

**Exploring combinations of increasing autonomy and
support that contribute to work-life balance,
improved absenteeism and roster satisfaction**
Using fuzzy set qualitative comparative analysis (fsQCA)

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Abstract

The aim of this research was to examine which combinations of self-rostering, use of modalities, worktime control, supervisory support and co-worker support contribute to work-life balance, improved absenteeism and roster satisfaction, in order to reduce the negative effects of shift work. Although substantial research towards worktime control has been conducted, little research towards self-rostering and conditions to make self-rostering successful has been carried out. Moreover, results of previous studies have contradicting findings and lack objective data from administrative sources. This study investigated combinations of conditions that lead to work-life balance, improved absenteeism and roster satisfaction. Secondary data collected within the Dutch police, which is currently experimenting with self-rostering and considered as a good representative of organizations working in shifts, was used. This data consists of interview data, survey data and data derived from the information system. The method used in this research was fsQCA. By using this method, it was possible to carry out a necessary conditions analysis and an analysis for sufficient conditions, by using fsQCA 2.5 software. The results showed that for each outcome three sufficient configurations were found, which shows that the principle of equifinality is applicable. This means that there are several configurations that lead to work-life balance, improved absenteeism and roster satisfaction. Except from one configuration, all configurations include a type of increasing autonomy over working times and support. It is important that an organization formulates a (main) goal when increasing worktime control. When this goal is formulated, organizations can look into the different configurations in order to find out which conditions to invest in and which not, in order to effectively achieve the goal. If work-life balance is the main goal, the focus should be on increasing worktime control, because it was found that work-life balance cannot be achieved when worktime control is absent. Moreover, the different configurations, including both synergies and substitutions between the conditions, showed that due to the absence of one or more conditions, other conditions should be present to be able to achieve work-life balance, improved absenteeism and roster satisfaction. Based on the findings, theoretical implications, practical implications, limitations and recommendations for future research are discussed.

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1. Introduction

1.1. Situation and complication

Some jobs require employees to work in a schedule different from a regular day shift, they work in 'alternative shifts' (Beers, 2000). Organizations that work around the clock, meaning they operate 24-hours a day and 7-days a week, often work in shifts. Examples of employees who work in alternative shifts are nurses and police officers (Beers, 2000; Rönnerberg & Larsson, 2009). Scheduling problems are more complex and challenging for these jobs (Rönnerberg & Larsson, 2009) and researchers found lots of negative effects for employees who work in shifts (e.g. Scott, 2000; Vila, 2000).

To illustrate, working alternative shifts is seen as a potential stressor (Brugere, Barrit, Butat, Cosset & Volkoff, 1997) associated with health consequences such as mental disorders (e.g. Shields, 2002). While Beers (2000) stated that the number of non-standard workers increased, most employees still work from Monday through Friday and '9-to-5' (Fenwick & Tausig, 2001). As a result, other activities in employees' social life are organized based on this 'standard schedule'. For example, schools are scheduled in the same way as the standard work schedule (Fenwick & Tausig, 2001). This challenges employees who work in shifts. Besides, night work, working in rotating shifts and working in shifts in general is found to be harmful for employees' health (e.g. Harrington et al., 1994; Puttonen, Härma & Hublin, 2010; Scott, 2000).

The increase in the number of people working alternative shifts concerns researchers and policy makers, because of the effects on physical, psychological and social adjustment (Fenwick & Tausig, 2001). Moreover, employees who struggle with physical and/or mental health problems are not too beneficial for organizational performance. Therefore, the unfavourable effects of working in shifts have to be reduced.

In 1979, Karasek already claimed, by introducing the job demand control model, that increasing autonomy contributes to an employees' capacity to cope with job demands. More recent research found worktime control to have a positive influence on employees' work-life balance, employees' health and job-related outcomes (e.g. Nijp, Beckers, Geurts, Tucker & Kompier, 2012). Worktime control can be defined as "employee's possibilities of control over the duration, position and distribution of worktime" (Nijp et al., 2012, p. 299). More specifically, schedule control was found to have a positive effect on family and health outcomes (Fenwick & Tausig, 2001). A more often used concept to describe the aforementioned practices is self-rostering or self-scheduling. This is the influence of employees on their own working hours within the boundaries of staffing requirements (Van Dalen & De Leede, 2016). Self-rostering is found to reduce the negative effects of shift work (Albertsen et al., 2007) and to increase employees' work-life balance, job satisfaction and health (e.g. Thornthwaite & Sheldon, 2004; Uijland, van der Veen, Hurink & Schutten, 2012). In the light of the increasing number of shift workers and the corresponding negative effects, self-rostering is definitely valuable to study.

Although self-rostering is a popular topic (Van Dalen & De Leede, 2016) and a lot of research towards self-rostering has been performed (e.g. Bailyn, Collins & Song, 2007; Rönnerberg & Larsson, 2009), Nijp et al. (2012) consider worktime control to be a fruitful ground for future research. They argue that more research is needed to draw conclusions about the causal influence of worktime control on relevant outcomes. Nijp et al. (2012) identified interesting topics for future research based on their systematic literature review of 63 papers regarding worktime control and work-non-work balance, health, and job-related outcomes. They argued that future studies should focus on modern worktime control practices such as self-scheduling or self-rostering. Previous research rather focussed

on control of working times instead of self-rostering (Van Dalen & De Leede, 2016). Secondly, Nijp et al. (2012) and Jansen and Baaijens (2011) stated that future research should include other data sources than self-reports as well, e.g. administrative data. Moreover, contradicting results can be found on the outcomes of self-rostering. As an example, Viitasalo, Kuosma, Laitinen and Härmä (2008) did not find evidence of recovery and general health due to worktime control, while Garde et al. (2012) did. This difference in outcomes might be explained by the fact that different types and degrees of self-rostering exist and are often used interchangeably. NCSI (2009) state that organizations already use the term self-rostering when employees only have (little) increasing control over their schedule. The differing contexts used might explain contradicting findings as well. Jansen and Baaijens (2011) noticed the contradicting results as well and request future researchers to examine which conditions need to be met in order to make self-rostering a success. Finally, Jansen and Baaijens (2011) argue that different forms of self-rostering exist. Therefore, future studies could focus on these different forms as well in order to discover which type of self-rostering works best in a particular context.

Based on the recommendations and findings of previous studies, it can be concluded that future research should focus on conditions which make self-rostering successful, by including different types of self-rostering, administrative sources and context variables in order to examine the influence of increasing worktime control on relevant outcomes. Therefore, this research will examine conditions that contribute to achieving positive outcomes of self-rostering. These outcomes are related to employees' well-being and are operationalized as work-life balance, decreasing absenteeism and roster satisfaction. Section 2.3 will further elaborate on these outcomes.

Karasek added support to the job demands control model (1979), resulting in the job demands-support-control model (Karasek & Theorell, 1990). By adding this variable, Karasek and Theorell (1990) argue that support is an important context variable for increasing autonomy in order to be able to deal with high job demands. Based on these insights, this research focusses on increasing autonomy and support as conditions for achieving work-life balance, decreasing absenteeism and roster satisfaction. In Section 2.5 and 3.3, increasing autonomy and support will be further operationalized into self-rostering, the use of modalities, worktime control, supervisory support and co-worker support. This results in the following research question:

Which combinations of self-rostering, use of modalities, worktime control, supervisory support and co-worker support contribute to work-life balance, improved absenteeism and roster satisfaction?

This research needs to adopt a holistic method, which enables to examine combinations of conditions, because the combination of increasing autonomy and support will be examined. Conjunctural causation enables to examine conditions which are sufficient and/or necessary in combination with other conditions (Schneider & Wagemann, 2010). QCA is a method that enables to examine conjunctural causation. Within conjunctural causation, sufficiency and necessity is important. A condition is necessary when it is always present if the outcome (i.e. work-life balance, decreasing absenteeism and roster satisfaction) occurs (Rihoux & Ragin, 2009). On the contrary, a condition is considered to be sufficient when the outcome always occurs when the condition is present, but the outcome can also occur when the particular condition is absent (Rihoux & Ragin, 2009). Additionally, QCA includes the principle of equifinality. Equifinality is in contrast to the unifinal perspective, which is used in many statistical techniques (Schneider & Wagemann, 2010), and enables to identify multiple pathways that lead to a given outcome (Fitzgerald, 2019).

Knowing the principles of QCA, QCA seems to be an applicable method for this research. This is because QCA is able to identify combinations of conditions that lead to a given outcome, which is considered to be important based on the job demands-control-support model. Moreover, when multiple conditions are included equifinality, which can be examined by using QCA, is often applicable for configurations (Baumgartner, 2015). Besides, a specific form of QCA, fsQCA, enables to adopt different degrees of variables by using an interval between [0] and [1] (Rihoux & Ragin, 2009). This enables this research to include different types of self-rostering. In this study, self-rostering is used as the concept to describe different degrees of self-rostering. Section 2.2 will further elaborate on these different types of self-rostering. Based on previous arguments, this study will use fsQCA to answer the research question.

1.2. Case-study description

Self-rostering is mostly applied in organizations that work in shifts, in order to provide shift workers more freedom regarding their work schedule (Nijp et al., 2012). Besides, self-rostering was found to reduce the negative effects that are involved by working in shifts (Albertsen et al., 2007). As a result, the data should be collected in an organization that has experience with different types of self-rostering and where employees work in shifts. Moreover, it should be possible to collect or obtain data on increasing autonomy, support, work-life balance, absenteeism and roster satisfaction, preferably from administrative sources as well. The particular case that fits these requirements is the Dutch police. The Dutch police is the organization that will be examined in this study.

The Dutch police, which is considered to be a good representative of organizations that work in shifts, is currently experimenting with self-rostering. The Dutch police operates 24-hours a day, 7-days a week and consequently, their employees work in shifts. The main objective of the police is to make the Netherlands safer. Their corresponding core organizational values are courageous, reliable, connective and honest (Politie, n.d.). The Dutch police is divided in ten regional units, a national unit and a police service centre. Additionally, several districts are operating at the more local level. This organizational structure is characterized by high levels of standardization and centralization (Politie, n.d.). Besides, the Dutch police is a highly formalized organization, which results in that it has to comply with a lot of rules, regulations and prescriptions.

In the collective labour agreement (2018-2020) of the Dutch police, it was announced that the employees of the Dutch police and their employability are currently important topics for the Dutch police (CGOP, 2018). Within these topics, the goal is to improve staff deployment by capacity management, which is characterized by five core concepts, namely: choosing responsible, flexibilization, cost consciousness, giving space and employee well-being. Self-rostering is one of the methods the Dutch police wants to use in order to find an optimum between labour supply and labour demand (CGOP, 2018). Additionally, the Dutch police wants to secure a good work-life balance for their employees (CGOP, 2018). Therefore, they want to expand self-rostering within the organization at both the individual and group level. Currently, around 50 to 70 teams are using some type of self-rostering at either the individual or at the group level.

The data used in this study is collected within the Dutch police. The data was collected by a consultancy company in order to objectively evaluate group and self-rostering within the Dutch police. Moreover, the data was collected to evaluate the project 'Anders Roosteren' within the Dutch police. This project involves the introduction of group and self-rostering, together with capacity management and the use of a software application related to group or self-rostering. Altogether, both qualitative and quantitative data is collected from three different data sources. Chapter 3 will further elaborate

on these three data sources. The data collected for the evaluations perfectly fits the goal of this research, because the data of the Dutch police is appropriate for fuzzy-set qualitative comparative analyses (fsQCA).

1.3. Academic and practical relevance

Although research towards self-rostering has already been done, this research is different from earlier studies, because it combines both qualitative and quantitative data from a survey, information system and interviews. Additionally, this research will contribute to academic literature by using fsQCA (Rihoux & Ragin, 2009). This, to our knowledge, has not yet been used to examine self-rostering and is therefore expected to bring rather refreshing insights within this field. This is expected because by using fsQCA, intervals instead of dichotomies can be used for the conditions and outcomes. Moreover, fsQCA contains conjunctural causation and equifinality, which enables to give insights in multiple combinations of various causal conditions. It is expected that this study will provide several configurations of conditions that contribute to the outcomes, instead of presenting the power of one single condition on the outcome (Woodside, 2013), which most studies do.

Besides, this study responds to the concern of researchers on the increasing number of people working in alternative shifts and the associated negative effects on physical and mental health, by focussing on combinations of conditions that contribute to employees' well-being. These conditions are derived from the job demands-support-control model and employees' well-being is operationalized as a good work-life balance, improved absenteeism and roster satisfaction. Identifying the conditions and exploring how combining these conditions contributes to achieving these outcomes, contributes to our knowledge on how to effectively implement or adapt the self-rostering process in practice. This gained knowledge can be used to optimize self-rostering within organizations. This in turn will contribute to achieving work-life balance, improved absenteeism and roster satisfaction, which in turn will provide several advantages for both the employees as the employer, and is expected to reduce the negative effects of shift work. Additionally, Fenwick and Tausig (2001) argue that schedule control is not only beneficial for shift workers who experience conflicting demands between work and non-work but for all workers. Therefore, the results of this research are highly relevant for practitioners, responsible for (implementing) self-rostering within organizations. In conclusion, it is expected that using this methodology will contribute to our knowledge on self-rostering, both in theory and practice, and provides a basis for future research.

1.4. Outline of the report

In the next chapter, the theoretical framework and key concepts regarding self-rostering will be introduced and explained. At the end of this chapter, three conceptual models are presented. These models display which conditions and outcomes are included in this study. The methodology used, fsQCA, will be explained in Chapter 3. Thereafter in Chapter 4, the results of this research will be presented. Eventually, in the discussion and conclusion section, the meaning, importance and relevance of the results will be discussed and the research question will be answered.

