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## Technology as integrated into institutions: expanding the list of actors affecting institutional conditions of cooperation

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**Abstract:** This study seeks to overcome the gap between institutions and technology in the literature of the commons. It emphasises the importance of inviting and testing different technologies as actors that are of importance for resolving social dilemmas. In this study, a test is carried out to see if a certain accounting technology mediates factors that facilitate the sustainable management of commons. The technology that is tested in this study regards ‘notched sticks’ that were used as accounting in self-governed farming villages during the seventeenth and eighteenth centuries, especially in upper Dalarna, Sweden, when organising ‘new urban commons’. The findings are that the notched sticks did function as mediators, connected in a network that did affect several factors, or conditions, for sustainable management of commons. As such, the technology of sticks was an actor that served in mediating relations, decision-making and transparency. For example, as accounting technology the sticks did change situations with possible individual bounded rationality through the construction of social entities and methods for balancing rights and obligations. Considering how accounting technology can be integrated into institutions, this implies that awareness is needed when changing and implementing technological solutions.

**Keywords:** Actor-network theory, commons, critical accounting, self-governed organisations

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## I. The gap between institution and technology

In the literature of the commons that explores ways of overcoming social dilemmas in the collective management of resources, much research has been done on institutions. Often, such institutions are considered to be expressed in the form of written rules, as by-laws that often contain lists of fines (for example, De Moor et al. 2016). However, in a special area in Sweden, upper Dalarna, regulations as by-laws seem to have been rare (even if there are some examples of written rules on the parish level) (Erixon 1931, 1953–1954; Larsson 2016). By contrast, in upper Dalarna, a certain technology was involved in farmers' self-organised managing of common goods. The farmers made use of a special technology, an accounting system consisting of symbols inscribed on wooden sticks. As accounting technologies, these sticks functioned as calculative devices that made it possible to keep records on individual farmers' rights and obligations. These notched sticks were used not only in the organising of traditional commons but also in new urban commons, at least during the eighteenth and nineteenth century that this study concentrates on. As such, an exploration of notched sticks can contribute to a richer understanding of accounting as a specific technology that was connected to institutions other than what previously had been considered in the literature of the commons.

Research in the commons can be criticised for neglecting different kinds of actors, especially technologies. Among the few studies in the field of commons that seek to include technology's role for overcoming social dilemmas, analyses have been done on how technology mediates relations, affects decision-making and functions as a tool for transparency; and links this to institutional design and creation of commons (Moss 2014; Van der Kooij et al. 2015). Furthermore, technological mechanisms can transcend individual rationality and 'open up' deliberative decision-making spaces (Pieraccini 2015). When it comes to the role of accounting for commons, arrangements that make commons more sustainable can be explained through generating regular information together with ceremonies involving accounting (Lana-Berasain 2017). Together, these studies indicate the relevance of considering technology for understanding sustainable communities.

This study seeks to contribute with further understanding that helps overcome the gap between institution and technology. The idea is to explore and bring in notched sticks as a specific accounting technology into the studies of commons to better understand what holds people together and how social dilemmas can be solved. As such, this study is written in a research tradition that explores new participants, especially non-human actors, as technological, calculative devices. It is also written to explore how they contribute with definitions of units, categories and calculations with value units that, when linked together, can be described as networks that mediate social ties (Latour 2005). With the theoretical stance from actor-network theory (ANT), the study seeks to extend the list of different actors that contribute to institutional conditions for

cooperation by letting in non-human elements as actors. From this perspective, notched sticks as an accounting-specific technology is explored as a technology with the potential to mediate relations, decision-making and transparency, and, thereby, facilitate institutional conditions for solving social dilemmas. As such, this study does not primarily seek to investigate and identify important factors facilitating sustainable management of commons (Agrawal 2001). Instead, the focus is put on the technology or, more precisely, to discover whether the notched sticks as accounting technology mediated factors facilitating conditions for successful management of common goods. As such, this study contributes to research of the commons, aiming at understanding institutions not just as something 'social', but rather how institutional conditions for cooperation are expressed through technologies (Van der Kooij et al. 2015).

The research question is: Did the notched sticks help to overcome social dilemmas?

Self-governed traditional village organising, particularly in upper Dalarna, during the eighteenth and nineteenth century, will illustrate the interaction between institutions and accounting technologies. As such, this study contributes to the literature that uses historical data for investigating under what conditions self-governed cooperation is made possible (De Moor et al. 2016; Laborda-Pemán and De Moor 2016), but with the focus on how technology is linked to institutions.

This study not only deals with some traditional commons but also with what has been labelled 'new urban commons', which often overlap with public goods as communal services and infrastructures that are organised by farmers at a local community level (Berge and Mckean 2015; Pieraccini 2015). As such, it involves goods that involve different social dilemmas. Public goods, such as roads, often have a low degree of subtractability and it is difficult to hinder people from using them. For such goods, the challenge is to create a situation where each member contributes to their maintenance. But management of common-owned flour and saw mills are also included in the study. These are goods that have some degree of subtractability, since a mill cannot be used by all members at the same time. In such cases, systems are needed for distribution of usage and to make each member contribute with work and resources.

## 2. Details of notched sticks

Notched sticks have not only been used in upper Dalarna. Making inscriptions on sticks is a technique that has been used all around the world for different purposes. According to one myth, it was one of the Yellow Emperor's ministers that invented the notched stick around 2700 BC in China (Graeber 2012). However, there are several findings of far older notched bones and stones in Africa (Annisette 2006; Sy and Tinker 2006). Notched sticks have also been used around Europe, especially along trading routes (Kovalev 2002), in medieval monasteries, mining, in England by the Royal Treasury and by taxmen (Menninger

1958/2014; Zidov 2010). For example, in Sweden, the tax clerk had one stick for each village with each farm's symbol on it. Next to each farm's symbol, notches were made when the farm paid (Grandell 1982). When it comes to village organising, there are examples of sticks used when organising farming, mills, cooperative local wine stores, voting calculations, turn-takings (night watch, carrying the flag, working in the forest, ringing the bell), calculating rights, organising snow ploughing and different transports, using the common water channel and distributing milk from the common herd (Menninger 1958/2014; Kataloge des Österreichischen Museums für Volkskunde 2004; Zidov 2010). Some of the symbols that were carved into the sticks are common, at least in Europe. Symbols like I, V and X are often used for 1, 5 and 10; not as roman sequential numbers but as groupings, in other words tallying (Menninger 1958/2014).

The Nordic museum in Stockholm has a collection of over 1300 sticks with inscriptions, most of them were used in self-regulated village organising. See Figure 1 for an example of a stick used for keeping records on workdays. Upper Dalarna is the area from which most sticks have been collected. This collection includes different kinds of notched sticks and different communities named the sticks in different ways. The length of these sticks was most often between 25 cm and 1.5 m. Often, there was a certain stick named after its function; for example,

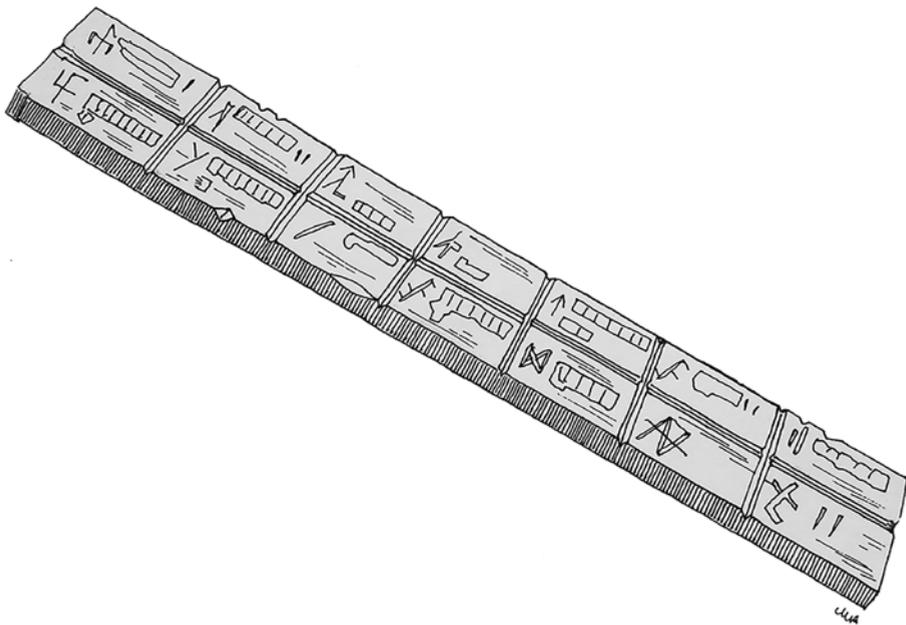


Figure 1: A notched stick for keeping records on workdays, from Landbobyn, Venjans sn, Dalarna. N.M: 15659. Length: 54 cm. Width: 5.9 cm. Thickness: 1.3 cm. The farms symbols are inscribed on the stick together with notches symbolising number of days worked.

the mill-stick used for organising a mill. In this article, ‘notched sticks’ is used as a concept for all different sticks, even if referring to bigger poles with a size around 1.5 m. The concept ‘notched stick’ has been used as a synonym to tally-stick, which occasionally has been used in the literature of anthropology, ethnology and accounting history.

