A conceptual model of Solawi

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Contents

1 Introduction

Today we are faced with multiple crisis. In the biosphere we are witnessing the loss of biodiversity and fertility of catastrophic extend. The econosphere only remains stable by infusions into the monetary system of fantastic height. The political sphere is marked by a never seen and increasing gap of power between the rich and the poor. The shameless use of the medial power to influence the masses leads to large parts of the population being enmeshed in the web of artificial bliss promising images of industrial products. This leads to more and more confusion, as these images only serve increasing sales, and have nothing to do with, and are contrary to, basic life processes. The contrast between life fostering and life draining economic practices is especially stark in the primary production, agriculture.

Agro-economic schemes that care about life had continuously been developed further since the "green" revolution. The spearhead of this movement, *Community Supported Agriculture (CSA)*, proved to be able to retain and spread agroecological farming in various regions of the world. CSA is not only beneficial on the economic tier, the nourishing of the community, but has also the potential to mitigate social aspects of crisis by community building and reconnecting with basic life processes.

The conceptualization of CSA contributes to its understanding from an abstract, mathematical perspective. Core elements can thereby be identified, described, explained and maybe transferred to completely different economic contexts. The abstract concept, the model, is the base for deriving software modules of clearly distinct elements.

1.1 Solawi

Solawi is an abbreviation for "Solidarische Landwirtschaft" (Solidary Agriculture) and is a German variant of CSA. The term was coined around 2011 to reflect local adaptations of certain aspects of the broader notion CSA (Netzwerk Solidarische Landwirtschaft e.V. 2020a). The idea is spread by the network "Netzwerk Solidarische Landwirtschaft e.V.". The website lists around 300 Solawis and 70 starting initiatives at the time of this writing (Netzwerk Solidarische Landwirtschaft e.V. 2020b). As the idea is quite fresh, the exact characteristics are still subject to discussion and research. Within the Solawi network there is a working group that develops a self-conception of the idea (Heintz 2020). On the website, a general description of the concept can be found[1]. The follow-up of the nascent project[2] is dedicated to the investigation of Solawi. Figure 1 is a pre-publication of the project results and shows core and manifested principles.

Lately, the network `gemeinschaftsgetragen.de` emerged, that transfers Solawi concepts to other economic sectors. On their website about 10 successful examples are linked.

The success of cooperative style Solawi was reflected in 2020 by installing an own website presenting this legal form of collective ownership[3]. Around 10 good examples of Solawi cooperatives are presented in word and film.

On global tier the idea of CSA is brought forward by the France based network `urgenci.net` with the broader notion "Local and Solidarity based Partnerships for Agroecology (LSPA)" (Perényi et al. 2019). These are subclasses of the notion "Social and Solidarity Economy (SSE)" that is tended by RIPESS (RIPESS

[1] `https://www.solidarische-landwirtschaft.org/das-konzept`
[2] `https://www.nascent-transformativ.de/`
[3] `https://solawi-genossenschaften.net/`

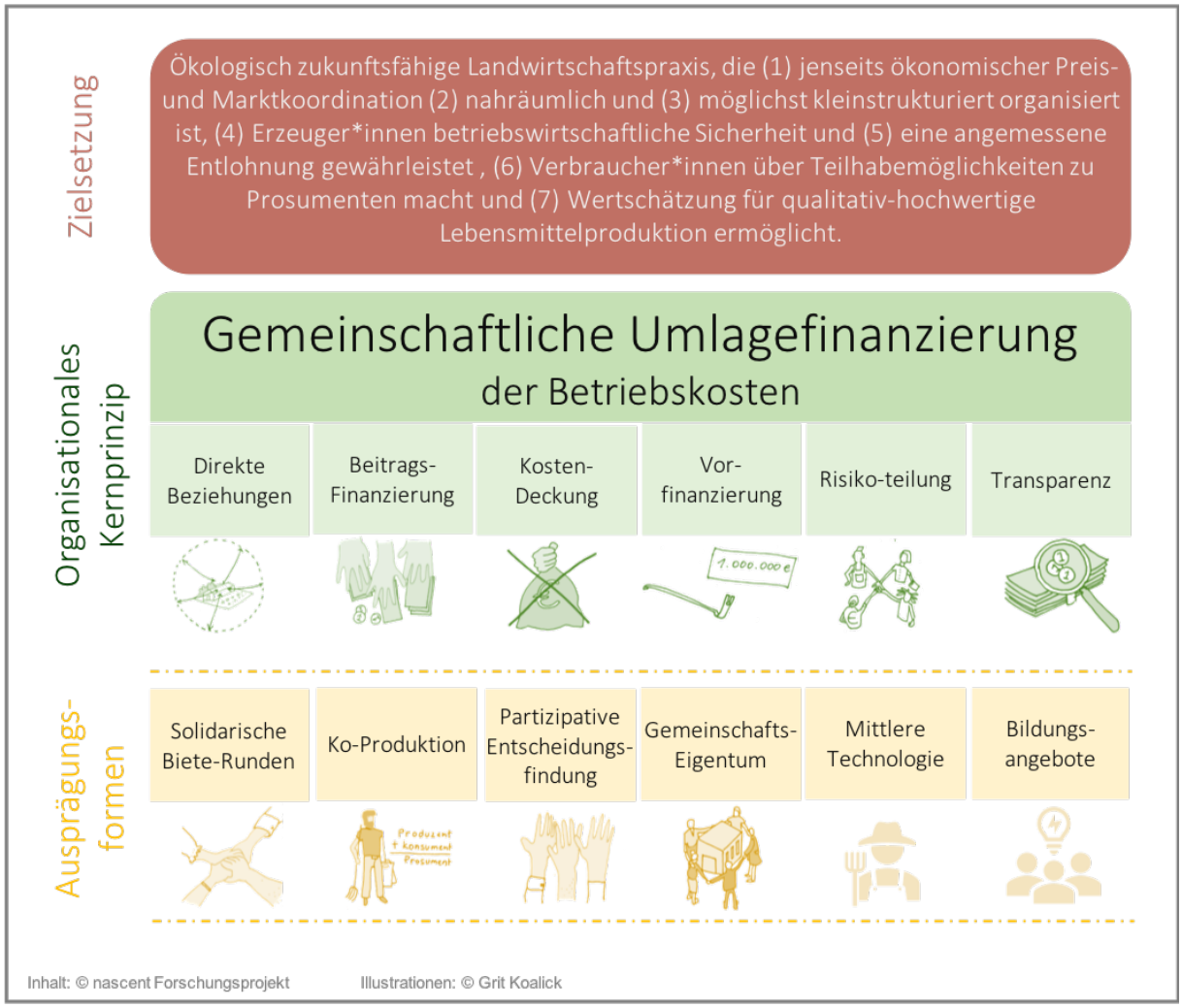

Figure 1: *Solawi model. Nascent2 2020. Pre-publication*

2020), another word for *Transformative Economies*, on which a virtual one week lasting world social forum took place in June 2020[4].

1.2 Conceptual modeling

There is an ongoing trend towards digitization. The digital world is a simplified model of real life. The development process of software can also be described as translating a human readable model into a machine readable one.

There are attempts to fully automatize this process, which means that the design process of a model becomes completely technology agnostic[5]. For building models, *ontologies* are used. These are formal vocabularies equipped with semantics. Standardized, open ontologies make apps interoperable, they are the common language in between. This is the base for the development of an "Open App Ecosystem" for facilitating innovative social and economic organization[6]. The fediverse, that is a free social network,

[4] `https://transformadora.org/en/`
[5] see the MERODE methodology as an example: `http://merode.econ.kuleuven.ac.be/`
[6] `https://github.com/open-app`

provides an outlook how a network for democratic economic organization could look like technically[7].

The starting point of software development, the human readable model, is at first, no more than a written narrative of the proceedings happening in real life. Often it makes sense to change the narrative to be more digital native. To only mirror the processes happening in real life has no potential for change through technology, additionally this approach is cumbersome for machines. To use digital native models for communication, means information exchange becomes independent from time, space and errors in transmission. This opens up completely new possibilities. An impressive example for this might be how dating apps are designed and how much they changed the behavior of partner search.

To change the narrative to be more digitally native, is like a jump into the unknown. It remains in question, whether the model will work and be accepted by the users. It is a danger to overwhelm the user with a super complex monolith of software. Tools that have a manageable range of functions, and thus have a easily graspable impact on reality, have a low access barrier. It is a major design question to define the scopes of a tool, and the needed interfaces towards other prospected tools in the network of apps. One aim of this work is to explore this in section "Value Chain level", page 20.

1.3 Is valueflows usable for modeling Solawi?

In a project thesis for university the author investigated possible ontologies for the use in the Solawi context (Winter 2020a). One of the investigated ontologies, *valueflows*, is made for designing the economic networks of the next generation, to which Solawi can be well counted. It is very fresh, currently its version number is 0.5[8]. It is currently being used in several projects under development. Bob Haugen and Lynn Foster, members of the core team consider it stable enough at least for testing. The second and main goal of this work is to explore the completeness and coherence of the valueflows ontology by exemplifying some fundamental economic processes of Solawi.

2 Material and methods

2.1 Field research

The author coordinated the "Solid Base" project for *Netzwerk Solawi e.V.* in the time of 2017-2020. Based on online questionnaires and copious interviews with SFS (Solidary based Food Systems) stakeholders background information about the local manifestations of the "community supported" idea was gathered in various countries (Krčílková et al. 2020, Parot et al. 2020). The author took special focus on software used to facilitate SFS and created a comprehensive list of software in use (Winter 2020b).