2. Theoretical framework

While self-rostering is popular nowadays, it is not particularly a new phenomenon. The idea to give employees more flexibility in working schedules was introduced for the first time in the 1960s in Sweden, in response to the pressure of unions. The concept of self-scheduling was first documented in 1963 by Jenkinson, who introduced a self-scheduling programme at a hospital (Hung, 2002). According to Van Dalen and De Leede (2016), self-rostering has been increasingly popular in The Netherlands in the last ten years. In Sweden, Stavrou and Kilanitois (2010) even claimed that more than 50% of private and public organizations implemented self-scheduling practices. Lately, ICT systems for self-rostering have developed increasingly well and are now able to facilitate different types of self-rostering, to make the individual rosters as efficient as possible (Van Dalen & De Leede, 2016). The different types and degrees of self-rostering will be discussed in Section 2.2, the following section focusses on creating a definition on self-rostering by examining relevant literature. Then, an outline of outcomes as a result of the implementation of self-rostering will be given. Finally, the important conditions for successful self-rostering will be covered and reduced in order to be able to properly use fsQCA.

2.1. Self-rostering: creating a definition

The concepts of self-rostering, self-scheduling and worktime control coexist and are often used interchangeably. Moreover, different definitions of the concepts exist. Even though different names and definitions are used, the meaning is similar and resembles control of employees over working times and schedules. However, the main concept used in this study is self-rostering. In order to be able to create a final definition of self-rostering that suits this study, the different definitions of self-rostering used in literature are discussed.

According to Teahan (1998), *self-scheduling* can be described as “a system wherein a group of staff [members] or a self-scheduling committee, when presented with the staffing needs for a particular unit or area by a manager, make their own schedule” (p. 361). A more recent definition of Van Dalen and De Leede (2016) is similar to the one of Teahan (1998). The authors state that the core of self-scheduling is the influence of the individual employee on his/her own working hours, within the boundaries of staffing requirements. Finally, *worktime control* can be defined as “employees’ possibilities of control over the duration, position, and distribution of worktime” (Nijp et al., 2012, p. 299).

While these three definitions all seem quite similar, there are some small differences. The first two definitions name the requirements or needs of the organization as the boundary of self-rostering. This involves that the employer determines the capacity requirements. These requirements form the framework for self-scheduling. It is important to keep this boundary in mind in order to avoid idealizing this concept too much. The definition of Uijland et al. (2012) adds to this that when employees do this (i.e. self-rostering) in a ‘good’ way, they will mostly work their shifts as preferred. This shows again that self-rostering is a phenomenon that needs to be implemented with care, because it is not automatically successful. Therefore, it is important to define the conditions for the successful use of self-rostering. These conditions can be found in Section 2.4.

Another difference between the three definitions is that the one of Teahan (1998) focusses on the group, while the other two focus more on the individual. This might be explained by the development of personnel policies from collectivism to more individualism in Western Europe (e.g. Brown, Deakin, Nash & Oxenbridge, 2000; De Leede, Looise & Van Riemsdijk, 2004). This implies that

personnel policies in general are nowadays more focussed on the individual instead of on the group. Besides, this difference might also be explained by the different types and degrees of self-rostering that exist. Therefore, it is important to cover the different types of self-rostering, see Section 2.2. Since self-rostering at the Dutch police is focussed on both the individual and the group level, both levels will be included in the final definition. This results in the following definition of self-rostering which will be used in this paper:

Self-rostering is the process in which an individual or group has influence on its/their schedule within the boundaries of staffing requirements.

The degree of influence an employee has, results in different types of self-rostering. The next section describes these different types of self-rostering.

2.2. Different types of self-rostering

NCSI (2009) states that as soon as employees may participate in creating the schedule, people soon refer to this as self-rostering. As a result, different types and degrees of self-rostering can be identified. However, this does not mean that in all types of self-rostering, employees have full autonomy in creating the schedule. So, when evaluating the different types of self-rostering, most research used both the amount of autonomy and the extent of individualism/collectivism to classify the different types of self-rostering. A review of literature towards self-rostering results in the following list of various degrees of self-rostering, which is already sorted from a little to a lot of autonomy.

- Exchanging shifts (Jansen & Baaijens, 2011; NCSI, 2009; Van Dalen & De Leede, 2016)
- Wish-rostering (NCSI, 2009; Van Dalen & De Leede, 2016)
- Shift picking (NCSI, 2009; Van Dalen & De Leede, 2016)
- Matching (Jansen & Baaijens, 2011; NCSI, 2009; Van Dalen & De Leede, 2016)
- Full self-rostering (NCSI, 2009; Van Dalen & De Leede, 2016)

In this study 'repetitive rostering' (NCSI, 2009), which is another type of self-rostering and enables employees to have structural wishes (e.g. every Friday is a day off), is included in this study as a separate condition variable. Section 2.2.6 will further elaborate on repetitive rostering. This results in a list containing five different types of self-rostering.

2.2.1. Exchanging shifts

Exchanging shifts enables an employee to change shifts of the already published roster with co-workers. This enables an employee to adapt the published roster to his/her own preferences (NCSI, 2009). This type of self-rostering is the only type that takes place after the publication phase (Van Dalen & De Leede, 2016) and is highly dependent on the availability and flexibility of co-workers. Therefore, the level of autonomy of an employee is not really high because of this dependency on colleagues.

2.2.2. Wish-rostering

When an organization makes use of wish-rostering, the scheduler takes the individual preferences of employees as much as possible into account. This can be done by classifying employees in groups, sorted by preference, e.g. by making a group of employees who prefer to work late-night shifts and/or

by meeting the preferences of individual employees. The goal of the scheduler is to meet the capacity requirements for the corresponding planning horizon, which is mostly a few weeks up to a couple of months (NCSI, 2009; Van Dalen & De Leede, 2016). The degree of autonomy for this type of self-rostering is still quite low because the supervisor is participating a lot in this process and the supervisor or a plan responsible is in charge of finalizing the schedule (NCSI, 2009).

2.2.3. Shift picking

In the process of shift picking, an overview of shifts which not yet have been allocated are given to the employees. Employees are then able, if they meet the required capacities, to register for a shift. Eventually, the software system or the scheduler allocates the shifts to employees, based on the preferences of the employees (NCSI, 2009). Mostly, this process is divided in three rounds. In the first round employees can pick a shift, then shifts will be re-arranged and finally, in the third round, the schedule will be finished and approved. Preferably, this process is completed without consideration of co-workers to let the employees decide as objective as possible (Van Dalen & De Leede, 2016).

2.2.4. Matching

The process of matching is similar to the shift picking process. However, matching does not define shifts in advance but only indicates tasks in units of time (Jansen & Baaijens, 2011; Van Dalen & De Leede, 2016). Employees give input for their preferences for working hours and the software system or scheduler will try to match the preferred working hours with the staffing demands (NCSI, 2009).

2.2.5. Full self-rostering

Full self-rostering gives an employee full responsibility for rostering within minimum and maximum requirements set by the employer (NCSI, 2009). Meaning that employees are not only responsible for creating the schedule but also for indicating staffing demands based on the labour supply and the demands of the organization (Van Dalen & De Leede, 2016).

2.2.6. Repetitive rostering: the use of modalities

As mentioned earlier, repetitive rostering enables employees to have structural wishes (e.g. every Friday is a day off) (NCSI, 2009). This type of self-rostering has a lot of overlap with the five types of self-rostering and is therefore separately discussed. Within the Dutch police, these structural roster wishes are embedded in so called 'modalities'. These modalities provide privileges to employees in form of fixed privileges which are valid for at least one year (ANPV, 2019). By being able to request and get these fixed privileges, employees have control over their schedules.

Figure 2.1 on the next page, displays the five different types of self-rostering schematically. In this figure, four degrees of self-rostering are arranged based on the level of autonomy and collectivism/individualism, both assigned to an axis. 'Exchanging shifts' has not been allocated in the diagram because this type of rostering takes place after the publishing phase (Van Dalen & De Leede, 2016). Even though this way of rostering gives an employee control in changing his/her schedule, it is not included as a type of self-rostering in this study.

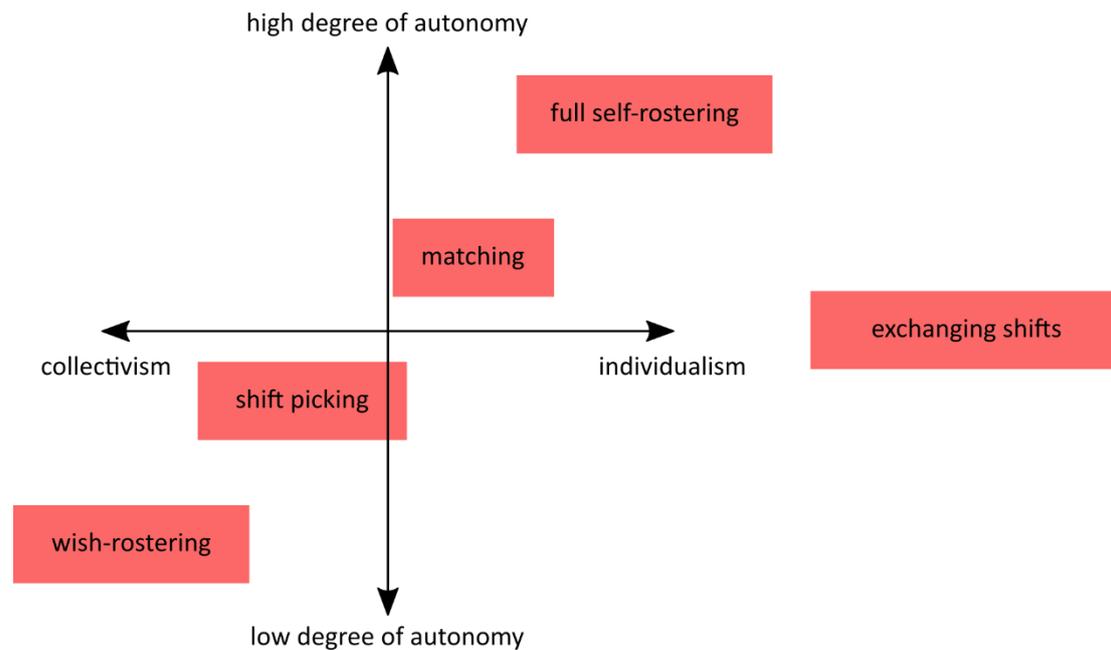


Figure 1: Different types of self-rostering, adapted from Van Dalen and De Leede (2016) and Jansen and Baaijens (2011)

2.3. The effectiveness of self-rostering: related outcomes

This research focusses on successful self-rostering. However, there is not much known on the outcomes of self-rostering (Van Dalen, 2011). Nevertheless, research has been conducted towards the positive effects of control of working times (Van Dalen & De Leede, 2016). Therefore, this section focusses on literature of the outcomes of both self-rostering and increased worktime control, in order to give an overview of the possible positive outcomes related to employees' well-being. Employees' well-being is in this study operationalized as work-life balance, improved absenteeism and roster satisfaction. These three outcomes are derived and adapted from research of Nijp et al. (2012), which used and classified the outcomes as work-non-work balance, health and well-being, and job-related outcomes. This classification is considered to be a profound classification to operationalize employees' well-being in this study, because it is generated based on a systematic review of 63 papers on outcomes of worktime control. The next sections will mainly focus on literature which found support for the positive association between increasing worktime control and the corresponding outcome in order to be able to describe the possible positive outcomes at best.

2.3.1. Self-rostering and work-life balance

Albertsen et al. (2007) found that different kinds of shift work arrangements are related to work-life problems. Besides, Bailyn et al. (2007) state that present literature on self-rostering identified, among other things, an increased work-life balance as a beneficial result of implementing self-rostering. In literature, different concepts, such as work-non-work balance, work-private life balance, work-family balance, are used to describe the same phenomenon. This study uses 'work-life balance' to refer to these concepts.

Nijp et al. (2012) found in their systematic literature review that most empirical studies identified that worktime control is positively associated with work-life balance (e.g. Barton, 1995; Jang, Park & Zippay, 2011; Russel, O'Connell & McGinnity, 2009). For example, an intervention study of Kelly, Moen and Tranby (2011) found that increasing employees' schedule control positively affects the work-life balance. This study measured the increased work-life balance by examining the reduction of

work-family conflicts due to the implementation of self-rostering. In line with this, Thornthwaite and Sheldon (2004) argue that self-rostering enables employees to manage domestic responsibilities with working hours, because employees can choose when they want to work. This implies that when using self-rostering, employees can more easily decide when they want to work and do not necessarily have to take a day-off for domestic demands. A restriction to this is that these domestic demands must already be clear when creating the roster. Whilst different concepts to describe work-life balance are used and different methods for measuring an increased work-life balance can be identified, it can be concluded that self-rostering or increased worktime control can be a good buffer against work-home interference (Nijp et al., 2012). However, some studies failed to find support for the positive association between worktime control and work-life balance (e.g. Girce, McGovern & Alexander, 2008; Russo & Waters, 2006), which underlines the importance to study the association between worktime control/self-rostering and work-life balance.

