Master's thesis

The impact of IT on coordination between self-managed teams.

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16th of August 2020
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Abstract

Purpose – Today's dynamic world and markets have given rise to self-managing organisations, with Holacratic organisations being the most prominent type. Within Holacracy, in order to effectively and efficiently achieve the business' goals, the self-managing teams need to have mechanisms of coordination in place. Therefore, this thesis aims to examine how IT tools can be used as a coordination mechanism between self-managing teams in a Holacratic organisation.

Design/methodology/approach – This qualitative study was conducted through interviews at a Holacratic software development company situated in the Netherlands. The interviewees were selected carefully based on a set of criteria. The collected data was coded and analysed using template analysis and thereafter presented in the results chapter of the thesis.

Findings – Many interdependencies relating to coordination were found during the interviews, namely shared resources, producer-consumer relationship and simultaneity constraint. Furthermore, it explored various coordination methods that can help to mitigate these interdependencies. Different IT tools were then identified that help self-managing teams in the Holacratic organisation to deal with these interdependencies.

Keywords: Self-managing teams, Holacracy, Coordination, Interdependencies, Shared resources, Producer-consumer relationship, Simultaneity constraint, Information technology

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1. Introduction

Today's dynamic world and markets have given rise to self-managing organisations. The most prominent type of self-managing organisation is Holacratic organisations (Kumar & Mukherjee, 2018; Velinov, Vassilev & Denisovet, 2018). Holacracy allows firms to adapt its organisational structure in order to distribute authority and provides a clear meeting process so that teams can keep in sync and are able to achieve company goals together (Robertson, 2015). The Holacratic structure is made up of various teams, called Circles, that are self-organising. The teams, or Circles, emerge in processes and they evolve over time (Bernstein Bunch, Canner & Lee, 2016). Additionally, Bernstein et al. (2016) explain that in Holacracy, leadership is contextual and teams design and govern themselves. Self-managing teams can be described as a team with a high degree of decision-making independence. Additionally, within self-managing teams, the managerial and core operational tasks are distributed throughout the entire team (Weerheim, Van Rossum & Ten Have, 2018). Within Holacracy, in order to effectively and efficiently achieve the business' goals, these teams need to have mechanisms of coordination in place.

Coordination is important in self-regulation, which is a key characteristic of self-managing teams (Kato & Owen, 2011; Sassenberg & Hamstra, 2017). 'Coordination' and 'collaboration' are terms that are often used interchangeably. Keast, Brown and Mandell (2007) explain that collaboration differs from coordination in that collaboration "*require(s) much closer relationships, connections, and resources and even a blurring of the boundaries between organisation*s". Yet, coordination focuses more on formal linkages, or interdependencies, of resources and processes during interactions, which are mobilised to achieve the organisation's goals (Jennings, 1994; Keast et al., 2007; McNamara, 2012). Coordination in the context of this research can be defined as the "*process of interaction that integrates a collective set of interdependent tasks*" (Okhuysen & Bechky, 2009, p. 463). According to Puranam and Raveendran (2013), interdependence and integration are features of coordination between self-managing teams. Puranam and Raveendran (2013) also express how coordination failures (such as misunderstandings or delays) occur when self-managing teams are not able to foresee

each other's operations or activities and, thus, adjust their own activities accordingly due to the lack of facilitative coordination tools.

Self-managing teams need to have access to the right resources and tools for their tasks in order to effectively and efficiently solve problems when engaging and interacting with other self-managing teams. Various studies have been done on the impact of certain tools and other characteristics but the realm of information technology tools and coordination between different self-managing teams still remains under-explored by scholars (e.g. De Jong et al., 2003; Magpili & Pazos, 2017). Information technology refers to systems (such as telecommunications, software applications and computers) that are used by businesses for collecting, processing, storing and delivering information and data to those who need it (Sarosa & Zowghi, 2003; Attaran, 2003). An example of this could be task management systems such as Jira or Asana. Given that the coordination process between self-managing teams relies heavily on information, knowledge and resource sharing (Okhuysen & Bechky, 2009; Puranam & Raveendran, 2013), a deeper understanding of how IT tools facilitate and enable coordination between self-managing teams is relevant for operational tasks, managerial activities and decision-making in order to have the firm run smoothly and successfully. Moreover, it provides an insight into how information technology strengthens the information and knowledge flows, which would make the overall coordination function between self-managing teams more efficient (De Jong, De Ruyter & Lemmink, 2003). Therefore, the following focal research question is formulated:

How do IT tools facilitate the coordination processes between self-organising teams in a Holacratic organisation?

To explore and answer the research question, a qualitative analysis will be carried out in order to answer the '*how*' nature of the research question. Symon and Cassell (2012) outline that qualitative research will provide a deeper understanding in how self-managing teams work with IT tools to enable coordination between them. Specifically, the data is primarily collected in the form of interviews. Interviews allow researchers to understand how people make use of the IT

tools to coordinate their teams (Symon & Cassell, 2012). Thus, conducting interviews gives an in-depth perspective on how self-managing teams use coordination IT tools and how these tools are used to facilitate coordination between self-managing teams. Ideally, seven to twelve interviews should give a good insight into themes (Hennink et al, 2016). The data for this research was collected in a software-developing firm that has an Holacratic organisational structure with various self-managing teams because this gives the study a practical perspective. This organisation has been working with a Holacratic structure for five years and is based in the Netherlands. The analysis shows how the self-managing teams in the Holacratic organisation use various IT tools to manage coordination challenges.

The purpose of this research is to address conceptual problems that can have implications for the practice of self-managing teams in Holacratic organisations. By answering the research question posed above, this thesis will contribute to how IT tools facilitate coordination between self-managing teams. The intent of this research with regards to its contribution is twofold. First, this research aims to contribute to the coordination literature. This is important because it can provide valuable practical insights for self-managing organisations to design and govern their relevant Circles. Specifically, this research will look into how IT tools are used to achieve the aforementioned capacity. This will be beneficial for self-managing organisations as it can give them an indication of the impact that various IT tools can have on the way they organise themselves. Moreover, for scholars, this research will create a deeper understanding of the methods that are used by self-managing teams to facilitate coordination between them. Second, this thesis wants to contribute to the literature on self-managing teams. This new form of organising is being increasingly researched by scholars and becoming more common in practice within organisations. Hence, it is becoming increasingly interesting for other firms to perhaps consider introducing self-managing structures to their organisation.

As previously mentioned, this thesis aims to consider IT as a means to manage the coordination between self-managing teams. The remainder of the thesis proceeds in the following way. Firstly, the key concepts of self-managing organisations with Holacratic structures, coordination interdependencies and IT tools will be clarified and explained. This will

grasp the research question and also lay the foundation stones for the rest of the research. Secondly, attention will then be turned to the research design and thought will be given to the qualitative methods in which the chosen methodology will be described and discussed. Thirdly, the findings of this research are presented focusing on key themes that result from the collected data. Finally, in the concluding chapter, the research question will be answered through the conclusion and discussion. Afterwards, thought will also be given to the limitations of this research and suggestions for future research will be made.

2. Theoretical background

This chapter will focus on the theoretical background surrounding the concepts and definitions that are relevant to this research. First, the concept of self-managing organisations and their Holacratic structures will be described. Furthermore, the idea of self-managing teams will be explained. Second, coordination is defined and why this is necessary between self-managing teams. Third, information technology will be introduced as a means to coordinate between self-managing teams by illustrating different types of information technology and elaborating on its role in coordination. Lastly, a short theoretical summary will be presented.

2.1. Self-managing organisations

Traditional forms of bureaucratic, hierarchical organisational structures are making way for new ways of organising in today's dynamic environment. Organisations[1] can be seen as systems with multiple agents[2] that work together to achieve a common goal or purpose (Puranam, Alexy & Reitzig, 2014). Recent research has shown that polyarchical approaches are beneficial towards preparing the ground for dealing with dynamic environments. Polyarchy gives autonomy to specialised individuals and sub-units within the boundaries of the firm, while minimising bureaucratic impediments to project approval and implementation (Felin & Powell, 2016). The combination of autonomy and minimised bureaucratic impediments in today's dynamic environment gives way to self-managing organisations.

Self-managing organisations decentralise authority throughout the organisation in an orderly and systematic fashion (Lee & Edmondson, 2017). This leads to more autonomy amongst the employees in the firm and makes the firm less hierarchical as a whole. Lee and Edmondson (2017) argue that there are three main trends that motivate less-hierarchical forms of organising within organisations. First, the pace of change due to faster information flows and

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[1] The words o*rganisation*, *firm, company* and *business* are used synonymously throughout this thesis.

[2] The words *agents*, *employees* and *members* are used synonymously throughout this thesis.

technological development. Second, the growth in knowledge-based work because firms operate more frequently in knowledge economies where the main sources of value creation come from ideas and expertise. Third, a trend has evolved which views organisations as places for personal meaning and improves employee experiences at work. Hence, the decentralisation of authority and the reduction of bureaucratic impediments helps organisations to deal with the fast-changing environment. It should be noted though that self-managing organisations can still be quite bureaucratic based on Max Weber's work bureaucracy. Bureaucracy includes a system of rules and a hierarchy of authority (Blau, 1956; Lutzker, 1982), but in self-managing organisations, specifically Holacracy, the defined and transparent rules are used to decentralise authority and distribute it amongst its employees making it less rigid than traditional bureaucratic companies (Bernstein et al., 2016). As a result, the faster decision-making permits the firm to be able to keep up and adapt quicker to the dynamic markets and environment.

The decentralised structure within self-managing organisations also allows for managers and traditional hierarchical reporting relationships to be removed. Holacratic organisations still have hierarchical reporting relationships, but these reporting relationships are amongst defined Roles rather than larger and person-bound job functions (Kumar & Mukherjee, 2018). The difference between Holacratic Roles and traditional job functions will be explained further in section 2.1.2. There are currently indications that employees in a self-managed organisation feel more involved in the company due to the decentralised structure (Hamel, 2011), and are therefore more highly motivated (Martela, 2019). A study by Hamel (2011) proposes that the high motivation levels in self-managing organisations make the employees more responsive to take initiative, which helps them to develop their skills and capabilities (Hamel, 2011). However, the described relations between involvement and motivation in self-managing organisations are still being researched by academics in order to fully understand this concept. Thus, it is suggested that decentralised structures improves the employees' experience at work as they can use their expertise more on the front-line of autonomous decision-making. Overall, it can be argued that self-managing organisations are ideally based on "*collaboration (rather than specialisation) [and] flexibility (rather than standardisation)*" (Reed, 2011, p. 233). Reed (2011)

also suggests that self-managing organisations are ideally based on negotiation rather than formalisation, but this is not in line with Holacratic organisations. Instead, these Holacratic organisations are highly formalised in the sense that behaviour and operations within the company are based on a written down, explicit set of rules as presented in the Holacracy Constitution 4.1. These rules are commonly decided upon during Governance Meetings (HolacracyOne, 2015). The next section will elaborate on the Holacratic structure further.

2.1.1. Holacratic structures

Holacracy is the most well-known form of self-managed organisations (Kumar & Mukherjee, 2018; Velinov et al., 2018). The Holacratic structure is made up of various Circles that are self-organising. The company as a whole makes up the Super-Circle, which in turn is made up of smaller Circles (Bernstein et al., 2016). The Super-Circle defines the boundaries of the organisation. In some instances, the Circles in the Super-Circle can also include Sub-Circles (Robertson, 2015). In the end, one is left with a network of Circles and Sub-Circles, all within the Super-Circle. An example of this circular Holacratic structure is illustrated in Figure 1a.
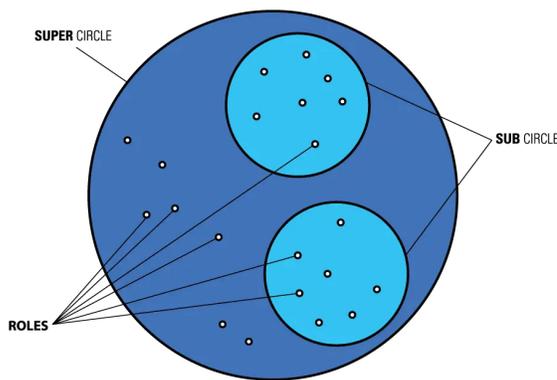

Figure 1a: An example of a Holacratic organisation with a Circular structure (HolacracyOne, 2015).
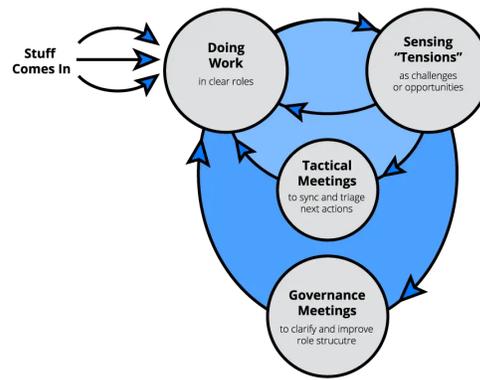
Figure 1b: The typical work processes in a Holacratic organisation (HolacracyOne, 2015).

The principal governance and operational processes in a Holacratic organisation are laid out in the Holacracy Constitution. The Constitution outlines explicit rules with regards to how Holacratic organisations should function. Projects and work in the organisation are worked on by Circles and their members in their Roles (Robertson, 2015). Roles are further discussed in section 2.1.2. First, the governance process caters to the improvement and clarification of the Circle structure. This includes clearly defining the Circles's Roles and policies. The defining, changing or removal of Roles and policies are discussed and handled during Governance Meetings. Changes to Circle Roles and/or policies often arise from Tensions identified by employees. Tensions are gaps between what something is currently like and what the employee feels that it could or should be like. For example, if a project is at its end, an employee may sense that there is no further need for a particular Role in the Circle and can thus propose for the removal of the redundant Role. Second, the aim of the operational process is to sync and triage tasks of the Circle. As part of this process, Tactical Meetings are held to share status updates on tasks and to check on the progress of projects, amongst other things. The governance and operational processes help Circles in their day-to-day work and allows them to assess whether they are on the right track to achieve the organisation's goals (Robertson, 2015).