The author is also member in the local *Solawi Freudenthal* since 2016, and knows it from the inside, as he worked for it as a gardener for one season. To have a concrete, palpable original for deriving the model, an interview had been conducted with *Stefanie Lettenmaier*, the responsible person for communication and public relations of Solawi Freudenthal.

[7] `https://fediverse.party/`

[8] `https://lab.allmende.io/valueflows/valueflows/releases`, for details on valueflows see section "From Resource, Event, Agent to valueflows", page 10

2.2 Literature research

In his studies of *agricultural sciences* the author focused on economics. Foundations of business studies were achieved by taking the courses of Prof. Dr. Detlev Möller[9]. The state of the art in planning ecological agriculture was investigated by studying the work of Hubert Redelberger[10].

Seminal work on the success factors of Solawi is from Katharina Kraiss[11] and on modeling structural properties of Solawi from Marius Rommel[12].

The ”digital native” approach for modeling business processes, *REA*, was studied with the work of its creator William E. McCarthy[13]. Practical appliances of *REA* were researched with the work of Cheryl Dunn[14] and Pavel Hruby[15]. The adaptation of *REA* for economic networks of the next generation, `valueflo.ws`, was studied with the documentation on the named website. As valueflows is still work in progress, it was needed to follow some of the conversations for its creation in its issue tracker[16]. The origins of valueflows are noted on the website of some of the creators, `mikorizal.org`. An advanced implementation of valueflows, Holo-REA, is significantly pushed by Sam Pospischil, who also blogs about this topic on `pospi.spadgos.com`. Another implementation is underway at `CommonsPub.org`.

The current developments in *REA* were followed by studying the papers of the last conferences for ”Value Modeling and Business Ontologies (VMBO)”[17] with special attention to Frederik Gailly[18] and Wim Laurier[19].

2.3 Experimental modeling

During the *Solid Base* project the author had the opportunity to write an app for budget presentation and planning[20]. Although in his university project work he came to the conclusion that this ontology was not the best choice for the Solid Base application, it was a good experience on working with valueflows (Winter 2020a).

For the current work the model will remain experimental, that is, not translated into software, as there are not yet tools to automatically derive software from a valueflows model. For REA, Wim Laurier is heavily working on this pipeline and is thinking of automated code generation to various platforms, including Holo (Laurier 2020).

For *valueflows* does not yet exist an editor. There is a *vocabulator* for creating example value flows, but it is not up to date with the latest version of valueflows (Winter and Haugen 2020). The examples on `valueflo.ws` are currently created manually without any automated testing (Winter, Foster, and Haugen 2020c). The currently used visual design language for example *Resource Flow Diagrams* is based on string diagrams, but is not yet formalized (Pospischil et al. 2020).

[9] `https://www.uni-kassel.de/fb11agrar/fachgebiete-einrichtungen/betriebswirtschaft/team/prof-dr-detlev-moeller.html`
[10] `https://www.redelberger.net/`
[11] `https://www.solidarische-landwirtschaft.org/kontakt/`
[12] `https://www.wiwi.uni-siegen.de/dekanat/kontakt/mitarbeiter.html`
[13] `https://msu.edu/~mccarth4/`
[14] `https://www.gvsu.edu/accounting/`
[15] `https://phruby.com/`
[16] `https://lab.allmende.io/groups/valueflows/-/issues`
[17] `http://ceur-ws.org/Vol-2383/`
[18] `https://www.mis.ugent.be/gailly/`
[19] `https://www.usaintlouis.be/sl/4015752.html`
[20] `solidbase.info`

The format of the `valueflo.ws` examples is YAML-JSON-LD (Williams et al. 2020). They are mainly created by Lynn Foster and checked for compliance with the current version of the ontology manually. This work will follow the current *state-of-the-art* techniques for valueflows modeling. This means, to publish the example models on the valueflows forum[21] and ask there for comments. For concentrating on the subset of the ontology that is involved in the modeled process, an UML-like class diagram is provided for each modeled process. This class diagram will be used for noting deviations or missing features.

3 State of knowledge

3.1 (Self-) perception of Solawi

Solawi emerged out of a global movement towards food sovereignty. To crystallize the very basic Solawi foundational principles, it seems helpful to show up the relations in historic and global context. For this we need to recapitulate previous self-definitions of CSA movements in detail.

3.1.1 Teikei principles

The origins of the CSA movement can be traced back to the teikei movement that emerged in the 70ies in Japan. In 1978 the *Japan Organic Agriculture Organisation* defined 10 principles of teikei (Japan Organic Agriculture Association 1978).

These are defined as following:

1. *Principle of mutual assistance*

   The essence of this partnership lies, not in trading itself, but in the friendly relationship between people. Therefore, both producers and consumers should help each other on the basis of mutual understanding: This relation should be established through the reflection of past experiences.

2. *Principle of intended production*

   Producers should, through consultation with consumers, intend to produce the maximum amount and maximum variety of produce within the capacity of the farms.

3. *Principle of accepting the produce*

   Consumers should accept all the produce that has been grown according to previous consultation between both groups, and their diet should depend as much as possible on this produce.

4. *Principle of mutual concession in the price decision*

   In deciding the price of the produce, producers should take full account of savings in labor and cost, due to grading and packaging processes being curtailed, as well as of all their produce being accepted; and consumers should take into full account the benefit of getting fresh, safe, and tasty foods.

[21] `https://lab.allmende.io/valueflows/forum-valueflo-ws`

5. *Principle of deepening friendly relationships*

   The continuous development of this partnership requires the deepening of friendly relationships between producers and consumers. This will be achieved only through maximizing contact between the partners.

6. *Principle of self-distribution*

   On this principle, the transportation of produce should be carried out by either the producer's or consumer's groups, up to the latter's depots, without dependence on professional transporters.

7. *Principle of democratic management*

   Both groups should avoid over-reliance upon limited number of leaders in their activities, and try to practice democratic management with responsibility shared by all. The particular conditions of the members' families should be taken into consideration on the principle of mutual assistance.

8. *Principle of learning among each group*

   Both groups of producers and consumers should attach much importance to studying among themselves, and should try to keep their activities from ending only in the distribution of safe foods.

9. *Principle of maintaining the appropriate group scale*

   The full practice of the matters written in the above articles will be difficult if the membership or the territory of these groups becomes too large. That is the reason why both of them should be kept to an appropriate size. The development of this movement in terms of membership should be promoted through increasing the number of groups and the collaboration among them.

10. *Principle of steady development*

    In most cases, neither producers nor consumers will be able to enjoy such good conditions as mentioned above from the very beginning. Therefore, it is necessary for both of them to choose promising partners, even if their present situation is unsatisfactory, and to go ahead with the effort to advance in mutual cooperation.

3.1.2 European CSA declaration

On European level, one major step forward in the definition of Community Supported Agriculture was the process of writing the European CSA declaration, that was adopted at the third European meeting of CSA in Ostrava, 2016 (Urgenci 2016).

CSA is defined therein as following:

> ## *Definition*
>
> *Community Supported Agriculture (CSA) is a direct partnership based on the human relationship between people and one or several producer(s), whereby the risks, responsibilities and rewards of farming are shared, through a long-term, binding agreement.*

CSA Guiding Principles

CSA is not a static model. Like a garden it is dynamic: it evolves and grows through daily care. Each CSA partnership has autonomy.

We also agree on these basic principles as our common ground to grow the CSA movement.

1. *Responsible care for the soil, water, seeds and the other commons through the agroecological principles and practices as found in this declaration and the Nyeleni Declaration 2015*
2. *Food as a common good not a commodity.*
3. *Human scale production rooted in local realities and knowledges.*
4. *Fair working conditions and decent income for all involved.*
5. *Respect for the environment and animal welfare.*
6. *Fresh, local, seasonal, healthy and diverse food accessible to all.*
7. *Community building through direct and long term relationships with shared responsibility, risks and rewards.*
8. *Active participation based on trust, understanding, respect, transparency and cooperation.*
9. *Mutual support and solidarity beyond borders.*

3.1.3 Solawi self-conception

Within the Solawi network the process of self-conception is an ongoing process starting with the network formation. The concept published on the website[22] has not yet completely passed an approval process of the whole network. This process takes place at the bi-annual meetings (e.x. Netzwerk Solidarische Landwirtschaft e.V. 2018, p. 16) and in a steady working group which prepared a resolution proposal for decision in the network council meetings (Heintz 2020). As of the time of this writing this process was not yet complete. The author has access to the working document but no permission to publish it.

3.1.4 Nascent project

Parallel to the creation of the self-conception of the Solawi network, the scientific project of the universities of Siegen and Oldenburg *nascent 2 - Entwicklungschancen durch Solawi*[23], is working on concretizing the basic concepts of Solawi. See figure 1, page 4, for the super-compressed display of the Solawi principles.

3.1.5 CSX

CSA proved to be successful in sustaining local food production in general. Economic difficulties had been investigated and addressed lastly by the Solid Base project. A major research result was, that the majority of stakeholders is optimistic about the appliance of CSA for their production (Parot et al. 2020).