2.3.2. Self-rostering and improved absenteeism

Shift work is found to have destructive effects on people's health (Harrington, 1994). Self-rostering enables employees to choose their own schedule. Working according to this preferred schedule is comfortable for employees. As a result, it prevents employees the struggle of working according to distressing schedules. Moreover, it was found that the absence rate decreases due to the implementation of self-rostering (Teahan, 1998; Van Dalen & De Leede, 2016). This study focuses on absenteeism because this enables employees to continue working productively and healthy for an increasing period of time (Van Dalen & De Leede, 2016). Furthermore, Garde et al. (2012) found that self-rostering, for employees who work alternative shifts, resulted in a positive effect on health and a decrease in recovery time after working a shift. Nijp et al. (2012) identify self-rostering as a recovery-regulation mechanism. Employees who do not recover sufficiently, might notice a relationship between stressful work and adverse health (Nijp et al., 2012). Finally, Takahisha et al. (2011) found that enhanced worktime control resulted in a decrease in incomplete recovery, insomnia symptoms, daytime sleepiness and depression symptoms. Consequently, they concluded that increased worktime control is associated with favourable health outcomes. However, some studies did not find support for the positive association between self-rostering or worktime control and improved health or a decreasing absence rate (Jang, 2009; Pisljar, van der Lippe & den Dulk, 2011) or even found worktime control to be negatively related to employees' health (Galova et al., 2010), which again underlines the importance to study the relationship between worktime control and the absence rate.

2.3.3. Self-rostering and roster satisfaction

Nijp et al. (2012) specify the last outcome of self-rostering as 'job-related outcomes'. There are several job-related outcomes due to self-rostering. Jang, Park and Zippay (2011) found evidence for the positive relationship between scheduling control and job satisfaction. Albertsen and Nielsen (2006) found that employees were more satisfied with their work hours and were less likely to exchange shifts. Moreover, they found that the increase of schedule control led to an increase in job satisfaction and community spirit. Besides, Hansen et al. (2015) found that the implementation of self-rostering positively influences job demands and the social environment of the workplace. Next, self-rostering positively influences work motivation and performance as well (Nijp et al., 2012).

Van Dalen and De Leede (2016) found some additional job-related outcomes in practice. First, they stated that if people are healthier and more committed, their productivity will increase. Secondly, due to the improved match between the demand and supply of capacity, flexibility increases. Finally,

self-rostering might contribute to the employer brand of a company. This in turn might increase the possibilities to attract talent (Van Dalen & De Leede, 2016). Job-related outcome is a rather general name. The main idea of the job-related outcomes seems to be that the employees are more satisfied. This study uses employees' roster satisfaction as the last outcome variable.

2.4. Conditions to make self-rostering successful

As discussed earlier, self-rostering has to be implemented with care and is not automatically successful in achieving the aforementioned outcomes. Therefore, this section dives further into theory on conditions to make self-rostering successful. These conditions are based on theory and in Section 2.5 the final conditions of self-rostering used in this study to examine achieving work-life balance, improved absenteeism and roster satisfaction will be presented. This results in a list of eight context conditions that contribute to the success of self-rostering, which in turn is expected to lead to achieving work-life balance, improved absenteeism and roster satisfaction. These conditions are presented in the next sections.

2.4.1. Supervisory support

Beutell (2010) found that perceived supervisory support is an important condition for work schedule control. Hoffart and Willdermood (1997) even state that without support of a manager, the implementation of self-rostering will fail. Furthermore, Van Dalen and De Leede (2016) explain that the supervisor controls the group process and has to make sure that the employees will actually use self-rostering. Here it is also important to notice that the manager must realize that he/she has to let go of some power (Hung, 2002).

2.4.2. Communication

Receiving instructions for the new way of self-rostering is considered to be important to successfully make use of self-rostering. Besides, it is important to train employees so they are aware of what possibilities self-rostering can offer (Silvestro & Silvestro, 2000). Here, it is important to clearly communicate that self-rostering must not be considered as an entitlement, but a joint agreement (Bailyn et al., 2007), this will further be discussed in Section 2.4.6. When an employee notices that the self-rostering process no longer functions according to the joint agreement, this should be discussed.

2.4.3. Software

Self-scheduling is a time-consuming activity (Rönnerberg & Larsson, 2009). Using software enables organizations to efficiently make use of self-rostering. Nowadays, there is a lot of software which can support the different types of self-rostering (Van Dalen & De Leede, 2016). These software programs are almost indispensable when using self-rostering in big teams. Besides making and viewing the rosters, software also adds the possibility to communicate with each other, even from home (NCSI, 2009).

2.4.4. Guidelines

Guidelines are considered to be a very important condition to successfully use self-rostering (NCSI, 2009). The guidelines are the rules of the game and must be clear for employees. These rules might be adapted to every team or to a group of team members. This is because there is not one best way that fits for every team (Wortley & Gierson-Hill, 2003). Furthermore, for example older employees might have extra privileges.

2.4.5. Group size

Both small and big teams can make use of self-rostering, but the group size influences the way of self-rostering (Van Dalen & De Leede, 2016). Some authors argue that the group size should not be too big (e.g. Drouin & Potter, 2005). This is because a smaller group has fewer complex rosters and the motivation and commitment will be increased when rostering in a small group (Silvestro & Silvesro, 2000). Furthermore, the ideal group size is dependent on the number of different jobs and the degree to which employees can substitute one another (NCSI, 2009). Van Dalen and De Leede (2016) argue that when the group size is bigger than ten people, one should use software to support the self-rostering process.

2.4.6. Co-worker support

Bailyn et al. (2007) state that employees must not see self-rostering as an individual entitlement. It should be considered as a balance between individual and unit benefit, otherwise everyone will lose. Van Dalen and De Leede (2016) also argue that team maturity is important. Team members must pay respect to their colleagues' preferences. Moreover, employees should be flexible: if employees do not want to exchange shifts, self-rostering will not work. Here, it is important to keep an eye on the balance within teams in order to avoid that the most flexible employees work all the tough shifts. This can be done by introducing a score system or the veto right (Van Dalen & De Leede, 2016).

2.4.7. Capacity

There must be a sufficient number of employees with the right capacity to see self-rostering as a sustainable long-term product. This is because self-scheduling does not offer a solution for insufficient staffing (Van Dalen & De Leede, 2016). The same applies to the contract mix. It is important to have a suitable contract mix, in order to be able to complete the schedule (Van Dalen & De Leede, 2016).

2.4.8. Organization and job fit

Self-rostering has to fit the strategical choices made by an organization (Van Dalen & De Leede, 2016). The organization's policies and vision must fit the central key of self-rostering, namely that the employees must operate independently within the set framework for the self-rostering process. With regards to the job, employees' tasks and competencies must be to some extent exchangeable (Van Dalen & De Leede, 2016). Ideally, a roster group consists of uniform jobs but differ when it comes to roster preferences. Finally, the total staff requirements should be predictable during the self-rostering process (Van Dalen & De Leede, 2016).

2.5. Using fsQCA: reducing the number of conditions and creating propositions

Because this research uses fsQCA as the method of analysis, the number of conditions needs to be reduced to a maximum of six conditions. This is due to the methodology being too complex, if more than six conditions are used (e.g. Berger-Schlosser & de Meur, 2009). Besides, propositions based on already existing theoretical knowledge need to be created for the remaining conditions. These propositions form the input for the approach towards using fsQCA.

As already mentioned in the introduction, we know from Karasek's job demand control model (1979) that employees' increasing autonomy contributes to their capacity to cope with job demands. Having control over working times is considered as employees' increasing autonomy. In this study, increasing autonomy is a condition for achieving work-life balance, improved absenteeism and roster satisfaction. This condition is split up in 1) the type of self-rostering as a tool: the more advanced the

type of self-rostering is, the more autonomy employees have. 2) The use of modalities as a tool that enables employees to have autonomy and control over working times by having structural roster wishes. 3) Worktime control, which is employees' perceived control (i.e. autonomy) over working times.

It is unlikely that increasing autonomy (i.e. self-rostering, the use of modalities and worktime control) is sufficient for achieving the positive outcomes of self-rostering. Karasek and Theorell had the same thought in 1990 by adding 'support' to the job demands control model. This resulted in the job demands-control-support model. This model is a well-known theory that helps explaining the relationship between job characteristics and employees' psychological well-being. This model implies that job control and support help employees in dealing with high job demands (Karasek & Theorell, 1990). Research already found this model to be applicable for job satisfaction, work-life balance (Hwang & Ramadoss, 2016) and health (e.g. Åhlin et al., 2018; Verhoeven, Maes, Kraaij & Joeke, 2003). These studies used supervisor support and support of co-workers as variables to measure support. Since the outcomes examined in these studies are similar to the outcomes of this study, the job demands-control-support model is considered to be applicable to this research.

The type of self-rostering and the use of modalities are tools used in order to increase employees' worktime control (i.e. autonomy). Worktime control is the employees' perceptions of the amount of control over working times (i.e. autonomy). Complementary to autonomy, support is also important for employees in order to deal with high job demands (Karasek & Theorell, 1990). Both supervisor and co-worker support are coping resources in the workplace to deal with job-related stress (Karasek, Triantis & Chaudhry, 1982). Moreover, supervisory support and co-worker support are important conditions for self-rostering as well, see Sections 2.4.1 en 2.4.6. As a result, supervisor support and co-worker support will be included in this study as condition variables.

Based on the job demands-control-support model it is expected that autonomy and support synergistically contribute to employees' well-being. By including multiple types of autonomy (i.e. type of self-rostering, use of modalities and worktime control) and support (i.e. supervisory support and co-worker support), it is expected that different conditions might synergize and substitute. Synergies occur when conditions work together such that the value of a condition depends on the presence of other conditions (Delery, 1998). On the contrary, substitutions occur when conditions replace each other (Delery, 1998).

By using fsQCA, the following question can be answered: "which conditions (or combinations thereof) are necessary or sufficient (or possibly both necessary and sufficient) to produce the outcome?" (Rihoux & Ragin, 2009, p. 19). A condition is considered to be necessary when it is always present if an outcome occurs. In other words, the outcome cannot occur when the condition is absent (Rihoux & Ragin, 2009). As stated in Section 2.3, the results of previous studies showed that self-rostering and (other types of) worktime control are positively associated and beneficial for achieving the outcomes. This implies that (the type of) worktime control supportively contributes to achieving the outcomes. As a result, it is not expected that the outcomes cannot occur when (a type of) worktime control or support is absent. Therefore, for this research it is not expected that increasing autonomy and support are necessary conditions for achieving the outcomes.

When a condition is considered to be sufficient, the outcome always occurs when the condition is present, but the outcome can also occur when the particular condition is absent (Rihoux & Ragin, 2009). Single sufficient conditions are rare (Baumgartner, 2015). Instead, configuration theory argues that combinations of conditions are sufficient to achieve an outcome (Fiss, 2011). Therefore, fsQCA often focusses on combinations of conditions that are sufficient for the outcome (i.e. sufficient

configurations). These sufficient configurations identify which combinations of conditions are observed in cases (Rihoux & Ragin, 2009). Usually, equifinality is applicable for sufficient configurations (Baumgartner, 2015). Equifinality is the assumption that there are multiple pathways that lead to a given outcome (Fitzgerald, 2019). This principle of configuration theory is expected to be applicable to this research because it is expected that different pathways (i.e. equifinality), both including synergies and substitutions among the conditions, result in achieving work-life balance, improved absenteeism and roster satisfaction. Previous mentioned expectations result in the following propositions:

Proposition 1a:

Several configurations consisting of 1) an advanced type of self-rostering, 2) a high amount of modalities, 3) worktime control, 4) supervisory support and/or 5) co-worker support are sufficient to achieve work-life balance, improved absenteeism and roster satisfaction.

Proposition 1b:

The configurations include synergies and/or substitutions among 1) an advanced type of self-rostering, 2) a high amount of modalities, 3) worktime control, 4) supervisory support and/or 5) co-worker support.

Unfortunately, the other conditions as mentioned in Section 2.4 will be excluded from this research because these variables do not fit the job demands-control-support model and need to be excluded in order to prevent reaching the maximum number of conditions for fsQCA.

2.6. Conceptual models

The theory as discussed in the previous sections and the reduction to five conditions results in three conceptual models, as presented below in Figure 2, 3 and 4. Each model contains five condition variables and one outcome variable. The three conceptual models are similar to each other and only differ on the outcome variable. These models reflect on and summarize the theory, as discussed in Chapter 2, schematically and in a simplified way. This model will be used as input for the operationalization in Section 3.3 and 3.4 in order to successfully execute the fsQCA analysis.

