2: Other). A general approach to (re)design workplaces is needed.

Conclusions

As a conclusion, aspects of QOW (only health and wellbeing) are mentioned in this article, and almost all the indicators of the dimensions of STSD are labelled. Although self-regulation and aspects of an LPVS structure are mentioned, decision latitude was more important than job autonomy and it is not very clear which aspects of STSD result in which aspects of QOW. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.

Relationship(s)

Aspects of STSD -> QOW in general

Article 7: Leadership, perceived team climate and process improvement in municipal government. Howard, Foster, & Shannon (2005).

Numbers

There is not much direct attention for quality of work. The terms quality of work, quality of working life and quality of work life are not mentioned in the article.

First, QOW. Of this concept the indicators of 'Health and wellbeing' are 9 times assigned to quotations. An indicator of 'Competence development' is 1 time assigned and the indicators of 'Job security' are not assigned at all. Moreover, the indicator of 'QOW, other but relevant' is 8 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are 19 times assigned to quotations, the indicator of 'Self-regulation' is 18 times assigned and the indicators of an 'LPVS' 14 times. In addition, an indicator of 'STSD, other but relevant' is 7 times assigned.

Comments

Example of a labelled quotation of 'Health and wellbeing' are: "*perceived team climate significantly explained variance in employee satisfaction, process improvement, and perceived customer satisfaction*" (Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption and Self-regulation characteristic 1: Small

units, internal coordination and semi-autonomous control) and “*Both technical training and perceived team climate was associated with employee job satisfaction.*” (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and, Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption, Health and wellbeing characteristic 2: There is work method autonomy and Competence development characteristic 1: There are opportunities for training skills).

Besides that, the indicator of ‘Self-regulation’ is often noticed, an example of this is: “*Perceived team climate includes perceptions of a shared commitment to teamwork, participative safety, high standards of performance, and systemic support for cooperation*” (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control)

Conclusions

As a conclusion, aspects of QOW (mainly health and wellbeing) are mentioned in this article, and all the indicators of the dimensions of STSD are labelled. The dimensions of open system and self-regulation are most noticeable in the article and shows to be related to health and wellbeing. However, the article is mainly about perceived team climate and the aspects of an LPVS are not often mentioned and linked to QOW. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.

Relationship(s)

Aspects of STSD -> QOW in general

Article 8: The impact of management and employees on cellular manufacturing implementation. Olorunniwo & Udo (2002).

Numbers

There is not much direct attention for quality of work. The term quality of work life is 3 times mentioned, and the terms quality of work and quality of working life are both not mentioned in the article.

First, QOW. Of this concept an indicator of ‘Health and wellbeing’ is 2 times assigned to quotations. An indicator of ‘Competence development’ is 3 times assigned and the indicators

of 'Job security' are not assigned at all. Moreover, the indicator of 'QOW, other but relevant' is 3 times assigned.

Besides that, of the concept STSD an indicator of 'Open system' is 1 time assigned to quotations, the indicator of 'Self-regulation' is 4 times assigned and the indicators of an 'LPVS' 27 times. In addition, an indicator of 'STSD, other but relevant' is 5 times assigned.

Comments

An example of a labelled quotation of 'Competence development' is: "*'Employees are cross-trained to run machines' Quality is higher and costs are lower where the employees are cross-trained to run machines.*" (Competence development characteristic 1: There are opportunities for training skills).

Besides that, the parameters 1, 2 and 3 are often noticed, an example of this is: "*one cell operator can be assigned to any machine should one of the team members be absent, and cross-training on all machines ensures that quality problems and operating costs may not increase.*" (Parameter 1 up to and including 3 and Competence development characteristic 1: There are opportunities for training skills).

In general, a quotation that was also labelled was: "*Most likely, workers' improved attitudes, sense of job satisfaction, and morale, may have positively affected their commitment to produce quality products and reduce costs.*" (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control, Parameter 1 up to and including 7 and Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption). In cellular manufacturing there is a positive effect on the commitment of workers.

Conclusions

As a conclusion, aspects of QOW (health and wellbeing; workers feel a sense of fulfilment, vigour, dedication and absorption, and competence development; there are opportunities for training skills) are mentioned in this article, and almost all the indicators of the dimensions of STSD are labelled. Especially, in this article and related to cellular manufacturing, the parameters 1, 2 and 3 are noticeable and shows to be related to health and wellbeing (workers

feel a sense of fulfilment, vigour, dedication and absorption) and competence development (there are opportunities for training skills).