[22] `https://www.solidarische-landwirtschaft.org/das-konzept`
[23] Development opportunities through Solawi

The success of this concept in the most capital-intensive economic sector (580.900€ per employed person in Germany 2018, Deutscher Bauernverband e.V. 2018) suggests the idea to apply that concept to other economic sectors as well. This is meant by CSX. The idea is propagated in Germany primarily by the network `gemeinschaftsgetragen.de` (communitysupported) and is scientifically anchored in the master thesis of Marius Rommel (Zukunftsfähige Wirtschaftsgemeinschaften (CSX) - Übertragung der CSA-Logik auf andere Versorgungsfelder[24], Rommel 2017). In this thesis Rommel develops a model of the structural properties of CSX by empirical investigation. See figure 2.

3.2 From Resource, Event, Agent to valueflows

3.2.1 REA

Only a very short overview is given here, for details see the excellent work of Dunn, Gerard, and Grabski 2016, and the home page of McCarthy[25].

With the rise of the computer age in the accounting industry, scholars had started to investigate methods for a more genuine digital representation of accounting data than was possible with conventional bookkeeping. McCarthy identified in 1979 four major defects of double entry bookkeeping in the digital age:

1. *Its dimensions are limited. Most accounting measurements are expressed in monetary terms: a practice that preludes maintenance and use of productivity, performance, reliability and other multidimensional data.*
2. *Its classification schemes are not always appropriate. The chart of accounts for a particular enterprise represents all of the categories into which information concerning economic affairs may be placed. This will often lead to data being left out or classified in a manner that hides its nature from non-accountants*
3. *Its aggregation level for stored information is too high. Accounting data is used by a wide variety of decision makers, each needing differing amounts of quantity, aggregation and focus depending upon their personalities, decision styles and conceptual structures. Therefore, information concerning economic events and objects should be kept in as elementary a form as possible to be aggregated by the eventual user.*
4. *Its degree of integration with the other functional areas of an enterprise is too restricted. Information concerning the same set of phenomena will often be maintained separately by accountants and non-accountants, thus leading to inconsistency and information gaps and overlaps.*

According to Dunn, Gerard, and Grabski 2016, McCarthy first mentioned REA in his doctoral thesis of 1978. In 1982 the concept was published as generalized accounting framework for the first time (McCarthy 1982). Since then REA evolved into a full blown enterprise design theory. REA opens the possibility to store detailed information, not only about the involved monetary values, but also about the involved persons and miscellaneous values, on each economic resource and event. See the meta

[24] Sustainable Economic Communities (CSX) - Transfer of CSA logic to other supply fields
[25] `https://msu.edu/~mccarth4/`

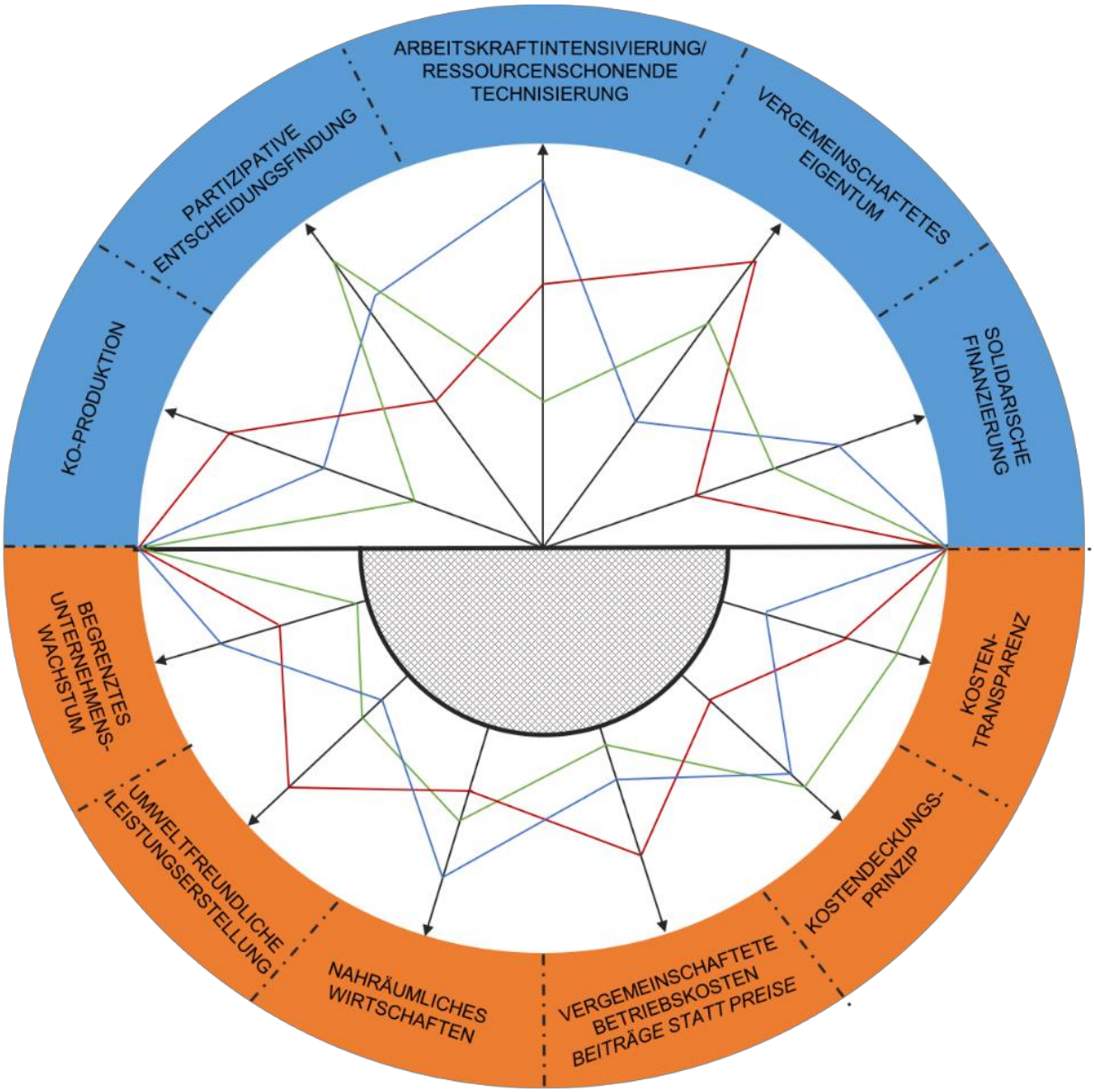

Figure 2: *CSX model (Rommel 2017)*

Orange are obligatory properties and blue optional. The spiderweb within is the peculiar manifestation of the property of hypothetical CSX entities.

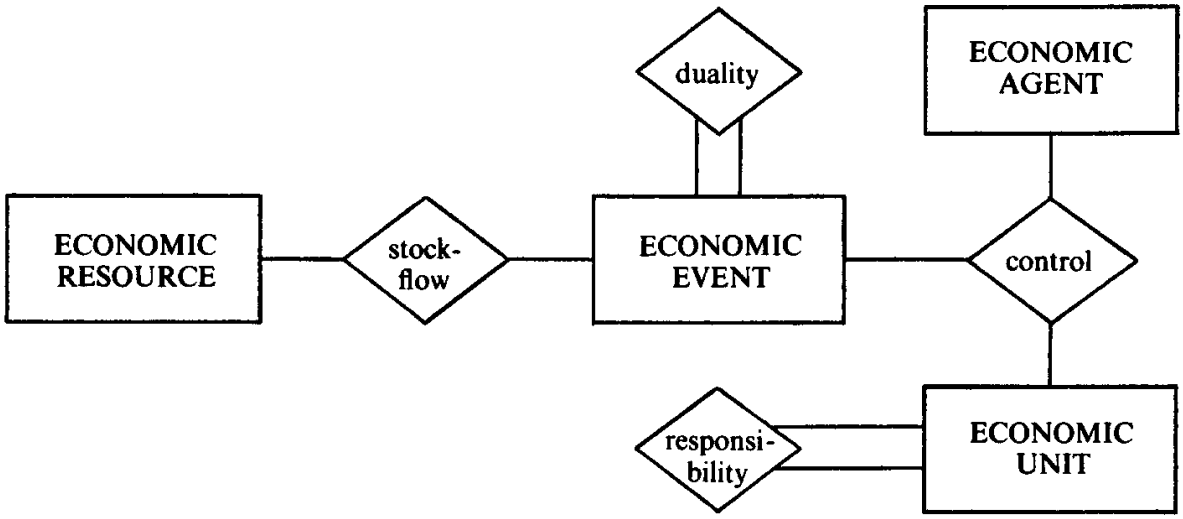

Figure 3: *REA Accounting Model (McCarthy 1982)*

Note that this is the inside view of an enterprise: *Economic Unit* (person acting inside the enterprise) was later merged with *Economic Agent* (in this view: Person acting outside the enterprise)

model of REA in figure 3. REA was first only applied within enterprises, but in 2000 Haugen and McCarthy developed the idea of using REA with semantic web technology to implement a view on supply chain collaboration, which is hence called "independent view". This idea successfully influenced the ISO standard ISO/IEC 2015b. The *Electronic Business using eXtensible Markup Language (ebXML)*[26] is also based on REA and certified as ISO norm ISO/TS 15000. IBM as well as SAP successfully used REA for their disbursement accounting software. Its to assume that the experiences SAP gathered with the appliance of REA qualified for collaborating with the *Regionalwert AG Freiburg* on the project "QuartaVista", a new accounting systems including the other three economic dimensions "society, nature and knowledge" next to financial profit[27].