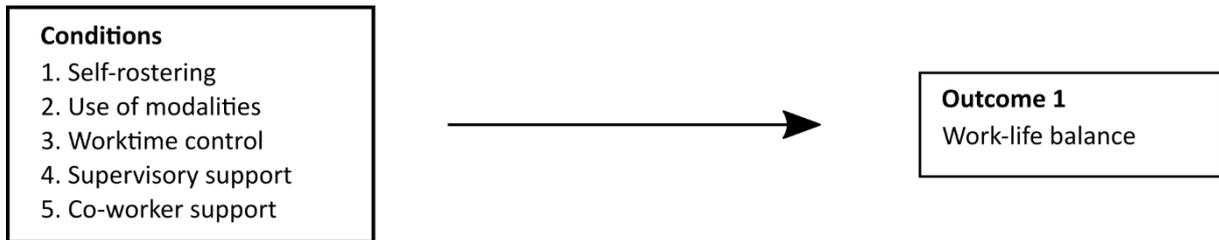


Figure 2: Conceptual model on self-rostering: conditions and work-life balance

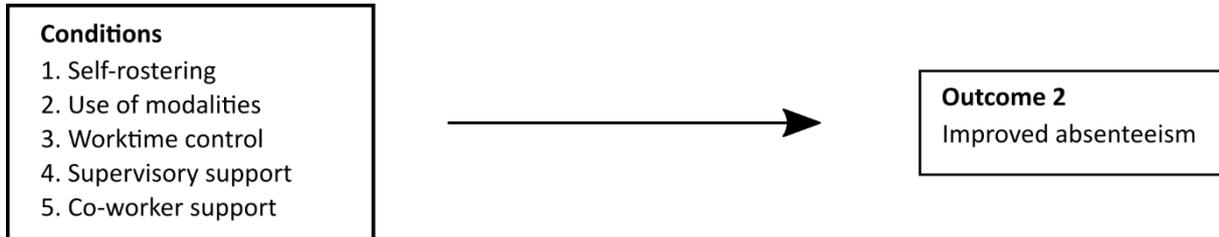


Figure 3: Conceptual model on self-rostering: conditions and improved absenteeism

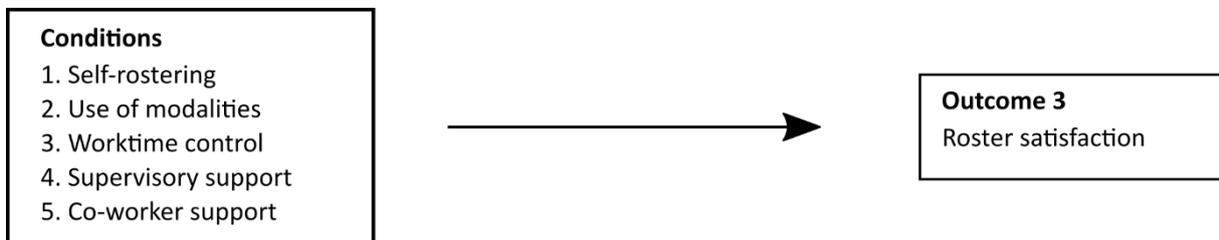


Figure 4: Conceptual model on self-rostering: conditions and roster satisfaction

3. Methodology

The goal of this research is to examine which conditions contribute to a good work-life balance, improved absenteeism and roster satisfaction of shift workers. Therefore, this research will test which combination of conditions contribute to achieving these positive effects related to self-rostering, in order to be able to answer the research question. The next sections will explain and elaborate on the methodology that is used to answer the research question.

3.1. Research method

In this research, fuzzy-set Qualitative Comparative Analysis (fsQCA) will be used to analyse the data. fsQCA is one of the four Configurational Comparative Methods (CCM) (Rihoux & Ragin, 2009). CCM can be used to perform a systematic comparative analysis of complex cases. These cases have to be transformed into configurations. A configuration is a specific combination of factors, also called conditions, that produces an outcome (Rihoux & Ragin, 2009). By using this method, the following question can be answered: “which conditions (or combinations thereof) are necessary or sufficient (or possibly both necessary and sufficient) to produce the outcome?” (Rihoux & Ragin, 2009, p. 19).

Within CCM, QCA is used as a heading for the three main types of QCA. QCA is seen as a ‘small-N’ approach (i.e. two to five cases) but also has been successfully applied in ‘large-N’ research (Rihoux & Ragin, 2009). QCA meets both the advantages of qualitative (case-oriented) and quantitative (variable-oriented) techniques. In short, QCA techniques allow systematic comparison of cases (Rihoux & Ragin, 2009). Each case is considered as a complex combination of properties. It is an advantage when these cases are known because this enables the researcher to clarify further aspects or to check and improve the relevant data (Rihoux & Ragin, 2009). Theory is very important within QCA, because the conditions and outcomes must be derived from theory. This shows that QCA is deductive. However, QCA can also be used inductively to get insight into the cases, to identify key aspects to be considered (e.g. Rihoux & Lobe, 2009). Each case needs to be narrowed down into a number of condition variables and an outcome variable. This is already done in Chapter 2 and an overview of the conceptual models can be found in Figure 2, 3 and 4.

QCA uses truth tables (i.e. tables of configurations), which is a combination of conditions associated with a given outcome. These truth tables show the presence/absence of dichotomies. However, many conditions of interest for social researchers, vary by level or degree and are not always easy to dichotomize (Rihoux & Ragin, 2009). Fortunately, fuzzy-set theory is a mathematical system which can address partial memberships in sets. This set-theory logic classifies cases into sets, each representing a configuration that produces the matching outcome. This is done by calibrating partial memberships in sets by using an interval between [0] (i.e. non-membership) and [1] (i.e. full membership) (Rihoux & Ragin, 2009). This method solves the problem of having to force-fit a case into one or two categories and fits the character of this research, which is rather social and abstract. Moreover, the fuzzy-set approach is more transparent (Rihoux & Ragin, 2009). Therefore, fsQCA will be used in this study. Fuzzy sets require substantive theoretical knowledge in order to specify the qualitative breakpoints between [0] and [1].

Compared to other more traditional methods, such as linear algebra, QCA enables that the loss of important information is low. In other methods, such as cluster analysis, averages are calculated, which involves great information loss (Büchel, Humprecht, Castro-Herrero, Engesser & Brüggemann, 2016). Moreover, QCA does not investigate one condition alone, but also potential combinations of conditions (Rihoux & Ragin, 2009). For example correlations, which is also considered as a more

traditional method, investigate the behavior of a dependent variable when the independent variable increases. Additionally, correlations explain an outcome without properly explaining the cause, while QCA does. Furthermore, when using QCA, the cases should be well-known instead of anonymous. It is possible to reflect more in-depth on the results of fsQCA in this study, by using the results of the interviews. Besides the previously mentioned advantages of QCA, traditional methods of analysis are already often applied in already existing research on self-rostering. This research might give some refreshing insights by using another method for the data analysis.

3.2. Data collection and case selection

The data used in this research is secondary data, collected in 2019 by De Leede and De Jager within the Dutch police. Three different data sources are available, namely:

- 1) Results of interviews with a representative of supervisors, a representative of schedulers and employees focussed on the motive to use self-rostering, the goal of implementing self-rostering, the way they use self-rostering, the outcomes, the role and contribution of stakeholders, conditions and the future of self-rostering.
- 2) A questionnaire among employees on shifts and schedules in general, some specific aspects of self-rostering, work-life balance, team spirit and team safety, communication, worktime control, the effect of modalities on autonomy, employees' opinion on the type of self-rostering and the future of self-rostering.
- 3) Team data from 2017, 2018 and 2019 derived from an information system, focussed on FTE, capacity, employability and schedule feasibility.

When looking at the data sources as presented above, it can be seen that also qualitative data is used. Rihoux and Ragin (2009) mention the following about this: "it is perfectly possible to work with subjective or qualitative data using QCA. The only practical requirement is to be able to transform these data into categories or numbers" (p. 13). For the qualitative data used in this study, it was possible to transform the data into categories or numbers.

The data is collected for 22 teams. Together, these teams are considered to be a good representative of the workforce of the Dutch police. The teams are selected based on the following criteria:

- 1) Different kind of teams
- 2) Geographically: both from the urban and rural area and in the north, east, south and west of The Netherlands. See Appendix 1 for an overview
- 3) Demographically: age
- 4) Group size: both small and big teams
- 5) Type of self-rostering
- 6) Experience with self-rostering
- 7) The successfulness of self-rostering
- 8) Willingness to collaborate in the evaluation

For this study, a case selection is important to successfully perform fsQCA. Before the data was collected, De Leede and De Jager (2020) already paid attention to a careful selection of the teams (i.e. cases), as the eight selection criteria, as previously presented, show. However, one team will be excluded from this research. This team is not a cooperative team, because it only has to cover shifts

together. Moreover, this team had a relatively small response rate in the survey (N=9) and some missing data. Additionally, another team will be deleted from this research as well, because there is no data available from the information system of this team. In conclusion, 20 teams will be included in this research. This involves variance within the different types of self-rostering between teams and, as a result, enables this study to examine the role of different types of self-rostering.

3.3. Measurement of the condition variables

Secondary data derived from interviews, a survey and an information system are used in this research. The data is derived from multiple data sources in order to be able to choose the most appropriate measurement for each condition variable. The data was collected in Dutch and for this research translated to English. The following section will elaborate on the measurement of the condition variables used in this study. Furthermore, Appendix 2.1-2.5 will give a data overview and additional explanation on the data preparation of the conditions.

3.3.1. Self-rostering

In this study, self-rostering represents the type of self-rostering a team uses. Besides, because the definition of self-rostering in this study is *“the process in which an individual or group has influence on its/their schedule within the boundaries of staffing requirements”*, the influence of employees on their schedule in the broad sense will be included as well. The secondary data used for this condition consists of data derived from interviews. On the basis of these interviews, the teams within the Dutch police are evaluated on their influence on their schedule. Four types of influence on the schedule are evaluated, namely:

- The employees' influence captured in the type of self-rostering;
- The employees' influence on decision-making in finalizing the schedule;
- The employees' degree of independence in exchanging shifts;
- The employees' degree of independence in allocating fixed roster-wishes.

As discussed in Section 2.2, the third evaluation, exchanging shifts, takes place after the publication phase. Therefore, this variable will not be included in this study. Additionally, this variable contains too much missing values. The last evaluation on fixed roster-wishes has a lot of overlap with the use of modalities, which is another condition (see Section 3.3.2), and will therefore be excluded from this condition as well.

The two remaining variables are measured on a scale from 1 to 10, see Appendix 3 for more information on the determination of the values. Cronbach's alpha, a reliability analysis to check whether those two variables can be used as one scale to measure self-rostering, has been performed. The two variables together score a 0.835 on Cronbach's alpha, which is considered to be above acceptable (Cronbach's alpha > 0.70) (Cortina, 1993) and therefore, self-rostering can be measured in this study by using those two variables.

3.3.2. Use of modalities

Repetitive rostering is a type of self-rostering that has a lot of overlap with all types of self-rostering and is therefore excluded as a type of self-rostering within this research. However, repetitive rostering enables employees to have structural wishes and can therefore be compared to the use of modalities, as earlier mentioned in Section 2.2.6. The use of modalities provides privileges to employees and is very common within the Dutch police. Because the use of modalities is a specific form of control in the

roster, this variable is included as a condition variable in this research, because it is seen as a form of worktime control, which might contribute to the positive effects of self-rostering as well. Three kinds of modalities exist within the Dutch police, namely:

- 1) Working nine-hours shifts
- 2) Fixed (part of the) days off
- 3) Night shift exemption

The last type of privilege is assigned to employees who are older than 57. This modality is automatically assigned to these employees. Therefore, this type of modality is excluded from this research, because employees will passively be assigned to this privilege. However, the other two types of modalities should be actively requested and assigned to employees. Data from the information system provides an objective overview of the existing modalities for each person. See Appendix 2.2 for further explanation on how the use of modalities for each team is calculated.

3.3.3. Worktime control

Worktime control can be defined as “an employee’s possibilities of control over the duration, position and distribution of worktime” (Nijp et al., 2012, p. 299). So, worktime control is the degree of influence an employee has on his/her working hours/schedule. We have already learned from other studies that employees’ perceptions will eventually influence their actions and attitudes (Veenendaal & Bondarouk, 2015). Therefore, the data used for this condition is derived from the survey and contains six questions regarding the perceptions of employees on worktime control. The questions were “I have influence on the starting- and finishing time of my shifts”, “I have influence on taking breaks during my shifts”, “I have influence on scheduling days off”, “I have influence on scheduling holiday days”, “I have influence on which days I have to work” and “I have influence of the number of shifts I need to work a week”. These six questions together scored 0.808 on Cronbach’s alpha and can therefore be used as one scale to measure worktime control.

3.3.4. Supervisory support

Supervisory support and communication will be combined into one condition in this research. This condition is called ‘supervisory support’ and mainly reflects the communication of the supervisor to support the self-rostering process. The survey data used in this study contains two questions that can be used in order to measure the degree of experienced supervisory support. Both questions were used in this study. These questions were measured by using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) and asked to the employees of the Dutch police in a survey. The questions were: “I experience good communication from the supervisor/plan responsible about the work demand and the principles of the roster” and “I experience good communication from the supervisor/plan responsible about the schedule and the schedule changes”. Unfortunately, the data did not provide any useful information on supervisory support except from employees’ perceived communication from their supervisor. Cronbach’s alpha is again used to check whether those two questions can be used as one scale to measure supervisory support. Those two questions score a 0.845 on Cronbach’s alpha, which is considered to be above acceptable (Cronbach’s alpha > 0.70) (Cortina, 1993) and therefore, supervisory support can be measured by using those two questions.

3.3.5. Co-worker support

Co-worker support needs to be high enough in order to be able to make self-rostering successful. The provided data contains four survey questions that are used to measure co-worker support. Those four questions were also measured by using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questions were: “I think the atmosphere within the team is safe and good enough to use self-scheduling”, “I am willing to adjust my working hours if necessary for the work that needs to be carried out”, “I think my team members are sufficiently willing to adjust their working hours if necessary for the work that needs to be carried out” and “I am willing to adjust my working hours if necessary for my colleagues”. While Cronbach’s alpha is lower than 0.70, namely 0.680, deleting one or more of the items does not increase Cronbach’s alpha. Since a value of 0.680 is still very close to acceptable and the fact that this research is limited to the available data, this scale to measure the co-worker support will still be used.

3.4. Measurement of the outcome variables

Besides the conditions, three outcome variables will be separately examined within this research by using fsQCA. The next sections will elaborate on specifying the measurement of the outcome variables. Furthermore, Appendix 2.6, 2.7 and 2.8 will give a data overview and additional explanation of the data preparation of the outcome variables. The used variables to measure the outcome variables are derived from the information system and the survey, but are chosen based on theory on the positive effects of self-rostering, as described in Section 2.3.