Relationship(s)

Parameter 1 -> health and wellbeing (workers feel a sense of fulfilment, vigour, dedication and absorption)

Parameter 2 -> health and wellbeing (workers feel a sense of fulfilment, vigour, dedication and absorption)

Parameter 3 -> health and wellbeing (workers feel a sense of fulfilment, vigour, dedication and absorption)

Parameter 1 -> competence development (there are opportunities for training skills)

Parameter 2 -> competence development (there are opportunities for training skills)

Parameter 3 -> competence development (there are opportunities for training skills)

Article 9: Teamworking and performance: the extent and intensity of teamworking in the 1998 UK Workplace Employee Relations Survey (WERS98). Procter & Burridge (2008).

Numbers

There is not much direct attention for quality of work. The terms quality of work, quality of working life and quality of work life are not mentioned in the article.

First, QOW. Of this concept an indicator of 'Health and wellbeing' is 4 times assigned to quotations. The indicators of both 'Competence development' and 'Job security' are not assigned at all. Moreover, the indicator of 'QOW, other but relevant' is 15 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are not assigned to quotations, the indicator of 'Self-regulation' is 9 times assigned and the indicators of an 'LPVS' 21 times. In addition, an indicator of 'STSD, other but relevant' is 14 times assigned.

Comments

An example of a labelled quotation of 'Health and wellbeing' is: *"in both the productivity and quality equations the modified variable representing semi-autonomous teamworking is positive and statistically significant. This suggests it is the level of responsibility exercised by teams that impact upon these measures of performance rather than teamworking per se."*

(Health and wellbeing characteristic 2: There is work method autonomy).

Besides that, the indicator of ‘Self-regulation’ is often noticed, an example of this is: *“the first two aspects of autonomy are in evidence: teams are given responsibility for specific products or services and can jointly decide how work is done”* (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control, Parameter 1 up to and including 7 and QOW, other but relevant 1: Other).

In general, quotations that were labelled as other relevant information were: *“STS theory. The emphasis in the latter is on the organizational flexibility facilitated by teamworking rather than the motivational impact of the design of individual jobs.”* (STSD, other but relevant 2: Other and QOW, other but relevant 1: Other) and *“Our study did not allow for a direct test of STS theory”* (STSD, other but relevant 2: Other).

Conclusions

As a conclusion, aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and not all the indicators of the dimensions of STSD are labelled. The dimension of self-regulation is most noticeable in the article. However, the authors of the article state that a direct test of STSD theory was not possible and the suggestion was that the theory need more attention. This is in line with the results of the labels that were assigned to quotations. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.

Relationship(s)

Aspects of STSD -> QOW in general

Article 10: A socio-technical approach for improving a Brazilian shoe manufacturing system. Renner, De M. Guimarães & De Oliveira (2012).

Numbers

There is not much direct attention for quality of work. The terms quality of work, quality of working life and quality of work life are not mentioned in the article.

First, QOW. Of this concept the indicators of ‘Health and wellbeing’ are 4 times assigned to quotations. The indicators of ‘Competence development’ are 4 times assigned and the

indicators of 'Job security' are 7 times assigned. Moreover, the indicator of 'QOW, other but relevant' is 4 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are 6 times assigned to quotations, the indicator of 'Self-regulation' is 3 times assigned and the indicators of an 'LPVS' 34 times. In addition, the indicators of 'STSD, other but relevant' are 7 times assigned.

Comments

An example of a labelled quotation of 'Job security' is: *"To override the impact of external environment on the stability of the workforce, the enterprise is focusing more on the internal market, therefore being less dependent on the external one, and investing in the improvement of the personnel sub-system (by training the workers and maintaining their jobs)."* (Job security characteristic 1: Work is at regular basis, Competence development characteristic 1: There are opportunities for training skills, Competence development characteristic 2: There are opportunities for career development, Open system characteristic 1: Internal environment and Open system characteristic 2: External environment)

Besides that, the indicators Parameter 1 up to and including 3 are noticed, an example of this is: *"Teams were formed with 6 to 8 people who, during the working day, and as they got more experience, could occupy any workstation in any group."* (Parameter 1 up to and including 3). These are the indicators that are assigned to quotations most, but at large there are no great outliers.