Laurier, Kiehn, and Polovina provided in 2018, influenced by ideas from valueflows, a unified formalisation of the independent and dependent view and called it REA². Wim Laurier is currently working on automatic code generation from REA models (Laurier and Horiuchi 2019).

3.2.2 Valueflows

Bob Haugen and Lynn Foster with their software company `mikorizal.org` developed a REA based *Network Resource Planner* for `sensorica.co`, a digital hardware creating *Open Value Network* in 2012[28]. It soon became clear that this monolithic software couldn't match the ambitious aim to implement a new economic system. Smaller, more flexible entities are in need, that are loosely coupled by means of protocols and common ontologies (Mikorizal 2020). Driven by discussions in the loomio group on an *Open App Ecosystem*[29] the work on the "vocabulary for the distributed economic networks of the next

[26] `http://www.ebxml.org/`

[27] The idea for this "correction of accounting" was invented by Christian Hiß in his monograph "Richtig rechnen!" and was developed further by the likewise named research project (Beckmann et al. 2020).

[28] `https://github.com/valnet/valuenetwork`

[29] `https://www.loomio.org/g/exAKrBUp/open-app-ecosystem`

Figure 4: *Basic action workflow (Flores 2013)*

economy", `valueflo.ws` started.

Valueflows is a variety of the "living breathing thing" REA that includes practical experiences made with the sensorica NRP. It is said to be easily mapped to other flavors of REA, as they are all build upon the same basic concepts. Valueflows is an attempt towards views on economic practices that can also include normally externalized costs, like waste and pollution, and hence extend the conventional view that only accounts values regarding private ownership (Haugen 2018).

It is aiming to support "Conversations for Action"[30] as formalized in Jayaweera, Johannesson, and Wikramanayake 2003 and ISO/IEC 2015a, although it is said not to be included in the vocabulary yet (Foster 2020). It is not yet decided on which level of detail conversations shall be implemented (Haugen and Hales 2020). Fernando Flores was the first to formalize CFA as a "basic action workflow" diagram, see figure 4. Several researchers identified other, more special types of conversation towards economic activity. For Solawi the "Conversation to Collaborate" seems to be of special interest, see figure 5.

Not only the conversations for establishing economic activity (what happens when you discuss the barter value of your chosen products at a market stall) are subject to this development, even the app logic itself (How is the production organized? What part of the earnings receives the seller, the producer, the boss?) is envisioned to be programmable by democratic interactive conversation (Winter, Foster, and Haugen 2020a).

[30] `https://valueflo.ws/introduction/cfa.html`

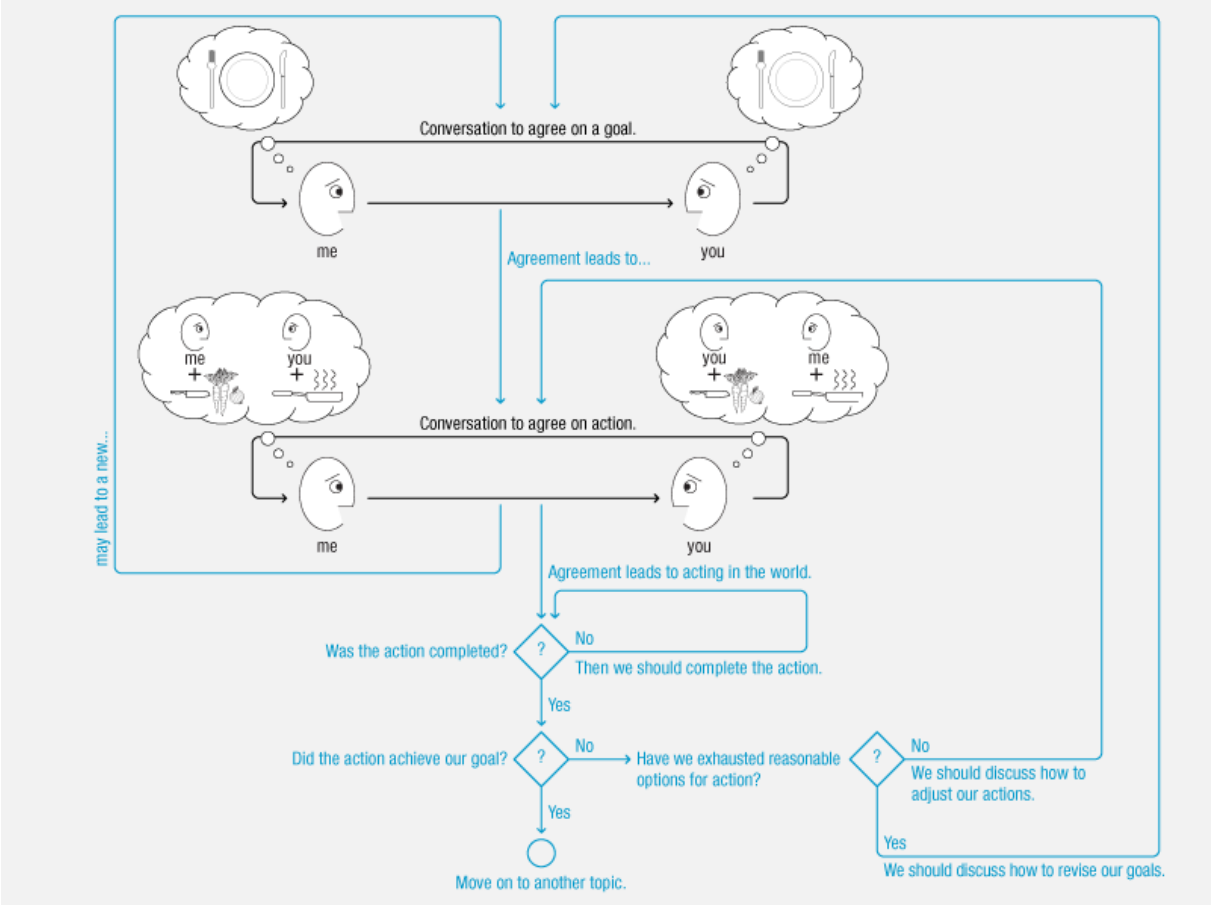

Figure 5: *Conversation to Collaborate (Dubberly and Pangaro 2009)*

4 Results

4.1 Presentation of local Solawi instance

Solawi Freudenthal[31] started a student initiative of the University of Kassel in 2011. It is based near the small university town Witzenhausen. In 2020 it produces around 130 shares of vegetables and herbs on 2.5ha and 5 hoophouses. It's legal form is a registered association. All land and facilities are rented. The machinery and hoophouses are owned by the association. The work on the fields is carried out by 5 long term (at least one season) employees, that all do not work full time. They are supported by 5 members who work 1 day a week for a share and occasional volunteer cooperation of members.

The main public event is the general assembly (Jahreshauptversammlung) in December or January to which is publicly invited some weeks before. On this general assembly, which lasts about 4 hours, the basic principles of Solawi are presented in the first half (for newcomers), in the second half the bidding round takes place. This comprises the presentation of the crop plan for the next year and the needed budget to realize it. The crop plan as well as the budget evolved over the years, with adjustments made every year. The members are asked upfront the planning, on their preferences towards vegetable varieties and their overall satisfaction with the work of the gardener team. The total monetary amount needed to realize the production is divided by the number of members to get a guiding value for the financial contribution needed from each member. The member can now decide whether this guiding value is appropriate for his or her financial situation and might adapt it. Better situated people are asked to contribute more to support less well off. If the sum of the contributions matches the height of the budget, the bidding round is over, else more rounds are made. In the past it had been almost always been a problem to reach the required number of members for the production optimum which is around 120 shares. The evening is closed by everyone handing over the filled contract with contact information and the height of the contribution.

All main organizational work is carried out by the gardener team, that meet once a week for planning the work. Every three months the membership is invited to an assembly for discussing and deciding on questions that have long term impact.

The distribution of the produce happens once a week over the full year. There are three deposits, with one, located in the town, being much bigger than the other two. The produce is divided on the the deposits, according to the number of members taking away from there. The further division of the harvest in the deposit is done by each member on their own. Often there are some rejects or grade b surpluses that are free to take away.

All main supplies are bought on the market. Some experiments startet with local seed exchange.

Solawi Freudenthal has strong ties with the nearby university from which it actually emerged. That is expressed by the opportunity to use a warmhouse of the university for seedling cultivation. In return the Solawi is object to copious works of student research. The Solawi also buys potatoes from an experimental agricultural operation of the university.

There had been cooperations with a friendly Solawi for the common usage of agricultural devices, but this faded away. Now and then still some cooperation exists on balancing crop failures and surpluses.

The only bigger investment made is the acquisition of a tractor and some agricultural devices, for which a loan about 10.000€ was taken from the GLS Bank. 20 members gave sureties of 500€ for the

[31] `https://solawi-freudenthal.de/`

case of the Solawi to fail. (*Interview Solawi Freudenthal* 2020)

4.2 Foundational Solawi characteristics

A working model denotes the support of the foundational conceptual characteristics.

The following summary of the CSA self-conceptions from chapter 3 is mainly based on the results of the nascent research project (which is heavily influenced by the work of Marius Rommel), displayed in figure 1. The organizational core principles are a bit more compressed displayed towards economic cause. To relate Solawi principles towards more general definitions of CSA, the similar definitions from the European CSA declaration and of the teikei principles are recaptured for each principle.