3.4.1. Work-life balance

The work-life balance of employees will be determined by using the following question “I can combine my work and private life well in the current schedule”. This question was asked to the employees in the survey by asking employees to rate their perception towards combining work and private life, by using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

3.4.2. Improved absenteeism

Improved absenteeism is measured by analysing the absence rates of 20 teams. Data on absenteeism rate is derived from the information system, which objectively reports on the values used as input for calculating the absence rate. The absence rate is determined based on data on absenteeism compared to data on the full-time equivalents of the corresponding period of time for the years 2017, 2018 and 2019. This results in an absenteeism rate for every year. Then, the trend of the absence rate is determined. See Appendix 2.7 for further explanation of the calculation of this outcome variable.

3.4.3. Roster satisfaction

This study examines employees’ satisfaction by examining their satisfaction of the current schedule they use. The following related question: “How satisfied are you with your current schedule in general?” is used to measure employees’ roster satisfaction. The survey’s respondents could choose again on the basis of a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

3.5. Fuzzy set calibration

When using QCA, the data needs to be calibrated. Calibration is the process where variables are transformed into a degree of set membership. Fuzzy set QCA allows to calibrate partial membership in sets by using an interval between [0] (non-membership) and [1] (full membership) (Rihoux & Ragin,

2009). Rihoux and Ragin (2009) claim that this process of calibration should be based on empirical and theoretical knowledge, in order to be able to objectively specify three thresholds: full membership (1), full non-membership (0) and the crossover point (0.5). This crossover point implies maximum ambiguity on whether a case is more in or more out of a set (Rihoux & Ragin, 2009).

By following other researchers (e.g. Meijerink & Bondarouk, 2018; Pickernell, Jones & Beyon, 2018; Ragin, 2008), this study uses percentiles to develop the threshold values. This method is called “the direct method” and uses the 75th percentile as the threshold for full membership, the 50th percentile as the cross-over point and the 25th percentile represents the threshold for non-membership. This empirical approach is combined with theoretical knowledge to justify the calibration. This results in adapting the threshold values of self-rostering. This is done based on the overview of different types of self-rostering as presented in Appendix 3. The threshold for full non-membership is set at 4.0, meaning that wish-rostering is the first type of self-rostering that is considered to fit full non-membership in the self-rostering variable. This is because the types of self-rostering 1-4 all involve a passive role of employees. Number 5 and 6 are considered as the cross-over point because these types of self-rostering requests employees to be more active in creating the roster. Finally, the threshold for full membership for self-rostering is set at 7, which implies that shift picking with three rounds is the first type of self-rostering that is considered as full membership in the self-rostering variable. This is because the employees are increasingly in control in these types of self-rostering and need to actively participate in the rostering process. See Table 1 for the determination of the threshold values of the conditions and outcome variables.

Table 1: Calibration table (n of cases = 20)

Variable	Mean (S.D.)	Percentiles			Thresholds		
		25%	50%	75%	Full membership	Cross-over point	Full non-membership
<i>Conditions</i>							
Self-rostering	4.78 (2.29)	2.03	5.25	6.56	7.00	5.50	4.00
Use of modalities	1.71 (0.53)	1.37	1.58	1.91	1.91	1.58	1.37
Worktime control	3.30 (0.38)	3.07	3.33	3.63	3.63	3.33	3.07
Supervisory support	2.87 (0.49)	2.67	2.84	3.22	3.22	2.84	2.67
Co-worker support	3.58 (0.21)	3.41	3.53	3.71	3.71	3.53	3.41
<i>Outcome</i>							
Work-life balance	3.67 (0.45)	3.50	3.77	3.95	3.95	3.77	3.50
Improved absenteeism	0.37 (1.97)	-0.82	-0.16	1.11	0.56	-0.16	-0.82
Roster satisfaction	3.86 (0.54)	3.70	3.93	4.23	4.23	3.93	3.70

3.6. Data analysis procedure

In order to analyse the data, the software fs/QCA 2.5 will be used. This software is chosen because it is considered to be user-friendly. Furthermore, this software is the most often used software (Thiem & Dusa, 2013). As a result, a lot of information on how to use this program and how to deal with problems within the program can be found on the internet. This is considered to be a big advantage of the software.

After preparing the data as presented in Appendix 2 and setting the thresholds as shown in Table 1, the data analysis in fs/QCA 2.5 is carried out. This process starts with calibrating the data based on the thresholds. See Appendix 4 for the steps for calibration and an overview of the calibrated data. Then, two types of analysis will be performed in order to test the propositions. The first analysis is an analysis of necessary conditions. Although it was argued that necessity was not expected in this study,

a necessity check has to be carried out before conducting the fuzzy truth table procedure (Rihoux & Ragin, 2009). This is because a truth table analysis is essentially an analysis for sufficiency (Rihoux & Ragin, 2009). As a result, it is useful to perform an analysis of necessary conditions as well, because a condition can be necessary, but not sufficient for achieving the outcome. After conducting the analysis of necessary conditions, a truth table is designed and an analysis of sufficient conditions is carried out. These steps will be discussed in the following sections.

3.6.1. Step 1: Analysis of necessary conditions

As mentioned previously, an analysis of necessary conditions needs to be carried out. This study focusses on the positive outcomes of self-rostering as the outcome variable. Necessary conditions are conditions that must be present for these outcomes (Schneider & Wagemann, 2012). However, a necessary condition also implies that its presence does not guarantee the outcome to occur (Rihoux & Ragin, 2009). Within fuzzy sets, a necessary condition is indicated when instances of the outcome constitute a subset of instances of a condition. The formula used to formally indicate necessity is as follows:

$$\text{Consistency } (Y_i \leq X_i) = \frac{\sum \min (X_i, Y_i)}{\sum(Y_i)}$$

In this formula, 'min' selects the smaller value of the two values, X_i represents the degree of membership in the causal condition and Y_i is the degree of membership in the outcome. The formula implies that when the threshold value is met for a condition, this condition is necessary, because the membership in the outcome is consistently less than the degree of membership in the condition. So, the consistency value indicates the degree to which a condition or combination of conditions display the outcome. This value can be compared to the significance value of a correlation coefficient (Meijerink & Bondarouk, 2018). The threshold value for necessary conditions in this research is set at 0.80 for consistency (Ragin, 2008).

Another value which will be generated from the analysis of necessary conditions is coverage. Coverage can, in terms of correlation, be compared to the correlation coefficients (Meijerink & Bondarouk, 2018). A high value of coverage within fsQCA provides support to assess the empirical relevance of the condition or combination of conditions. The accepted threshold for coverage is set at 0.010 (Ragin, 2008).

3.6.2. Step 2: Truth table analysis for sufficient conditions

Proposition 1 aims to test the sufficiency of conditions. A condition or a path of conditions is sufficient when this condition is present when the outcome occurs, but also allows the outcome to occur without the condition (Schneider & Wagemann, 2012). A test for sufficiency tests whether a condition is a subset of the outcome. In order to test for sufficiency, truth tables need to be created. This truth table consists of 2^k rows, where k implies the number of conditions used. This research included five conditions and the truth table thus consists of 32 rows. See Appendix 5 for the truth tables for each outcome variable derived from the fsQCA software. The software program assigns each team to a row based on their degree of membership for the conditions and outcome.

After creating the truth tables, the number of rows is reduced based on the number of teams that have membership in a row, this number is set to 1. Additionally, the value for consistency should be determined and is set at 0.80 again. This reduced the number of rows in the truth table. Now, each

row can be assigned to one or more teams. Appendix 6 shows the team codes for each team, which are included in the reduced truth tables as shown in Appendix 7.

Finally, a Boolean algebra algorithm is used to reduce this truth table to configurations (i.e. specific combination of conditions that produce an outcome) (Rihoux & Ragin, 2009). This algorithm sets positive cases to true [1] and negative cases to false [0]. As a result, the most parsimonious solution is created to indicate the positive outcomes of self-rostering.

The next chapter shows these configurations, both in words and schematically. At the end in Chapter 5, the meaning, importance and relevance of the results will be discussed.

4. Results

4.1. Results analysis of necessary conditions

As previously mentioned, it is important to check the necessity of the conditions. Therefore, an analysis of necessary conditions was carried out to test whether the conditions included in this research are necessary to achieve work-life balance, improved absenteeism and/or roster satisfaction. As stated in Chapter 3, the threshold value for consistency is set to 0.80. Since necessity is not expected, it is expected that the consistency values of the conditions are lower than 0.80.

The tables below show the results for the necessary conditions analysis in the fsQCA software. Only Table 2 shows a value for consistency of 0.80 or higher, namely 0.81, for worktime control. This means that worktime control is a necessary condition (i.e. must be present) for achieving a good work-life balance. So, employees' perceptions of their control over breaks, working hours, the number of shifts they have to work a week, etcetera, need to be good in order to be able to experience a good balance between work and private life. Still, the presence of solely worktime control does not guarantee a good work-life balance. The different configurations as presented in the next section show that other conditions should be present as well.

The consistency values for the other conditions for work-life balance and all condition variables of improved absenteeism and roster satisfaction do not meet the threshold value of 0.80. This means that these conditions are not necessary to achieve the outcomes (i.e. the outcomes can still occur when a condition is absent).

Table 2: Consistency and coverage scores of necessary conditions for work-life balance

Conditions	Consistency	Coverage
Self-rostering	0.72	0.75
The use of modalities	0.30	0.30
Worktime control	0.81	0.82
Supervisory support	0.76	0.77
Co-worker support	0.74	0.69

Table 3: Consistency and coverage scores of necessary conditions for improved absenteeism

Conditions	Consistency	Coverage
Self-rostering	0.53	0.57
The use of modalities	0.64	0.66
Worktime control	0.56	0.58
Supervisory support	0.48	0.50
Co-worker support	0.68	0.65

Table 4: Consistency and coverage scores of necessary conditions for roster satisfaction

Conditions	Consistency	Coverage
Self-rostering	0.65	0.69
The use of modalities	0.29	0.29
Worktime control	0.74	0.76
Supervisory support	0.74	0.76
Co-worker support	0.67	0.63

4.2. Testing proposition 1: configurations of sufficient conditions

Here, the results for testing proposition 1 will be presented. The propositions are presented below.

Proposition 1a:

Several configurations consisting of 1) an advanced type of self-rostering, 2) a high amount of modalities, 3) worktime control, 4) supervisory support and/or 5) co-worker support are sufficient to achieve work-life balance, improved absenteeism and roster satisfaction.

Proposition 1b:

The configurations include synergies and/or substitutions among 1) an advanced type of self-rostering, 2) a high amount of modalities, 3) worktime control, 4) supervisory support and/or 5) co-worker support.

Proposition 1a predicts that several configurations are sufficient for achieving the three positive outcomes. Tables are created to show the configurations for each outcome. The ● symbol indicates the presence of a condition, the ⊖ symbol the absence of a condition and no symbol expresses that the presence or absence of the condition is irrelevant (derived from several studies, e.g. Fiss, 2011; Meijerink & Bondarouk, 2018). Another table is added to show the configurations and the teams that have strong (>0.50) membership in the configuration. See Appendix 6 for an overview of the full team names. Here, the name of the condition without a symbol indicates the presence of the condition, the ~ symbol expresses the absence of a condition and when the condition is not mentioned, this indicates the irrelevance of the condition.

The consistency and coverage values are given as well. The overall consistency indicates to what extent the teams, which represent the overall set of configurations, agree in displaying the outcome. This value lays between 0 and 1, where a value close to 1 indicates high agreement in displaying the outcome of the teams which represent the set of configurations. The value of overall coverage indicates the percentages of those teams which experience a high score on the outcome. Next section will present the results for testing proposition 1 for work-life balance, improved absenteeism and roster satisfaction.

4.2.1. Testing proposition 1 for work-life balance

Table 5 shows the presence, absence or irrelevance of a condition for work-life balance. It was already found that worktime control is a necessary condition for work-life balance. This is confirmed by the three ● symbols for worktime control for each configuration.

The first configuration shows that even when co-worker support is lacking, an advanced type of self-rostering, good supervisory support and worktime control are jointly sufficient for achieving a good work-life balance. In line with configurational thinking, supervisory support here substitutes for co-worker support. Table 6 presents the two teams that have membership in this configuration.

The second configuration shows that when the use of a high number of modalities is absent, the presence of supervisory support, co-worker support and worktime control is sufficient to achieve work-life balance. Here, both supervisory support and co-worker support complement each other to substitute for the absence of the use of modalities. Six teams have high membership in the second configuration. The relatively high coverage value for this configuration confirms this relatively high amount of teams with membership in the configuration.

The last configuration shows the opposite of configuration 1, because in the last configuration co-worker support substitutes for the absence of supervisory support. Only one team has strong membership in this configuration. This configuration shows that when employees support each other, experience worktime control, use an advanced form of self-rostering and a high amount of modalities, the supervisor does not have to support the team to achieve work-life balance.

Table 5: Configurations for work-life balance

Conditions	1	2	3
Self-rostering	●		●
Use of modalities		⊖	●
Worktime control	●	●	●
Supervisory support	●	●	⊖
Co-worker support	⊖	●	●
Consistency	0.99	0.96	0.81
Raw coverage	0.16	0.55	0.11
Unique coverage	0.09	0.48	0.07
Overall consistency	0.94		
Overall coverage	0.72		

Table 6: Configurations for work-life balance and corresponding teams

Configuration	Team
self-rostering*worktime control*supervisory support*~co-worker support	5, 6
~modalities*worktime control*supervisory support*co-worker support	14, 4, 2, 1, 7, 13
self-rostering*modalities*worktime control*~supervisory support*co-worker support	9

4.2.2. Testing proposition 1 for improved absenteeism

Table 7 and 8 present the configurations for achieving improved absenteeism and the corresponding teams. The first configuration indicates that a high amount of modalities (i.e. working in 9-hours shifts or having (part of the) days off) substitutes for the absence of worktime control, co-worker support and supervisory support in achieving a decrease in the absence rate. This means that a decreasing absence rate can still be achieved when these three conditions are absent and the type of self-rostering irrelevant, as long as employees are allowed to have a high number of modalities. The teams that have membership in this configuration (see Table 8), do not experience worktime control despite the high amount of modalities used.