The Circles in an Holacratic firm emerge from the processes described previously and they evolve over time (Bernstein et al., 2016). Thus, the Holacratic structure of a self-managing organisation is always changing depending on the processes and goals that the business is working on. Consequently, Circles can evolve when necessary but also cease to exist if it is no longer relevant to the organisation.

On the whole, self-managing Holacratic organisations have three main characteristics: (1) Circles evolve and change in accordance with the needs of the organisation, (2) Circles design and govern themselves and (3) leadership is contextual (Bernstein et al., 2016). As mentioned in the previous section, in Holacracy the traditional managerial and hierarchical reporting relationships are reduced which means that authority and power are distributed throughout the organisation (Martela, 2019). This authority is distributed through the governance and operational processes. The distributed authority gives Circles and its members more freedom to

make their own decisions, whilst sticking to the individual, teams and organisational purpose (Robertson, 2015; Bernstein et al., 2016; HolacracyOne, 2015). In this way, the aim of Holacracy is to provide Circles with their own ability to learn, change and adjust accordingly when faced with any issues and to effectively achieve their goals (Velinov et al., 2018).

2.1.2. Circles as self-managing teams

As in most other businesses, the work that needs to be done in order to achieve the organisation's goals needs to be divided. Holacratic organisations make this division of labour in terms of Roles. These Roles are then grouped into Circles. Employees, or members, of these Circles have Roles rather than job functions (Kumar & Mukherjee, 2018). Holacracy Roles differ from traditional job functions in several ways. First, in traditional hierarchical companies, employees usually only fill one (large) function. In Holacracy, an employee can energise several Roles. Second, the descriptions of job functions are often rigidly defined and are then rarely changed. Hence, the job function can remain quite static over a very long period of time. In contrast, Roles include more of a reflection of what is needed in a Circle and are thus more task-bound. This makes the Roles smaller, which is why employees normally fulfill several Roles. Additionally, the description of a Role is monitored and reviewed more frequently to ensure that it is still accomplishing the tasks that it was designed for. If this is not the case suggestions can be made to adjust and improve the Role during Governance Meetings. Third, employees that hold a specific job function often do not have space to change their function unless a promotion is made, for example. Roles are much more flexible in this aspect: employees can pick up or return Roles much more easily due to the dynamic nature of the Roles (Robertson, 2015).

Each Role has one or more Purpose and Accountabilities. The Purpose represents the goal of that Role and the Accountabilities are the means by which this Role should accomplish its Purpose (i.e. through tasks or activities) (Bernstein et al., 2016; Robertson, 2015). The employee who energises a given Role is then responsible to take initiative to fulfill their Purpose. Some Roles will also include Domains, which entail that that Role has exclusive control over something such as assigning other Roles within a Circle. Other Roles wishing to gain access to

or regulate this will need to receive permission from the Role who has that Domain (Holacracy Constitution, 2015). As previously mentioned, in contrast to a traditional hierarchical organisational structure where an employee has one function, a member of a Holacratic organisation will usually energise between five and fifteen Roles. This makes it possible for all members in a Circle to be assigned managerial and core operational tasks (Weerheim, Van Rossum & Ten Have, 2018).

The Roles that are included in a particular Circle will depend on the organisation, but each Holacratic Circle will have four Core Roles: the Lead Link, the Rep Link, the Facilitator and the Secretary. The Holacracy Constitution (2015) defines the Purpose of the Lead Link to be to ensure that the Circle sticks to its goal(s), to prioritise tasks and to decide on Circle strategies when necessary. For example, if the Lead Link feels that someone is not energising their Role effectively, and thus not contributing actively to the Circle's goal(s), the Lead Link may reallocate that Role. The Rep Link serves as a representative of a Circle's Purpose in the Super-Circle. Additionally, the Rep Link can take a Circle's Tension(s) to discuss at the Super-Circle level. For instance, a Circle may need a new Role in order to carry out tasks for a project. In this case, the Rep Link can formally take this Tension to a Super-Circle Governance Meeting so that it may be resolved. The Facilitator Role is responsible for keeping the Circle's governance and operational activities in line with the Holacracy Constitution. The Secretary Role is responsible for the Circle's formal documents and record-keeping process. Examples of a Secretary's activities include scheduling Governance and Tactical meetings for the Circle and maintaining an organised overview of the Circle's metrics. Therefore, one can see that the Lead Link and Rep Link formally have Purposes and Accountabilities that may require the involvement of other Circles. Hence, they form a valuable coordinating link between Circles. Reed (2011) suggests that for this reason, a form of overall coordination between these structural Circles and Roles is achieved through a decentralised, scattered control system. This is needed in order to open up processes and work conjointly and in a coordinated fashion on the organisation's goals (Reed, 2011). Some Circles may also choose to have a Cross Link Role. In this Role, a person from another Circle who is allowed/invited to participate in another Circle

(Holacracy Constitution, 2015). As a result, this can facilitate the working together of two Circles. Table 1 provides a definition summary of key Holacracy-specific terms.

Table 1: Summary of definitions of Holacracy-specific terms used in this research based on the Holacracy Constitution 4.1 (HolacracyOne, 2015).	
Super-, Sub-, Circle	A Circle is a self-managed team consisting of various Roles. The Super-Circle defines the boundary of the organisation and often includes several Circles. A Sub-Circle is a Circle within a Circle.
(Circle) member	A person who has a Role within a particular Circle.
Governance Meeting	Meetings to clarify and improve the Role/Circle structure.
Tactical Meeting	Meetings to sync and triage tasks or activities.
Purpose	The goal of a Circle or member Role.
Accountabilities	The means by which this Role should accomplish its Purpose through tasks or activities.
Domains	Something that a Role has exclusive control over and can regulate this on behalf of the Circle or the organisation.
Tensions	Gaps between what something is currently like and what the employee feels that it could or should be like.
(Core) Role	A Role has a description/reflection and a descriptive name. It has one or more Purpose, Accountabilities and Domain. Core Roles are the Lead Link, Rep Link, Facilitator and Secretary.
Lead Link	Responsible for holding the Purpose of the Circle in question. Lead Links also have the Domain of Role assignments within the Circle and may define relative priorities for the Circle. The Lead Link also holds all unassigned Domains and Accountabilities within the Circle.
Rep Link	Represents the Purpose of a Circle in the Super-Circle, along with the particular Circle's Tensions.
Facilitator	Responsible for keeping the Circle's governance and operational activities in line with the Holacracy Constitution.
Secretary	Responsible for the Circle's formal documents and record-keeping process.
Cross Link	A person from another Circle who is allowed/invited to participate in another Circle.

2.1.3. Drawbacks of Holacratic structures

Using a Holacratic form of organising can also bring some drawbacks with it. According to Bernstein et al., 2016) a common misconception about Holacracy (and other self-managing organisations) is that everyone has the same status in the organisation (i.e. that all employees are completely equal). Although the differences between employees are reduced in a traditional managerial and hierarchical sense, some differences still exist and need to be addressed. Namely, some employees in a Holacratic organisation will have more Roles and Accountabilities than others. This may also give some employees more of a say than others in decision-making processes. Similarly, whilst each person is responsible for effectively energising their own Roles, not everyone will exercise their authority and voice equally during meetings, for example.

Moreover, with employees fulfilling so many Roles, it can become a challenge to balance all of the tasks related to these Roles and keep a good overview. As a result, the productivity of accomplishing each of these tasks may be reduced. This might be applicable to individuals who struggle to prioritise, for instance. Likewise, Circles can experience the same issues if they do not prioritise correctly and lose overview of what the Circle is doing (Bernstein et al., 2016). Consequently, this can have an impact on the work of other Circles. Hence, Circles need good coordination mechanisms to ensure that they can continue to work together effectively.

2.2. Coordination

Coordination is a main challenge between self-managing teams (Ingvaldsen & Rolfsen, 2012). Coordination integrates a shared set of interdependent tasks through a process of interaction as defined by Okhuysen and Bechky (2009). In order to efficiently and effectively achieve organisational goals, these interactive processes often require several steps of information processing and various interdependent activities (Puranam, Raveendran & Knudsen, 2012). The information processing required for coordination objectives needs expertise that comes from one self-managing team and is then shared with another team. More specifically, this knowledge (or expertise) sharing needs to happen in a joint effort between teams so that goals can be attained

(Cherns, 1976, as cited in Denison, 1982). According to Puranam and Raveendran (2013) and Puranam et al. (2012), bounded rationality is a key assumption for understanding the barriers to knowledge-related issues. In other words, the aforementioned authors suggest that teams only have limited knowledge of the tasks that they are assigned. As a result, incomplete or inadequate knowledge of each team can impede coordination efforts between these teams (Puranam & Raveendran , 2013; Puranam et al., 2012).

A lack of facilitative coordination tools and the impediment of coordination efforts would result in coordination failures (Puranam & Raveendran, 2013). Such coordination failures may include misunderstandings or delays in the information processing course. Puranam and Raveendran (2013) state that this means that self-managing teams are unable to interact efficiently and thus cannot adjust their own activities in accordance to other self-managing teams' tasks because communication and interactions between self-managing teams cannot be optimised. The inability to foresee each other's operations leads to cracks in the overall firm's performance (De Jong et al., 2003). Furthermore, coordination failures also disrupt the autonomous nature of self-managing teams (Magpili and Pazos, 2017). Hence, to avoid such failures facilitative coordination tools need to be in place.

Studies by Puranam et al. (2012) and Denison (1982) argue that activities or tasks for information processing are often (inter)dependent. This line of reasoning suggests that self-managing teams cannot fully proceed with their operational tasks without having received the necessary information from another team. The potential interdependencies in coordination will be discussed in the next section.

2.2.1. Interdependencies in coordination

Coordination theory requires the identification of (inter)dependencies (Crowston, Rubleske & Howison, 2006). These interdependencies can also exist between tasks of the different Roles in the self-managing teams and the coordination mechanisms that are used by the self-managing teams to coordinate these tasks . The tasks, or activities, that self-managing teams carry out can be categorised in four main dependencies: shared resources, producer-consumer relationships,

simultaneity constraints and task-subtask (Malone & Crowston, 1994). First, the shared resources dependency arises when multiple tasks need the same resources. A resource is "*an economic or productive factor required to accomplish an activity*" (BusinessDictionary, 2020). Examples of resources include time, members, office space and software tools. Second, the producer-consumer dependency refers to a dependency where one task creates a resource that is needed by another task. In other words, the output of one team could be the input for another team. Third, simultaneity constraints refer to scheduling and synchronisation dependencies (Malone & Crowston, 1994). This means that certain tasks may need to happen at the same time, or on the contrary, cannot occur at the same time. Fourth, the task-subtask dependency concerns goal selection and task decomposition (Malone & Crowston, 1994; Crowston et al., 2006). Moreover, the task-subtask dependency can be defined as "*a group of activities are all 'subtasks' for achieving some overall goal*" (Malone & Crowston, 1994, pp. 95-96). This means that all activities or tasks in the organisation can be broken down into subtasks and distributed over the Super-Circle, Circles and Sub-Circles. Crowston et al. (2006) note that when breaking down these tasks it is important to keep in mind the overall goals of the organisation. Otherwise, it is easy for the Circles to lose focus on their part within the organisation and lose focus on the overall organisational goals. For the remainder of this thesis, this fourth dependency is not elaborated upon because it merely reflects the structure of the organisation or how the organisation is broken down (i.e. whether a Circle is a Super-Circle, a 'normal' Circle or Sub-Circle). Figure 2 in Chapter 4 shows the task-subtask dependency of the organisation researched.

In line with Emery (1980), Crowston et al. (2006) also recognise that the degree of autonomy may not necessarily be the biggest critical problem in the interdepencies of tasks but rather in the information needs. These information needs can be in the form of information systems (i.e. resources) that facilitate productive coordination. This confirms that the correct information and resources are vital in effective coordination processes. To this degree, Crowston et al. (2006) suggest several coordination mechanisms that can help with the information needs of these interdependencies.

2.3. Information technology as a coordination mechanism

To overcome coordination problems and manage the aforementioned interdependencies, teams need coordination mechanisms (Crowston et al., 2016). Information technology presents itself as such a mechanism to manage coordination between self-managing teams.

Information technology (IT) refers to systems (such as telecommunications, software applications and computers) that are used by businesses for collecting, processing, storing and delivering information and data to those who need it (Sarosa & Zowghi, 2003; Attaran, 2003). Examples of information technology that are used by self-managing organisations with Holacratic structures are GlassFrog, Slack and Jira. Nowadays, IT has become an integral part of a business' communication and decision tasks (Lau, Wong, Chan & Law, 2001). According to Lau et al. (2001, p. 269), IT can also lead to "new coordination-intensive business structures" by removing costly management layers. Thus, this leads to more flexibility within the company and faster communication.

The interdependent information and resources needed in the carrying out of tasks in self-managing teams require processing, storing and delivering through information technology tools. Modern-day devices and information systems ensure that information and communication reaches the relevant roles as soon as possible. Subsequently, information technology makes it possible to receive feedback very quickly (Van de Kamp, 2014). This can help with the simultaneity constraint if tasks need to be carried out at the same time, for example. Moreover, the fast availability of information aids fast, autonomous decision-making in order for the self-managing organisation to keep up with changing markets.