Obligatory characteristics:

1. Long term commitments by pre-financing the production, thereby risk sharing

   Emphasized by teikei principle 3 of accepting the produce & CSA declaration principle 7 of community building through long term relationships

2. Principle of cost recovery / not-for-profit production

   Emphasized by teikei principle 4 of mutual concession in the price decision & CSA declaration principle 4 on fair working conditions

3. Transparency through direct relations

   Emphasized by teikei principle 5 of deepening friendly relationships

4. Paying for the production, not the product

   Emphasized by CSA declaration principle 2 of food as common good, not a commodity

5. Reasonable enterprise size

   Emphasized by teikei principle 9 of maintaining a appropriate group scale & CSA declaration principle 3 of human scale production

Optional characteristics:

1. Bidding rounds

2. Co-production

   Emphasized by teikei principle 1 of mutual assistance, teikei principle 6 of self-distribution,

3. Participative decision making

   Emphasized by teikei principle 7, pinciple of democratic management & CSA declaration principle 8 on active participation

4. Common property

   Emphasized by CSA declaration principle 2 of food as common good, not a commodity

5. Self controlled technology

6. Education

   Emphasized by teikei principle 8, principle of learning among each group

The idea of bidding rounds is not present on global tier historically. As input from the Solawi network, the idea was adopted from the international CSA network urgenci on its general assembly 2018 for their membership contributions (Parot 2019). The use of "self-controlled technology" is also not mentioned globally, although this is a big topic for small scale farming, as can be observed by specialized organizations like `latelierpaysan.org` and `farmhack.org`. For accounting this is an important topic, see section 4.3.2.

Principles that seem to be less emphasized in the Solawi realm are the autonomy of each Solawi and the steady evolution of the principle, as expressed in the introduction of the CSA guiding principles of the declaration and teikei principle 10 on steady development.

4.3 Modeling decisions

4.3.1 Agent roles

Who participates in the Solawi, and how do they relate to each other? In the local example there are the groups *members*, *employees* and *suppliers*, there is the *lessor*, another friendly Solawi and the teaching and experimental agricultural operation from the agricultural department of the University of Kassel (*uni WIZ*), from where potatoes are purchased and from whom a warm house can be used for raising seedlings. Finally there is a loan from an "ethical" bank for the acquisition of a tractor and accessory equipment for which members gave surety.

For defining the roles of these, their economic relationship towards the Solawi needs to be investigated. The first two groups have an intrinsic interest for the Solawi to run. The *members* want to receive a share of the harvest and the *employees* want to make a living from the work they are putting into the farm. The *members* mainly contribute money, but they are also asked frequently to help on the farm, there are also some *members* that regularly work on the farm in exchange for a share of the harvest. Tobias Hartkemeyer from Hof Pente is one of the spokespersons who consider this member cooperation as one of the main aspects of Solawi, as by working together, the members are taught in the fundamental aspects of farming, and get thus reconnected to basic life processes (Hartkemeyer 2019). In the Swiss variety of Solawi this member cooperation is normally obligatory[32]. Experience showed that it is very beneficial for the *community feeling*, for the psychological attachment of the members to the farm. It seems to be a general interest to close the dichotomy between farmers and consumers, which is also expressed in new word creations like *prosumers* (Parot et al. 2020) and *co-farmer* (Urgenci 2020) as notion for *members*. To lower the price of the share and to have enough manpower available on the farm it seems to be generally indicated to foster member cooperation[33,34]. Both groups only differ in what

[32] This can be derived from the fact that obligatory member cooperation is a central functionality of the CSA administration tools `acp-admin.ch`, `juntagrico.org` and `openolitor.org`, that all originate from Switzerland

[33] E.x. in the concept of the farm cooperative Ortoloco its stated: "Through cooperation, producers and consumers grow together. The cooperation is not only symbolic, but in the order of magnitude of about one third to one half of the volume of skilled agricultural work. It is through the efforts of many that we ultimately achieve social and ecological added value."(Ortoloco 2020)

[34] Cooperative supermarkets also seem to successfully employ obligatory member cooperation: `http://bees-coop.be/en/`

they contribute to the Solawi and what they return. The two groups can thus be subsumed under the agent relationship role *Contributor* to *Solawi*.

With the *lessor* exists a contract for leaving the land and facilities to the Solawi in return of money and vegetables[35]. He is actually the *supplier* of land. An important characteristic of the *supplier* group is, that the involved economic exchanges are based on money and happen on the normal market. Therefore an appropriate name for this agent relationship role is *market player*. This characteristic is also shared by the *Uni WIZ*, from where the potatoes are bought. They offer the possibility to lower the buying price for the potatoes by contributing work, but as this work is directly translated into monetary values, it does not change the classification of this economic relationship as *market player*. But there exists another economic relationship between *Uni WIZ* and *Solawi Freudenthal*: The allowance for using the university's warm house for growing the young plants in spring. This is based on the history of Freudenthal being a offspring of the university and being a gladly used object of scientific investigation nearby. So in this *Role* the relationship is better classified as the next group, the *Solawi partners*.

This is kind of a mixture of the first two roles. It shares the same goal with the *Contributors* to let Solawi, or at least local food production, thrive. This shared goal is the ground for solidarity based cooperation. Economic exchanges within this group are based on mutual support. Means of production are used commonly, production inequalities can be balanced. Economic cooperation can go as far as the production is planned together, but then it might be better to model the partners as sub-processes of the *conversion* process.

Finally, how to model the role of the bank? The sureties, the members provided, could be seen as additional *contributions*, the bank as a *supplier* of money, the interest for the loan as the compensation for the supply. It seems questionable whether this process needs to be modeled at all, as the future is quite unsure especially in this context, and probably belongs to more peer2peer finance. In the recent past there had been at least one Solawi project (Luzernenhof using the OpenCrowdinvest[36] platform) that had gathered more than one million euro for initial investments by crowd funding. Blockchain based direct borrowings without any bank intermediary appear on the horizon, e.x. the OpenSource money market protocol Aave[37].

4.3.2 Ownership, custody and maintenance

On agricultural farms the means of production usually are a mixture of privately owned and leased land, facilities and devices. The local Solawi is an explicit example of this: All land and facilities are rented, only the transportation vehicle, the tractor and all other movable farming tools are owned by the association. It has been shown before (in the case of *lessor*) that renting can be modeled as a normal market relation. If the land is owned, there would still exist a market relationship with the state, as taxes need to be payed for the ownership. If the facilities are self-owned they are subject to maintenance, see below. Depending on the contract, also leased facilities need to be maintained. For the more valuable movable tools custody should be recordable and planable. This can be modeled with the `transfer-custody action` and `onhandQuantity` of the `EconomicResource`. Ownership of economic resources is expressed by storing the corresponding data on the address of the owner, so ownership can be derived

[35] At least historically: Currently there is no exchange of veggies in return for land anymore

[36] `https://www.opencrowdinvest.org`

[37] `https://aave.com/`

from the URI of the economic resource.

In conventional accounting, the concept of depreciation of the means of production is central. In the Solawi context mainly used vehicles are operating, for which the normal depreciation idea is not applicable, as they already arrived at their end of life in terms of bookkeeping before acquisition. Depreciation can thus be fully replaced by *maintenance*, which is modeled as an own top level process in the *value chain*. Economic resources consumed here need to be sufficiently considered in the planning stage.

4.3.3 Exchange medium

It belongs to the core idea of Solawi to release pressure from the producers of competing on the free market. That means, inter alia, to be less dependent on money based economic exchanges. Not only as a side effect that results in a potential resilience towards heavy fluctuations in the value of money, which happen during periods of financial crisis can that can be expected on a regular frequency in capitalism (Clarke 1994). The local Solawi already allows for economic exchanges, that use working hours as exchange medium. This happens when members work for their share. The voluntary member-cooperation is actually an experiment with gift economy. The only return the volunteers get is the joy of working on the fields. Experience showed, that it seems beneficial on multiple tiers to make these non-monetary contributions obligatory (see above, agent roles).

Valueflows is designed for supporting all kinds of value flows (Haugen, Pavlik, et al. 2020). To support the translation into various currencies, it seems to make sense to use working hours as meta currency.

4.3.4 Scope and granularity

This work does not claim to provide a complete model to derive ready to use software for all CSAs. It aims at modeling the core economic processes that make Solawi distinct from other enterprises. What distincts Solawi, is focus of ongoing research, see the results of the nascent2 project[38] for details. A lot of interpretations of the core principles like *risk sharing* and *long term commitments* in terms of organization design emerged. The local Solawi is used as basic foundation for the modeling. Concepts not practiced locally, but well known from broader research, are added. Whether parts of the model, the complete model can be applied to other CSA flavors or even to other kinds of SSE, needs to be investigated in further research.

The depth of detail is the *process level*. One main target is to investigate for which processes, or process clusters, it would be worth to design independent apps, and which interfaces these would need. This is pictured as *Value Chain*, see section 4.5. For deriving applications, task level models would still be needed, but this is beyond the scope of this thesis.

The accidental reader might be surprised, that the everyday action on a Solawi, the work on the fields, is only discussed as a side note. In terms of social innovation, the self organization of the Solawi entity and how agglomeration and distribution of resources happen for implementing the Solawi principles, are the building blocks that can be expected to have an equally social regenerative power on other economic sectors, like Solawi has on local horticulture.