Even if there were several different sticks with different functions, they were based on the same technique. Next to each farm’s symbol, notches were made in order to keep record of, for example, how much material each farm had contributed to the common village house. At the annual meetings, fines or debts were calculated and the sticks were balanced.

Different sticks were used for different kinds of cooperation. Most of the sticks that are preserved from the eighteenth and nineteenth century were used for keeping records on the village-members obligations and rights not only when it comes to cooperation related to farming but also public goods as post-delivery, taking care of poor people or guests of the village. But there were also other sticks used for governing cooperation that did include different farms from different villages, as, for example, the church boat, mill, saw and mountain farms. Sticks were also used for balancing obligations and rights that had to do with the membership in the parish and a certain geographical area (*rote*) that had responsibility to support one soldier with, for example, food and clothes.

### 3. The special features of Upper Dalarna: the context in which the sticks were used

Upper Dalarna is a special geographical area considering that the traditional, self-governed village organisation survived for longer times in this area compared to other regions in Sweden. The explanation for this is that enclosure reforms with the aim of concentrating landownership and dissolving the old village communities occurred later compared to other parts in Sweden (see Figure 2) (Erixon 1961; Sporrang and Wennersten 1995). Something else that characterised this area is that the concentration of capital and power were lower compared to other regions in Sweden. Moreover, in upper Dalarna, capitalistic forms of credits and monies were introduced relatively late (Forsberg 2015). And, in comparison to Spain, where pre-industrial commons were managed by landlords (Lana-Berasain 2008), pre-industrial commons in upper Dalarna, as in most part of Sweden, were organised in smaller egalitarian teams (*lag*) (Granlund 1971; Sandström et al. 2017). Another difference is that the heritage was divided into smaller parts between all children and was not like other parts of Sweden where one child took over the farm (Erixon 1961; Hellspong and Löfgren 1994). This area also differs from other areas in Sweden, and even parts of Dalarna, where villages were built up around, or located close to, mining industries (Isacson 1979). Something else that may explain the collective and egalitarian way of life is that in upper Dalarna taxes were fixed and collective for longer periods of

time instead of being linked to individuals, like in most other areas in Sweden (Granlund 1971). Moreover, farming that took place close to the village was not that dominant in upper Dalarna compared to southern Sweden where grain production dominated. Instead, cattle farming and dairy production, together with using forests and fields around mountain huts as alternative resources, was common; and incomes in national currencies were received on travels or hand-crafts sold at markets and often used for buying metal products and paying taxes (Sporrong and Wennersten 1995; Sundberg 2002; Larsson 2016). As such, upper Dalarna has parallels to European areas with diversified economic systems, where the heritage was divided by all children, that particularly was the case in mountain areas with small scale landownerships and egalitarian social systems (Sporrong and Wennersten 1995).

When it comes to livelihood strategies in upper Dalarna, these are heavily dependent on the cold climate. Due to its localisation and altitude, especially in the mountain areas, the conditions for farming is worse compared to southern Sweden. Most parts of the area are covered in snow from late October to April. Seeds were planted in May and harvested in August. This cold climate meant risks for frost, especially in the later part of August. This is one of the factors, together with cases of too much rain or lack of rain, that explain that around at least each fourth year, the harvest was injured, and every 30–50 years, the harvest was so bad that it caused famine. However, there are some areas in upper Dalarna that are, to some extent, better suited for crops, for example the island of Sollerön, located in the Siljan lake, that had a slightly milder climate in the autumn. These rather bad conditions for farming are said to have eased obligation to pay taxes. Additionally, classes were equalised in upper Dalarna due to starvation, something everyone in the region suffered from (Andersson and Arosenius 1903).

Ownership of commons were often divided in parts. For example, the habitants at Sollerön had many different parts in different commons around the island. For instance, acres and meadows could be divided in everything from one up to over two hundred owners. But they did the work on the commons together. Part-ownerships were also used at different mountain huts (that also had urban goods such as mills and saws) where the cattle was taken for a better supply of food (Granlund, 1938).

The area of upper Dalarna did not suffer from any wars, as south of Sweden and most parts of Europe were farming areas and houses that were partly destroyed; and old cultures were challenged by usage of coinage. These kinds of monies were spread where the troops went (Graeber 2012). But many soldiers were demanded from Dalarna; and in some villages inhabitants claimed that they could not afford any taxes since they lacked adult men, who had died in wars during the seventeenth and eighteenth century (Andersson and Arosenius 1903). This shortage of men could be a possible explanation for the detailed control of contribution of daily works by men. But, during the later part of the eighteenth century the number of inhabitants in Dalarna generally increased. Still, the land in upper Dalarna was sparsely inhabited, however, it was densely inhabited if one looks at the size of land suitable for cultivation (Boethius 1933). Larger groups

that were going to share limited resources is, of course, another reason for controlling contributions and usage of different resources.

Yet, another reason for having a technology that helped order the works may be that the farmers did not stay in their villages all year round. They moved around all the time. Cultivation was only one part of livelihood strategies among others, as

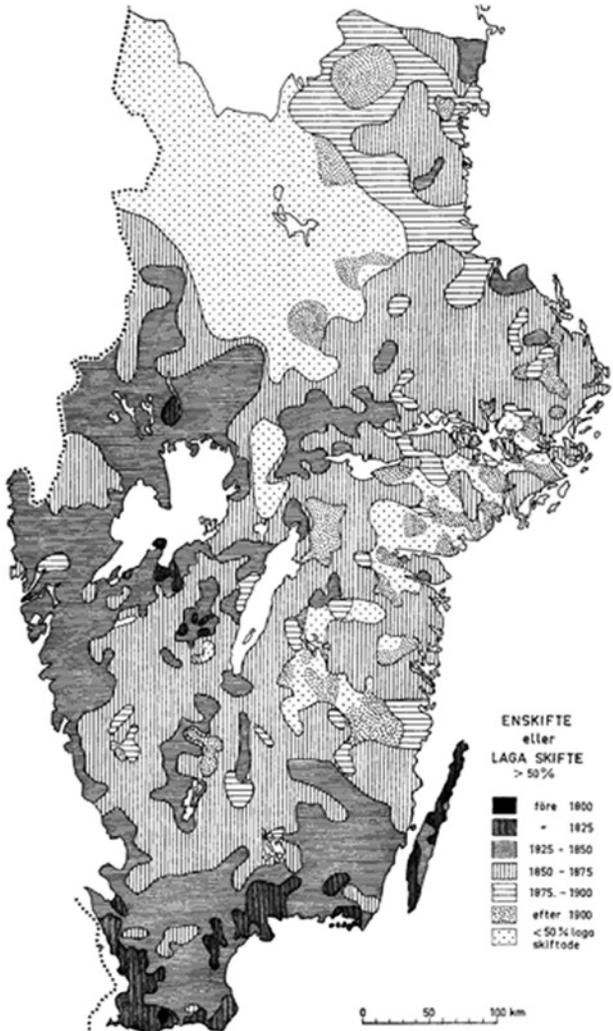


Figure 2: 'The pattern of establishment of "enskifte" and "lagaskifte" in Sweden' (Helmfrid 1961, 123). Dalarna is located in the dotted area in the upper left part of the map, which illustrates that the enclosures with the idea to dissolve old village communities was less frequent in this area compared to other Swedish areas. The area called Upper Dalarna stretches north from the lake Siljan, located in the midst of this dotted area.

mentioned above. The importance of cows and goats explain, among other things, the usage of different mountain huts where families moved depending on the time of year when there was no snow for around six months (except when work needed to be done at the home village). But also, commons as meadows around the village as well as the mountain villages were important for collecting hay for the winter. But there were also other complementary livelihoods, especially during the winter. Several handcrafts were made and sold at markets in the southern part of Sweden and Norway. Other works were cutting and transporting timber together with making coal. Moreover, large groups of people from Dalarna walked several weeks to different areas in Sweden to work with timber, build roads, bridges, dams or transportations and other services for the mining industry. Such works were especially important during years with bad harvests (Boethius 1933). But at the end of the nineteenth century, the supply of such kinds of work decreased. At the same time, the land suitable for crops was occupied, there was a shortage of manure and it was hard to find new places in the forests where the cattle could graze (Boethius 1933).