Information technology can not only help a self-managing organisation with dealing with external competition and markets, but it can also serve as a coordination tool for internal purposes. By using information technologies, members of self-managing teams can develop their operations, structure (for example by creating a new Circle or getting rid of redundant Circles) or strategy and purpose. Hence, information technology can create countless new opportunities for self-managing organisations (Lau et al., 2001).

2.3.1. Types of IT tools

For coordination purposes, it is important that IT tools are available to Circles that allow for and facilitate the working together of multiple Circles. Studies by Malone and Crowston (1994), Crowston et al. (2006) and Cataldo, Bass, Herbsleb and Bass (2007) identify multiple mechanisms for coordination where IT tools can help to address interdependencies. These are summarised in Table 2 below. First, good documentation helps teams to reduce unnecessary communication between teams and gives teams access to information that they are looking for. This can increase the work pace and reduce the time trying to find something. Second, communication and notifying tools help to reinforce other coordination mechanisms through the exchange of information between various teams. Keeping track of progress and adequate task management are also considered important coordination mechanisms, especially to deal with producer-consumer interdependencies. Having a suitable ticketing system to manage tasks/projects and keeping track of their progress, allows for the sequencing and prioritisation of tasks. This in turn aids the Holacratic way of working in which employees are responsible for prioritising and planning their own tasks (HolacracyOne, 2015). Thus, IT tools can help with keeping a systematic overview of projects and tasks, which employees and Circles need to work on in order to contribute to the organisation's overall goals. Furthermore, IT tools such as Slack or GlassFrog facilitate the setting of period meetings and also allow for self-managing teams to schedule and synchronise their tasks (Malone & Crowston, 1994; Crowston et al., 2006; Cataldo et al., 2007). This means that a close overview can be kept on which tasks need to be performed simultaneously (and which ones can't be performed simultaneously) in order to effectively and efficiently fulfill the organisation's goals. Hence, different types of IT tools can be used for various functions such as documentation, task management and scheduling so that self-managing teams in a Holacratic organisation can coordinate between the Circles.

Table 2: Overview of example IT tools as a coordination mechanism

Interdependencies	Examples of coordination mechanisms	IT tool examples for Holacratic/self-managing teams
Shared resources	Communication (Cataldo et al., 2007; Malone & Crowston, 1994)	Slack, emailing tools, online conferencing tools
	Documentation (Cataldo et al., 2007)	GlassFrog, Holaspirit
Producer-consumer relationship	Keeping track of progress (Malone & Crowston, 1994); Crowston et al., 2006)	Trello, Todoist
	Notifying (Malone & Crowston, 1994); Crowston et al., 2006)	Slack
	Project/task management (or ticketing) through sequencing and prioritising (Malone & Crowston, 1994; Crowston et al., 2006)	Jira, Asana
Simultaneity constraint	Periodic meetings (Cataldo et al., 2007)	GlassFrog
	Scheduling & synchronisation (Malone & Crowston, 1994)	Slack

On the whole, it is evident *what* information technology can help with. However, the question remains *how* self-managing teams use these tools between them to coordinate themselves.

2.4. Theoretical summary

In sum, this chapter presented a theoretical background on the main concepts that will be studied in this master's thesis research. First, an overview was created of self-managing organisations with Holacratic structures. The reduction in hierarchical reporting relationships and decentralisation of authority means more autonomy and responsibility for employees. The chapter then explored the self-managing teams (i.e. Circles) that exist within these Holacratic structures and some drawbacks of Holacratic organisations were presented. Second, it was established that members of self-managing teams require information and resources from other

Circles in order to fulfill their Purposes. In other words, task interdependencies arise between Circles, which calls for coordination mechanisms to manage these interdependencies. This then led on to the various coordination mechanisms that are used to deal with the interdependencies. Furthermore, which IT tools can help to facilitate the coordination of interdependencies were also pointed out.

3. Methodology

This chapter will cover the methods that were used during the trajectory of this research. First, the general study design and case selection will be discussed. Next, the data collection and data analysis methods will be described. Third, the attention will be turned to considerations regarding research ethics.

3.1. General study design

In order to answer the research question posed in Chapter 1 (*How do IT tools enable coordination processes between self-managing teams in a Holacratic organisation?*) and to explore the concepts previously described, a qualitative research approach will be applied[3]. This form of research allows for a deeper understanding to be created as to *how* self-managing teams work with IT tools to facilitate coordination between them (Symon & Cassell, 2012; Fischer & Julsing, 2014).

3.2. Case selection and description

The research for this thesis was conducted as a single case study at a Dutch-based firm that develops software for other organisations. This software is built for more efficient, effective, open and personal business communication. The firm was chosen because of its Holacratic organisational structure and its direct link to information technology. After all, information technology is needed in order to create software. The relatively small size of the firm, with just over 60 employees, makes the entire structure of the organisation clear and also makes it easier to pinpoint specific Roles and Circles that are relevant. The small firm-size also may suggest that Circles have to work more closely together given the compact nature of the type of firm. Hence, having good coordination mechanisms in place will be vital for the smooth functioning of the organisation and so that employees can effectively achieve the firm's goals.

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[3] Disclaimer: Although this master's thesis has been written individually by the researcher, parts of this thesis have been carried out in close consultation with the researcher's supervisor as parts of the data were also relevant for a joint project between the researcher and her supervisor.

3.3. Data collection

The data collection for this qualitative study happened in two main steps: (1) an orientation interview to get a basic understanding of the organisation and its structure's interdependencies, and (2) individual in-depth interviews to dive deeper into the concepts explained in Chapter 2.

3.3.1. Orientation interview

To get a good basic understanding of the organisation in question and to comprehend its interdependencies within its structures a preliminary orientation interview was conducted. It is important to have this basic understanding because it helped to clarify any uncertainties about the organisation itself. It also gave some basic insights into the practical side of coordination between the self-managing teams in this particular organisation. Furthermore, it created a comprehension of the basic needs of information and resources that different Circles need from each other. The results of this orientation interview then helped with the structuring of the individual in-depth interviews and to further understand the topics that were covered in these interviews.

In preparation for this orientation interview, a matrix was made which included all Circles (including the Super-Circle and Sub-Circles) within the organisation. This information was collected from the GlassFrog tool, which is a tool used by many Holacratic companies to visualise their structure, amongst other things. For each Circle, the Purpose and Accountabilities were identified. Additionally, the interdependencies were defined and determined. Table 3 displays an example of the interdependencies matrix template used for the orientation interview.

As good general knowledge of the entire organisation was needed, it was important to select someone for this interview who would have a good overview of the organisation's structure and whose Role(s) include coordinating tasks and Accountabilities. Therefore, the orientation interview was conducted with an employee who fulfills a Core Role in the Super-Circle. During the interview, the basic relationships between all of the Circles in the Super-Circle were discussed. Specifically, the discussion gave an indication of the Circle

interdependencies: namely, which resources Circles shared (shared resources); what information the Circles need from each other and the directionality of this information (producer-consumer relationship); and whether Circles could operate simultaneously or not (simultaneity constraint).

The interviewee was initially approached via e-mail through the researcher's supervisor. The supervisor also attended the orientation interview and took on more of an observatory role. The interview was conducted in English and through the online conferencing tool Jitsi. The strengths and limitations of conducting online interviews are discussed in section 3.3.3.

Table 3: Example of interdependencies matrix template for orientation interview.

		Circle 1	Circle 2
	Purpose		
	Accountabilities		
	Domains		
	Strategies		
	Members		
Circle 1	Shared resources		Members: Information: Software tools: Hardware: Physical infrastructure:
	Producer-consumer		What information is needed from each other: Directionality:
	Simultaneity constraint		Same actor: Same time: Not same time:
	Task-subtask		E.g. Circle 1 is a Sub-Circle of Circle 2.
Circle 2	Shared resources		
	Producer-consumer		
	Simultaneity constraint		
	Task-subtask		

3.3.2. Individual interviews

In light of the research question, the research design and the case description, the most prominent data source was individual in-depth interviews. As mentioned before, the researcher has the ability to explore unclear problems or issues through interviews (Creswell, 2013). Seeing that interviews are an interaction between the interviewer and the respondent, ideas, knowledge and communication can be played back and forth between the two parties more easily (Vennix, 2011). This means that interviews are also a flexible research method that can be used to 'mould' the responses to the research question. Symon and Cassell (2012) also mention that in-depth interviews grant a good platform for interviewees to openly share and elaborate on their own insights and experiences with coordination between self-managing teams.

However, having said this, it is also important to note that the responses and quality of interviews will be partially dictated by the attitude and atmosphere (Vennix, 2011). This means that certain respondents may feel uncomfortable answering questions that have a more personal nature and that requires them to express their explicit opinion about a certain IT tool that they are using, which may affect themselves or others. Similarly, respondents may be more reluctant to elaborate on negative experiences than positive experiences. This can be a potential limitation for this study and must be kept in mind by the researcher. Therefore, it is important for the researcher to carefully consider how to word questions, how to introduce certain topics that may be more personal in nature and how to make the interview run smoothly overall. By carefully considering this, the quality of the interviews is likely to improve.

During the data collection stage of this research, eight individual interviews were conducted. The respondents (or interviewees) of the individual interviews were carefully selected on the basis of the following criteria. First, interviewees were selected based on their Role within the organisation. This Role should have a coordinating Purpose or Accountabilities. This includes Rep Links, Lead Links and Cross Links, for example. Second, the researcher also looked at overlaps of Roles in different Circles. A particular member could be considered as a

shared resource in two or more Circles, for example, and be seen as a valuable coordinating link between Circles.

All the individual interviews were conducted in English except for one, which was conducted in Dutch after the participant indicated that this was their preferred language for the interview. Furthermore, all of the individual interviews were conducted using the online conferencing tool Google Meet. Section 3.3.3. elaborates further on the online interview method. Based on the preliminary results of the orientation interview, a semi-structured interview guide was created in preparation for the individual in-depth interviews (see Appendix B). The interview guide includes a series of open-ended questions and is constructed in a semi-structured way. The open-ended questions allowed for the interviewee to elaborate on their answers and for the interviewer to ask probing follow-up questions (Vennix, 2011). Consequently, the results from these individual interviews are expected to provide richer and more in-depth insights into the selected members' experience and examples.

The main material discussed during the individual interviews included a brief introduction of the interviewee's Circles and Roles within the organisation, interdependencies between the Circles that they are a member of and which information technology tools they use to perform their tasks. Specifically, the interdependencies topic covered shared resources, producer-consumer relations and simultaneity constraints. The IT tools part of the interviews dealt with what tools Circles were using to accomplish different tasks (e.g. sharing updates, project/task management, general communication and making to-do lists) and how the tools were being used. Some IT tools had already been identified during the orientation interview, such as GlassFrog, Slack and Asana, and this served as a basis for exploring these and other tools during the individual interviews.

3.3.3. Strengths and limitations of conducting online interviews

In light of the current global crisis situation and national regulations concerning the coronavirus (COVID-19), the interviews were conducted using an online conferencing tool. Online conferencing tools (such as Google Meet, Skype, Jitsi, Zoom and Microsoft Teams) can

serve as good alternatives to face-to-face interviews as online conferencing tools also provide synchronous, or real-time, conversational possibilities. Additionally, most online conferencing tools also offer instant messaging features and the option to chat via audio and video calling (Janghorban, Roudsari & Taghipour, 2014). These options and the flexibility can create the feeling that two or more people are meeting face-to-face. Specifically, online conferencing tools also generate greater organisational flexibility in establishing meeting times (Deakin & Wakefield, 2014). Moreover, the video function via the webcam allows the researcher to pick up on some non-verbal signals (Fischer & Julsing, 2014). This can be important for the interpretation of data because the respondent could give a particular verbal signal but give off a completely different signal non-verbally.

However, the webcam on online conferencing tools usually only shows a 'head shot' of a person, meaning that only facial expressions can be picked up upon by the researcher and other body language may be missed (Janghorban et al., 2014). Another downside to this online method of interviewing is that the researcher cannot get a physical 'feel' during observation in meetings or even in the canteen of the organisation. Therefore, aspects of signals or other cues could be missed for the interpretation of data. Lastly, the environment in which the interviewee and/or interviewer are sitting in, may be disruptive causing distraction during the interview and/or a bad Internet signal can also hinder the interaction by lagging responses and reactions, for example (Deakin & Wakefield, 2014; Seitz, 2016).

The *Limitations* section in Chapter 5 will discuss small hindrances that were experienced during the interviews. However, in general, conducting online interviews did not create a lot of problems for this research because the content of information given was still sufficient to effectively carry out this thesis.

3.4. Data analysis

The data analysis took place during and after the data collection phase. To analyse the data, audio recordings were made of each interview, with the permission of each respondent. Thereafter, the interviews were transcribed to create interview transcripts. These interview

transcripts would then help with the subsequent analysis and interpretation of the data (Creswell, 2013). From the transcripts, a code book was developed using template analysis. This type of analysis permits a "*relatively high degree of structure in the process of analysing data in textual form, whilst still giving the analysis the flexibility to be able to adapt it*" to the core concepts of this thesis (King, 2012, p. 426). The code book provides an opportunity for the researcher to systematically organise and code the data into main themes in such a way that the researcher can then logically interpret the data and draw conclusions (Creswell, 2013; King, 2012; Vennix, 2011).