The second configuration shows that a high amount of modalities substitutes an advanced type of self-rostering and worktime control. Besides, due to the presence of co-worker support, supervisory support is irrelevant for achieving a decreasing absence rate in this combination of conditions. This means that a decrease in the absence rate can be achieved when co-worker support is good and complemented by the use of a lot of modalities, even when an advanced type of self-rostering and perceived worktime control are absent.

Finally, the last configuration shows that all conditions need to be present to substitute for the absence of supervisory support in order to be able to achieve a decreasing absence rate. Here again, one team has strong membership in this configuration, this is the same team as the one of the third configuration in the previous section. It could be that the supervisor of this team does not invest much in communicating on self-rostering because without his/her support, the results of the type of self-rostering they use are still good. This can also be seen in the third configuration in the previous section.

Table 7: Configurations for improved absenteeism

Conditions	1	2	3
Self-rostering		⊖	●
Use of modalities	●	●	●
Worktime control	⊖	⊖	●
Supervisory support	⊖		⊖
Co-worker support	⊖	●	●
Consistency	0.86	0.84	0.96
Raw coverage	0.37	0.22	0.13
Unique coverage	0.24	0.11	0.04
Overall consistency	0.84		
Overall coverage	0.54		

Table 8: Configurations for improved absenteeism and corresponding teams

Configuration	Team
modalities*~worktime control*~supervisory support*~co-worker support	16, 8, 15, 3
~self-rostering*modalities*~worktime control*co-worker support	18, 17, 10
self-rostering*modalities*worktime control*~supervisory support*co-worker support	9

4.2.3. Testing proposition 1 for roster satisfaction

The configurations and the corresponding teams for the last outcome, roster satisfaction, are shown in Table 9 and 10. The first configuration shows that the presence of an advanced type of self-rostering, good supervisory support and worktime control are jointly sufficient for achieving roster satisfaction and substitute for the use of modalities. The teams that have membership in this configuration (see Table 10), are satisfied with the advanced type of self-rostering they use.

The second configuration also indicates that the presence of an advanced type of self-rostering, good supervisory support and worktime control are sufficient to achieve roster satisfaction among employees. In line with configuration theory, supervisory support substitutes here for the absence of co-worker support. Besides, the presence of an advanced type of self-rostering and worktime control cause the irrelevance of the use of modalities. So, when co-worker support is lacking, satisfaction on the roster can still be achieved when an advanced type of self-rostering, supervisory support and worktime control are present.

The last configuration indicates that the presence of the use of modalities, supervisory support and co-worker support are jointly sufficient for achieving roster satisfaction when an advanced type of self-rostering and worktime control are lacking. This configuration shows that even when a team does not use an advanced type of self-rostering, the team members can still be satisfied with the type of roster they use when the three previous mentioned conditions are present.

Table 9: Configurations for roster satisfaction

Conditions	1	2	3
Self-rostering	●	●	⊖
Use of modalities	⊖		●
Worktime control	●	●	⊖
Supervisory support	●	●	●
Co-worker support		⊖	●
Consistency	1.00	0.94	0.88
Raw coverage	0.44	0.15	0.08
Unique coverage	0.35	0.05	0.05
Overall consistency	0.96		
Overall coverage	0.55		

Table 10: Configurations for roster satisfaction and corresponding teams

Configuration	Team
self-rostering*~modalities*worktime control*supervisory support	2, 4, 1, 7, 6
self-rostering*worktime control*supervisory support*~co-worker support	5, 6
~self-rostering*modalities*~worktime control*supervisory support*co-worker support	10

5. Discussion and conclusion

Given the increase of the number of people working in alternative shifts and the destructive effects of working in these alternative shifts, this research focussed on decreasing the negative effects of working in shifts by examining self-rostering. The particular case examined in this study is the Dutch police, which is currently experimenting with self-rostering. Therefore, different types of (self-)rostering are investigated in this study. As a result, this study is not limited to self-rostering, it is also examined different types of rostering as a continuum, with self-rostering as the highest value of the continuum.

Self-rostering was found to reduce the negative effects of shift work (Albertsen et al., 2007). However, research on the conditions for self-rostering was found to be important, because of inconsistent results of previous studies and in order to examine context variables as well. Moreover, this study also responds to the call of researchers to focus on more modern worktime control practices such as self-rostering and to include administrative sources. Therefore, this research focusses on conditions that contribute to achieving the positive effects of self-rostering. This is done by examining conditions, which contribute to a good work-life balance, improved absenteeism and roster satisfaction, in order to be able to reduce the negative effects of shift work. The next sections will transform the results as presented in Chapter 4 into a broader context by combining the results with information derived from the interviews, and by concluding on theoretical and practical contributions. Finally, limitations of this study are discussed, recommendations for future research are given and the research question is answered in the conclusion.

5.1. Interpretation of key findings

The findings of this study will be presented and interpreted by combining the results of the analysis for necessary conditions, the analysis for sufficient conditions and additional information on the teams and their type of self-rostering. The latter is derived from the interviews with team representatives.

5.1.1. Interpretation of key findings for work-life balance

Worktime control is found to be necessary for achieving a good work-life balance. This means that employees' perceptions of their control over breaks, working hours, the number of shifts they have to work a week, etcetera, need to be good in order to be able to experience a good balance between work and private life. The fact that only worktime control and not the particular practices (i.e. the type of self-rostering or the use of modalities) is necessary, is in line with previous research of Veenendaal and Bondarouk (2015), which stated that not the HR practices but employee perceptions of HR practices matter. Still, the presence of solely worktime control does not guarantee a good work-life balance. The different configurations show that other conditions should be present as well.

The results of the interviews show that the teams that have membership in the first configuration, both use a form of shift picking and share the goal of creating tranquillity in the roster. Another goal they share is creating awareness among employees for work demands. The fact that this is a goal they want to achieve seems to be in line with their score for co-worker support, which is currently low. This low score for co-worker support in combination with the presence of supervisory support implies that in teams where employees do not support each other, a good leader needs to be in place to guide the team in the self-rostering process to achieve work-life balance.

The second configuration shows that when the use of a high number of modalities is absent, the presence of supervisory support, co-worker support and worktime control is sufficient to achieve work-life balance. What is remarkable, is that when the use of modalities is absent and the type of self-

rostering is irrelevant, a good work-life balance can still be achieved. Based on this finding, it could be that an advanced type of self-rostering or the use of modalities is not important as long as employees experience worktime control combined with supervisory and co-worker support, which will contribute to be able to pleasantly work with the corresponding type of self-rostering. Eventually, this will result in experiencing worktime control and thus work-life balance.

The team that has membership in the third configuration, uses shift picking with two rounds as type of rostering. This team uses their current form of rostering since 2019. This might explain why the use of modalities is still a sufficient condition for achieving work-life balance. When the team gets used to the type of self-rostering, the number of modalities might decrease while still achieving a good work-life balance. The last configuration shows the opposite of configuration 1, because in the last configuration co-worker support substitutes for the absence of supervisory support.

5.1.2. Interpretation of key findings for improved absenteeism

The results show that for all three configurations, the presence of a high amount of modalities is a sufficient condition. In the first configuration, the use of modalities is the only condition that is present. Most of the teams that have membership in this configuration lack an advanced type of self-rostering, this might explain the absence of worktime control, even when a high amount of modalities is used. Three of the teams that have membership in the first configuration reported during the interviews that the use of modalities obstructs the rostering process. However, the results show that this does not harm the decrease in the absence rate (i.e. improved absenteeism).

The third configuration is the same as the third configuration of work-life balance. Moreover, the same team has membership in these configurations. Therefore, the same arguments as used in the previous section apply for this configuration for improved absenteeism.

5.1.3. Interpretation of key findings for roster satisfaction

Again, three configurations for sufficient conditions were found. During the interviews, the representatives of all five teams that have membership in the first configuration already mentioned that increasing employee satisfaction is an outcome of their current type of self-rostering. It might be that an advanced type of self-rostering causes satisfaction on the roster and a decreasing desire for modalities. This seems logical since roster satisfaction is measured by asking employees if they are satisfied with the current type of self-rostering. So, for these teams an advanced type of self-rostering is preferred.

The teams that have membership in the second configuration both use shift picking as type of self-rostering since 2016. The teams that have membership in this condition share the goal of creating awareness among employees for work demands. The fact that this is a goal they want to achieve seems to be in line with their score for co-worker support, which is currently low. While the employees do not take their responsibilities for the work demands, they are satisfied with their current roster.

One team has strong membership in the third configuration. This team uses shift picking with two rounds since the summer of 2019. Although this is not considered as an advanced type of self-rostering, the team members are satisfied about the type of self-rostering. This indicates that employees can also be satisfied with the type of self-rostering when it is not an advanced type of self-rostering.

5.2. Theoretical implications

It was expected that all conditions examined were rather supportive for achieving the outcomes. Therefore, necessity of the causal conditions was not expected. However, when conducting the analysis of necessary conditions, worktime control was found to be a necessary condition for achieving work-life balance. This implies that worktime control (i.e. employee's perceptions of the control they have over working times) always needs to be present when work-life balance occurs. So, work-life balance can only occur if employees perceive control over working times. The fact that worktime control is a necessary condition for work-life balance might be explained by the results of the study of Nabe-Nielsen et al. (2013) towards employees' prioritising decisions when scheduling their own shifts. This study found that most employees (almost 90%) gave high priority to family life and, as a result, schedule their own shifts around their family life and leisure-time activities (Nabe-Nielsen et al., 2013). This means that when people perceive that they actually have control over working times, most employees' schedule is adapted to family life and leisure-time activities, which causes work-life balance. The study of Veenendaal and Bondarouk (2015) found that employees' perceptions will eventually influence their action and attitudes, which additionally underlines the importance of employees' perceptions over working times (i.e. worktime control) for achieving work-life balance. So, while necessity was not expected, the outcome can be explained by theory on employees' prioritizing decisions when having control over working times and employees' perceptions, which eventually influence their attitudes and actions.

Proposition 1a examined the principle of equifinality, which implies that multiple pathways are equally effective in achieving the positive outcomes, by performing an analysis for sufficient conditions. Considering that for each outcome three configurations were found, indicates there are several pathways that contribute to achieving the outcome. The results of this analysis provide support for proposition 1a and thus for equifinality. This finding adds to HRM literature because it provides a theoretical support for the persistence of a variety of designs that lead to achieving work-life balance, improved absenteeism and roster satisfaction. Other researchers already added similar findings to management literature (e.g. Fiss, 2007; Short, Payne & Ketchen, 2008).

The job demands-control-support model (Karasek & Theorell, 1990) was used in this research to decide which conditions to include in the model and which not. This resulted in including three conditions for increasing autonomy over working times and two conditions for support. It was expected that these conditions help employees to cope with high job demands (i.e. working in shifts). Except from one configuration, all configurations contain both the presence of one of the increasing autonomy conditions and one of the conditions for support. This provides support for the model. However, it was found that not all five conditions need to be present in order to achieve the positive outcomes, this adds to our knowledge that some type of increasing autonomy and support are important, but several types of increasing autonomy and support are not needed to achieve work-life balance, improved absenteeism and roster satisfaction.

As predicted in proposition 1b, synergies and substitutions among the conditions were found among the condition variables in order to achieve work-life balance, improved absenteeism and roster satisfaction. The configurations show that self-rostering, the use of modalities and worktime control follow from synergies and substitutions. In two configurations, all conditions of increasing autonomy over working times needed to be present (i.e. synergize) to achieve work-life balance and improved absenteeism. In these configurations, the three conditions synergize, together with co-worker support, in order to substitute for the absence of supervisory support. So, for these configurations, all conditions need to be present to substitute for the absence of supervisory support. Besides, in

configuration 2 for improved absenteeism and configuration 3 for roster satisfaction, an advanced type of self-rostering was absent. Considering increasing autonomy, the use of modalities was always present within these configurations. This result might imply that the use of modalities can, together with support, substitute for an advanced type of self-rostering. Concluding, we found both synergistic (e.g. configuration 1 of work-life balance and configuration 3 for improved absenteeism) and substitutive (e.g. configuration 2 of work-life balance and 1 of roster satisfaction) effects for the conditions of increasing autonomy for each outcome.

Six configurations contain substitutions between co-worker support and supervisory support. This indicates that for most configurations, either one of the two support conditions were present when the other condition for support was absent or irrelevant. Within two configurations, the support conditions complemented each other in order to substitute for the absence of the use of modalities and the absence of an advanced type self-rostering and worktime control. Additionally, one configuration where both supervisory support and co-worker support were absent, still resulted in improved absenteeism due to the presence of a high amount of modalities. This configuration shows that support is not always a sufficient condition for achieving improved absenteeism. Concluding, both synergistic (e.g. configuration 2 of work-life balance) and substitutive (e.g. configuration 3 of roster satisfaction) effects can be found for the conditions for support as well, except from one configuration where both types of support were absent.