#### 4. Social dilemmas and institutional conditions for cooperation

In the literature of commons, institutions are often seen as solutions to social dilemmas (Ostrom et al. 1994). Social dilemmas arise because individuals tend to maximise self-utility instead of considering what would be the best for the collective. Such an argument is based on experiments and game theories where no communication between participants is assumed to take place and all individuals act from their individual interest; no one considers the consequences of their actions and the cost is high for changing the situation.

There are several possible social dilemmas in and around a traditional farming village. When it comes to common fields and forests, there is a risk for individuals seeking to maximise their utility by grabbing more than others and not caring for the commons, such as when giving help with fencing. The same dilemmas hold true for mill and saw members where an individual would benefit most from using the facilities as much as possible and contribute as little as possible. In the same way, free riding could be a problem when it comes to guarding or giving food to the schoolteacher, contributing to school buildings and common houses, driving the priest and helping the poor.

Furthermore, there are also dilemmas that concern the value of work. Some farms contributed with a horse and wagon; while others only with a workday. Another possible dilemma is that an individual farm owner does not care if the neighbours are disturbed and just does what is best for his or her farm. Such as, for example, walking across others' fields because it is the shortest way or not bothering to keep their fence in order, causing cattle to damage the neighbours' private land or commons.

But, when facing social dilemmas, it is possible to change the situation. Incentives can be changed through agreements on rules that increase the joint

outcome. This is assumed to be possible at least in situations that are rather simple and where individuals have symmetrical interests and there are possibilities for communicating on a face-to-face level; a learning process of who can be trusted, considerations of causes individuals' actions have on each other and for the common resources. It is when individuals try to change situations that norms and social capital are said to develop (Ostrom and Ahns 2003). Rules that individuals tend to agree upon are such that are 'already known to them', 'easy to learn, follow, and monitor' and assumed to 'improve joint' outcomes (Ostrom et al. 1994, 323). Furthermore, eight principles of design are said to explain sustainable self-organised management of common goods (Ostrom 1990/2011, 90): clearly defined boundaries; congruence between appropriation and provision rules and local conditions; collective-choice arrangements; monitoring; graduated sanctions; conflict-resolution mechanisms; minimal recognition of rights to organise and nested enterprise.

Other studies of what factors facilitate conditions for sustainable cooperation and management of commons have, to a larger extent, recognised 'resource systems and characteristics', grouped them together with an external context in addition to how groups and resources are connected and give rise to factors like '[f]airness in allocation of benefits from common resources' (Agrawal 2001, 1659). When it comes to 'institutional arrangements', which are the focus for most of Ostrom's principles, other studies have pointed out the importance of having rules that are simple and easy to understand. When it comes to factors that involve any technology, technology has been considered to belong to a context (Agrawal 2001), not as an actor that mediates conditions for sustainability of the commons.

However, institutions set up to manage commons do not always need to be the optimal from a rational-choice perspective. According to a critical institutional perspective, the bounded rationality model can be enriched by explanations of institutions and resources as socially embedded and included in the analyses of power relations, multiple social identities, different possibilities for agency and resistance as well as path dependency (Cleaver and de Konig 2015). Institution design in sustainable communities seems to be able to adapt to variations in the broader institutional and economic context (De Moor et al. 2002). There are also variations of commons, such as economic/productive, associational and symbolic commons, that are not just developed based on economic benefit but also on the background of 'how they are related to preferred ways of life, wellbeing, attachment to place, historical narratives and village identity' (Sandström et al. 2017, 526). Furthermore, powerful people may seek to maintain certain social structures through institutional arrangements that make possible a certain kind of democracy, which makes it possible for different persons to have different rights. The opposite is also true, people may choose an institutional design that makes a democracy where community member can influence rules and sanctions in equal terms possible (Lana-Berasain 2008).

## 5. Relating actor-network theory to institutional conditions

### 5.1. Accounting as a technology that does something

Research in the field of self-governance has been kept separated from the field of accounting. One reason for this may be that much research in accounting has been directed at understanding accounting as inscriptions that make controlling and governing at a distance possible (Robson 1992). As such, it has mainly dealt with organisations that are not self-governed and, thereby, are connected to what Ostrom (1990/2011, 1995, 2007) described as state control or market-based solutions. On the other hand, traditional studies on the commons have usually excluded specific technologies like accounting.

Even if the perspectives of commons and social dilemmas usually are not frequently considered in accounting studies, certain research in accounting history is relevant as it outlines that inscriptions have played an important role in cooperation. An important departure for such studies is that accounting effects organisations and society (Hopwood 1983). Accounting is not just about keeping records. Accounting is performative and, as such, often plays a constitutive role for cooperation of the underlying society. Through history, inscriptions have been used in different cultures over different periods of time for keeping order, facilitating organising and making complex exchanges possible (Ezzamel and Hoskin 2002; Basu et al. 2009; Ezzamel 2012). When it comes more explicitly to self-governed organisations, alternative accounting has been designated an important role (Jayasinge and Thomas 2014) and regular flow of information, as well as ceremonies that accounting involves, can explain why certain organising of commons survived over longer periods of time (Lana-Berasain 2017). For example, accounting made democratic organisations, such as the Swedish parish possible; since it created transparency and made it possible for members to ask questions and get involved in economic decisions (Rothstein and Broms 2013). Different accounting technologies have different social functions and are important in the democratisation of public space (Kurunmäki et al. 2016).

To explore how accounting as a technology is integrated into institutions in the context of self-governed organising of commons, this study seeks to highlight how notched sticks became important, that they did something and how the sticks with inscriptions created associations between different farms, acres, workdays, horses and collectives. In this way, the study is inspired by Latour (2005), along with other studies on accounting as technology. As such, it contains an analysis of units in a network and how these units are stabilised by measures and techniques as well as how these units relate to each other (Justesen and Mouritsen 2011; Barter and Bebbington 2013; Tresch 2013). Moreover, accounting can become a technology that creates a space where the members' opinions are invited together with local adaptations of solutions (Tresch 2013). Furthermore, this perspective makes it possible to analyse accounting not only as a tool used by humans but also as a technology doing

something. According to this perspective, cooperation cannot be explained by neither individual attitudes nor institutional rules. Instead, accounting needs to be taken into the analyses as a technology that gives rise to institutional conditions for sustainable management of commons.

## 5.2. Actor-network theory and communities

According to an actor-network perspective, ‘the social’ is not a thing in itself. Instead of being separated from technological actors, the social depends on technology; social stuff is mediated by ‘*a type of connection* between things that are not themselves socially’ (Latour 2005, 5). Following this way of reasoning, communities can be seen as being grounded in ties that are non-social. Therefore, studies of what holds people together, as in the case of cooperation around commons, needs to incorporate technologies. Notched sticks that were used in upper Dalarna will be analysed as such technology, for example, if and how the sticks create connections, equip the farmers with calculative devices that tells them who has a debt to who or what work each one should do and so on. According to actor-network theory, the notched sticks as a technology would be considered as an actor if they make a difference, such as their ability to ‘modify [the] state of affairs’ (Latour 2005, 71).

According to actor-network theory, the social is visible only when actors are connected; when the social ‘shines through the concatenations of mediators’ (Latour 2005, 136). As such, the social is to be seen in the network of technological calculative devices that equip people with calculations of what is good for the collective; common goods; accounting identities as debtors and indebted. Therefore, when taking the stance in actor-network theory, the task is to offer descriptions of what the sticks make humans as well as non-humans do. As technological actors, the sticks could function as connections through which farmers were associated together. Descriptions of such actor-networks can explain how the farmers could live in the same common world.

Latour (2005) has pointed out that techniques such as accounting calculations contribute to the durability of social ties and that it is not social relations which ‘embed’ economical calculations. Instead, it is the economists’ ‘calculations that provide actors with the competence to behave in an economic way’ (238). One could, of course, question if people that are not expert economists actually use calculations just because there is something called economic theory (Forsberg 2009). But, when it comes to the stick, it is of high interest if the sticks functioned as calculative devices that had the ability to give the actors competence to behave in a cooperative way through calculations that benefitted the sustaining of community goods.

In other words, it is important to bring these notched sticks into studies of commons, as technological and calculative devices and investigate if they did build formats, categorisations and units of values, in addition to how such assemblages can renew our understandings of the collective (Latour 2005). In this way, a deeper

understanding of how certain technologies are integrated into institutions can offer insights into sustainable cooperation. Applied to this study, this means that the notched sticks can be integrated into institutions due to the function of being important for mediating relations, making joint decision-making and transparency possible. Thus, against this theoretical background of institutions that facilitate self-governed organisations and accounting as a technology, there is one hypothetical explanation of how the notched sticks helped to overcome social dilemmas:

Notched sticks, as an accounting technology, was an actor that mediated institutional conditions. This explanation will be complemented with considerations of how accounting-specific technologies are linked to the social, economic and political contexts of upper Dalarna.