[38] `https://www.nascent-transformativ.de/ergebnisse/#Projekt2`

4.3.5 Abstraction levels

At the time of this writing there had not yet been a diagram of the different abstraction levels involved in modeling with valueflows. As valueflows is based on REA and thereby upwards compatible, the diagram of Cheryll Dunn (figure 6) can be applied for depicting the different levels of abstraction in REA models. For each of these levels (except task level) a model will be supplied in the following subsections.

Valueflows takes the independent view by default, which is also the default of the new REA version, while the diagram takes an dependent view, the business seen from inside the enterprise. As this work is on modeling a single Solawi entity, this only makes a difference on the *business process level* for modeling exchanges with other agents (Winter, Foster, and Haugen 2020a).

4.4 Value system level

Figure 7 pictures the participating agents and their relations in the investigated system for value creation. The involved agents are described in section 4.3.1. The notions for exchange media (see section 4.3.3) had been chosen to reflect the social characteristic involved in the exchange. *Contributors contribute contributions* to *Solawi*. These might be work, cash or other economic resources. In return the *Contributors* receive a *share* and additional *consideration*, which is hitherto cash, to make a living. Beyond cash, other imaginable *considerations* could be access to resources like free board and lodging (also after retirement) and consumables. The difference to the *compensation* the *market players* receive, is that the height of *consideration* is based on mutual agreement between all *contributors*, while the *compensation* for *supplies* is solely based on the market relations between *Solawi* and *market player*.

4.5 Value Chain level

In figure 8 you can see the top level processes within the Solawi and the resource flows between them. Some of these processes are easy to fathom, as they can be directly observed in real life. These are *Maintenance*, *Distribution*, *Exchange with partners and Acquisition*. What's behind *Conversion* is also easily comprehensible when its known that this is an abstract notion for the farming process. Solawi converts soil, water and sun into food by utilizing plants, animals and machinery. The tricky processes are related to the clusters of *Coordination* and *Conversation for Collaboration*. These are the processes that are really special to the Solawi principle and are thereby of concern for this work.

Conversation For Action (CFA) From a macro-perspective and in the sense of Flores' "Basic Action Workflow" the covered action is the enduring production of vegetables for the period of one year. In the existing Solawi literature, the yearly organizational agricultural and social cycles are displayed as closely connected to the natural cycles, which is clear as horticultural production is fully dependent on natural processes. Interestingly the basic action workflow mirrors itself in the yearly natural cycles of Solawi (Kraiß 2019; Kraiß 2012).

The "Preparation phase" happens during *Planning*. The proposal is "offered" to the community in *Proposal presentation*. On the "Negotiation phase" which equals the *Agreeing* process, the roles of the performers are made clear. These corresponds with the phases of "Reflexion", "Integration" and "Closing" during the winter.