In general, an emphasizing labelled quotation in the article is: *"The results made clear that the socio-technical (multi-functional and collective) model is one of the alternatives for making the work more flexible to meet the demands of an increasingly demanding and competitive globalized market, which affects the entire footwear industry"* (STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

Conclusions

As a conclusion, aspects of QOW (health and wellbeing, competence development and especially job security) are mentioned in this article, and all the indicators of the dimensions

of STSD were labelled. The parameters 1, 2 and 3 are most noticeable in the article and shows to be related to health and wellbeing, competence development and job security.

Relationship(s)

Parameter 1 -> health and wellbeing

Parameter 2 -> health and wellbeing

Parameter 3 -> health and wellbeing

Parameter 1 -> competence development

Parameter 2 -> competence development

Parameter 3 -> competence development

Parameter 1 -> job security

Parameter 2 -> job security

Parameter 3 -> job security

Article 11: Improving the primary task: Effects of implementation intensity on employee health and organizational performance. Sorensen (2016).

Numbers

There is not much direct attention for quality of work. The term quality of work is 1 time mentioned and the terms quality of working life and quality of work life are both not mentioned in the article.

First, QOW. Of this concept the indicators of 'Health and wellbeing' are 4 times assigned to quotations. The indicators of 'Competence development' and 'Job security' are both not assigned to quotations. Moreover, the indicator of 'QOW, other but relevant' is 17 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are 2 times assigned to quotations, the indicator of 'Self-regulation' is 1 time assigned and the indicators of an 'LPVS' 7 times. In addition, an indicator of 'STSD, other but relevant' is 13 times assigned.

Comments

An example of a labelled quotation of 'Health and wellbeing' is: *"By collaborating with the employees and by focussing on the organizational needs that the employees find most salient (restructuring of work tasks, more effective meetings, social coherence, improved*

professionalism, etc.), management can create improvements that benefit both employees and users.” (Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption, Health and wellbeing characteristic 2: There is work method autonomy, Open system characteristic 1: Internal environment, Open system characteristic 2: External environment, Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and Parameter 1 up to and including 7).

Besides that, the dimensions ‘STSD, other but relevant’ and ‘QOW, other but relevant’ is noticed, an example of this is: *“The review identifies a range of organizational resources that affect employee well-being and health and organizational performance, such as transformational leadership, positive labour-management relations, self-determination and autonomy, and training and development. Outcome measures included job satisfaction, well-being, employee turnover and commitment. Performance measures included management rated performance, financial performance, innovation performance, productivity and quality of service.”* (STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

In general, a quotation that was labelled as other relevant information was: *“The results support the already established proposition that employee health and organizational effectiveness is related”* (Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption, Health and wellbeing characteristic 2: There is work method autonomy, STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

Conclusions

As a conclusion, not many and not often are aspects of QOW (only health and wellbeing) mentioned in this article, and the indicators of the dimensions of STSD are not often labelled. The few labelled quotations show no clear support for (aspects of) quality of work. This research shows no relationship between adhering to STSD principles and QOW.

Relationship(s)

No.

Article 12: Work systems, quality of working life and attitudes of workers: an empirical study towards the effects of team and non-teamwork. Steijn (2001).

Numbers

There is not much direct attention for quality of work. The term quality of working life is 6 times mentioned, and the terms quality of work and quality of work life are both not mentioned in the article.

First, QOW. Of this concept the indicators of 'Health and wellbeing' are 9 times assigned to quotations. The indicators of 'Competence development' are 4 times assigned and the indicators of 'Job security' are not assigned at all. Moreover, the indicator of 'QOW, other but relevant' is 13 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are not assigned to quotations, the indicator of 'Self-regulation' is 10 times assigned and the indicators of an 'LPVS' 14 times. In addition, the indicators of 'STSD, other but relevant' are 16 times assigned.

Comments

An example of a labelled quotation of 'Health and wellbeing' is: *"work systems are an important factor for the quality of working life and the shaping of attitudes of workers. This is especially true with respect to autonomy ($\eta = 0.27$), learning ($\eta = 0.19$), and commitment ($\eta = 0.16$)."* (Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption, Health and wellbeing characteristic 2: There is work method autonomy, Competence development characteristic 1: There are opportunities for training skills, Competence development characteristic 2: There are opportunities for career development and STSD, other but relevant 2: Other).