## 6. Method

### 6.1. Testing if the sticks were actors

When exploring what actors are included in an actor-network and how they matter, the test is about looking for traces. If something is an actor, it does something and if it does something, it leaves traces. Instead of investigating the social as something that exists in itself, the point with an actor-network approach, is to explore if and how social stuff is mediated by different actors, especially non-human actors. Therefore, the method is to follow the ‘trail’ of the social that moves between different actors. In other words, to test if the notched sticks were actors means to investigate if they did something and if they contributed with solutions to social dilemmas through institutional conditions for sustainable cooperation. In that sense, institutional conditions would be something that comes out of technological arrangements and can be traced through the ‘concatenations of mediators’ (Latour 2005, 136). Therefore, the specific task in this article is to contribute with descriptions of notched sticks as actors that mediate institutional conditions.

When exploring the notched sticks as part of an actor-network, three questions organised the study: Were notched sticks part of the network mediating institutional conditions? How did they mediate factors facilitating sustainable cooperation? How were they linked to the broader context?

A lot of research has been done on testing different factors that are said to create institutional conditions for solving social dilemmas (Agrawal 2001). If the sticks are actors that explain sustainable cooperation, it would be possible to see traces of changes depending on different social dilemmas. But it would also be possible to link the sticks to at least some factors that facilitate institutional conditions of sustainable cooperation.

### 6.2. How the research material was collected

This study makes use of the Nordic museum’s collection of notched sticks together with archive material about how village organisations in Sweden functioned around the eighteenth and nineteenth century. Besides material from upper

Dalarna, material from other areas in Sweden have been included in the study in cases when it enriches the interpretation of how notched sticks functioned.

The collection of notched sticks kept by the Nordic museum is relatively rich compared to other museums, considering the number of sticks that were used for village organising and when it comes to the descriptions of how the sticks functioned. The descriptions and explanations of how the sticks were used are collected as enclosures and letters that the museum's 'collectors' attached to the objects when sending it to the museum. A major part of these has been included in a special register consisting of sticks used for village organising. This register has the following classifications:

*Tools used for summoning members:* Message sticks etc.

*Signs of honour:* Old man's stick etc.

*Sticks for measuring:* The fence stick etc.

*Village list:* Sticks with the different farms marks/list of members etc.

*Turn taking sticks:* Snowploughing, post-delivery etc.

*Accounting sticks:* Sticks for keeping records of fines, working days, materials etc.

*Other sticks:* Sticks for church boats, weddings etc.

The following list shows notched sticks, used as examples underpinning the following empirical presentation (see Table 1). References to sticks in literature have been made directly in the text. When referring to sticks from the Nordic museums' ethnological investigations' (E.U.) (see Appendix), this has been done with the E.U., followed by an identity number, also directly in the text.

Beside the actual objects and their attached information, other evidence has been used for making sense of the functions that the sticks had in villages organising. Especially valuable information about the sticks has been collected from the Nordic museum's 'List of questions', especially the one about village organising that was sent out around 1910 to 1940. This list gives further information about sticks than what is included in the Nordic museum's collection. Personal archives of former ethnological researchers connected to the museum have also been valuable (as Sigurd Erixon and John Granlund). And, of course, the topographic archive and village investigations of certain villages (especially Sollerön, Dalarna). Furthermore, previous research and reports in history and ethnology that deals with notched sticks have been consulted, especially Erixon (1929a,b,c, 1931, 1953–1954, 1961), Granlund (1938, 1971), Grandell (1982, 1989) and Forsberg (2015).

This research has its limitations. When relying on archive material, it is difficult to claim that villages that had lists of fines or notched sticks preserved in archives functioned better than villages that did not leave any traces. Cooperation based on informal mutual gifts might have been a common method for cooperation among farmers, but there are not many traces in archives that prove it. Moreover, the collectors from the Nordic museum concentrated on relic areas, such as upper Dalarna, at a certain time during the end of nineteenth century and

Table 1: List of notched sticks underpinning the empirical presentation.

Sort of stick	Landscape and parish	Identity number at Nordic museum
Mill-stick ( <i>Kvarnsticka</i> )	Dalarna, Noret sn	NM: 12790
Mill-stick ( <i>Kvarnsticka</i> )	Dalarna, Malung sn	NM: 17299
Mill-stick ( <i>Kvarnsticka</i> )	Dalarna, Elfdalens sn	NM: 25941
Mill-stick ( <i>Kvarnsticka</i> )	Dalarna, Äldalens sn	NM: 26844
Mill-club ( <i>Kvarnklubba</i> )	Dalarna, Malungs sn	NM: 30563
Mill-stick ( <i>Kvarnsticka</i> )	Dalarna, Malungs sn	NM: 30575
Mill-stick ( <i>Kvarnsticka</i> )	Hälsingland, Söderdala sn	NM: 104010
Saw-stick ( <i>Såg-sticka</i> )	Dalarna, Mora sn	NM: 46897
Daywork-roll ( <i>Bydagsverkskavel</i> )	Dalarna, Mora sn	NM: 4751
Village-stock ( <i>Bystock/skullstör</i> )	Dalarna, Mora sn	NM: 9760
Daywork-roll ( <i>Dagsverkskavle</i> )	Östergötland, Grebo sn	NM: 41219
Daywork-stock ( <i>Bystock</i> )	Dalarna, Mora sn	NM: 12911
Daywork-roll ( <i>Bydagsverkskavel</i> )	Dalarna, Venjans sn	NM: 15633
Daywork-stick ( <i>Bydagsverkssticka</i> )	Dalarna, Orsa sn	NM: 64392
Daywork-roll ( <i>Dagsverkskavel</i> )	Dalarna, Venjans sn	NM: 15659
Accounting-stick ( <i>Räkenskapskavel</i> )	Hälsingland, Södersala sn	NM: 155876
Sick-roll ( <i>Sjukkavle</i> )	Dalarna, Orsa sn	NM: 112469
School-stick ( <i>Karvsticka/skolsticka</i> )	Dalarna, Älvdalens sn	NM: 26854
Praying-club ( <i>Bönklubba</i> )	Dalarna, Älvdalens sn	NM: 29943
Grave-roll ( <i>Gravkavel</i> )	Dalarna, Älvdalens sn	NM: 25938
Grave-roll ( <i>Gravkavel</i> )	Dalarna, Älvdalens sn	NM: 26835
Soldier-food-roll ( <i>Soldatmatkavel</i> )	Dalarna, Leksand sn	NM: 93005
Soldier-roll ( <i>Rotkavel</i> )	Dalarna, Sollerön sn	NM: 71609
Soldier-roll ( <i>Rotkafvel</i> )	Dalarna, Malung sn	NM: 30572
Soldier-roll ( <i>Rotkafvel</i> )	Dalarna, Nås sn	NM: 130292

the beginning of twentieth. This means that sticks could have been more common in other areas in Sweden at earlier times than what is mirrored in the museum's collection.

The collection of notched sticks at the Nordic museum comes from different villages and parishes in Sweden, but especially from the area of the northern part of Dalarna. However, there are not any full collections of all different kinds of sticks from one village. From some villages, there are a couple and from others only one. Then, there are many villages from which nothing has been collected. Moreover, the level of descriptions about what the sticks have been used for and what the notches symbolise differ from stick to stick. In other words, it is a rich material, but it is geographically spread out and contains variations.

Therefore, in order to avoid the risk of overestimating single sources, the method that has been used is 'reference pluralism' where different sources are used and weighted against each other. But there is also a risk of only finding clues that one is looking for. Therefore, reference pluralism has been combined with the indicia method, as suggested by Myrdal (2007). The idea with the indicia method is that different clues from different sources makes interpretation of the notched sticks that include more aspects possible and avoids interpretations

based on a few sources. In this way, single sticks and explanations of their uses have been weighted not only against each other but also from other clues from several sources. For example, descriptions of notched sticks in materials about village organising and written interpretations from historians and ethnographers have been weighted against each other.

Research material can be presented in several ways (Czarniawska 1998). I have used ‘tales of the fields’ when presenting descriptions of the sticks from the archive. But this presentation technique has been complemented with my ‘sense-making’ of the material. I have chosen to give several examples of different kinds of sticks in order to give a detailed and deep description of a few of the sticks while also mirroring the plurality of the sticks.

## 7. Empirical presentation of notched sticks

### 7.1. Notched sticks and village organisation

As an introduction to the function sticks had in traditional village meetings, a brief description of an annual meeting will be given based on Erixon (1929a). The major village counsel met once a year, often in May, before the farmers moved to different mountain huts where they stayed during summer. It was the farms that were members in the village and not actual people. In most cases, the oldest man on a farm represented it. During this annual meeting, the members checked each other’s fences and compared their communal working days. Several notched sticks were used by the local village council and can be outlined as examples of a certain technology that summoned the members, weighted their deeds, informed everyone who had a debt to who, calculated and made balancing to a certain value possible.