As previously explained, the orientation interview served as a base for setting up the semi-structured interview guide. An initial template was created based on *a priori* themes, which in turn were based on the questions in the interview guide. After analysing the first two individual interviews using the initial template, the researcher was content that the results gave a satisfactory and systematic understanding of the interviewees' insights and experiences regarding interdependencies between Circles and IT tools used. Hence, the template was not altered. In the coding process, quotes were taken out of the transcripts that reflected the main themes of *self-managed teams*, *(coordination) interdependencies* and *information technology*. These quotes were then interpreted through open coding and assigned a sub-topic (axial coding). Afterwards, this was matched through selective coding to the main themes/topics. Appendix C includes the *a priori* themes and the initial template used for the code book).

3.5. Research ethics

Research ethics is a critical part in the conduction of (academic) research. Following the *Netherlands Code of Conduct for Research Integrity* (KNAW et al., 2018), Creswell (2013) and Pimple (2002), not adhering to an acceptable level of research ethics and integrity can lead to research misconduct (e.g. plagiarism), questionable research practices (e.g. misinterpreting results) and sloppy science (e.g. mismanagement of data), amongst other things. In addition, the Netherlands Code of Conduct for Research Integrity identifies five guiding principles: honesty, scrupulousness, transparency, independence and responsibility (KNAW et al., 2018). Again,

researchers who are not guided by these principles can risk compromising the quality of the research, as well as society's trust in (academic) research.

To ensure that an acceptable level of research integrity is adhered to in this study, the following measures were taken. The use of academic and scientific literature from credible sources ensure that the researcher adheres to the scrupulousness principle. Prior to data collection, the respondents were sent a research integrity document (see Appendix A). The respondents were also informed about the purpose of the study twice: via e-mail prior to the interview and during the introduction in the interview. The participants were also clearly informed that the audio recordings of the interviews would be used for transcription purposes only. Moreover, the participation of the respondents was voluntary and they were allowed to discontinue participation in the research at any moment in time if they wished to do so. As a result, honesty and transparency are safeguarded. The results in Chapter 4 are presented in an honest way. Regarding the data collection methods, respondents were notified that the audio recordings of the interviews would be used for transcription purposes only. Additionally, respondents were also notified that all their responses would be treated in a confidential manner to protect the identity of the individual and the organisation. Having said this, the information in the data can be shared with the supervisor who is guiding the student. Consequently, the principle of responsibility can be fulfilled. The researcher will attempt to stay independent and impartial to the study by considering both sides of arguments. This is important in order to eliminate, or at least reduce, prejudice and distortion of results (Creswell, 2013).

4. Results

This chapter will first provide a general description of the firm where the data was collected and the IT tools that are used by this organisation. This will set the stage for the results that follow. Then the chapter will discuss the challenges faced by the organisation in the face of using different IT tools and challenges in coordination. Thereafter, the analysis on the interdependencies between various Circles (as mentioned in Chapter 2) will be presented. Finally, the results linking the IT tools and the interdependencies will be examined. The results were collected in several interviews as outlined in Chapter 3.

4.1. Setting the stage

4.1.1. The Holacratic organisation

The company where the data was collected is a Dutch-based firm that develops software for other organisations. The main purpose of the organisation is to build software for more efficient, effective, open communication tools to connect businesses and people. Their primary product is a telephony platform, which includes mobile and desktop applications. It formally adopted Holacracy in March 2015 and currently has just over 60 employees. As is normal in Holacratic companies, the structure is dynamic and can change frequently. To avoid complexity, the Circle structure taken in this research was that in April 2020 when the data collection began. The firm currently has 14 Circles, including the Super-Circle and two Sub-Circles. An anonymised overview of the Circles in the organisation can be found in Table 4 below. Figure 2 further visualises the Holacratic structure of the company.

Table 4: Anonymised overview of Circle in the organisation	
<u>Circle name*</u>	<u>Brief description of the Circle Purpose</u>
Super-Circle	Defines the boundary of the organisation. Its Purpose is to develop open communication tools for people and businesses.
Infrastructure	Maintaining a stable infrastructure for the telephony platform.
Web Application	Responsible for a usable and well-functioning web application.
Main Product	Developing and maintaining the software for the telephony platform.
Mobile Application (Sub-Circle)	This is a Sub-Circle of the Main Product Circle. Its Purpose is to provide a usable and reliable mobile application on the telephony platform.
Desktop Application (Sub-Circle)	This is a Sub-Circle of the Main Product Circle. Its Purpose is to provide a usable and reliable desktop application on the telephony platform.
Main Product 2.0	Building parts needed for a new version of the main product.
Daily Operations	Ensures the company can run smoothly on a daily basis.
Integrations	Integrating the telephony platform with other products.
Development Operations	Coordinating multi-disciplinary technical challenges to improve the telephony platform.
Innovation	Innovating for future products.
User Experience	Increasing user value for customers and monitoring customer satisfaction.
Open Source	Expanding the organisation's involvement in the Open Source Community and releasing code under an Open Source license.
Temporary project Circle	Implementing the milestone related to the temporary project.

* The names of the Circles in this table have been changed there where the original name is not generic enough in business or software development jargon.
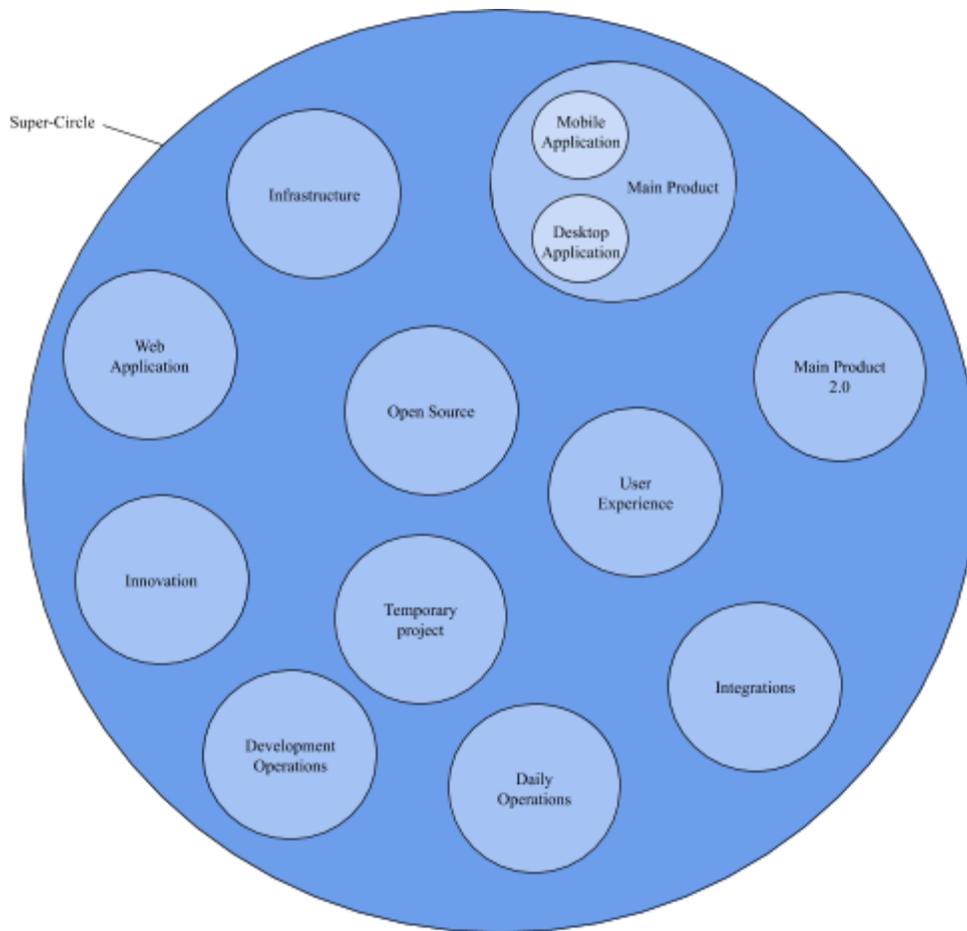
Figure 2: *Visualisation of the Holacratic structure of the organisation. Note: The size of the Circles does not represent the actual size (i.e. how many members are in each Circle).*

4.1.2. Types of IT tools

Intuitively, a software development company has access to various kinds of software and information technology tools to carry out their operations. All participants confirmed this intuition by describing the several software and IT tools used by the members of Circles. These tools are used for the Circles' daily operations and each tool has its own purpose. In order to better understand the role of IT tools on the interdependencies, the various IT tools identified and discussed during the interviews are explained below, in alphabetical order of the name of the IT tool. An overview of the IT tools used is also presented in Table 5 below.

Asana – This tool primarily serves as a task management or project management tool. It is used by some Circles to give and receive updates on the status or progress of particular tasks in a project. Asana can provide a timetable view of a project, which can then be switched to be viewed in a checklist review manner. Notes can also be taken by Circles about the progress that has been made in a project. As a result, some Circles have started viewing Asana as an alternative to getting updates instead of waiting for the next Tactical Meeting of a Circle. The User Experience Circle is experimenting with Asana for project management updates. A few interviewees indicated that Asana is a similar but less technical version of Jira (see 'Jira' explanation below). Therefore, more technical Circles like Infrastructure and Web Application use Jira for ticketing and task management.

Discord – Discord serves as a forum to discuss issues with members in the Open Source Community, amongst others. Hence, this tool is mainly used by the Open Source Circle to communicate with external parties in the Open Source community. Within the Super-Circle, Discord is used by some employees as a(n) (informal) chat tool, either written or using audio.

GitHub – This tool is primarily used as a development platform that can be used for reviewing code, managing projects and building software. This tool is used by the Main Product Circle and all developers within the company.

GitLab – Different Circles use GitLab for different purposes. The Main Product Circle, Mobile Application Circle and Desktop Application Circle use the GitLab tool for their issue and ticket management, so that they can keep track of the status or progress of tasks. Alternatively, the Infrastructure Circle uses GitLab as more of a repository tool for code. Similar to GitHub, GitLab can also be used to review code by developers.

GlassFrog – All Circles use this tool. GlassFrog is used by Holacratic companies to create a visualisation of their organisational structure. This helps employees to find out who is responsible for what in the company. Circles and Roles can also be added, changed or removed using this tool. Additionally, GlassFrog is used for structuring Governance and Tactical Meetings of Circles; for example, by adding points to the agenda of these meetings. Tensions can be submitted through GlassFrog as well.

Google Drive − Google Drive is used to share documents with other Circles and to store files. Circles also use other parts of the G-Suite (i.e. Google Suite) such as Gmail and Google Calendar. This helps with viewing when other employees are available for meetings and with sharing agendas, for example.

Google Meet − Members of Circles work at the shared office most of the time. Some members chose to work remotely from home once in a while. One participant stated that he usually works from home about one day a week. In this case, an online conferencing tool comes in handy, where the member is still able to join meetings with their Circle, for example, through video or audio calling. The advantage of Google Meet is that screens can be shared, which helps to visualise things to support the issues being discussed. Employees can easily share links with other members of Circles so that they can also join the video or audio call.

HubSpot − Hubspot is used by the Infrastructure Circle for support of another Circle outside the Super-Circle (and that external Circle in turn uses it to communicate with customers). The Infrastructure Circle also uses HubSpot to check metrics of how their support is going.

Jira − This is a ticketing system used in the organisation that is used by the more technical Circles such as Infrastructure, Web Application, Open Source and the temporary project Circles. Through this ticketing system, Circles are able to keep tabs on progress updates of individual tasks and of a project as a whole. Circles can create or log tickets for themselves or for other Circles. This provides a systematic overview of each ticket, or task for a project, which aid Circle to also keep track of the progress of each task. This is particularly important if a Circle, or a member of a Circle, is waiting for someone else from another Circle to complete a task, so that they can then continue with their tasks as well.

Jitsi − Jitsi is another online conferencing tool. This tool is based on the company's own telephony platform. Similar to Google Meet, it has audio and video calling functions and the possibility to share screens or use the chat feature is also present. Jitsi can also be used when employees work remotely, for example during the COVID-19 pandemic.

Slack − The primary tool for communication used in the organisation is Slack. This tool provides all Circles of the organisation with real-time communication channels, chats and

threads of discussion. Additionally, Slack also has an audio calling feature, which can further facilitate communication with other Circles. All members of all Circles use it to find information about other Circles or finding information needed for a project that is currently being worked on.

Todoist – This tool is used by some individual members at their own discretion to make their personal to-do lists and to keep track of which tasks they still need to work on. One interviewee stated that they preferred using Todoist because of its simplicity compared to Asana.

Trello – This tool is similar to Todoist. It is used by individual employees – if they prefer to do so – to keep track of all the tasks they still need to do. It provides an organised overview for individuals of their tasks.

Wiki – The Wiki functions as a general tool with all information about a particular Circle. This is practical for new colleagues, for example. The Wiki is updated and maintained by each Circle. However, during the interviews it was revealed that not all Circles keep it entirely up to date anymore. For technical documentation only the Web Application Circle still uses it.

Table 5: Overview of IT tools identified		
IT tool name	What is the IT tool used for?	Which Circle(s) use(s) this IT tool?
Asana	- Task/project management - Sharing updates	- User Experience Circle - Daily Operations Circle - Other Circles but unclear which ones
Discord	- Chat forum - Communication with Open Source community (Informal) written and audio chat tool within the Super-Circle	- Open Source Circle - Individual employees
GitHub	- Coding review - Building software - Project management	Main Project Circle
GitLab	- Coding review - Ticketing/task management	- Main Product Circle - Mobile Application Circle - Desktop Application Circle
GlassFrog	Visualising the organisation's Circle structure.	All Circles in the organisation.