Besides that, the indicator of 'Self-regulation' is often noticed, an example of this is: *"Surprisingly, significant effects on the complexity of the work and work pressure are absent. Therefore, teamworking seems to result in neither a higher nor a lower work pressure."* (Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous control and Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedication and absorption).

In general, a quotation that was labelled as other relevant information was: *"Professional workers clearly have more autonomy than teamworkers, who in turn have more autonomy*

than workers in a Tayloristic work system.” (STSD, other but relevant 2: Other and Health and wellbeing characteristic 2: There is work method autonomy).

Conclusions

As a conclusion, aspects of QOW (health and wellbeing and competence development) are mentioned in this article, and most of the indicators of the dimensions of STSD are labelled. It is mentioned in the article that especially autonomy, learning and commitment is high in STSD. The dimension of self-regulation is most noticeable in the article and shows to be related to health and wellbeing and competence development.

Relationship(s)

Self-regulation -> health and wellbeing

Self-regulation -> competence development

Article 13: The moderating role of just-in-time on sociotechnical practices' effect over quality and workers' health. Tortorella, Fettermann, Piñeres & Gaiardelli (2019).

Numbers

There is not much direct attention for quality of work. The terms quality of work and quality of working life are both 1 time mentioned, and quality of work life is not mentioned in the article.

First, QOW. Of this concept the indicators of 'Health and wellbeing', 'Competence development' and 'Job security' are all not assigned. Moreover, the indicator of 'QOW, other but relevant' is 11 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are 5 times assigned to quotations, the indicator of 'Self-regulation' is 1 time assigned and the indicators of an 'LPVS' 7 times. In addition, the indicators of 'STSD, other but relevant' are 15 times assigned.

Comments

An example of a labelled quotation in this article is: *“both ST constructs (WD and OP) are significant and positively associated ($\beta = 0.386$ and $\beta = 0.271$; $p < 0.001$, respectively) with*

quality and workers' health" (STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

Besides that, a quotation was labelled: *"we confirmed that the use of the 18 ST practices contributes to improving the performance on scrap and rework, as well as enhancing life quality at work mitigating absenteeism and turnovers through the reduction of accidents and injuries."* (STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

Conclusions

As a conclusion, aspects of QOW are mentioned in this article but they are not directly related to the dimensions. All the indicators of the dimensions of STSD are labelled. The dimension of open system is most noticeable in the article. It could be stated that there shows to be a relation between work design and quality of work. In the results section of the article not many labels of QOW and only labels that are considered as 'QOW, other but relevant' were assigned to quotations, but the authors of the article state that work design and organisational practices are significant and positive in this research. The difference in analysing the assigned labels and the conclusion of the article might rely on the other aspects of the article that are about lean manufacturing and the just-in-time principle. It is not very clear which aspects of STSD result in which aspects of QOW. STSD shows to be related to quality of work in general, but stating a specific relationship is not possible.

Relationship(s)

Aspects of STSD -> QOW in general

Article 14: Putting a band-aid on a wooden leg: A sociotechnical view on the success of decentralisation attempts to increase job autonomy. Vermeerbergen, Van Hootegem & Benders (2016).

Numbers

There is not much direct attention for quality of work. The term quality of working life is 3 times mentioned, and the terms quality of work and quality of work life are both not mentioned in the article.

First, QOW. Of this concept an indicator of 'Health and wellbeing' is 4 times assigned to quotations. The indicators of 'Competence development' and 'Job security' are both not assigned. Moreover, the indicator of 'QOW, other but relevant' is 6 times assigned.

Besides that, of the concept STSD the indicators of 'Open system' are not assigned to quotations, the indicator of 'Self-regulation' is 2 times assigned and the indicators of an 'LPVS' 50 times. In addition, the indicators of 'STSD, other but relevant' are 13 times assigned.

Comments

An example of a labelled quotation of 'Health and wellbeing' is: *"jobs in organisations with a flow- and operation- structure had no increase in job autonomy, jobs in organisations with a stream-oriented structure had a slight increase in job autonomy, jobs in organisations which went from an operation-oriented to a stream-oriented structure had an increase in job autonomy and finally, jobs in organisations which went from an operation-oriented to a combination of a operation- and stream-oriented structure had a decrease in job autonomy."* (Health and wellbeing characteristic 2: There is work method autonomy, STSD, other but relevant 2: Other and QOW, other but relevant 1: Other).