The summoning stick (*budkavlen*) was used when collecting the members for meetings. The ‘oldest in the village’ sent a certain stick that travelled between the different farms. In some villages, it went in a circle and in other cases it followed the order of the farms’ symbols as inscribed into the stick. This summoning stick can be described as moving between the members in a certain order and commanding the members to meet at certain occasions. Harsh punishments or fees were given to members that did not send the stick to the next one in order. The farms’ symbols often looked like symbols from the *futhark* or cross. When the farms had their symbols inscribed on the stick like a network, they were bounded together as members and had obligations to each other. Each farm having a symbol inscribed on the stick meant that it was the farm, not persons, that had obligations and rights and could participate in meetings. (There are cases where the signature of a farmer was carved into the sticks instead of the farms’ symbols, especially after processes of enclosure where the land become centralised and privatised.)

Villages could also have a neighbour stick (*grannstaven*) that had all the farms’ symbols on it together with the year they entered the village. Besides stating whom the members were, this stick was also a stick of honour kept by the oldman, as the appointed head of a team was named. In the same way, like when it

comes to the summoning-stick, the inscriptions on the stick symbolised members in the village and created a clear boarder between members and non-members.

The stick of duty/fines (*pliktstaven*) can be described as related to the institutional rules and sanctions linked to dilemmas, such as when neighbours only work for their own utility and do not care about if they cause damage to their neighbours. For example, walking the shortest way across others acres/fields, not caring about using or polluting water that others needed, or exploiting the common fields before others.

Sticks of fines had all farms' symbols belonging to a village on it; and beside each farm's symbol, notches for keeping records of fines were made. This means that when the farms had their symbols on the stick, they had obligations to each other; and when not fulfilled, they had debts, expressed as notches, to each other. In this way, debts were made visible and defined. When a member that had debts to the village paid them, the notches symbolising fines were carved away. In this way, the notches on the sticks also functioned as local monies; they could store value and make comparisons between different services and materials possible (Forsberg 2015). The fines were often paid in extra workdays, booze or mead. In, for example, Utby in the southwest of Sweden, each notch symbolised one fault, which was transformed into fines. The fines were calculated as one *halvstop* (almost one pint) booze for each fault/notch (E.U. 38591, Utby).

The stick for measuring fences (*gårdesgårdskavlen*) was used for making sure that it had no holes that animals could slip through. As such, it was an important tool of transparency that made it possible to measure and decide upon a certain fault and then transform this to certain sanctions. At Sollerön, the stick for fences specified with letters what parts of the common fence each farm was responsible for (Granlund 1938). The stick of fences was related to a stick of fines where one hole/fault on the fence became a notch symbolising a debt that was translated to fines at the annual meeting.

## 7.2. Notched sticks used for organising the collective

There are some basic principles for distribution and cooperation that are more prevalent than others, and they were more or less present in all different kinds of organising that involved notched sticks. Depending on what kind of basic principle that underlay the cooperation, the notched sticks were developed in a certain way and can be linked to certain social dilemmas.

The farms can cooperate through the principle of *turn taking* (following a list that stated the order when each farm should contribute with work). Another principle is the principle of *fines* (the members that did not fulfil their obligations had to pay a fine). Then, there is the principle of *exchange* (one gives up something in order to get something else). Yet another principle is fair distribution by lottery, as when five fishermen make five piles of their catch and let the lot divide the piles. These different ways of distribution are mirrored in the designs of the notched sticks. Thus, there are different sticks used for turn taking, fines and exchange.

Beside these ways of organising, there are informal but institutional ways where people in a village helped each other when needed. But, in such events like helping each other with building a roof, the one that received help was supposed to hold a food feast afterwards. In these cases, there were no sticks involved. Then, there are activities that followed a collective rhythm; like, for example, on a certain day each year, everyone was supposed to take part in collecting wood or harvesting hay. Calendar sticks (*runstav*) were used for keeping records on days (Lithberg 1921).

Below I will give several examples of sticks that were used in different cooperative activities and then relate them to social dilemmas and institutional principles of design.

A *turn-taking stick* was a common solution when distributing different obligations between farms. From the perspective of a bounded, rational, individual farmer the most rational decision was to concentrate the work on their own farm instead of common facilities like roads, bridges, mills, saws, taking away snow, giving the school teachers food and working on the common house. Turn-taking sticks specified whose turn it was to contribute with a certain type of work. In this way, transparency was created and sanctions could be applied in cases where someone did not contribute like others.

On these sticks, inscriptions of the farms' symbols functioned as an order that specified whose turn it was to do a certain work. And, since the stick travelled around between the farms in a special order, the farms had a technology that told them who was supposed to have done a special duty. Thereby, misunderstandings could be avoided together with unnecessary discussions about who was responsible. In this way, turn-taking sticks also functioned as tools of transparency. When, for example, the snow had not been taken away from the roads, the answer on who was responsible for this could be found on the snow-ploughing stick. Sometimes the actual duties were specified, with letters and words, on the turn-taking stick. An example is the stick for the duty to be a fireguard. On this stick, it was specified what times the fireguard should walk around and what was going to be checked (E.U. 38825).

There are many kinds of turn-taking sticks that were used in different activities in villages: taking care of the sick, going for water, being a guard and, sometimes, even being oldman. And, when it comes to duties of the parish, there were often sticks for taking care of the poor, giving rides to the king's men and priests, ploughing snow, arranging the weekly Sunday school, ringing the church bell, digging graves and doing fire inspections (Grandell 1982; Forsberg 2015). Also, the sticks with a turn-taking principle made use of inscriptions, symbolising fines next to the farms' symbols to make it possible to compare and make sure that everyone had not done too much or too little.

But, it was, of course, also possible to put the notches directly on a general stick of fines. Turn-taking sticks were often linked to *sticks of fines*. A farm that was included in the village team had turn-taking duties; and when these were not fulfilled, fines were inscribed on the actual turn-taking stick or the general stick

of fines. Sometimes, a notch for a missed day of work meant that the farm had to work an extra day the upcoming year. But, it also happened that this shortage of workdays was transformed into money units. Thus, the members in the cooperation had debt to the community that was quantified into money. Debt valued in money units was often paid in other ways than with coinage monies. And if the farm that had a debt to the village did not do the extra day of work, the village counsel could instead take things from the farm up to a certain value. Thus, in this way, the sticks made reciprocity through value possible (Ezzamel 2012) by transforming duties into value units. As such, the sticks made sanctions possible, which could be at a low level at the beginning of someone's misbehaving, and if not the misbehaving did stop, the sanction could become more powerful.

In order to overcome the dilemma with individual farms trying to minimise their contributions, distinctions between different workdays were made and sometimes the number of men or size of land were considered when calculating obligations and rights. For example, on some sticks, one day of work for a man was signified by one long dash for a man's day of work, a shorter dash for women and points or crosses for horses (Lithberg 1921). The sticks of working days are examples on how day-work functioned as an abstract unit of value that functioned as 'calculative monies', which made it possible to compare different farms' contributions to the common. Furthermore, it translated works of humans by using categories and made it possible to compare different farms' contributions, and, in the end, calculate what debts farms had to entities as certain teams or the community.

### **7.3. Notched sticks that were used in saw and mill cooperatives**

Beside the actual village organising, the farmers also cooperated when building and taking care of saws and mills. As well as other cooperative initiatives in and around the village, these organisations built on egalitarian principles of distribution. Compared with the sticks for traditional village organising, the sticks used for organising saws or mills were more complex and depended on more abstract value measures. Such sticks were used for making it possible for members to contribute with different goods and exchange it for rights of usage. As such, the sticks for mills and saws were used to solve more complex social dilemmas, like when individuals sought to minimise their contributions and maximise usage of facilities.

The members in a saw or mill team not only contributed with workdays but also timber, planks and, sometimes, horses and wagons. Even more, they also had to buy the actual saw from outside the village and, therefore, at least some members needed to contribute with coinage money. Something that made the organising even more complex was that some members owned bigger parts in the saw, and, therefore, were supposed to contribute with more material and work; and they had the right to use the saw for longer times. Methods used when deciding ownership parts varied, sometime the rights were divided based on how much land the farms owned and, sometimes, how many men lived at the farm, or how

many resources the farm put down in the construction of the building (Nikander 1932; Granlund 1938; Grandell 1982).

And, to make it even more complex, another social dilemma was that when it comes to using the saw or mill, an individual with bounded rationality would seek to use it on the days when the river stream was the strongest. In such cases, listing the members' symbols in an order on a stick could solve the problem (Granlund 1938).

As the cooperation becomes more complex, there seems to be a need for accounting technology that could translate the different materials, works and currencies to a single unit of value; balance this value against rights of usage; and construct an order that made the usage fair. What times the members could use the mill could be decided through a lottery. If no one was supposed to use the mill, someone else could pay to use it instead. Each mill had, as it often was called, an 'oldman', that functioned as a chief in the same way as the oldman for the village. The oldman stored the key and consulted the sticks when making sure that the members contributed with maintenance in a fair way. And, once a year the oldman summoned the members and all different notched sticks that had been used during the year were put together. All activities and materials used for maintenance were transformed into a money unit. And if any member had not contributed as much as others, they become indebted to the mill team. But actual coinage money was never paid, instead the ones in debt had to do extra work until the debt was paid. If someone did not work the extra days, they were excluded from the cooperation (Granlund 1938).