	● Finding information about other Circles. ● Documenting Governance and Tactical Meetings.	
Google Drive	● Used to share documents within the same Circle and with other Circles.	● All Circles in the organisation.
Google Meet	● Online conferencing tool	● Used by employees/Circles when working remotely
HubSpot	● Support of another (external) Circle	● Infrastructure Circle
Jira	● Ticketing ● Task/project management	● Temporary project Circle ● Infrastructure Circle ● Web Application Circle ● Open Source Circle
Jitsi	● Online conferencing tool	● Used by employees/Circles when working remotely
Slack	● Sharing updates ● Audio and written communication ● Getting/finding information from/about other Circles	● All Circles in the organisation.
Todoist	● Make personal to-do lists	● Some individual employees according to their personal preferences.
Trello	● Make personal to-do lists	● Some individual employees according to their personal preferences
Wiki	● Getting/finding information from/about other Circles	● Mostly new hires.

As there is more than one tool for a particular type of task, it may be difficult to choose which tool to use for what. The discussion during the interviews revealed that most tools are chosen based simply on experience and personal preference. For example, employees choose their own tools to make their to-do lists: some use Trello, some use Todoist, whilst others may keep track of their own to-dos in a notebook or on Post-it Notes. Task management tools, for example, are chosen more based on the needs of a project. As mentioned before, more technical Circles like Infrastructure and Web Application use Jira for their ticketing/project management. This is because Jira is more of a technical tool and meets the requirements of these Circles better.

In line with this, less technical Circles like the Daily Operations Circle use Asana as their project/task management tool because it better suits the needs for their types of tasks. The Holacracy tool GlassFrog and Slack are two tools that are used company-wide. These are chosen by the organisation as a whole due to their functionalities, as described previously.

4.2. Challenges

4.2.1. Challenges of having different IT tools

Although the 14 IT tools listed above can help the organisation and its Circles keep a nice overview of their task management, for example, a number of challenges were identified by the interviewees in relation to this. First, some respondents indicated that not everyone knows how to use all of the tools. It also happens sometimes that an employee does not know where to find something in particular within a given tool because it is not well documented how the tool works. For example, Asana and Jira are both used as ticketing systems or project management tools. Of the two, Asana is less technical than Jira and is thus used more by less or non-technical Circles such as Daily Operations. The use of the different tools needs to be taught and this takes effort and time. Furthermore, having so many IT tools can also be experienced as "*overwhelming*" (interview 6) and/or "*confusing*" (interview 5) and/or "*frustrating*" (*interview 2*).

Second, several interviewees pointed out that they have two or more tools for the same type of task. An example that was repeatedly given was that GlassFrog and Asana both contain projects, so if a Circle is working on a particular project they have to maintain it in two places. This means that the same job is done twice, which is "*really not efficient [...] and [a waste] of time*." (interview 3). Additionally, it scatters where the information is kept, which can cause some Circles or its members to lose overview of what is going on. Moreover, members of different Circles will have to keep close tabs on which Circle is using which tool and need to have accounts for each different tool. This can make the use of different IT tools more complicated.

Third, it was argued during the interviews that not all tools are always as useful. For example, the usefulness of the Wiki will depend on two things: (1) Circles will actually have to frequently feed the tool information and (2) other Circles will have to frequently check or consult the Wiki to find the updated information. However, the Wiki is not being kept entirely up to date by all Circles. For example, for technical documentation only the Web Application Circle is still using it according to one interviewee.

Another challenge that was identified was with regards to notifications within certain tools, specifically GitHub and GitLab. The Circles that commit their code to these tools, such as Main Product and Mobile Application, need to have this reviewed by other developers in the organisation. However, as different Circles use different tools (i.e. GitLab or GitHub) reviews can be missed if employees do not know in which tool to look. Therefore, code reviews are sometimes missed. Although two interviewees indicated that Circles can still function without too much hassle if one or two reviews are missed occasionally, it is not favoured as feedback can be missed out on. This feedback allows Circles to improve their work. To avoid missed reviews, members of Circles can create notifications in Slack for others that need to review the code. This means additional work for the Circles.

4.2.2. Challenges in coordination

Chapter 2 pointed out that coordination between Circles is a main challenge in Holacratic organisations. It was described that failures in coordination could lead to misunderstandings or delays in processing information, for example. As a reminder, coordination was defined as a "*process of interaction that integrates a collective set of interdependent tasks*" (Okhuysen & Bechky, 2009, p. 463).

The participants of the interviews agreed that coordination in general was very important in Holacracy. One participant acknowledged that effective coordination does take considerable effort and involves a lot of people, especially within Holacracy. This participant also identified that coordination is important from a technical perspective as well, which is highly relevant for the software development company. Coordination is needed in Holacracy to define which Circle

does what. Participants also expressed that it is important to define which Circle needs to receive what piece of information or resource from another Circle in order to be able to proceed with their tasks. This also helps with jointly achieving the Circles' and the organisation's goals: "*[...] we try to get everyone in the organisation in the same direction. Because if [a Circle is] pulling the rope to one side and the other one to the other side [...] [you're] stuck in the middle.*" (interview 3). Being stuck in the middle results in no effective and efficient progress being made towards accomplishing tasks and reaching goals.

Furthermore, given the self-organising nature within Holacracy, it can sometimes be challenging to organise the allocation of time. As one participant put it: "*[...] you can't force people to work on something [in Holacracy]. You can only explain to them why it's so important that it gets done in a certain timeframe or explain to them why you need it for a certain date and then you can see if they can work on it together, if you need more resources [...]*" (interview 2). This embodies the Holacratic way of operating and highlights the importance of prioritising and planning. It is up to the person fulfilling a certain Role to ensure that they energise it accordingly and distribute their time over their various Roles and tasks, which can be a challenge if someone is not very organised or able to prioritise by nature. Another respondent mentioned that they would find it "*counterproductive if to improve communication I have to sacrifice more of my time*" (interview 6). This illustrates an arising trade-off between better communication (to coordinate more effectively) and allocating time between Roles and Circles. As a consequence, Circles can become more reluctant to draw more bridges between each other if that is going to take up more time and thus leaves less time for Circles to focus on project tasks. In addition, the fact that Circles also have different levels of knowledge about something (e.g. the user experience interface of products) can also hinder coordination.

Following on from the communication trade-off, a recurring issue during the interviews was that it could be hard to work with other Circles because there might not be enough resources. Circles have to share members and the member's time. For example, one of the interviewees is in seven Circles with at least one Role in each of these Circles. Although this interviewee admitted that their Roles do not all take up the same amount of time, some Roles do demand a significant

portion of time. This can be challenging to allocate to each Role and Circle as projects and task requirements often change as do the structures of the Circles.

It was previously mentioned that Circles already use different IT tools to carry out various tasks – and sometimes even the same type of task – which can hinder coordination and lead to inefficient processes. Adding to this, another challenge of coordination is the fact that Circles use different methods to carry out their tasks. These methods may not complement the way in which other Circles work. For example, some Circles may work at a higher pace than others. This means that faster working Circle have to wait for slower working Circle to finish their tasks before the faster working Circle can continue. Specifically, interviewees mentioned that developers in the Infrastructure and Web Application Circles work at a different pace and that these developers also have different working styles individually. Hence, this can impact the overall progress and output of a Circle.

Table 6 provides an overview of the challenges pointed out during the interviews.

Table 6: Overview of challenges in this study
Challenges of having different IT tools   - Not everyone knows how use all of the tools   - Two or more tools for the same type of task   - Not all tools are always as useful or as frequently updated   Challenges in coordination   - Effective coordination takes effort and involves many people   - Time needs to be distributed amongst many tasks   - Trade-off between better communication and allocating time to project tasks   - Limited amount of resources   - Different level of knowledge in Circles   - Circles and its members have different working methods

4.3. Interdependencies

Before coordination challenges can be mitigated, specific interdependencies need to be identified (Crowston et al., 2006). As explained earlier, the interdependencies can be divided into three main aspects: shared resources, producer-consumer relationship and simultaneity constraint.

Shared resources – Resources were defined in Chapter 2 as "*an economic or productive factor required to accomplish an activity*" (BusinessDictionary, 2020). All Circles in the organisation share the same office space (i.e. physical infrastructure). Members of Circles are free to move around the office as they like and often sit together with members of the same Circle in smaller working rooms. This enables faster in-person communication between different Circles as it is easy to move around the office when there is a need for it. To this extent, IT tools do not play a part in the shared office space. In addition, hardware equipment is also used by all members and Circles of the organisation. Specifically, each employee has their own work laptop and the organisation also uses servers and data centres: "*There are two data centres where the data is stored*" (interview 1). Having said this, the server space used by the organisation is outsourced to a third party: "*We don't have a server space of our own. [...] we work together with an external company*" (interview 1). The hardware servers are not used as an IT tool but rather helps to store information, which is used by Circles to perform their tasks.

As previously mentioned, shared members play an important part in coordination between Circles. The dynamic nature of Holacratic organisations means that it is possible for employees to have several roles across multiple Circles. For example, one interviewee had Roles in seven Circles, including the Super-Circle. As a result, employees act as shared members across various Circles. This affects the simultaneity constraint interdependency because, in theory, employees are able to work on tasks for two or more Circles at the same time. In practice, participants argued that this is not the case because (1) most participants indicated that they cannot multitask, and (2) tasks and requirements differ for each Circle. Additionally, having several Roles across different Circles can create scheduling issues (as explained in Chapter 2)

and calls for a structured overview of to-do lists, which can be achieved using tools like Trello and Todoist.

Furthermore, Circles in this Holacratic organisation also share documentation. This documentation includes who does what in the organisation, project descriptions and the guidelines by which these Circles should operate, amongst other things. GlassFrog, the Wiki and Google Drive were identified by participants to be the main tools used to find the information mentioned. Slack may also be used if a Circle wants to find specific information about a project. Here, the Circles as a whole or individual members can join a particular Slack channel to stay in the loop and participate in discussion and notifications that appear in the Slack channels.

Producer-consumer relationship – A variety of perspectives were expressed in determining the producer-consumer relationship between Circles. Some interviewees argued that their main Circle operates quite independently from other Circles, whilst others stated that their Circles are dependent on the output of another Circle in order to carry out their own tasks. To give a specific example, the Infrastructure Circle that maintains the company's product platform and the Open Source Circle "*don't work that often together*" (interview 2). In contrast, the Infrastructure Circle and the Web Application Circle frequently need information from each other. The comment below shows that the two Circles sometimes need to wait for each other to finish a particular step or task so that another Circle can continue with the next step or task:

"*Because often there's a dependency like we need to wait until Web Application [Circle] has finished with this step and then we need to do that step. So yeah you definitely need to keep close communication about that. [...] So the technical work is actually being done within Infrastructure and Web Application [Circle] [...] but the coordination of how we do this together then that's then being done in the Development Operations Circle.*" (interview 3).

In particular, the Web Application and Infrastructure Circles share a staging environment, or production environment, which serves as a type of testing environment for the telephony platform. Each of these two Circles builds on what the other has done and deploys it once a week

to the Staging environment where a feature can be tested, for example. Hence, here the producer-consumer relationship is illustrated nicely where Infrastructure and Web Application need each other's deployed features in order to continue with their own. The staging environment platform facilitates this exchange of information. Furthermore, Jira is used by these two Circles to create tickets for each other for what still needs to be completed with regards to deploying information to the staging environment. Thereafter, a notification is often sent via Slack from the Infrastructure Circle to the Web Application Circle, and vice versa, as a reminder for the other Circle to complete the task. Hence, in this manner Jira and Slack help with the project management and notifying processes.

Simultaneity constraint – As explained in Chapter 2, the simultaneity constraint mainly consists of scheduling and synchronisation dependencies. In other words, it looks at what can and cannot be done at the same time (e.g. scheduling meetings for all members or accessing the same software at the same time). The results of the producer-consumer relationship often overlap with those of the simultaneity constraint. Similar to the producer-consumer relationships, the scheduling and synchronisations dependencies in general also differ from Circle to Circle. The fact that some Circles need to wait for the output of another Circle in order to proceed themselves automatically creates scheduling dependencies due to the waiting time. For example, the Web Application Circle sometimes needs to wait for the Open Source Circle to release a piece of code or feature under an open source license. Moreover, the waiting times also affect the synchronisation of tasks just like in the case of the staging environment: the tasks of the Infrastructure Circle and then Web Application Circle cannot happen at the same time in this case.

Nevertheless, although Circles like Infrastructure and Web Application do need to wait for each other for information or for certain tasks to be completed, (shared) members in these Circles can still work on tasks at the same time depending on how the Circle divides the tasks amongst members and on other roles that the employee might have. According to the majority of the respondents, this is achieved, in part, through the project management tool Jira (although non-technical Circles use Asana instead). The aforementioned Circles use Jira to overcome the

challenge that members of Circles need to distribute their tasks over many tasks, which was presented earlier. Through the project overview that Jira gives, it is easier for members to decide which tasks to prioritise and therefore allocate more time. As the results found, even though the aforementioned Circles cannot work simultaneously on testing their respective features through the staging environment, it is still possible for the two Circles to work simultaneously on other tasks. This was illustrated in interview 7: "*There are usually other tasks that we can pick up in meanwhile. So it's not that people are like sitting at their desk doing nothing. There's always other work that they can do.*" Hence, progress on tasks, as analysed previously, can be tracked so that Circles can still plan and divide their work in such a manner that the whole Circles does not become temporarily idle. Table 7 provides an overview of the interdependencies that were identified during this research.

Table 7: Overview of interdependencies identified in this study	
Interdependencies	Coordination processes for managing these interdepencies
Shared resources	- Office space and servers - Shared members and the members' time - Documentation
Producer-consumer relationship	- Notifying/communicating - Tracking progress - Sequencing/prioritising tasks
Simultaneity constraint	- Scheduling/planning - Synchronising tasks

4.4. The role of information technology tools in coordination interdependencies

From the dataset, a number of reasons were identified as to why IT tools are important for coordination. Firstly, IT tools allow for information and updates to be shared between Circles. Secondly, IT tools facilitate faster communication between Circles, which helps run operations more smoothly and efficiently. This is important for Circles to be able to reach their goals. Third,

members of Circles need to be able to find relevant information swiftly, allowing them to progress with their own tasks using the correct information. Hence, finding saved documentation, for instance, and knowing where to find it is imperative to ensure continuity in the organisation. These points will be further analysed below and how they affect the coordination interdependencies.