Besides that, the parameters 1, 2 and 3 are often noticed, an example of this are: *"the way in which operational tasks are divided (i.e. the operational task environment) may explain the success of decentralisation attempts at increasing job autonomy."* (Parameter 1 up to and including 3) and *"the success of decentralisation measures might be explained by the way in which the production structure is redesigned"* (Parameter 1 up to and including 3).

In general, there is a quotation that was labelled as other relevant information and could be seen as the key point of the article: *"This study shows that decentralising indirect tasks did not always lead to an increase in job autonomy. The way in which operational tasks were divided did matter."* (Parameter 1 up to and including 3, STSD, other but relevant 2: Other and QOW, other but relevant 1: Other). This is in line with the assigned labels to quotations.

Conclusions

As a conclusion, aspects of QOW (only health and wellbeing; there is work method autonomy) are mentioned in this article, and almost all the indicators of the dimensions of

STSD are labelled. The parameters 1, 2 and 3 are most noticeable in the article and shows to be related to health and wellbeing (there is work method autonomy).

Relationship(s)

Parameter 1 -> health and wellbeing (there is work method autonomy)

Parameter 2 -> health and wellbeing (there is work method autonomy)

Parameter 3 -> health and wellbeing (there is work method autonomy)

As total per article

Confirms there is a specific relationship [1,2,3,4,8,10,12,14]

Confirms there is a relationship, but only in general [6,7,9,13]

No evidence for a relationship [5,11]

	1 Bacon, N., & Bl...	2 Bitter, J., Van V...	3 Clark, E. E. (20...	4 Cordery, J. L.,...	5 Dhondt, S., & B...
● ◇ Competence development characteristic 1: There are opportunities for training skills		1	5		
● ◇ Competence development characteristic 2: There are opportunities for career developm...			1		
● ◇ Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedicati...		4	2		
● ◇ Health and wellbeing characteristic 2: There is work method autonomy	1	1	6	5	
● ◇ Job security characteristic 1: Work is at regular basis			1		
● ◇ Job security characteristic 2: Work is at acceptable working hours					
● ◇ Open system characteristic 1: Internal environment		6	5	3	
● ◇ Open system characteristic 2: External environment		3	1	1	
● ◇ Parameter 1: The degree of functional concentration	4	4	7	3	1
● ◇ Parameter 2: The degree of differentiation of operational activities	5	4	5	3	1
● ◇ Parameter 3: The degree of specialization of operational activities	5	3	6	3	1
● ◇ Parameter 4: The degree of differentiation of regulatory activities into parts	4	7	4	7	1
● ◇ Parameter 5: The degree of differentiation of regulatory activities into aspects	4	8	4	7	2
● ◇ Parameter 6: The degree of specialization of regulatory activities	4	7	4	7	1
● ◇ Parameter 7: The relation between operational and regulatory activities, and hence the r...	4	9	5	9	2
● ◇ QOW, other but relevant 1: Other	6	8	5	13	9
● ◇ Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous...	17	15	13	18	4
● ◇ STSD, other but relevant 1: Different when compared to STSD principles	2		10		8
● ◇ STSD, other but relevant 2: Other	8	1	8	3	14
Totals	64	81	92	82	44