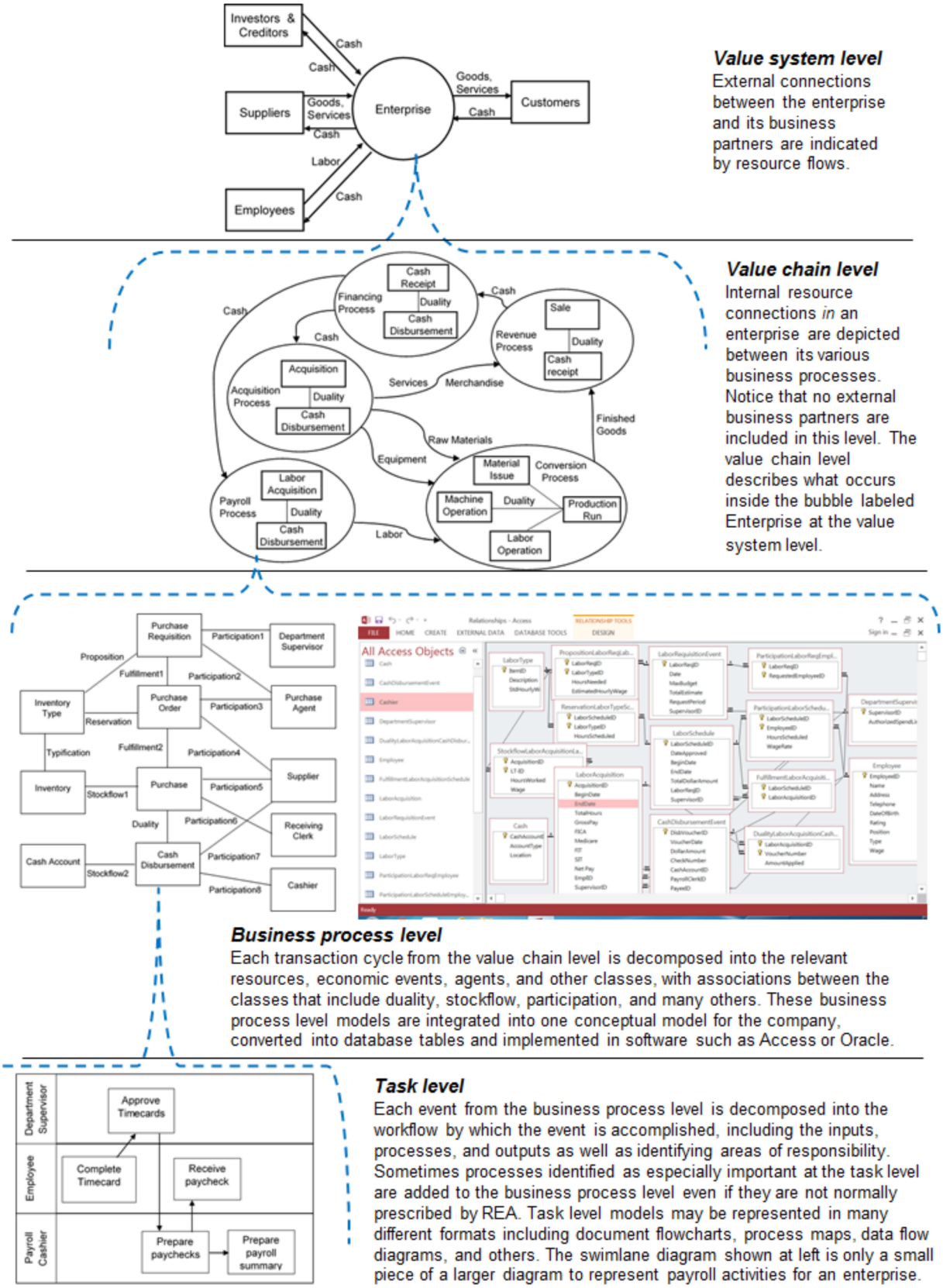

Figure 6: *Four Levels of the REA Ontology (Dunn, Gerard, and Grabski 2016)*

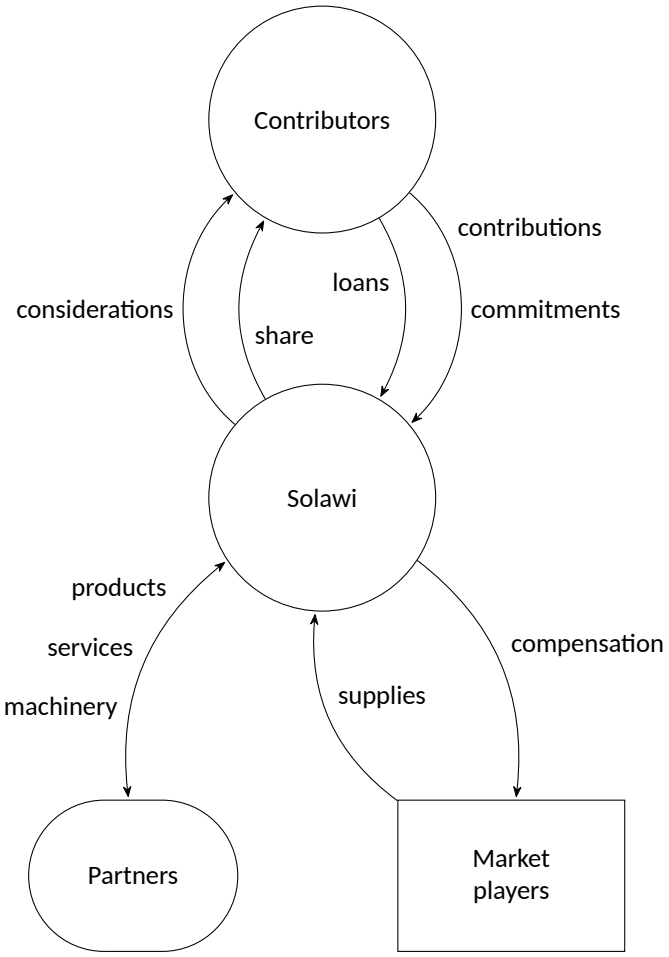

Figure 7: *Value system level*

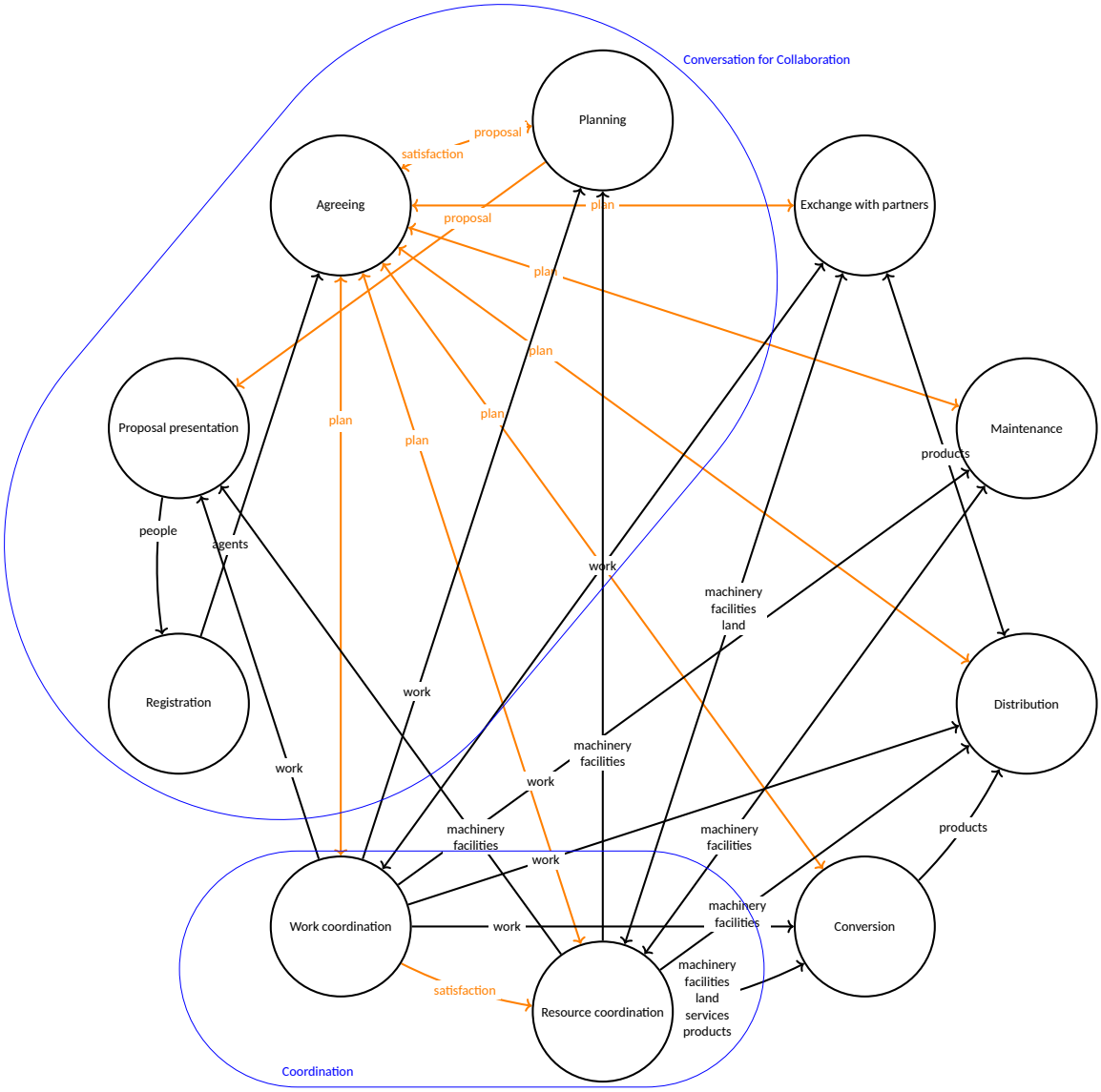

Figure 8: *Value chain level*

The *Performance phase* happens during spring and summer and involves all business processes. Data is gathered continuously for optimizing the ongoing processes and as foundation for next year's plan.

The successful completion of the farm year is declared with the invitation to the thanksgiving farm party in autumn, and the satisfaction of the community is declared by having a remarkable party.

Conversation for Collaboration (CFC) The processes aggregated as CFC in figure 8 quite well match the concept of Dubberly's diagram seen in figure 5. Dubberly only modeled a two-agent conversation, in our case we have an independent view on a multi-agent conversation, but that does not change the basic workflow as can be clearly seen from the diagram. Only the identification phase, mentioned in ISO/IEC 2015a, is missing. This would comprise the *Proposal presentation* for enduring *Contributors* and additionally the *Registration* process for newcomers. The *Planning* process can be mapped to "Conversation to agree on a goal". This conversation will not be a fundamental one, and generally very technical, as it is mainly about estimating reasonable values for the intents the community is asked to agree on. *Agreeing* can accordingly be mapped to Dubberly's "Conversation to agree on action". Here, the *Contributors* agree on who commits to which intent, so who grows the veggies, and who eats them.

Resource and Information flows Of course, this model is software, hence everything visible in the model is information. To allow for long term commitments, the planning is of particular importance for Solawi. To visualize information flows that are related to the long term planning, another color (orange) had been chosen than for those information flows that are related to the dispatching of tangible economic resources.

To keep the diagram simple, the back flow of information on the plan is only visualized by double arrows. It is assumed that in the processes the data of the really happening economic events is recorded, to have data for continuous monitoring and future planning.

Domains of decision making Solawi is a very democratic economic form. At Solawi Freudenthal all main decisions should theoretically be made by the membership. As the member assemblies happen only 3-4 times a year, only very general questions can be discussed in the plenary. By digitizing this decision making process, improvements in including interested people could be expected. But it is not generally desirable to let the members decide on everything, as it is important for those that commit for a job to be able to shape the working conditions according to their personal preferences. No other, than those who do the work, know best how to fulfill it.

It is natural for collective decision making processes to take long, as everybody needs to respond. In Solawi Freudenthal that led to the behavior, that all decisions for ongoing operations are discussed and decided on the weekly gardeners meeting. The gardeners decide on everything regarding their domain. They also split up the gardening into indoor and outdoor gardening, which is dealt on by separate groups. In bigger Solawis, other domains are existing, like bakery, livestock and arable farming. Maintenance and Distribution can also be separate decision making domains.

4.6 Process Level

4.6.1 Planning

Narrative Main planning work for a Solawi is the crop planning to ensure sufficient food production for distribution every week in the year. The decisive factors for the creation of the crop plan are the desired cultures for distribution per week (distribution plan) and the number of shares. Based on the crop plan, the resources needed to fulfill the intended production, are calculated, or estimated, if the detailed planning is done with other frameworks. Together with the estimated contributions the proposed *Plan* results, to which is agreed by all *Contributors* (see 4.6.4). The *Plan* contains *Proposals* for each target group.

Planning in the sense of this Business Process is thus the gathering of the needed resources for production and their allocation to Proposals for groups of Contributors.

In valueflows terms, the crop plan contains the recipes for the conversion processes. The schedule and the amount of the resources needed for the conversion process recipes are calculated from the distribution plan. As agricultural production is prone to variability of output, the amount of actual distributed products will be dependent of the achieved harvest. This is not true for additionally bought bulk products and only partly true for stored harvest for distribution in winter.

In the most simple case, there is only one type of share, which equals one person or one household. It is a factor of social balancing if one doesn't like one crop, someone else would pick it up from the deposit. But there are attempts to personalize the crop planning process from the project *growing futures*[39], what opens new possibilities in interacting with the needs of the eaters.

Next to the conversion and distribution processes, needed resources, working hours and schedules are to be planned for the other processes as well. All planning aims at allowing the distribution to be as close to the needs of the eaters as possible.

There is a dynamic relationship between *Planning* and *Agreeing*. During *Planning* it remains unsure how many *Commitments* will be achieved, thus the *Plan* should be dynamically adapted according to the achieved *Commitments*. To anticipate possible fluctuations in conversion process output, edge cases and production optima, it might also be useful to model multiple *Scenarios*. For this an extra Business Process is envisioned.

See the related valueflow classes in appendix A.1 page 38

Example Joe and Anna are planning a new Solawi operation for 80 people. They had been asked by the initiative to do the planning work. Joe, together with Judy, are full time gardeners, while Anna does organizational work in return for a share. Initial investments could already by accomplished thanks to the provision of a cooperative share of 250€ from each of the contributors. They start with setting up a distribution plan and are deriving the crop plan from it. The crop plan shows up which, and how many resources and work are needed for production. They calculate that they need 80 working hours a week, of which they would like 20 to be fulfilled by contributors. The 30 hours per person per week should return enough cash to satisfy their livelihood. The obligatory working hours for contributors sum up to 2 working days á six hours a year for each contributor. To have enough man power on site anyway, they decide to offer shares in return for half a day of cooperative work a week.

[39] `https://gitlab.com/growing-futures`

They estimate, that they need an amount of similar height of external resources (equivalent value to 60 working hours/week) as input for their processes.

The proposed intents are:

- 60h/week of paid work
- 60h/week equivalent of consumed resources
- 20h/week cooperative work by Contributors

They intent to provide 80 shares in reciprocity.
See yaml example in appendix B.1, page 44.

Explanation For each `Process` needed resources and workload are specified as `Intents` and published in a `Proposal` for agreement for each target group. The processes are nested within a `Plan`.

4.6.2 Proposal Presentation

Narrative This is the presentation of the plan for next years production. Technically this is just the issuance of the *Scenario* in human readable form to be communicated to the *Contributors*. Practically this involves a lot of *public relations* work, as often, especially in the starting phase of a Solawi, for each new year, new *Contributors* need to be found.

It is very important to have a convincing presentation of the *Plan* to have contributions of adequate height for allowing fluent production.

Model This stage only is a view on the model. All planned economic units of the Solawi should be visually navigable for finding unmatched intents.

Example Anna writes an article on the new Solawi operation for social media. She writes: “New Solawi operation is going to start next year. Some shares are left, virtual bidding round is not yet over. Join gardening! The guiding value for monthly contribution is your personal monetary equivalent to only 6 hours of work. Follow this link for a presentation of the plan: `https://app.solidbase.info/chart`”.