4.4.1. Shared resources

In the previous section, two main shared resources were found: office space, documentation and shared members with shared time. Access to the office was not found to be directly tied to any type of IT tool. Here, employees gain access to the office via keys or badges, for instance. It emerged that GlassFrog, Google Drive and the Wiki play a significant part in dealing with the documentation mechanism to deal with the shared resource dependency. Knowing who is responsible for what helps to track down accurate and relevant information for the producer-consumer interdependencies. The majority of interviewees stated that it is relatively easy to find what you are looking for within GlassFrog, Google Drive and the Wiki.

However, some participants mentioned that some Circles have not kept their part of the Wiki completely up to date anymore. For example, one interviewee said: "*I don't know how often they use it or not because it might be that it's just very old and they moved [information] somewhere else. [...] for technical documentation only the Web Application [Circle] is still using it. For general information everyone within [the organisation] is using it.*" (interview 3). It can be concluded from this statement that in order to find the correct and complete information, Circles are dependent on other Circles to ensure that they continuously upload updated information. To this view, interviewees said that Slack and GlassFrog are the most used tools for finding information and documentation. Nonetheless, a common view the interviewees shared was that often the easiest and fastest way to find a necessary piece of information is to just ask colleagues in the office in person. To this extent IT tools may become temporarily obsolete: "*...you're never gonna find a tool that's as good as talking to someone*" (interview 4).

GitHub and GitLab were named as two tools used to view information about coding. As previously mentioned, codes are independently produced by each Circle and only certain knowledge is shared between Circles. Thus, all participants that are involved in developing activities expressed that the IT tools are used to review code but not necessarily to share the written code. This makes Circles more independent with regards to code information compared to finding out who is responsible for what.

Although Circles can have many shared members, most employees were hired for a specific skill set or job profile they have, meaning that they spend most of their time working in one Circle. Each participant that was interviewed spends most of their time energising one of their Roles of their 'main' Circle. IT tools such as Asana, Todoist and Trello are used by employees to assess which tasks they need to do for each Role and thus help them to determine how much time to allocate to each Role.

The benefit of Circles having access to the same members is the knowledge and skills that each member is able to bring to the Circle. The shared member is able to transfer their knowledge more seamlessly between Circles. This was indicated by two interviewees: "*[The Infrastructure Circle has] a lot of knowledge about how the [product] protocol works. And sometimes [the Main Product Circle] need[s] information about that so what actually happened in the past is we share now one of the [Infrastructure] members...*" (interview 3) and "*Since I occupy quite a lot of User Interface or User Experience roles across different Circles those roles are in those Circles mainly because they need the competence in there.*" (interview 4). Consequently, even though most participants mentioned that they cannot multitask and that tasks for Circles differ, having shared members with relevant knowledge and skills allows various Circles to operate simultaneously.

4.4.2. Producer-consumer relationship

The three main producer-consumer dependencies that were found are notifying/communicating, tracking progress and sequencing/prioritising tasks. A recurring theme in the interviews was a sense amongst interviewees that IT tools definitely contributed towards sharing work and tasks

with other Circles. Ticketing appeared to be the most common activity related to the producer-consumer relationship. Whilst most Circles use Jira as their primary ticketing tool, some Circles also use GitLab for this. There was a sense amongst interviewees that although they have the decision-making power to decide themselves when to work on which task, they still have to take into consideration members in other Circles that might be dependent on them finishing a task. In this respect, the organisation's project goals and Circle goals are not onefold: in order to achieve a goal, many steps must be taken or tasks must be completed. The ticketing IT tools allow Circles to view and keep track of the progress on tasks so that they know when they can expect a task to be completed.

Nevertheless, when talking about this issue, an interviewee said: "*[...] you have to wait on people to finish something and that's not always easy in a Holacratic organisation. Because you can't force people to work on something. You can only explain to them why it's so important that it gets done in a certain timeframe or explain to them why you need it for a certain date...*" (interview 2). This statement illustrates how coordination is accomplished in a Holacratic organisation through notifying and prioritising. By doing this, Circles in the organisation can plan their own time as well so that they do not have to do nothing.

4.4.3. Simultaneity constraint

The overarching feeling amongst the participants regarding the simultaneity constraint interdependency was that IT tools play an important role in keeping track of progress and waiting times. It has become evident that ticketing tools such as Jira and GitLab give a clear structure and overview of tasks relating to a project. Jira and GitLab are both used by different Circles to synchronise tasks between Circles. For example, the Main Product Circle uses GitLab for its task management. Other Circles can see in the GitLab tool what the progress on a particular task is. Furthermore, it helps other Circles to decide whether they are able to complete other open tasks whilst they wait for the Main Product Circle to complete the task that others are dependent on. Other Circles can use this information to plan and schedule their own tasks. Jira works in a similar way to GitLab for task management. By using these task management or

project management tools, the interviewees are better able to plan their work and decide how to best divide their time over the various roles that they energise. Consequently, this is also linked to the producer-consumer relationship analysed above.

Furthermore, IT tools such as Slack and Asana facilitate the information flow of tasks and projects between Circles. This is done through notifications via these tools, where members of Circles stay informed of what they still need to do. In terms of inter-Circle coordination, this is important because it also alerts members in other Circles when tasks are done so that they are able to continue with the next steps of the task. As one interviewee put it: "*I think it's very important. Primarily because we are all dependent on each other. [...] it does take some effort to, so if we do something [in the Infrastructure Circle] then it would change something. We should all think how this change will impact other Circles and notify them about it.*" (interview 5). This statement shows the importance of being aware of the impact that your Circle has on others, as coordination is a joint effort by many actors. Hence, the interviewee agreed that these tools aid in the scheduling and synchronisation interdependencies. According to several interviewees, this especially applied to Slack as all Circles use Slack channels. The use of Asana is still being debated by various Circles as the preferences and views amongst members in Circles differs.

Having said this, a minority of participants mentioned that having two tools for the same type of task – for example, ticketing or sharing updates – is not very efficient because you are essentially doing the same work twice. In addition, employees, and especially shared members, need to know which Circle uses which ticketing or task management tool. In the account of one interviewee, this poses a problem especially for new hires: "*From my point of view the disadvantage is for onboarding new people because then of course the process is longer. And it might seem a bit overwhelming for them because it's suddenly they're presented with so many different tools.*" (interview 6). With time, employees are able to internalise which Circle uses which ticketing or task management tool.

Table 8: Overview of interdependencies, coordination mechanisms and IT tools

Interdependencies	Coordination processes for managing these interdepencies	IT tools
Shared resources	● Office space and servers ● Staging environment(s) ● Shared members and the members' time ● Documentation ● Online communication	● None ● Not specified ● GlassFrog ● Wiki, Google Drive, Slack ● Google Meet, Jitsi
Producer-consumer relationship	● Notifying/communicating ● Tracking progress ● Sequencing/prioritising tasks	● Slack, GlassFrog ● Jira, Asana ● Todist, Trello
Simultaneity constraint	● Scheduling/planning ● Synchronising tasks	● GlassFrog, Google Calendar, Asana, Jira

5. Conclusion and discussion

The final chapter provides a conclusion of the research results presented in Chapter 4 and discusses whether the research question posed in Chapter 1 was answered. Next to this, practical implications will be discussed. Finally, some limitations of this research will be considered and suggestions for future research will be made.

5.1. Conclusion and discussion

Holacratic organisations have risen to prominence within the self-organising organisations scene as a result of today's dynamic world and markets. Self-managing teams, or Circles, within these Holacratic organisations are free to make decisions and divide tasks amongst themselves and their members. Therefore, coordination mechanisms need to be in place to ensure that Circles are able to work together to effectively and efficiently achieve the organisations' goals. Members of self-managing teams need to have the right tools in their Roles in order to effectively and efficiently solve problems when engaging and interacting with other self-managing teams. Various studies have been done on the impact of certain tools and other characteristics but the realm of information technology tools and coordination between different Circles still remains under-explored by scholars (e.g. De Jong et al., 2003; Magpili & Pazos, 2017).

Hence, the aim of this research was to investigate how IT tools enable Circles in a self-managing organisation to work together on tasks and how they use IT tools to facilitate this coordination. Thus, the research was built on the following research question:

How do IT tools facilitate the coordination processes between self-organising teams in a Holacratic organisation?

This research shows how different IT tools are used to help manage interdependencies in order to deal with coordination processes between Holacratic self-managing teams. All participants that were interviewed are a member of several Circles that act as self-managing teams. Therefore, they all need to distribute their time over the Roles and Circles that they have, and, together with

other team members, contribute to the general coordination between all of the Circles in the organisation. The coordination between Circles can be hindered by interdependencies. To overcome the challenges caused by these interdependencies, Circles use IT tools to help them manage this. Being a software development company, the organisation in this study had access to multiple information technology tools. These tools are used for a variety of tasks including communication, creating and sharing documentation, distributing updates or notifications, keeping track of progress and scheduling. Although the IT tools are very handy to increase the pace of communication, most participants felt that no IT tool will ever be good enough to (fully) replace in-person communication with colleagues. The interdependencies put forward by Malone and Crowston (2004) and Crowston et al. (2006) were also illustrated in the results. Shared resources, producer-consumer relationships and simultaneity constraint between the Circles create challenges, such as distributing time (a shared resource) over shared members in different Circles. Here, IT tools such as GlassFrog can help with structuring the Roles in Circles and defining what each Role and Circle are responsible for. This then helps shared members to allocate their time to each Role/Circle according to the Purpose of their respective Roles and Circles.

Another main challenge was the Circles in the organisation have a different way of working and use different tools for the same type of task. For example, the Main Product Circle was found to use GitLab as their ticketing system, whilst the Infrastructure Circle uses Jira as their ticketing system. However, the freedom of choice that the self-managed teams in the organisation have leads to so many tools being used for the same task. Having multiple IT tools can be seen as a challenge by some employees, but in a Holacratic setting IT tools are seen in general as a valuable asset to carry out daily tasks. Consequently, the multiple IT tools make it easier for Circles to share and receive information regarding who is responsible for what (e.g. GlassFrog) and keeping track of task progress (e.g. Asana, Jira, GitLab), for example. The producer-consumer relationship is primarily aided by the ticketing IT tools (e.g. Jira and GitLab), which allow Circles to view and keep track of the progress on tasks of projects. As a result, the Circles can get an insight into when they can expect a task to be completed and so that they can

start on the next step. This leads to the simultaneity constraint where the IT tools also help Circles and its members to determine and schedule how to divide and plan their time over various tasks and Roles.

Task requirements can change for each project and not all Circles are evenly dependent on each other. In other words, some product Circles tend to work more independently from each other, whilst others strongly depend on information, knowledge, time and members to be shared, amongst other things. For example, the Mobile Application and Desktop Application Circles generally work very independently from each other because they have two different products, whilst the Infrastructure and Web Application Circles depend more much on each other. In this scenario, the use of IT tools does not necessarily impact the frequency of Circles working together, but this is rather dictated by the project(s) that Circles are working on at that point in time. However, on the contrary, IT tools do impact how the Circles work together.

This thesis contributes to current literature in several ways. First, it makes a contribution to the way in which self-managing teams operate. Similar to the works of Bernstein et al. (2016) and Robertson (2015), this research explores the formal yet flexible structure of Holacratic organisation and self-managing teams. Furthermore, the decision-making authority and self-governance are highlighted in the choice of how Circles choose to work and what tools they work with.

Second, this research fits the study done by Malone and Crowston (2004) and Crowston et al. (2006), in which they identify key interdependencies of coordination. The contribution of this research to this is how IT tools can be used to overcome the challenges of coordination. Specifically, how they can help to manage the interdependencies between the Circles. However, it may still be debatable whether IT tools have the same impact on the coordination interdependencies in self-managing teams in non-Holacratic organisations.

Third, although Lau et al. (2001) pointed out that information technology can create countless opportunities for organisations – such as dealing with the external environment and developing an organisation's operations, structure, strategy and purpose – it also creates many challenges. These challenges identified in this research highlight the importance of good

coordination between all self-managing teams involved to avoid inefficient operations. Nevertheless, it still remains questionable whether self-managing teams would still be able to accomplish the same effective coordination without using so many different IT tools as they would by just talking to colleagues: "... *you're never gonna find a tool that's as good as talking to someone*" (interview 4).

5.1.1. Practical contribution and implications

By examining the results, a few practical implications can be pointed out for the Holacratic organisation. The discussion of the results of this research could stimulate a conversation between employees and Circles to reflect on how coordination processes could be improved by managing the interdependencies. It could be that certain coordination issues such as communication could be improved by the end of the conversations, but it may also occur that certain issues will remain to be resolved.

Given that the Holacratic organisational structure is ever-changing, employees may experience continued confusion if they keep on having to use different IT tools when adopting new roles in new Circles. This might especially be the case for new hires. On the one hand, it can be overwhelming having to learn exactly which Circle uses which tools for a particular purpose. On the other hand, it can be motivating for employees to be able to choose which tools they want to use to carry out their tasks because members of Circles can then choose what they are more comfortable with and what they know best. Hence, the Holacratic organisation could look into streamlining the use and amount of IT tools to reduce tensions or frustration that arise from having too many tools.