Nijp et al. (2012) identified in a systematic literature review that all studies towards worktime control used self-reports. This study responded to the request from Jansen and Baaijens (2011) and Nijp et al. (2012) to include administrative data sources. Finally, by using fsQCA, this study adds to theory by looking at (combinations of) conditions in order to predict work-life balance, improved absenteeism and roster satisfaction. This is rather exceptional because previous studies towards self-rostering used linear models. This study therefore contributes to already existing research, by using both quantitative and qualitative data, and by optimally using the data, because of low information loss by using QCA and by examining combinations of conditions instead of one condition alone.

5.3. Practical implications

It is important to mention that this research examined different types of (self-)rostering. As a result, this study is not limited to full self-rostering, but the results are also useful for organizations or teams that use less advanced types of self-rostering.

The results of this study found support for the equifinality principle, meaning that different pathways lead to achieving the outcomes. For practice, this implies that organizations need to define what their main goal is when giving employees increasing control over working times. An organization should focus on a main goal in order to be able to choose which type of increasing autonomy over working times and which type of support fits best. When the main goal is to achieve work-life balance, organizations should invest in employees' worktime control since this is a necessary condition for achieving work-life balance. Worktime control is the perception of an employee regarding the amount of autonomy/freedom they experience over working times. These perceptions are found to be more important than the HR practice (i.e. self-rostering and the use of modalities) and its appropriate design (Veenendaal & Bondarouk, 2015). Therefore, employers should ask employees about worktime control in order to find out how to invest best in this.

Besides, it was found that when supervisory support is absent, all other conditions should be present in order to substitute for this. An organization could possibly better invest in supervisory support, because then fewer conditions need to be met in order to achieve the outcomes.

Moreover, when an organization's main goal is to improve shift workers' absence rate, this organization should focus on the use of modalities (i.e. having regular (part of the) days off) as the type of worktime control, in combination with other conditions (see configurations 2 and 3 for improved absenteeism). During the interviews it became clear that sometimes it is hard to use self-rostering when the amount of modalities used is high. A suggestion would be to allow employees to have a fixed day off or to work 9-hours-shifts within the type of self-rostering used. This can be added to the guidelines and rules of self-rostering.

For roster satisfaction, all three configurations show that the supervisor should be supportive in order to achieve satisfaction. Within two configurations, an advanced type of self-rostering and worktime control should be present in combination with supervisory support. However, when an advanced type of self-rostering and worktime control are absent, the use of modalities and both types of support are jointly sufficient for achieving roster satisfaction.

Since one of the main findings of this study is that there are different paths leading to the positive effects of self-rostering, organizations and teams should know that there is not one best way for achieving the positive effects of self-rostering in order to reduce the negative effects of shift-work. Moreover, some conditions show in some configurations a high value (i.e. presence) while they show a low value (i.e. absence) in another configuration. This principle is called asymmetry. This means that different values of the same condition can lead to achieving the outcomes (Fitzgerald, 2019). An organization, or even better: a team, should therefore critically reflect on their characteristics in order to find out which (combination of) conditions would fit. Based on these characteristics, an organization or team can decide what type of self-rostering to use, how much modalities need to be used, how much the supervisor has to support the team and how to guide employees in order to achieve co-worker support and worktime control.

For the Dutch police, it is important as well to realize that there is not one way to achieve work-life balance, improved absenteeism and roster satisfaction. The Dutch police is currently experiencing with different types of (self-)rostering. As a result, it was possible to reflect on different types of (self-)rostering. However, the Dutch police eventually wants to effectively implement one type of self-rostering within the entire organization (De Leede & De Jager, 2020). This research does not provide a straightforward answer to which type of self-rostering is/fits best. Nonetheless, the results provide guidance for achieving work-life balance, improved absenteeism or roster satisfaction in form of configurations, containing conditions with regards to increasing control over working times and support.

5.4. Limitations of the current research and recommendations for future research

This study is not without limitations. First, Section 2.4 showed eight conditions that are related to successful self-rostering. However, only five conditions were included in this model. The limited number of conditions that can be included in the research is a disadvantage of using QCA. And despite the fact that the conditions are in line with the job demands-control-support model, one of the criticisms of this model is that it is too simplistic (Parkes, Menham & Von Rabenau, 1994) and that other job conditions might explain additional variance. Another drawback of QCA is that measurement calibration might be biased due to the researchers' subjectivity. However, we are confident that the results are robust enough due to using both empirical and theoretical knowledge from differing data sources. The fact that a lot of conditions of self-rostering have been excluded from this research, enables future studies to examine different (combinations of) conditions as well.

Secondly, this study was limited to secondary data collected by a consultancy company. The high amount of available data resulted in a good measurement of most of the variables. However, supervisory support only contained data on the communication of the supervisor. Including other types of support, e.g. emotional support (Fukui, Rapp, Goscha, Marty & Ezell, 2014), would have enriched this research. Furthermore, improved absenteeism was measured by using data on the absence rate of 2017, 2018 and 2019. If additional data on previous years would be available, the improvement of absenteeism could be better measured and probably be compared to the implementation date of the type of (self-)rostering used. Finally, the value of Cronbach's alpha for co-worker support did not reach the threshold value of 0.70. These limitations might provide guidance for future researchers for collecting the data.

In the third place, this research tried to clarify which conditions contribute to achieving the promising effects of self-rostering. However, the different pathways for each outcome do not provide a clear answer to this question because conditions differently synergize and substitute within the configurations. Therefore, future research could benefit from this by discovering additional team characteristics that contribute to achieving an outcome. Future studies that include teams or organizations in its research with similar characteristics would possibly be able to make general statements on one best way to achieve work-life balance, improved absenteeism and roster satisfaction.

Finally, other studies found that a mismatch between employees' priorities and working hours is associated with dissatisfaction of the working hours (Nabe-Nielsen et al., 2010) and negative outcomes such as psychological distress (Gareis & Barnett 2002). So, when employers claim to give employees worktime control while ignoring roster wishes, this will lead to dissatisfaction. This study did not include configurations where an advanced type of self-rostering was present while worktime control was absent. Moreover, this study only examined the positive effects. Future research could examine worktime control and dissatisfaction.

5.5. Conclusion

This research tried to answer the following research question:

Which combinations of self-rostering, use of modalities, worktime control, supervisory support and co-worker support contribute to work-life balance, improved absenteeism and roster satisfaction?

Despite the limitations as previously mentioned, this research found, by using fsQCA, different pathways that almost all include a form of increased worktime control and support of the supervisor and team members, that lead to work-life balance, improved absenteeism and roster satisfaction. For achieving work-life balance, organizations should invest in worktime control because it was found that work-life balance can only occur when worktime control is present. For each outcome, three sufficient configurations of combinations of the conditions were found, which shows support for equifinality. These configurations include both synergies and substitutions of the conditions, meaning that depending on the absence of one or more conditions, other conditions should be present. Due to equifinality, it is not possible to give a clear answer to the research question. However, it can be concluded that different designs, including almost always a type of increasing autonomy and support, will lead to achieving work-life balance, improved absenteeism and roster satisfaction. For example, when supervisory support is absent, all other conditions should be present in order to be able to achieve work-life balance and improved absenteeism. For additional specific answers, researchers and

practitioners should formulate a main goal for increasing worktime control and look into the different configurations in order to find out which conditions to invest in and which not, in order to be able to effectively achieve the goal.

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Appendix 1: Geographic overview of the 22 teams

Graph hidden in this public available version.

Appendix 2: Data overview and preparation

2.1. Condition variable 1: Self-rostering

In the table below the value of the self-rostering condition can be found for each team. This variable is determined based on the two variables as stated in Section 3.3.1. The mean and standard deviation are calculated by using Excel, this counts for all conditions and outcomes and therefore this will not be repeated in the next sections.

Table 1: Value for self-rostering for each team

Team	Self-rostering
1	7.25
2	7.50
3	7.50
4	6.75
5	6.50
6	7.25
7	6.50
8	6.25
9	6.00
10	5.50
11	5.00
12	5.00
13	4.75
14	3.50
15	1.75
16	1.75
17	1.75
18	1.75
19	2.13
20	1.13
Mean	4.78
Standard deviation	2.29

By using SPSS, the value of Cronbach's Alpha is generated for self-rostering. The table generated from SPSS is shown below.

Table 2: Reliability statistics self-rostering

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.835	.854	2

After the values for each team are determined and the value of Cronbach's alpha is checked, the percentiles were calculated to determine the thresholds for calibration. The results can be found in

Table 1 in Section 3.5. These values are calculated by using the PERCENTILE.INC function in Excel, this counts for all conditions and will therefore not be repeated in the following sections.

2.2. Condition variable 2: Use of modalities

The use of modalities is measured by using data from the information system. This data consists the existing modalities in November 2019. Three kinds of modalities exist within the Dutch police, but this study only uses the unavailability of employees on (part of the) days and the modality to work nine-hours shifts, see Section 3.3.2 for further explanation. After cleaning the data, the use of modalities is identified for each person. This results in the hours of unavailability for each person and a value of 1 for persons who works nine-hours shifts and of 0 for persons who do not work nine-hours shifts.

After collecting this data, each employee is assigned a value between 1 and 5, based on the amount of modalities they use, by using Excel. Employees are assigned to a category based on the hours of unavailability a week as presented in Table 3 below. Moreover, employees who work nine-hours shifts are automatically assigned to the third category. So, employees who are assigned to category 1 or 2 based on their unavailability, are shifted to category 3 when the work nine-hours shifts. The average per team is used to indicate the use of modalities for each team.

Table 3: Categories based on the unavailable hours a week

Category	Hours unavailable a week
1	0-3
2	4-18
3	19-33
4	34-48
5	>48

Table 4 on the next page presents the average for the use of modalities for each team.

Table 4: Value for the use of modalities for each team

Team	Use of modalities
1	1.45
2	1.41
3	2.75
4	1.39
5	2.94
6	1.55
7	1.37
8	1.78
9	1.74
10	2.07
11	1.60
12	1.28
13	1.12
14	1.11
15	1.84
16	1.86
17	2.17
18	2.36
19	1.04
20	1.36
Mean	1.71
Standard deviation	0.53

2.3. Condition variable 3: Worktime control

In Section 3.3.3 is described how the condition worktime control is measured in this study. In the table below the values for worktime control for each team are shown.

Table 5: Value for worktime control for each team

Team	Worktime control
1	3.75
2	3.85
3	3.31
4	3.87
5	3.41
6	3.71
7	3.62
8	2.73
9	3.37
10	3.21
11	3.34
12	2.76
13	3.48
14	3.65
15	3.27
16	3.15
17	2.52
18	2.99
19	3.08
20	3.02
Mean	3.30
Standard deviation	0.38

The following table shows the value of Cronbach's alpha for worktime control.

Table 6: Reliability statistics worktime control

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.808	.816	6

2.4. Condition variable 4: Supervisory support

In Table 7, the value for supervisory support can be found for each team. Further specification of this condition and the two corresponding questions can be found in Section 3.3.4.

Table 7: Value for supervisory support for each team

Team	Supervisory support
1	3.19
2	3.80
3	2.73
4	3.17
5	3.30
6	3.29
7	2.99
8	2.74
9	2.59
10	3.09
11	2.69
12	2.32
13	2.94
14	3.44
15	2.61
16	2.15
17	1.66
18	2.70
19	2.74
20	3.32
Mean	2.87
Standard deviation	0.49

The results of calculating Cronbach's alpha in SPSS can be found in the table below.

Table 8: Reliability statistics supervisory support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.845	.845	2

2.5. Condition variable 5: Co-worker support

In the table below, the value for co-worker support can be found for each team. Further specification of this condition and the four corresponding questions can be found in Section 3.3.5.

Table 9: Value for co-worker support for each team

Team	Co-worker support
1	3.70
2	4.18
3	3.51
4	3.71
5	3.51
6	3.51
7	3.78
8	3.30
9	3.61
10	3.75
11	3.42
12	3.37
13	3.80
14	3.69
15	3.39
16	3.36
17	3.54
18	3.71
19	3.32
20	3.47
Mean	3.58
Standard deviation	0.21

The results of calculating Cronbach's alpha in SPSS can be found in the table below.

Table 10: Reliability statistics co-worker support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.680	.690	4

2.6. Outcome variable 1: Work-life balance

The table below shows the value for the outcome variable work-life balance. Section 3.4.1 further describes how this value is determined. Because the outcome variables all consist of only one variable, determining the value of Cronbach's alpha does not make sense and is therefore excluded in this section.

Table 11: Value for work-life balance for each team

Team	Work-life balance
1	4.18
2	4.50
3	3.58
4	3.98
5	3.81
6	3.94
7	3.82
8	3.29
9	3.87
10	3.73
11	3.63
12	3.75
13	3.78
14	4.04
15	3.47
16	3.00
17	2.50
18	3.07
19	4.02
20	3.51
Mean	3.67
Standard deviation	0.45

2.7. Outcome variable 2: Improved absenteeism

Improved absenteeism is measured by using the absenteeism rates of 2017, 2018 and 2019. These absenteeism rates are calculated based on the absenteeism hours of period 1 to 11. This is because data for all periods of 2019 was not available. Next, these absenteeism hours are compared to the full-time equivalents in hours rectified for the same period of time. This results in an absenteeism rate for all 20 teams for 2017, 2018 and 2019. Then, the trend for absenteeism is determined in order to be able to determine whether absenteeism (i.e. absenteeism rate) of a team improved or not. This is done by calculating the average absence rate for 2017 and 2018. Subsequently, this average absence rate is subtracted from the average rate of 2019. This results in a number which describes the change in absence rate based on the average for 2017/2018 and 2019 in percentage points. Finally, these results are multiplied by minus one in order to indicate improved absenteeism (i.e. a decreasing absence rate) by a positive number. The table below shows the results.