When it comes to both sawing and milling, extra days could be bought. In such cases, the price was defined in money but paid with extra workdays since coinage money seldom was used in the village (Granlund 1938; Forsberg 2015). The notched sticks used in saws and mills are shaped in many ways, from being simple sticks with farms' marks inscribed on them and notches next to them, to sticks with several sides that functioned as columns that made it possible to see each farm's contribution of material and workdays as well as usage.

## **8. How conditions for sustainable cooperation are constituted through notched sticks**

The notched sticks that were involved when organising the communalised economy between the farms were shaped in different ways and had different functions. This makes it possible to trace variations among the sticks that can be seen as responses to different social dilemmas.

When it comes to traditional commons, it is a risk for individuals trying to take more than others. Such commons have a high degree of subtractability and it is difficult to limit exploitation. From the perspective of the individual farm's bounded rationality, the most important would be to concentrate on work that creates value for the farm itself as an isolated unit. Sticks were involved when changing this situation; by functioning as a contract specifying obligations, as tools of transparency, made sanctions possible and thereby changed the incentives for the individual

farms. For example, traditional village organisations often solved this dilemma with sticks of fences combined with a stick of fine to protect common land.

Sticks based on the turn-taking principle were used to solve social dilemmas related to public goods, where it is difficult to exclude people from using the resources and where there is a low degree of subtractability, such as roads, bridges, snow cleaned from roads and the ability to not be damaged by fires through fire-guarding. These sticks organised members' contributions most often by making sure that each farm contributed on certain days and through the year with the same amount of days.

When it comes to mills and saws, it is rather easy to exclude non-members from using it and there is some degree of subtractability involved. The members could not use the mill at the same time and both the mill and saw functioned best when the stream was flooding. Social dilemmas in these teams were free riding, not only when it came to contributions to buildings but also when members sought to use the mill or saw more than others. The sticks used for these goods made it possible to compare different contributions and balance rights and obligations by using calculative-monies.

The development of notched sticks as responses to different social dilemmas can be related to institutional principles of design (Ostrom 1990/2011), and also some other factors that can facilitate conditions of sustainable self-governed cooperation (Agrawal 2001). Below, the sticks will be analysed with a focus on how units and relations were expressed through inscriptions and symbols on the sticks, how rules and sanctions of the game were constituted, and how a situation with bounded rational individuals that tried to take as much as possible could be changed with notched sticks as technological actors.

(i) *Clearly defined boundaries*

The stick with the farms' symbols had a social meaning. The farm's symbols and notches were inscribed relations. As such, the sticks connected appropriators together with their rights and obligations. Symbols of the farms were inscribed on the stick as signs of a contract, and borders were created against outsiders. In this way, entities, such as teams and communities, were constructed. And since it usually was the farms that were members, and not individual persons, membership was connected to ownership of land. But clear borders of resources were also defined by the sticks; for instance, different sticks were used when managing different resources and also when it came to the sticks of fences, where each member's part of the fence was specified.

(ii) *Congruence between appropriation and provision rules and local conditions*

The configuration of notched sticks varies depending on context in front of certain social dilemmas. Even when it came to tax and obligations, like giving the priest a ride, the sticks were designed by the teams themselves and the sticks were used to make sure that everyone contributed. In upper

Dalarna, taxes were collective and it was up to the farms in the village to make sure that each farm contributed with what they should. In this way, the technology of the sticks can be described as an infrastructure for different forms of contracts, monies and distribution of obligations and rights, and this made development of accounting technology that fitted the local context possible.

(iii) *Collective-choice arrangements*

The teams in and around villages are all examples on self-governmental organisations where the members could take part in designing rules and sanctions by participating in the decision-making around the design of notched sticks. This happened in certain meetings linked to management of certain goods, annual village meetings or during ordinary parish meetings. It was through the sticks that the members were summoned; the sticks made transparent what sanctions should be used and how debts could be paid back possibly. But the sticks also helped with remembering details of certain work activities with inscribed work descriptions. For example, when it came to the stick for fire guarding, the inscriptions specified what roads you should walk; and the sticks of fences specified different farms' responsibilities and how it was connected to sticks for measuring faults in the fences.

Thus, the diversity in the forms of sticks and notches that symbolised different things can be understood as a sign of local adaption together with influences from different members.

(iv) *Monitoring*

The different teams had an oldman, or similar, that summoned the farms for meetings, and stored the notch sticks. Often, this duty went in turns, often according to the list inscribed on the village stick, or was elected annually by the members. The turn-taking principle, as well as the voting system, are mechanisms that makes it possible for the members to control and demand responsibility from that particular oldman. This frequent changing of oldman may have also hindered asymmetrical power structures. If someone tried to benefit from the others while serving as the oldman, he would probably be retaliated when others did become appointed.

There are some examples of the sticks being stored in a coffin with two locks, with the keys given to different members. But there are also examples that can be interpreted as a sign of trust between the members, for example, the oldman sometimes seemed to have had the sticks just hanging on the wall.

(v) *Graduated sanctions*

Sanctions were decided on at the annual village or parish meetings and often had the form of fines, symbolised with one notch for each fault. Definitions of misdeeds and applied sanctions differed between different villages. The value of these fines was often expressed in calculation-money, but often paid in daily works or booze. At the annual meetings,

debts were cleared or it was specified what someone that had not fulfilled their obligations should do in order to pay their debt to the village or team. In practice, the members agreed upon what someone in debt needed to do for the debt to be cleared. There are examples of how the indebted ones were given an offer to do extra days that would be calculated as extra valuable to make them free from debts.

(vi) *Conflict-resolution mechanisms*

According to traditional village organising, internal conflicts in the village were supposed to be solved at village meetings. Such meetings followed a formal structure, and traditionally such meetings have been described as meeting where all hidden conflicts between members should be expressed (E.U. 38550). At these annual meetings, the members accused each other and the sticks transformed the faults to debts to the community and transformed these debts into value units that could be paid in different ways. The sticks functioned as memory sticks that recorded contributions like days of work or material. In this way, it became possible for the members to overview each other's contributions, calculate debts and made it possible to pay back the local community. The drinking and food-sharing connected to a traditional meeting functioned as a ceremony where the punished member became reunited with the collective.

(vii) *Minimal recognition of rights to organise*

External authorities did not question villages' and the other teams' ways of organising. Internal conflicts inside the village were supposed to be solved during village meetings. However, there are examples where villages trying to build a local church that would make them more independent and able to have more to say about distributions of obligations and rights connected to the parish that consisted of several villages. It is important to note here that the church and priest were financed directly from its local members, and the people that paid the priest, as a consequence, demanded accountability (Rothstein 2003; Rothstein and Broms 2013). Therefore, the local context of self-governed parishes with local democratic solutions may have had more effects on parish and village accounting than standardisation, which usually is enforced by external authorities in hierarchical relations.

(viii) *Nested enterprises*

Generally, the tax and external obligations were expressed in collective ways and it was up to the village-members to organise the work between them. No external authorities enforced any standard accounting. Instead, different accounting solutions were developed locally in many different variants. This made it possible to link external demands with the village organisation without giving up the principles of self-organising. But, there are signs that a lot of organising and democratic solutions can be a way of keeping external influences (king, state, church) at a distance. That would be in line with Scott (2009), which has emphasised the role of resistance

that may cause disconnection between different levels in the strife for more autonomy.

The sticks as an accounting technology expressed institutional design, in the sense that it created borders around entities, and, thereby, constituted communities together with obligations and rights that were defined and linked to a system of rules and sanctions. As such, this technology did something; it supported conditions important for successful cooperation and overcoming social dilemmas (Ostrom 1990/2011; Ostrom et al. 1994; Agrawal 2001). As such, the notched sticks were not used for any calculations of individual benefits, nor comparisons between individual benefits and joint benefits. But the sticks facilitated joint decision-making, transparency and mediated relations. While individual farmers may have made calculations of what benefitted him or her most, the notched sticks contributed to defining responsibilities and calculations that tell the debts of those who did not fulfil their obligations.

The sticks were not costly technological solutions; pieces of wood were easy to find, and everyone could understand the principle of farmers' symbols and notches for telling (participants did even not need to be familiar with numbers or letters). Everyone could participate and have opinions of the rules and suggested orders. Moreover, as actors, the sticks told whose turn it was and what needed to be done, and contributed with transparency.