Furthermore, having two or more IT tools to do the same task – for example, ticketing – means doing the same job twice. This double work leads to inefficiencies and thus leaves less time to focus on performing other tasks and energising other Roles that a person may have. Thus, creating a new IT Role to monitor the efficiency and practicality of using so many IT tools can be beneficial. Additionally, from the interviews it became clear that most IT tools are chosen based on personal preference. However, it could be evaluated whether the different IT tools for

the same task are in fact compatible and whether these can be streamlined in this way. This can help to improve the overall efficiency within the organisation and Circles.

5.2.2. Limitations

There are a few limitations to this research that may affect the interpretations of the results.

To start off with, there are a few limitations to the online interviews during which a few small hiccups were experienced. Firstly, the Internet signal caused the online conferencing tool to freeze a few times. Although these frozen periods usually did not last more than three seconds, it affected the audio recordings. This made it more difficult to understand and transcribe certain parts of the interviews. Furthermore, by having to conduct the interviews online, the audio quality of the recordings was also affected. This also contributed to a few difficulties whilst transcribing the interviews and having the researcher make educated guesses as to particular words that were said. Secondly, there was one participant who did not have a functioning webcam. As a result, no facial expressions or body language could be detected by the researcher. This may have affected the way in which the data from this interview was interpreted.

Another main limitation is related to the general data collection. Although the researcher made intensive use of documentation provided in the GlassFrog tool and the interviews provided ample data, no observations were made of the teams during meetings, for example. This is because in Holacracy, only Core Circle Members are invited to attend Governance Meetings as defined by the Holacracy Constitution (HolacracyOne, 2015). Similarly, usually the people invited to attend Governance Meetings are also invited to attend Tactical Meetings. This was not the case for the researcher. Real-life observation could have added valuable insights as to how these self-managing Circles are using IT tools or discussing coordination in practice. Triangulation of data allows the researcher to contrast different types of data (e.g. documents, observations) (Bleijenbergh, 2013). Therefore, the triangulation of data including observations would also have enhanced the reliability of this research, as the researcher could have observed meetings, for example, in order to confirm the personal accounts given during the interviews.

The timeframe in which this study was conducted also serves as a limitation. Some Circles like the Integration and Innovation Circles were under-discussed during the thesis timeline. More time would have allowed the researcher to go more in-depth into all Circles equally. Moreover, with additional time the history of IT tools used could have been discussed. Given the dynamic nature of Holacracy, it may have been the case that the organisation has used different IT tools in the past and also had different Circles. These past Circles could have experienced different interdependencies. Exploring the history of IT tools and interdependencies between past Circles could have widened the scope of the research.

5.2. Future research

Considering the results of this study, a couple of suggestions can be given for future research. Whilst conducting the research, it became evident that IT tools can be used to overcome the challenges of coordination in self-managing teams in a Holacratic company. Specifically, how they can help to manage the interdependencies put forward by Malone and Crowston (2004) and Crowston et al. (2006). However, further research can be done as to whether the effects of IT tools would have the same effect in the interdependencies in self-managing teams in non-Holacratic organisations.

As mentioned earlier, IT can create a lot of opportunities for organisations (Lau et al., 2001). This study focused on showing how IT can help firms to deal with coordination challenges. Nevertheless, many other methods or mechanisms should be explored in order to establish whether IT tools in itself are sufficient to deal with these challenges and interdependencies, or whether other factors also heavily influence and contribute to this.

5.3. Reflection and reflexivity

A short reflection – On the whole, the writing of this master thesis was a very interesting, yet challenging trajectory. I experienced a steep learning curve, both in relation to the topic of this thesis and the academic research and writing world. Since embarking on the thesis trajectory, it took a few tries to finally arrive at the final topic and research question. Holacratic

structures caught my eye quite early on as it is quite a new form of organising and this is a topic that greatly interests me. Regarding the interviews, even though I was nervous for the orientation interview and the first individual interview, I soon got the hang of it and I enjoyed the interviewing experience. Despite not being able to physically visit the site of the organisation, a relaxed environment was still created through the online interviewing method. Finally, I feel that the COVID-19 pandemic and subsequent lockdown affected and impacted my work progress. The experience would have been different if in-person interviews would have been possible rather than getting to know the organisation digitally. Overall, I learned a lot from working on this thesis: the general thesis writing process, how to systematically go through data, how to conduct qualitative research, amongst other things.

Reflexivity – "*Reflexivity is an awareness of the researcher's role in the practice of research and the way this is influenced by the object of the research, enabling the researcher to acknowledge the way in which he or she affects both the research processes and outcomes*" (Haynes, 2012, p. 72). Considering the definition of reflexivity, I can conclude that, as a researcher, it is likely that I had an impact on the research, specifically the interpretation of results. As a researcher, I tried to keep a realist standpoint in an effort to keep natural during the research. Nevertheless, the chance exists that the interpretation of the data was affected. The way in which I interpreted and coded the transcripts may differ from how other researchers may interpret and code the same transcripts. Furthermore, no two interviews were the same: the way in which questions were phrased or the intonation of how questions were asked most likely differed for each interviewee. Therefore, the way in which interviewees responded to the intonation or the question itself can also have affected the way in which I interpreted things. Another point to consider is the pre-existing knowledge or assumptions that I may have had as a researcher. This could also have influenced the interpretation of the data. However, given that Holacracy was a new topic of research for me, I think it limited the amount of influence that my pre-existing knowledge had on the interpretation.

References

Attaran, M. (2003). Information technology and business‑process redesign. *Business Process Management Journal*, *9*(4), 440-458. doi:10.1108/14637150310484508

Bernstein, E., Bunch, J., Canner, N., & Lee, M. (2016). Beyond the holacracy hype. *Harvard Business Review*, *94*(7).

Blau, P. M. (1956). *Bureaucracy in modern society* (2nd ed.). New York, NY: Random House.

Bleijenbergh, I. (2013). *Kwalitatief onderzoek in organisaties*. Den Haag: Boom Lemma Uitgevers.

BusinessDictionary. (2020). Resource. Retrieved from https://www.businessdictionary.com/definition/resource.html

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: SAGE.

Crowston, K., Rubleske, J. F., & Howison, J. (2006). Coordination theory: A ten-year retrospective. In *Human-computer interaction and management information systems: Foundations* (pp. 120-138). Armonk, NY: M.E. Sharpe.

Deakin, H., & Wakefield, K. (2014). Skype interviewing: Reflections of two PhD researchers. *Qualitative Research*, 14(5), 603-616. doi:10.1177/1468794113488126

De Jong, A., De Ruyter, K., & Lemmink, J. (2003). The adoption of information technology by self-managing service teams. *Journal of Service Research*, *6*(2), 162-179. doi:10.1177/1094670503257046

Denison, D. R. (1982). Sociotechnical design and self-managing work groups: The impact on control. *Journal of Organizational Behavior*, *3*, 297-314. doi:10.1002/job.4030030404

Emery, F. (1980). Designing socio-technical systems for 'Greenfield' sites. *Journal of Occupational Behaviour*, *1*(1), 19-25.

Fischer, T., & Julsing, M. (2014). *Onderzoek doen! Kwantitatief en kwalitatief onderzoek* (2nd ed.). Groningen, The Netherlands: Noordhoff Uitgevers.

Hamel, G. (2012). First, let's fire all the managers. *Harvard Business Review*, *89*(12), 48-60.

Haynes, K. (2012). Reflexivity in qualitative research. In *Qualitative organizational research: Core methods and current challenges* (2nd ed., pp. 72-89). Thousand Oaks, CA: SAGE.

Hennink, M. M., Kaiser, B. N., & Marconi, V. C. (2016). Code saturation versus meaning saturation: How many interviews are enough? *Qualitative Health Research*, *27*(4), 591-608. doi:10.1177/1049732316665344

HolacracyOne. (2015). *Holacracy Constitution 4.1*. Retrieved from https://www.holacracy.org/constitution

Ingvaldsen, J. A., & Rolfsen, M. (2012). Autonomous work groups and the challenge of inter-group coordination. *Human Relations*, *65*(7), 861-881. doi:10.1177/0018726712448203

Janghorban, R., Roudsari, R. L., & Taghipour, A. (2014). Skype interviewing: The new generation of online synchronous interview in qualitative research. *International Journal of Qualitative Studies on Health and Well-being*, 9(1), 24152. doi:10.3402/qhw.v9.24152

Jennings, E. T. (1994). Building bridges in the intergovernmental arena: Coordinating employment and training programs in the American states. *Public Administration Review*, *54*(1), 52. doi:10.2307/976498

Kato, T., & Owan, H. (2011). Market characteristics, intra-firm coordination, and the choice of human resource management systems: Theory and evidence. *Journal of Economic Behavior & Organization*, *80*(3), 375-396. doi:10.1016/j.jebo.2011.04.001

Keast, R., Brown, K., & Mandell, M. (2007). Getting the right mix: Unpacking integration meanings and strategies. *International Public Management Journal*, *10*(1), 9-33. doi:10.1080/10967490601185716

King, N. (2012). Doing template analysis. In *Qualitative organizational research: Core methods and current challenges* (2nd ed., pp. 426-450). Thousand Oaks, CA: SAGE.

KNAW, NFU, NWO, TO2-federatie, Vereniging Hogescholen, & VSNU. (2018). *Netherlands Code of Conduct for Research Integrity*. Retrieved from DANS website: https://doi.org/10.17026/dans-2cj-nvwu

Kumar S., V., & Mukherjee, S. (2018). Holacracy – the future of organizing? The case of

Zappos. *Human Resource Management International Digest*, *26*(7), 12-15. doi:10.1108/hrmid-08-2018-0161

Lau, T., Wong, Y. H., Chan, K. F., & Law, M. (2001). Information technology and the work environment – does IT change the way people interact at work? *Human Systems Management*, *20*(3), 267-279.

Lutzker, M. (1982). Max Weber and the analysis of modern bureaucratic organization: Notes toward a theory of appraisal. *The American Archivist*, *45*(2), 119-130.

Magpili, N. C., & Pazos, P. (2017). Self-managing team performance: A systematic review of multilevel input factors. *Small Group Research*, *49*(1), 3-33. doi:10.1177/1046496417710500

Malone, T. W., & Crowston, K. (1994). The interdisciplinary study of coordination. *ACM Computing Surveys*, *26*(1), 87-119.

Maruping, L. M., & Agarwal, R. (2004). Managing team interpersonal processes through technology: A task-technology fit perspective. *Journal of Applied Psychology*, *89*(6), 975-990. doi:10.1037/0021-9010.89.6.975

McNamara, M. (2012). Starting to untangle the web of cooperation, coordination, and collaboration: A framework for public managers. *International Journal of Public Administration*, *35*(6), 389-401. doi:10.1080/01900692.2012.655527

Okhuysen, G. A., & Bechky, B. A. (2009). 10 Coordination in organizations: An integrative perspective. *The Academy of Management Annals*, *3*(1), 463-502. doi:10.1080/19416520903047533

Oswick, C. (2012). Discourse analysis and discursive research. In *Qualitative organizational research: Core methods and current challenges* (2nd ed., pp. 473-491). Thousand Oaks, CA: SAGE.

Puranam, P., Alexy, O., & Reitzig, M. (2014). What's "New" about new forms of organizing? *Academy of Management Review*, *39*(2), 162-180. doi:10.5465/amr.2011.0436

Puranam, P., & Raveendran, M. (2013). Independence and organization design. In *Handbook of economic organization: Integrating economic and organization theory* (pp. 193-209).

Cheltenham, UK: Edward Elgar Publishing Limited.

Puranam, P., Raveendran, M., & Knudsen, T. (2012). Organization design: The epistemic interdependence perspective. *Academy of Management Review*, *37*(3), 419-440. doi:10.5465/amr.2010.0535

Reed, M. (2011). The post-bureaucratic organization and the control revolution. In *Managing modernity. Beyond bureaucracy?* (pp. 230-255). Oxford, UK: Oxford University Press.

Robertson, B. J. (2015). *Holacracy: The new management system for a rapidly changing world*. New York, NY: Henry Holt and Company.

Roufaiel, N., Meissner, M. (1995). Self-managing teams. *Benchmarking for Quality Management & Technology*, *2*, 21-37. doi:10.1108/14635779510081625

Sarosa, S., & Zowghi, D. (2003). Strategy for adopting information technology for SMEs: Experience in adopting email within an Indonesian furniture company. *Electronic Journal of Information Systems Evaluation*, *6*(2), 165-176.

Sassenberg, K., & Hamstra, M. R. W. (2017). The intrapersonal and interpersonal dynamics of self-regulation in the leadership process. In *Advances in experimental social psychology* (Volume 55, 1st ed., pp. 193-257). US/UK: Elsevier.

Seitz, S. (2016). Pixilated partnerships, overcoming obstacles in qualitative interviews via Skype: A research note. *Qualitative Research*, 16(2), 229-235. doi:10.1177/1468794115577011

Sexton, C. (1994). Self-managed work teams: TQM technology at the employee level. *Journal of Organizational Change Management*, *7*(2), 45-52. doi:10.1108/09534819410056122

Symon, G., & Cassell, C. (2012). *Qualitative organizational research: Core methods and current challenges* (2nd ed.). Thousand Oaks, CA: SAGE.

Van de Kamp, P. (2014). Holacracy - A radical approach to organizational design. In *Elements of software development process - Influences on project success and failure* (pp. 13-26). doi:10.13140/2.1.3740.8645

Velinov, E., Vassilev, V., & Denisov, I. (2018). Holacracy and obliquity: Contingency management approaches in organizing companies. *Problems and Perspectives in Management, 16*(1), 330-335. doi:10.21511/ppm.16(1).2018.32

Vennix, J. A. (2011). *Theorie en praktijk van empirisch onderzoek* (5th ed.). Harlow, UK: Pearson.