Table 12: Value for improved absenteeism for each team

Team	Improved absenteeism
1	5.64
2	2.32
3	-0.18
4	-0.13
5	-1.09
6	-1.41
7	-0.82
8	0.61
9	4.15
10	0.24
11	-0.44
12	-3.08
13	
14	-0.72
15	1.44
16	-0.21
17	1.00
18	1.72
19	0.15
20	-0.83
Mean	-0.96
Standard deviation	0.37
1	1.97

2.8. Outcome variable 3: Roster satisfaction

The table below shows the value for the outcome variable roster satisfaction. Section 3.4.3 further describes how this value is determined.

Table 13: Value for roster satisfaction for each team

Team	Roster satisfaction
1	4.53
2	4.50
3	3.68
4	4.34
5	4.33
6	4.06
7	4.04
8	3.56
9	3.76
10	3.92
11	3.78
12	4.17
13	4.27
14	3.93
15	3.89
16	2.98
17	2.32
18	3.17
19	4.22
20	3.70
Mean	3.86
Standard deviation	0.54

Appendix 3: Overview types of self-rostering

Table 14: Classification organized independence rostering

Degree of organized independence	1	2	3	4	5	6	7	8	9	10
	Repetitive rostering	Term rostering	Request rostering	Wish-rostering	Scratch rostering	Shift picking (2 rounds)	Shift picking (3 rounds)	Matching (2 rounds)	Matching (3 rounds)	Self-rostering
Employees' influence entered in the type of self-rostering	Fixed roster	Roster for each period of time	Roster for each period of time with employee participation	Request preferences	Fixed roster with removing possibilities	1: sign-up 2: finalize roster	1: free signing up 2: reallocation 3: finalize roster	1: free signing up 2: finalize roster	1: free signing up 2: reallocation 3: finalize roster	0: determine staff requirements 1: free signing up 2: reallocation 3: finalize roster
Employees' influence on decision-making in finalizing the schedule	Capacity management	Team leader		Operational expert capacity management		First supervisor		Team representative		Team

Appendix 4: Data calibration

The data is calibrated by using the `calibrate(x,n1,n2,n3)` function. This function is used to compute the data in calibrated data. The `x` is the original variable and `n1`, `n2` and `n3` respectively represent the threshold values for full membership, the cross-over point and full non-membership, e.g. `calibrate(selfrostering,7.0,5.5,4.0)`. The calibrated data is presented in the table below.

Table 15: Calibrated data

Team	Self-rostering	Use of modalities	Worktime control	Supervisory support	Co-worker support	Work-life balance	Improved absenteeism	Roster satisfaction
1	0.97	0.14	0.99	0.94	0.94	1.00	1.00	1.00
2	0.98	0.08	0.99	1.00	1.00	1.00	1.00	1.00
3	0.98	1.00	0.44	0.13	0.38	0.11	0.48	0.04
4	0.92	0.06	1.00	0.93	0.95	0.97	0.52	0.98
5	0.88	1.00	0.69	0.97	0.38	0.66	0.01	0.98
6	0.97	0.39	0.98	0.97	0.38	0.94	0.00	0.79
7	0.88	0.05	0.95	0.77	0.98	0.70	0.05	0.75
8	0.82	0.85	0.00	0.15	0.00	0.00	0.86	0.01
9	0.73	0.80	0.60	0.01	0.79	0.84	1.00	0.10
10	0.50	0.99	0.20	0.88	0.98	0.39	0.72	0.47
11	0.27	0.54	0.52	0.07	0.06	0.17	0.22	0.12
12	0.27	0.01	0.00	0.00	0.02	0.44	0.00	0.92
13	0.18	0.00	0.82	0.69	0.99	0.54	0.07	0.97
14	0.02	0.00	0.96	0.99	0.94	0.99	0.98	0.50
15	0.00	0.91	0.33	0.02	0.03	0.03	0.44	0.37
16	0.00	0.92	0.11	0.00	0.01	0.00	0.94	0.00
17	0.00	0.99	0.00	0.00	0.54	0.00	0.99	0.00
18	0.00	1.00	0.02	0.08	0.95	0.00	0.68	0.00
19	0.00	0.00	0.05	0.15	0.01	0.98	0.05	0.95
20	0.00	0.04	0.03	0.98	0.18	0.05	0.03	0.05

Appendix 5: Output truth tables

The truth tables are generated from the fsQCA software. The first five columns are the conditions, N of cases stands for the number of cases that have membership in the row, the last three columns present the values for consistency.

Table 16: Truth table for work-life balance

Self-rostering	Use of modalities	Worktime control	Supervisory support	Co-worker support	N of cases	raw consist.	PRI consist.	SYM consist.
1	0	1	1	1	4	0.983051	0.979827	1.000000
1	1	0	0	0	2	0.304568	0.041958	0.041958
0	0	1	1	1	2	0.926829	0.880952	1.000000
0	1	0	0	1	2	0.303317	0.075472	0.075472
0	1	0	0	0	2	0.181230	0.023166	0.023166
0	0	0	0	0	2	0.670412	0.500000	0.553459
1	1	1	1	0	1	0.985401	0.971831	0.971831
1	0	1	1	0	1	1.000000	1.000000	1.000000
1	1	1	0	1	1	0.805755	0.662500	0.662500
0	1	0	1	1	1	0.797787	0.095192	0.095193
0	0	0	1	0	1	0.308271	0.155963	0.155963
0	1	1	0	0	1	0.446808	0.113636	0.113636
1	1	1	1	1	0			
1	1	0	1	1	0			
1	0	0	1	1	0			
1	1	0	1	0	0			
1	0	0	1	0	0			
1	1	0	0	1	0			
1	0	0	0	1	0			
1	1	1	0	0	0			
1	0	1	0	0	0			
1	0	0	0	0	0			
0	1	1	1	1	0			
0	0	0	1	1	0			
0	1	1	1	0	0			
0	1	0	1	0	0			
0	0	1	1	0	0			
0	0	1	0	1	0			
0	0	0	0	1	0			
0	0	1	1	0	0			
0	0	0	1	0	0			
0	0	0	0	1	0			
0	0	1	0	0	0			

Table 17: Truth table for improved absenteeism

Self-rostering	Use of modalities	Worktime control	Supervisory support	Co-worker support	N of cases	raw consist.	PRI consist.	SYM consist.
1	1	1	0	1	4	0.610169	0.531977	0.601974
1	0	0	1	0	2	0.908630	0.833333	0.865385
0	1	1	0	1	2	0.648780	0.576471	0.576471
0	0	1	1	0	2	0.862559	0.801370	0.959016
0	0	0	1	0	2	0.825243	0.740385	0.781726
0	0	0	0	0	2	0.329588	0.118227	0.118227
1	1	0	1	1	1	0.270073	0.065421	0.065421
1	1	0	0	1	1	0.290698	0.102941	0.102941
1	0	1	1	1	1	0.964029	0.929578	0.929578
0	1	1	1	0	1	0.851080	0.641118	0.641118
0	1	0	0	0	1	0.315789	0.052083	0.052083
0	0	0	1	1	1	0.751773	0.453125	0.453125
1	1	1	1	1	0			
1	1	1	1	0	0			
1	1	1	0	0	0			
1	1	0	1	0	0			
1	1	0	0	0	0			
1	0	1	1	0	0			
1	0	1	0	0	0			
1	0	0	1	1	0			
1	0	0	0	0	0			
0	1	1	1	1	0			
0	1	1	0	0	0			
0	1	0	1	1	0			
0	1	0	1	0	0			
0	1	0	0	1	0			
0	0	1	1	1	0			
0	0	1	1	1	0			
0	0	1	0	0	0			
0	0	0	1	0	0			
0	0	0	1	0	0			
0	0	0	0	1	0			

Table 18: Truth table for roster satisfaction

Self-rostering	Use of modalities	Worktime control	Supervisory support	Co-worker support	N of cases	raw consist.	PRI consist.	SYM consist.
1	1	1	0	1	4	0.995157	0.994318	1.000000
1	0	0	1	0	2	0.192893	0.012422	0.012422
0	1	1	0	1	2	0.785366	0.636364	1.000000
0	0	1	1	0	2	0.222749	0.012048	0.012048
0	0	0	1	0	2	0.242718	0.008475	0.008621
0	0	0	0	0	2	0.749064	0.685446	0.685446
1	1	0	1	1	1	0.934307	0.906250	0.906250
1	1	0	0	1	1	1.000000	1.000000	1.000000
1	0	1	1	1	1	0.395683	0.115790	0.115790
0	1	1	1	0	1	0.882885	0.521512	0.521512
0	1	0	0	0	1	0.315789	0.107843	0.107843
0	0	0	1	1	1	0.546099	0.098592	0.098592
1	1	1	1	1	0			
1	1	1	1	0	0			
1	1	1	0	0	0			
1	1	0	1	0	0			
1	1	0	0	0	0			
1	0	1	1	0	0			
1	0	1	0	1	0			
1	0	0	1	0	0			
1	0	0	0	1	0			
1	0	0	0	0	0			
0	1	1	1	1	0			
0	1	1	0	0	0			
0	1	0	1	1	0			
0	1	0	1	0	0			
0	1	0	0	1	0			
0	0	1	1	1	0			
0	0	1	1	1	0			
0	0	1	0	0	0			
0	0	0	1	0	0			
0	0	0	1	1	0			
0	0	0	0	1	0			
0	0	0	0	1	0			

Appendix 6: Team name and corresponding team code

*Team names are hidden within this public available version.

Table 19: Team names and corresponding team codes used in this research

Team	Team code
Team 1	1
Team 2	2
Team 3	3
Team 4	4
Team 5	5
Team 6	6
Team 7	7
Team 8	8
Team 9	9
Team 10	10
Team 11	11
Team 12	12
Team 13	13
Team 14	14
Team 15	15
Team 16	16
Team 17	17
Team 18	18
Team 19	19
Team 20	20

Appendix 7: Reduced truth tables

Table 20: Reduced truth table for work-life balance

Team	Self-rostering	Use of modalities	Worktime control	Supervisory support	Co-worker support	N of cases	Outcome	raw consist.	PRI consist.	SYM consist.
6	1	0	1	1	0	1	1	1.000000	1.000000	1.000000
5	1	1	1	1	0	1	1	0.985401	0.971831	0.971831
1, 2, 4, 7	1	0	1	1	1	4	1	0.983051	0.979827	1.000000
13, 14	0	0	1	1	1	2	1	0.926829	0.880952	1.000000
9	1	1	1	0	1	1	1	0.805755	0.662500	0.662500
10	0	1	0	1	1	1	0	0.797787	0.095192	0.095193
12, 19	0	0	0	0	0	2	0	0.670412	0.500000	0.553459
11	0	1	1	0	0	1	0	0.446808	0.113636	0.113636
20	0	0	0	1	0	1	0	0.308271	0.155963	0.155963
3, 8	1	1	0	0	0	2	0	0.304568	0.041958	0.041958
17, 18	0	1	0	0	1	2	0	0.303317	0.075472	0.075472
15,16	0	1	0	0	0	2	0	0.181230	0.023166	0.023166

Table 21: Reduced truth table for improved absenteeism

Teams	Self-rostering	Use of modalities	Worktime control	Supervisory support	Co-worker support	N of cases	Outcome	raw consist.	PRI consist.	SYM consist.
9	1	1	1	0	1	1	1	0.964029	0.929578	0.929578
3,8	1	1	0	0	0	2	1	0.908630	0.833333	0.865385
17, 18	0	1	0	0	1	2	1	0.862559	0.801370	0.959016
10	0	1	0	1	1	1	1	0.851080	0.641118	0.641118
15, 16	0	1	0	0	0	2	1	0.825243	0.740385	0.781726
11	0	1	1	0	0	1	0	0.751773	0.453125	0.453125
13, 14	0	0	1	1	1	2	0	0.648780	0.576471	0.576471
1, 2, 4, 7	1	0	1	1	1	4	0	0.610169	0.531977	0.601974
12, 19	0	0	0	0	0	2	0	0.329588	0.118227	0.118227
20	0	0	0	1	0	1	0	0.315789	0.052083	0.052083
6	1	0	1	1	0	1	0	0.290698	0.102941	0.102941
5	1	1	1	1	0	1	0	0.270073	0.065421	0.065421

Table 22: Reduced truth table for roster satisfaction

Teams	Self-rostering	Use of modalities	Worktime control	Supervisory support	Co-worker support	N of cases	Outcome	raw consist.	PRI consist.	SYM consist.
6	1	0	1	1	0	1	1	1.000000	1.000000	1.000000
1, 2, 4, 7	1	0	1	1	1	4	1	0.995157	0.994318	1.000000
5	1	1	1	1	0	1	1	0.934307	0.906250	0.906250
10	0	1	0	1	1	1	1	0.882885	0.521512	0.521512
13, 14	0	0	1	1	1	2	0	0.785366	0.636364	1.000000
12, 19	0	0	0	0	0	2	0	0.749064	0.685446	0.685446
11	0	1	1	0	0	1	0	0.546099	0.098592	0.098592
9	1	1	1	0	1	1	0	0.395683	0.115790	0.115790
20	0	0	0	1	0	1	0	0.315789	0.107843	0.107843
15, 16	0	1	0	0	0	2	0	0.242718	0.008475	0.008621
17, 18	0	1	0	0	1	2	0	0.222749	0.012048	0.012048
3, 8	1	1	0	0	0	2	0	0.192893	0.012422	0.012422