Something can also be said about group size. The sticks often have eight or twelve symbols (of farms). Often the number of farms in a village was around 8–12, but increased after the late eighteenth century. In such cases, the sticks may not always have mirrored the number of members in a geographical area. Instead, it may have been used for dividing a larger number of farms into smaller units suitable for sustainable cooperation. But, the sticks also seem to have given rise to the ability to cooperate in teams consisting of more members, like for milling and church boat teams.

The sticks as technology is an actor of importance considering its function as mediator, expressing factors facilitating self-organised cooperation and continuance of traditional as well as new urban commons, in other words in different ways pointing out common ways, reminding, creating order, equipping individuals with certain calculations. But there are complementary explanations on why the sticks become important actors. The usage of notched sticks could, to some extent, be explained by critical institutional perspective (Cleaver and de Konig 2015), like path dependency, social identity, power structures, democracy and preferred ways of life. Such perspectives can contribute to a richer perspective on notched sticks in the specific context of village organising in upper Dalarna.

In upper Dalarna, the notched sticks, together with traditional village organising, were involved in community organising for a longer time compared to most other regions in Sweden. Reasons for this can be found in the context of the farmers seeming to have been protecting their egalitarian lifestyle, making resistance against external powers as well as accumulating private capital. The traditional

self-governed organisation, with its special accounting, was part of a social network with a certain democratic system and egalitarian values. Moreover, instead of institutional mechanisms that conserved the hierarchy and situations were certain persons, as landlords, were given more rights than others, like in pre-industrial Spain (Lana-Berasain 2008); in Dalarna, the accounting system of sticks was integrated with the democratic traditional village organising (Forsberg 2015). At village meetings, the members could influence the distribution of resources and come up with egalitarian solutions and, thereby, contribute with a sense of fairness.

Considering the social effect of the sticks, such as accounting technology, an alternative view of performativity of accounting is involved; and in this way this study complements accounting research that has put the focus on accounting as an actor that makes control and action at a distance possible. The variances of sticks used for village organising shows how accounting provides the members with calculations that make it possible for them to act in a way that is good for the collective. Such calculations that are constituted and expressed through the inscriptions and symbols on the sticks could be discussed and become objects for democratic solutions. As such, this kind of accounting is an example of performativity facilitating local democratic involvement (Ezzamel 2012).

It is also possible to interpret the notched sticks against the view that there are variations of commons (Sandström et al. 2017). As such, the usage of sticks cannot only be explained by economic joint benefit linked to traditional commons but also being involved in the creation of associational commons, like public goods in the pre-industrial area, as well as being symbolic for the local community. When it comes to associational commons, parallels can be drawn to the standpoint that farmers live in a village because they want to cooperate (Hanssen 1952/1977). According to this perspective, cooperation is not seen as having its roots from free individuals that always calculate costs and benefit. Instead, cooperation seems to be about making sure that there is a functional mill and the road is in good shape. As such, notched sticks as accounting technology was part of a system that was supposed to create well-being and was connected to a preferred way of life, making it possible for each member to participate in decision-making and maintain egalitarian relations. But there were also sticks that were used in symbolic community activities, like the common house and church boats. But even in such cases the sticks were used for egalitarian distribution of work. As such, the sticks could mediate fairness in allocation of benefits from common resources, a factor that is claimed to facilitate sustainable management of commons (Agrawal 2001).

## 9. Conclusions

The interaction between technology and institutions is important for understanding self-governance and cooperation around common goods. This has been illustrated by traditional village organisations in upper Dalarna that were based on notched sticks – a certain technology that provided solutions to social dilemmas.

Social dilemmas could be overcome by the notched sticks' ability to mediate different factors that facilitate sustainable management of commons. These sticks contributed with transparency, specifications of each member's obligations and calculations of debts. As such, it created a situation where each person that did not fulfil the obligations turned out to have a debt to the community. Moreover, the inscriptions on the sticks constituted relations through defining borders, entities and members. Acres, cows, farms, communal activities and different values were defined and linked to each other through inscriptions and symbols on the sticks. In this way, individual farms (that may calculate what is best for themselves) were related through the inscriptions on a stick, and became part of an 'accounting entity' constituting a collective, for example a village or a certain team. When resources and groups had been defined and connected in this way, the sticks could function as an accounting technology that balanced members' obligations and rights against each other. The sticks equipped the farmers with calculations of what they were obliged to do and if someone owed debts to the others. In this way, the sticks constituted conditions for joint decision-making. When specifying what each farm should do and comparing what each one had done, the sticks also functioned as tools of transparency.

This study points out the relevance of including technologies, as actors, into the analyses of factors that facilitated sustainable management of commons. When analysing what institutional conditions were mediated through the sticks, this study reveals that accounting together with local monies, which only existed as inscriptions on the sticks, played an important role for sanctions and balancing of rights and obligations. As such, the analysis of sticks points to the importance of bringing different kinds of monies together with ceremonies where rights and obligations were balanced into the analysis of institutional arrangements. Moreover, this accounting technology extended people's memory when it came to not only doing certain kinds of work but also when it came to the ability to remember debts.

Yet, there was another function of the stick that explains survival of the communities in the long run. The sticks survived individual peoples' lives and, in cases of heritages, the sticks told the new people at a farm what rights and obligations the farm had. As a mediator, the technology of sticks made traditional and urban commons as well as obligations and rights inheritable (transferable) through symbols.

But the technology of notched sticks seems not to have been static, or immune to people's opinions and influences. The function of the notched sticks can be described as an infrastructure that made adoption to the local context possible as well as reflecting different social dilemmas. In this sense, the sticks invited people's judgments; at the meetings surrounding the usage of sticks, participants could control each other's contributions and express opinions about how common obligations and rights should be distributed.

Moreover, the function of notched sticks, in terms of overcoming social dilemmas through integrating with institutions, can be complemented by considering the social context. The notched sticks can be understood in the broader context

of sustaining the traditional village organisation, with its democratic decision-making, social identity, connection to place, well-being and egalitarian style.

Any technology integrated with institutions has implications. Notched sticks as an accounting technology were interwoven into a social system of traditional village organising that developed through longer periods of times. As such, notched sticks developed as responses to different social dilemmas and were interwoven with institutional solutions and fitted into the social context. It follows, therefore, that abrupt changes in accounting technology may disturb socio-technical systems' ability to respond to social dilemmas as well as disturb their relation to the social context, including preferred ways of life such as equality, democracy and well-being.

Understanding how technology is integrated into institutions can more deeply enrich our understanding of communities as sustainable self-governed cooperative entities. Further research is needed on how different kinds of technology effect sustainable self-governed management of commons. This is especially the case when it comes to what different factors (that facilitate sustainable management of commons) different kinds of technology mediate, and also how such technology is fitted into (of if it is a powerful actor, affects) the social, economic and political contexts.

## Literature cited

- Agrawal, A. 2001. Common Property Institutions and Sustainable Governance of Resources. *World Development* 29(10):1649–1672.
- Andersson, G. and E. Arosenius. 1903. Öfre Dalarna förr och nu. Stockholm: Wahlström & Widstrand.
- Annisette, M. 2006. People and Periods Untouched by Accounting History: An Ancient Yoruba Practice. *Accounting History* 11(4):399–417.
- Barter, N. and J. Bebbington. 2013. Actor Network Theory: A Briefing Note and Possibilities for Social and Environmental Accounting Research. *Social and Environmental Accounting Journal* 33(1):33–50.
- Basu, S. M. Kirk, and G. Waymire. 2009. Memory, Transaction Records, and The Wealth of Nations. *Accounting, Organizations and Society* 34(8):895–917.
- Berge, E. and M. Mckean. 2015. On the Commons of Developed Industrialized Countries. *International Journal of the Commons* 9(2):469–485.
- Boethius, B. 1933. Dalfolkets herrarbete. *Rig* 16:1–28.
- Cleaver, F. D. and J. de Koning. 2015. Furthering Critical Institutionalism. *International Journal of the Commons* 9(1):1–18.
- Czarniawska, B. 1998. *A Narrative Approach to Organization Studies*. Thousand Oaks: Sage Publications.
- De Moor, M., L. Shaw-Taylor, and P. Warde. 2002. *The Management of Common Land in North West Europe, c. 1500–1850*. Turnhout, Belgium: Brepols Publishers.
- De Moor, T., M. Laborda-Pemán, J. M. Lana-Berasain, R. van Weeren, and A. Winchester. 2016. Ruling the Commons. Introducing a New Methodology for