Table 7: Overview used for results per article 1/3

	6 Dhondt, S., Pot...	7 Howard, L. W.,...	8 Olorunniwo, F.,...	9 Procter, S., & B...	10 Renner, J. S.,...
● ◇ Competence development characteristic 1: There are opportunities for training skills		1	3		3
● ◇ Competence development characteristic 2: There are opportunities for career developm...					1
● ◇ Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedicati...	5	7	2		1
● ◇ Health and wellbeing characteristic 2: There is work method autonomy	6	2		4	3
● ◇ Job security characteristic 1: Work is at regular basis					2
● ◇ Job security characteristic 2: Work is at acceptable working hours					5
● ◇ Open system characteristic 1: Internal environment	9	13	1		3
● ◇ Open system characteristic 2: External environment		6			3
● ◇ Parameter 1: The degree of functional concentration	10	2	5	3	6
● ◇ Parameter 2: The degree of differentiation of operational activities	10	2	5	3	6
● ◇ Parameter 3: The degree of specialization of operational activities	10	2	5	3	6
● ◇ Parameter 4: The degree of differentiation of regulatory activities into parts	11	2	3	3	4
● ◇ Parameter 5: The degree of differentiation of regulatory activities into aspects	10	2	3	3	4
● ◇ Parameter 6: The degree of specialization of regulatory activities	10	2	3	3	4
● ◇ Parameter 7: The relation between operational and regulatory activities, and hence the r...	10	2	3	3	4
● ◇ QOW, other but relevant 1: Other	19	8	3	15	4
● ◇ Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous...	13	18	4	9	3
● ◇ STSD, other but relevant 1: Different when compared to STSD principles	1				2
● ◇ STSD, other but relevant 2: Other	11	7	5	14	5
Totals	135	76	45	63	69

Table 8: Overview used for results per article 2/3

	11 Sorensen, O....	12 Steijn, B. (200...	13 Tortorella, G....	14 Vermeerberge...	Totals
● ◇ Competence development characteristic 1: There are opportunities for training skills		2			15
● ◇ Competence development characteristic 2: There are opportunities for career developm...		2			4
● ◇ Health and wellbeing characteristic 1: Workers feel a sense of fulfilment, vigour, dedicati...	2	5			28
● ◇ Health and wellbeing characteristic 2: There is work method autonomy	2	4		4	38
● ◇ Job security characteristic 1: Work is at regular basis					3
● ◇ Job security characteristic 2: Work is at acceptable working hours					5
● ◇ Open system characteristic 1: Internal environment	1		3		44
● ◇ Open system characteristic 2: External environment	1		2		17
● ◇ Parameter 1: The degree of functional concentration	1	2	1	10	59
● ◇ Parameter 2: The degree of differentiation of operational activities	1	2	1	10	58
● ◇ Parameter 3: The degree of specialization of operational activities	1	2	1	10	58
● ◇ Parameter 4: The degree of differentiation of regulatory activities into parts	1	2	1	5	55
● ◇ Parameter 5: The degree of differentiation of regulatory activities into aspects	1	2	1	5	56
● ◇ Parameter 6: The degree of specialization of regulatory activities	1	2	1	5	54
● ◇ Parameter 7: The relation between operational and regulatory activities, and hence the r...	1	2	1	5	60
● ◇ QOW, other but relevant 1: Other	17	13	11	6	137
● ◇ Self-regulation characteristic 1: Small units, internal coordination and semi-autonomous...	1	10	1	2	128
● ◇ STSD, other but relevant 1: Different when compared to STSD principles		4	1	5	33
● ◇ STSD, other but relevant 2: Other	13	12	14	8	123
Totals	44	66	39	75	975

Table 9: Overview used for results per article 3/3

Appendix H: Overview results per variable

The results per variable described is described in Appendix H. Between the square brackets the articles are mentioned.

Possible relationships	
Open system (2 indicators)	Health and wellbeing (2 indicators)
Self-regulation (1 indicator)	Competence development (2 indicators)
LPVS (7 indicators)	Job security (2 indicators)

Table 10: Overview possible relationships

10 (open system with 2 indicators, self-regulation with 1 indicator and LPVS with 7 indicators) x 6 (health and wellbeing with 2 indicators, competence development with 2 indicators and job security with 2 indicators) = 60 relationships. Besides that, a general relationship between aspects of STSD and quality of work is possible, which makes a possibility of 61 total relationships in this research.

Health and wellbeing

Self-regulation -> health and wellbeing [2]

Self-regulation -> health and wellbeing [3]

Self-regulation -> health and wellbeing [12]

Self-regulation -> health and wellbeing (there is work method autonomy) [1]

Self-regulation -> health and wellbeing (there is work method autonomy) [4]

Parameter 1 -> health and wellbeing [3]

Parameter 1 -> health and wellbeing [10]

Parameter 1 -> health and wellbeing (workers feel a sense of fulfilment, vigour, dedication and absorption) [8]

Parameter 1 -> health and wellbeing (there is work method autonomy) [14]

Parameter 2 -> health and wellbeing [3]

Parameter 2 -> health and wellbeing (workers feel a sense of fulfilment, vigour, dedication and absorption) [8]