Weerheim, W., Van Rossum, L., & Ten Have, W. D. (2018). Successful implementation of self-managing teams. *Leadership in Health Services, 32*(1), 113-128. doi:10.1108/lhs-11-2017-0066

Appendices

Appendix A: Master's thesis research integrity information

Master's thesis research integrity information

This document contains information to inform the participant what they can expect during the data collection process and the handling of the data during the researcher's master's thesis trajectory.

Researcher/interviewer: Inez Notermans   **Participant/interviewee:** [name]
Organisation: Radboud University   **Organisation:** [name]

Informed consent

Research and aim: The research for the master thesis will focus on how circles work together on tasks; how they use IT tools such as Slack/GlassFrog/online conferencing tools, etc.

Purpose for which data will be used: The data collected will be transcribed, fully anonymised and analysed for research purposes.

Process of data collection:
- With the permission of the participant, audio recordings will be made by the researcher. Recorded interviews will be transcribed verbatim by the researcher to make it easier to analyse.
- Participation in the data collection process is voluntary. The participant has the right to withdraw at any time.

Confidentiality and anonymity

Confidentiality: All data will be handled with confidentiality.

Anonymity: In order to protect the identity of the organisation and its employees, all names will be anonymised or pseudonyms will be used. Other information that could be used to trace back to a particular person will also be anonymised.

Appendix B: Interview guide for individual interviews

Below is an outline of the general interview guide used during the individual interviews. Not all questions were asked to all participants. Based on the responses of participants during the interviews, other probing and content-related questions were also asked by the researcher. The interview guide below has been anonymised to protect the identity of the company. To this extent, pseudonyms have been used for some Circle names where the name is not generic enough in common business or software development jargon.

<u>Interview guide individual interviews</u>

Note: Prior to each individual interview, the Research Integrity document composed by the researcher will be sent to the participant to inform him/her what he/she can expect during the data collection process and the handling of the data during the researcher's master's thesis trajectory.

1. Introduction
My name is Inez Notermans. I am currently a master student at the Radboud University in Nijmegen. For my degree Organisational Design & Development, I am now in the process of writing my master's thesis. The aim of my thesis is to research how Circles in a self-managing organisation work together on tasks and how they use IT tools such as Slack, Asana, GlassFrog, online conferencing tools, etc. The aim of this interview is to get an idea how you experience/view this 'working together' of the various Circles which you are a member of. The interview will last about 60 minutes. For my research, I am looking at the Circles within the organisation's Supercircle. *[Briefly explain why I picked this person as an interview partner.]* With your permission, I would like to audio record this interview so that I can process and analyse it with more ease afterwards. Do you give permission for me to audio record this interview? *[The researcher will also ask if they have any further questions regarding the Research Integrity document sent earlier to the participant. If the participant has not read it, the researcher will go over the information in this document first before carrying on with the interview.]* During this interview, I would like to cover four main topics. First, I'd like to cover some general background information; second, we'll talk about coordination interdependencies; third, I have some questions about the IT tools that you use to work together; and lastly a few questions about how the corona crisis has potentially affected the connection/interdependencies between circles. Do you have any questions for me before we start? *[Note to researcher: Also mention to the participant that it is okay if they do not know the answer to a question.]*
2. Overview / background information

Main topic	**Sub-topic**	**Questions**

General working information	Roles	- Could you please introduce yourself? - What is your study/work background? - How long have you been working for the company? - How many Roles do you currently fill? - Which kinds of Roles do you have? - More specifically, do you fill any Core Roles? If yes, which ones? - Can you tell me a bit about what each Role entails? - How long do you usually keep each Role? - How long have you had your current Roles for?
	Circles	- How many Circles are you currently a member of? Can you tell me a bit about these Circles? - Have you been part of other Circles in the past? If yes, which ones? - How often do you work with other Circles? - How often do you change Circles (if at all)? Circle or Role-specific questions: - Do you think that once the temporary project is done, that the Circle will cease to exist or do you think that it will turn into another Circle? (E.g. like an old project Circle essentially turned into the Hatchery Circle?) - Can you tell me a little bit about the history of the Sub-Circles? - Could you please elaborate a little on the difference between the 'telephony platform Circle' and the 'telephony platform 2.0 Circle'? Why was a '2.0' version of the Circle necessary?
	Other general questions	- How important do you think coordination is between Circles? Why do you think this? Circle or Role-specific questions: - As a core member of two Circles, are you also the 'contact person' for members of other Circles? - Do you have a lot of communication with the 'outside world'? (I.e. outside of the Super-Circle?) - Could you please elaborate a little on the difference between the infrastructure and the web application Circles? - Can you tell me a little bit about the Virtual Environment/Testing Platform? As I understood, only a limited number of people can access it at the same time. How do you manage this? *[Also linked to simultaneity constraint.]*
3. Coordination in self-managing teams (i.e. Circles)		
Main topic	**Sub-topic**	**Questions**

Coordination interdependencies [*Note to researcher for the interview: Don't forget to briefly explain what I mean by coordination and what each interdependency aspect entails.*]	Shared resources	● Out of the Circles that you are a member of, which Circles do you feel have the most shared resources? Why? ● What kind of information is shared between these Circles? Can you give examples? Circle or Role-specific questions: ● You have a user experience-related Role in various Circles. Does this make you an important link between that Circle and the User Experience circle? How so? What information is relayed through you? *[Same question can be asked for a developer-related Role.]* ● Why do certain Circles really 'need' each other? ● How many/which Circles rely on the activities/information produced by your main Circle(s)? ● Does your main Circle(s) depend on other Circles for specific information? If yes, which ones and what information is you Circle dependent upon? ● Are there any Circles which your main Circle(s) do(es) not work with?
	Producer-consumer relationships	● Do the Circles you have a Role in have to wait on information or output from each other to be able to continue/progress on their own tasks? ● If yes, what kind of information does each Circle need to wait for? ● What is the directionality of this information that needs to be shared? *[E.g. Does Circle 1 only share information with Circle 2 or does Circle 1 also need something back from Circle 2?]* Circle or Role-specific questions: ● How much information is shared with the external partners or stakeholders? ● How much information do you receive in return?

	Simultaneity constraints	Circle or Role-specific questions:
		● How many/which tasks can be performed at the same time? How many/which tasks cannot be performed at the same time? Why is this?
		● If you are waiting for information from another Circle, can you work on tasks at the same time? Why/why not?
		● Can you tell me a little bit about the Virtual Environment/Testing Platform? As I understood, only a limited number of people can access it at the same time. How do you manage this?
		● You are a member of many different circles.
		    ○ How do you divide your time over these circles?
		    ○ Can you perform tasks at the same time for various circles? Or can you not perform them

| | | at the same time? |
| | | ○ Do the circles that you're in work on tasks at the same time or do they have to wait for each other? |

4. The role of information technology (IT) tools		

Main topic	**Sub-topic**	**Questions**
IT tools [*Note to researcher for the interview: Don't forget to briefly explain what I mean with IT tools.*]	Types	● Which IT tools do you use to do what tasks? E.g. which IT tool(s) does your circle use for: ○ Finding information about other Circles? ○ Noting down your to-do list? ○ Sharing work updates with your colleagues in: ■ The same Circle? ■ Other Circles? ○ Keeping track of your own progress? ○ Keeping track of the progress of others (if applicable)? ● Why do you think it's important to have these tools in place? ● As I understood, different Circles sometimes use different tools, which can lead to confusion. What happens in the case of confusion? ○ Are there miscommunications? Other issues? ○ Does it slow down the work pace of Circles? ○ Does it make you work less efficiently? ○ How does it affect the interdependencies between Circles? ● Do you think it is better to have lots of different IT tools for different tasks or to have one large enterprise solution where you can do everything in? Circle or Role-specific questions: ● The Purpose of one of your Roles is "*The right tools are used for each project*". ○ How do you decide on which tools to use for each project? ○ Do you only advise on tools to use for your main Circle or for other Circles as well? ● As I understood, the Lead link of a Circle has the responsibility to allocate resources within a Circle. How do you decide which resource to allocate to whom? How do you decide which tools to use for your tasks and the Circle's tasks? ● As a Secretary, your responsibilities/accountabilities include scheduling Governance and Tactical meetings, for example. How does IT help you do this? Would you be able to carry out this task without the use of IT tools?

	Work updates and tasks	● How often do you share work updates?
		   ○ Within the Circle?
		   ○ With other Circles?
		   ○ Within the company?
		   ○ With external parties?
		● In your opinion, do you feel that it is necessary to even share updates with other Circles or would it suffice to keep the work updates within one Circle? Why?

5. Other questions

Main topic	Sub-topic	Questions
Adverse events / corona crisis		● How do you feel the interdependencies that we have talked about changed since the corona crisis began? ● Are some Circles now more/less dependent on other circles? Can you give examples if this is the case? ● How has the corona crisis changed the (self-managing) dynamics between Circles? ● Do the Circles that you are a member of organise more/less (Governance) meetings now, for example? ● Do you share work updates more/less frequently since the corona crisis began? ● Are you using different (IT) tools in these times of the coronavirus? If yes, which ones? ● How often would you work home under 'normal circumstances'? ● How has your daily work routine changed since working from home?

6. Closing

Thank participant for their time. Ask if the participant has any closing questions for the researcher.

Appendix C: A priori themes and initial template

Tables C1 and C2 below show the *a priori* themes and the initial template used for the code book, respectively. The complete code book has been submitted to the supervisor separately.

Table C1: A priori themes	
A priori theme	Description
Self-managed teams	Includes: Holacracy, (Core) Roles, Circles, communication.
(Coordination) interdependencies	Includes: challenges in coordination, shared resources, producer-consumer relationship, simultaneity constraint.
Information technology	Includes: types of IT tools, issues/challenges with using different IT tools.

Table C2: Initial template used for coding			
Quote/statement	*Interpretation of quote* Open coding	*Sub-topic* Axial coding	*Main topic/theme* Selective coding
		Holacracy (Core) Roles Circles Communication	Self-managed teams
		Challenges in coordination Shared resources Producer-consumer relationship Simultaneity constraint	(Coordination) interdependencies
		Types of IT tools Issues/challenges with using different IT tools	Information technology

Appendix D: Overview of participants

The overview of participants below is in no particular order. The participant number also does not necessarily correspond with the transcript/interview number. Pseudonyms have been used for some Circle names where the name is not generic enough in business and/or software development jargon. The Roles and relevant Circles do not represent all of the Roles that these participants have within the organisation.

Participant number	Relevant Role(s) of participant and relevant Circle	Type of interview and why this participant was chosen
1	*Relevant Role(s)*: Core Role *Relevant Circle(s)*: ● Super-Circle	*Type*: Orientation interview. *Why chosen*: ● Has a core role in the Super-Circle.
2	*Relevant role(s)*: Core Roles *Relevant circle(s)*: ● Infrastructure Circle ● Development Operations Circle	*Type*: Individual interview. *Why chosen*: ● Core Roles in two Circles. ● One of the Circles this participant is in serves as a large overarching Circle (i.e. it has a lot of interdependencies with other Circles). The other relevant Circle is interesting due to the multidisciplinary nature of it.
3	*Relevant role(s)*: Core Roles *Relevant circle(s)*: ● Two Sub-Circles	*Type*: Individual interview. *Why chosen*: ● Core roles in two Circles. ● The Sub-Circles are more secluded within the Super-Circle. This likely gives different interdependency relations.
4	*Relevant role(s)*: Developer *Relevant circle(s)*: ● Web application Circle ● Temporary project Circle	*Type*: Individual interview. *Why chosen*: ● Web application Circle is one of the largest Circles in terms of members, so it is possible to have many interdependencies with other Circles. ● Overlapping roles in the web application Circle and the temporary project Circle. ● Temporary project Circle is likely to have different interdependencies than longer-term Circles.

5	*Relevant role(s)*: Core Roles
	Relevant circle(s):
	   • Daily Operations Circle
		Type: Individual interview.
		Why chosen:
		   • This Circle is mainly involved with the Super-Circle as a whole, rather than Circles separately. Hence, there are probably limited interdependencies.

6	*Relevant role(s)*: Core Role and User Experience
	Relevant circle(s):
	   • User Experience Circle
		Type: Individual interview.
		Why chosen:
		   • Member of seven Circles within the Super-Circle. Hence, this participant would have interesting insights in the interdependencies between these Circles and the tools used.

7	*Relevant role(s)*: Core Roles
	Relevant circle(s):
	   • Super-Circle
	   • Web application Circle
	   • Temporary project Circle
	   • Development Operations Circle
		Type: Individual interview.
		Why chosen:
		   • Core Roles in four Circles.
		   • Member of large and small Circles, which means that interdependencies may also vary.
		   • Member of temporary project Circle as well as longer-term Circles.

8	*Relevant role(s)*: Developer
	Relevant circle(s):
	   • Infrastructure Circle
	   • Web application Circle
		Type: Individual interview.
		Why chosen:
		   • Shared member between two large Circles. From the orientation interview it became clear that most Circles depend to some extent on the output of these two Circles. Hence, this creates possibilities for interdependencies.

9	*Relevant role(s)*: Core Role, tool-related Roles
	Relevant circle(s):
	   • Open Source Circle
		Type: Individual interview.
		Why chosen:
		   • The Open Source Circle reaches beyond the Super-Circle, so external interdependencies may exist.
		   • The participant also fills several Roles that may influence the tools that are used.

Appendix E: Interview transcripts

Interview transcripts have been submitted to the supervisor separately.

Appendix F: Interdependencies matrix

The interdependencies matrix has been submitted to the supervisor separately.