- the Analysis of Historical Commons. *International Journal of the Commons* 10(2):529–588.
- Erixon, S. 1929a. En bys insignier och instrument. In *Svenska kulturbilder*, eds. S. Erixon and S. Wallin, 95–106. Första banden (del I&II. Stockholm: Aktiebolagets Skoglunds Bokförlag).
- Erixon, S. 1929b. Bröllopsstugor, i Svenska kulturbilder. In *Svenska kulturbilder*, eds. S. Erixon and S. Wallin, 239–256. Första banden (del I & II. Stockholm: Aktiebolagets Skoglunds Bokförlag).
- Erixon, S. 1929c. Kyrkbåtslag. *Tidskriften Budkavlen* 2:39–55.
- Erixon, S. 1931. *Granne är grannes broder*. Fataburen: Nordiska Museets och Skansens årsbok 1931.
- Erixon, S. 1953–1954. Svenska byordningar. *Folk-Liv* 17/18:81–124.
- Erixon, S. 1961. Swedish Villages Without Systematic Regulation. *Geografiska Annaler* 43(1/2):57–74.
- Ezzamel, M. 2012. *Accounting and Order*. New York: Routledge.
- Ezzamel, M. and K. Hoskin. 2002. Retheorizing Accounting, Writing and Money with Evidence from Mesopotamia and Ancient Egypt. *Critical Perspectives on Accounting* 13(3):333–367.
- Forsberg, P. 2009. Testing Prices in Markets: How to Charter a Tanker. *Ethnography* 10(3):265–290.
- Forsberg, P. 2015. Pengar som ristningar på träpinnar: icke-monetära pengars funktion för fungerande lagbildningar. *Historisk Tidskrift* 135(3):401–431.
- Grandell, A. 1982. *Karvstocken: En förbisedd kulturbärare*. Ekenäs: Ekenäs tryckeri aktiebolag.
- Grandell, A. 1989. *Historiska studier i folkliv, handelsteknik och redovisning: Withe two articles and summaries in English*. Åbo: Åbo akademis förlag.
- Graeber, D. 2012. *Debt: the first 5.000 years*. Brooklyn: Melville House Publishing.
- Granlund, J. 1938. Familj och gård. In *Gruddbo på Sollerön: en byundersökning*. Red: Gösta Berg och Sigfrid Svensson, 77–106. Stockholm: Bokförlags aktiebolaget Thule.
- Granlund, J. 1971. *Rote- och tunnlag som folkliga lagbildningar*. In Leksands sockenbeskrivning del III. Falun: Leksands kommun.
- Hanssen, B. 1952/1977. *Österlen: allmoge, köpstafolk & kultursammanhang vid slutet av 1700-talet i sydöstra Skåne*. Stockholm: Gidlunds.
- Hellspång, M. and O. Löfgren. 1994. *Land och stad: svenska samhällen och livsformer från medeltid till nutid*. Malmö: Gleerups förlag.
- Helmfrid, S. 1961. The Storskifte, Enskifte and Laga Skifte in Sweden: General Features. *Geografiska analler* 43(1/2):114–129.
- Hopwood, A. G. 1983. On Trying to Study Accounting in the Contexts in Which it Operates. *Accounting, Organizations and Society* 8(2/3):287–305.
- Isacson, M. 1979. Ekonomisk tillväxt och social differentiering 1680-1860: bondeklassen i By socken, Kopparbergs län. *Uppsala Studies in Economic History* 18.

- Jayasinge, K. and D. Thomas. 2014. Alternative and Social Accounting. In *The Routledge Companion to Alternative Organization*, eds. M. Parker, G. Cheney, V. Fournier, and C. Land, 267–279. New York: Routledge.
- Justesen, L. and J. Mouritsen. 2011. Effects of Actor-Network Theory in Accounting Research. *Accounting, Auditing & Accountability Journal* 24(2):161–193.
- Kataloge des Österreichischen Museums for Volkskunde. 2004. *Ur-Ethnographie: Auf der Suche nach Elementaren in der Kultur: Die sammlung Eugenie Goldstern*. Band 85. Wien: Österreichischen Museums for Volkskunde.
- Kovalev, R. 2002. Karvestokker – middelalderens 'regneark'. *Spor: nytt fra fortiden* 17(2):37–39.
- Kurunmäki, L., A. Mennicken, and P. Miller. 2016. Quantifying, Economising and Marketising: Democratising the Public Sphere. *Sociologie du Travail* 58(4):390–402.
- Laborda-Pemán, M. and T. De Moor. 2016. History and the Commons: A Necessary Conversation. *International Journal of the Commons* 10(2):517–528.
- Lana-Berasain, J.-M. 2008. From Equilibrium to Equity. The Survival of the Commons in the Ebro Basin: Navarra from the 15th to the 20th centuries. *International Journal of the Commons* 2(2):162–191.
- Lana-Berasain, J.-M. 2017. Accounting for the Commons: Bookkeeping and the Stewardship of Natural Resources in Northern Spain (Sixteenth to Twentieth Centuries). *Accounting History Review* 27(3):223–248.
- Larsson, J. 2016. Conflict-Resolution Mechanisms Maintaining an Agricultural System. Early Modern Local Courts as an Arena for Solving Collective-Action Problems Within Scandinavian Civil Law. *International Journal of the Commons* 10(2):1100–1118.
- Latour, B. 2005. *Reassembling the Social: An Introduction to Actor-Network Theory*. New York: Oxford University Press.
- Lithberg, N. 1921. Runstavens uppkomst. *Fataburen: Nordiska museets och Skansens årsbok 1921*. Stockholm: Nordiska museet.
- Moss, T. 2014. Spatiality of the Commons. *International Journal of the Commons* 8(2):457–471.
- Menninger, K. 1958/2014. *Number Words and Number Symbols: A Cultural History of Numbers*. Göttingen: Dover Publications.
- Myrdal, J. 2007. Källpluralismen och dess inkluderande metodpaket. *Historisk Tidsskrift* 127(3):495–504.
- Nikander, G. 1932. Kvarnrotar och såglag i svensk-Österbotten. In *Svenska kulturbilder*, band 6, del XI & XII, 159–184. Stockholm: Aktiebolagets Skoglunds Bokförlag.
- Ostrom, E. 1990/2011. *Governing the Commons: The Evolution of Institutions for Collective Actions*. New York: Cambridge University Press.
- Ostrom, E. 1995. Self – Organization and Social Capital. *Industrial and Corporate Change* 4(1):131–159.

- Ostrom, E. 2007. Challenges and Growth: The Development of the Interdisciplinary Field of Institutional Analysis. *Journal of Institutional Economics* 3(3):239–264.
- Ostrom, E. and T. K. Ahns. 2003. *Foundations of Social Capital*. Cheltenham, U.K.: Edward Elgar Publishing Ltd.
- Ostrom, E., R. Gardner, and J. Walker. 1994. *Rules, Games, & Common-Pool Resources*. Michigan: The University of Michigan Press.
- Pieraccini, M. 2015. Democratic Legitimacy and New Commons: Examples from English Protected Areas. *International Journal of the Commons* 9(2):552–572.
- Robson, K. 1992. Accounting Numbers as “Inscription”: Action at a Distance and the Development of Accounting. *Accounting Organizations and Society* 17(7):685–708.
- Rothstein, B. 2003. *Sociala fällor och tillitens problem*. Lund: Studentlitteratur.
- Rothstein, B. and R. Broms. 2013. Governing Religion: The Long-Term Effects of Sacred Financing. *Journal of Institutional Economics* 9(4):469–490.
- Sandström, E., A.-K. Ekman, and K.-J. Lindholm. 2017. Commoning in the Periphery – The Role of the Commons for Understanding Rural Continuities and Change. *International Journal of the Commons* 11(1):508–531.
- Scott, J. 2009. *The Art of Not Being Governed*. New Haven: Yale University.
- Sporrong, U. and E. Wennersten. 1995. *Marken, gården, släkten och arvet*. Leksands sockenbeskrivning del X. Meddelande B.91., Kulturgeografiska institutionen, Stockholms universitet, Stockholm.
- Sundberg, K. 2002. Nordic Common Land and Common Rights. In *The Management of Common Land in North West Europe, c. 1500–1850*, eds. T. de Moor, L. Show-Taylor, and P. Warde. Turnhout, Belgium: Brepols Publishers.
- Sy, A. and T. Tinker. 2006. Bury Pacioli in Africa: A Bookkeeper’s Reification of Accountancy. *Abacus* 42(1):105–127.
- Tresch, J. 2013. Another Turn After ANT: An Interview with Bruno Latour. *Social Studies of Science* 43(2):302–313.
- Van der Kooij, S., M. Zwarteveen, and M. Kuper. 2015. The Material of the Social: The Mutual Shaping of Institutions by Irrigation Technology and Society in Seguia Khrichfa, Morocco. *International Journal of the Commons* 9(1):129–150.
- Zidov, N. 2010. *Rovasi/Tally Sticks: The Collection of the Slovene Ethnographic Museum* (Vol. 11). Ljubljana: The Slovene Ethnographic Museum.

## Appendix

### *Nordiska museet, Etnologiska undersökning/Ethnological investigations (E.U):*

E.U: Nordiska Museet, Etnografiska Undersökningar. Härands- socken och byorganisation. Frågelista 1. (Questionnaire concerning parish and village organisation).