Parameter 2 -> health and wellbeing [10]

Parameter 2 -> health and wellbeing (there is work method autonomy) [14]

Parameter 3 -> health and wellbeing [3]

Parameter 3 -> health and wellbeing (workers feel a sense of fulfilment, vigour, dedication and absorption) [8]

Parameter 3 -> health and wellbeing [10]

Parameter 3 -> health and wellbeing (there is work method autonomy) [14]

Parameter 4 -> health and wellbeing (there is work method autonomy) [4]

Parameter 5 -> health and wellbeing (there is work method autonomy) [4]

Parameter 6 -> health and wellbeing (there is work method autonomy) [4]

Parameter 7 -> health and wellbeing [2]

Parameter 7 -> health and wellbeing [3]

Parameter 7 -> health and wellbeing (there is work method autonomy) [4]

Health and wellbeing (possibilities: 10x2=20 possible relationships)		
	Workers feel a sense of fulfilment, vigour, dedication and absorption	There is work method autonomy
Open system: Internal environment	-	-
Open system: External environment	-	-
Self-regulation	[2,3,12]	[1,2,3,4,12]
Parameter 1	[3,8,10]	[3,10,14]
Parameter 2	[3,8,10]	[3,10,14]
Parameter 3	[3,8,10]	[3,10,14]
Parameter 4	-	[4]
Parameter 5	-	[4]
Parameter 6	-	[4]
Parameter 7	[2,3]	[2,3,4]

Table 11: Overview relationships health and wellbeing

In summary, there are 13 relationships. 34 times health and wellbeing show to be affected by aspects of STSD. The 34 times are all part of the 13 out of 20 possible relationships.

Competence development

Self-regulation -> competence development [3]

Self-regulation -> competence development [12]

Parameter 1 -> competence development [3]

Parameter 1 -> competence development [10]

Parameter 1 -> competence development (there are opportunities for training skills) [8]

Parameter 2 -> competence development [3]

Parameter 2 -> competence development [10]

Parameter 2 -> competence development (there are opportunities for training skills) [8]

Parameter 3 -> competence development [3]

Parameter 3 -> competence development [10]

Parameter 3 -> competence development (there are opportunities for training skills) [8]

Parameter 7 -> competence development [3]

Competence development (possibilities: 10x2=20 possible relationships)		
	There are opportunities for training skills	There are opportunities for career development
Open system: Internal environment	-	-
Open system: External environment	-	-
Self-regulation	[3,12]	[3,12]
Parameter 1	[3,8,10]	[3,10]
Parameter 2	[3,8,10]	[3,10]
Parameter 3	[3,8,10]	[3,10]
Parameter 4	-	-
Parameter 5	-	-
Parameter 6	-	-
Parameter 7	[3]	[3]

Table 12: Overview relationships competence development

In summary, there are 10 relationships. 21 times competence development show to be affected by aspects of STSD. The 21 times are all part of the 10 out of 20 possible relationships.

Job security (10 x 2 = 20 possible relationships)

Parameter 1 -> job security [10]

Parameter 2 -> job security [10]

Parameter 3 -> job security [10]

Job security (possibilities: 10x2=20 possible relationships)		
	Work is at regular basis	Work is at acceptable working hours
Open system: Internal environment	-	-
Open system: External environment	-	-
Self-regulation	-	-
Parameter 1	[10]	[10]
Parameter 2	[10]	[10]
Parameter 3	[10]	[10]
Parameter 4	-	-
Parameter 5	-	-
Parameter 6	-	-
Parameter 7	-	-

Table 13: Overview relationships job security

In summary, there are 6 relationships. 6 times job security show to be affected by aspects of STSD. The 6 times are all part of the 6 out of 20 possible relationships.

QOW in general

Aspects of STSD -> quality of work in general [6]

Aspects of STSD -> quality of work in general [7]

Aspects of STSD -> quality of work in general [9]

Aspects of STSD -> quality of work in general [13]

QOW in general (possibilities: 1x1=1 possible relationship)	
	Quality of work in general
Aspects of STSD	[6,7,9,13]

Table 14: Overview relationships QOW in general

In summary, there is 1 relationship. Quality of work in general show to be affected by aspects of STSD. This is mentioned four times.

Total relationships

In summary, there are 30 (13+10+6+1) from a total of 61 possible relationships.