4.6.3 Registration

Narrative *Registration* comprises in first place the recording of name, contact and billing information and additional information, like the requested deposit, of an involved person or organization, thereby becoming a Solawi agent. The assignment to one of the three roles happens on registration. It is possible to assign multiple roles to agents in different scopes. *Contributors* need to have the possibility to register themselves. These do not need to be real persons. It is very common that one share equals one household. *Market players* and *Partners* will be registered by *Contributors* with adequate rights. For these it is not necessary to have the possibility to actively access the system, although it might be interesting for *Partners* to read information from the *Exchange with partners* process.

For cooperatively set up Solawis it is common to give a monetary contribution on registration. For very simple Solawi models that only have a fixed price per share, the process of agreeing can already be completed on registering. With registration one agrees to the plan and the amount of *Contribution*.

See the related valueflow classes in appendix A.2 page 39

Example Judy registers to Solawi as *Contributor*. On registration a commitment to contribute a cooperative share of 250€ is due. See yaml example in appendix B.2, page 48.

4.6.4 Agreeing

Narrative In this process the *Contributors* agree to the *Plan* by committing to its proposed *Intents*. The possible commitments of *Contributors* side comprise the *transfer* of exchange media, the *use* of economic resources and the supply of *work*. It is also possible to do coarse grained commitments, that are refined later. For example, this is needed when the Solawi is based on obligatory member cooperation. Contributors might commit to do 2 working days on the farm a year, but the exact date is not yet clear.

On *Solawi*'s side the commitment is to provide a share of the harvest for all *Contributors* and *Considerations* for those, who contribute more than what's specified as equal value of a share.

If not all *Intents* are matched in this phase, the *Plan* is not accepted and needs to be reworked. If all *Intents* are matched, the *Plan* is accepted and becomes operational.

If a exchange with partners belongs to the proposal, their agreement could be formally logged here. Long lasting *Agreements* with *Market Players* (ex. lessor), *Partners* (shared usage of resources) and *Contributors* (ex. open ended employment contracts) need to be considered here, too.

Bidding round is an innovation of the Solawi idea. It replaces the value equation of a fixed amount of exchange media for each Contributor in return of a share with an individually specifiable Contribution. The bidding round is an instrument for assuring all intents are matched with commitments. According to the modeling decisions on the exchange media (see 4.3.3), the currency for communicating the value of the intents and commitments are working hours.

See the related valueflow classes in appendix A.3 page 40

Examples

- When Joe realizes that more than 2/3 of the shares are taken, he decides to finally commit to do the gardeners job by signing a working contract with the Solawi.
  See yaml example in appendix B.3, page 49.

- Greg is a student and is looking for some compensation for his steady intellectual work. He commits to work once a week in return for a share.
  See yaml example in appendix B.4, page 50.

- Alex has a good job as IT expert and a beloved husband, Jeff, who cares well for the two children and loves cooking. She's fascinated by the way this new Solawi organizes and loves to contribute the asked amount, which is around 700€ in her case.
  Beth does not have this much surplus exchange media. She recently lost her job as actress in the local independent theater due to the crackdown of culture industry because of the measurements taken to face the Corona virus. She's currently dependent on public care and needs to care for

her children herself, as kindergartens locked down once more. For her the asked amount equals to 30€.
See yaml example in appendix B.5, page 51.

- In the first turn of the bidding round the emerging value was not satisfying for Joe and Judy. A lot of people in similar economic situations like Beth took part, the collapse of industry last winter let to unforeseen unemployment rates. Alex finally decided to contribute 1000€, but is not really happy with that. Joe and Anna discuss with the other contributors to move to a higher rate of cooperative work.
  Bidding rounds regard the *Controller*[40] related elements of the software. The used model would stay the same as in the simple *Intent - Commitment* matching example above. The latter would mean to redo the *Planning*.

- The bidding round reached a Satisfaction rate of 90% (*Commitments/Intents*) which is considered to be enough for a start. This is expressed by *Solawi* committing to produce and share the harvest.
  See yaml example in appendix B.6, page 53.

4.6.5 Work coordination

Narrative Work coordination is about planning and tracking who does what when, i.e. the economic events related to work. It is a calendar of open *Intents* and *Commitments* offering the possibility to enter associated completed assignments or also unplanned actions. Noticing, alerting and also penalty mechanisms can be implemented here for reminding *Contributors* of their commitment and intentions.

In this *business process Contributors* have the possibility to refine their *Commitments* to work. During *Agreeing* the exact dates of the assignments do not necessarily need to be clear. Some kind of automatic ordering of the intents will happen based on predefined preferences, like common working times. The commitments made during *Agreeing* are rather coarse grained. The settlement of coarse commitments (like “I will work two days on the farm next year”) and their refinement to exact dates (“I’ll work next Monday from 8-10 on the carrots and from 10-14 on the onions”) will be implemented here. So this is a calendar where the contributor can commit to desired shifts or change the assignments.

This is also the place where working hours are tracked. A main functionality will be to log time spend on a process with an simple app similar to `beetclock.com`.

Sometimes, in case of emergencies or for conducting work intensive building projects, it can be desireful to offer (or get) work to (from) friendly Solawis. For accomplishing this *Work coordination* is coupled with *Exchange with partners*.

See the related valueflow classes in appendix A.4 page 41

Examples

- Judy imports the intents and commitments to work on the conversion process from the plan of *Agreeing* and refines them by defining values for common working times and peak working times.
  See yaml example in appendix B.7, page 54

[40] `https://blog.iandavis.com/2008/12/what-are-the-benefits-of-mvc/`

- Anna opens a new calendar with shift times for the bar of the farm party. Judy assigns to a shift. Judy enters the completion of her assignment at the farm party. She also enters the completion of the last shift, she had to do as well, as no one assigned to it.
  See yaml example in appendix B.8, page 56.

4.6.6 Resource coordination

Narrative This is about tracking and transferring rights on resources. In terms of bookeeping, this is general accounting: Keeping track of inflows and outflows of economic resources. Besides other, this means the matching of commitments for the contribution of economic resources and their *fulfillment* on the inflow side and on the outflow side the *transfer* of economic resources (*Considerations*) to *Contributors* for work done.

Also, the acquaintance of needed economic resources is done here. That is the *transfer* of exchange media to *Market players* in return for goods. Requests and offers for use of *machinery, facilities and land* are passed over and read from *Exchange with partners*. As this is the virtual representation of the stock, also harvest stored for winter distribution is tracked here.

Other economic resources that can be tracked here are, for example, seeds, fertilizer and vehicles. For the latter it becomes obvious, that it might be useful to be able to transfer custody of the economic resources. This would ease the sharing of the machinery and facilities among the *Partners* and also among the *Contributors*. Likewise, on extended Solawis, it might be useful to have methods to reserve economic resources for concrete conversion processes to avoid resource conflicts. To let the conversion run smoothly, this reservation process should be automatically derived from the conversion plan.

See the related valueflow classes in appendix A.5 page 43.

Examples

- Anna is allowed to do bank transactions: (See yaml example in appendix B.9, page 58)
  - Anna is in the group of contributors that is allowed for cash transactions (*custodians-cash*)
  - Solawi transfers custody of wallet to Anna
- The lead gardeners and Greg are allowed to use the distribution vehicle. Beth enters the wish to use the distribution vehicle on Sunday. (See yaml example in appendix B.10, page 59)
- Anna buys some molasses: (See yaml example in appendix B.11, page 60)
  - Anna orders molasses from molasses seller
  - Molasses seller sends molasses and invoice
  - Molasses is inventoried
  - Molasses seller has claim for cash
  - Anna transfers cash to molasses seller
  - Molasses seller's claim for cash is settled
- Joe gets paid. (See yaml example in appendix B.12, page 61)
- It was intended to distribute 1t of potatoes but 1.5t had been harvested (See yaml example in appendix B.13, page 62)

4.6.7 Conversion

Narrative This is the food producing process. It might comprise multiple semi-autonomous farming sites on top level, down to the process of cultivating one bed of carrots. Also processing processes, like bakery and conservation are some kind of conversion. Resources needed for the conversion process are reserved and tracked in the coordination processes. The harvest is passed over to *Distribution*

Note that the resulting products from the conversion process are modeled as *dropoff* and not as *produce actions*. This is because the actual production is done by the plants, resp. livestock.

See the related valueflow classes in appendix A.6 page 44

Example The plan to grow veggies for 80 people is refined to a plan to grow 1ton of potatoes and 500kg carrots.
See yaml example in appendix B.14, page 62.

4.6.8 Distribution

Narrative For the *Distribution* the harvest needs to be shared among the *Contributors*. In the most simple case the harvest is divided according to the number of *Contributors* taking from each deposit. This soon can become a complex process if the Solawi runs a lot of deposits and the distribution process then becomes similar to that of a box scheme.

Example The harvest is delivered to three deposits.
See yaml example in appendix B.15, page 63.

5 Discussion

5.1 Matching the principles

It should have become clear by the introduction into valueflows (section 3.2.2), that the envisioned economic network mirrors, by its utmost flexibility, core elements of CSA that are only little emphasized hitherto in Solawi realms, but boldly emphasized on global tier: Autonomy of each Solawi and steady development of the idea. Supposedly it was just forgotten to articulate this. The pure existence of the CSX idea proofs the great will to develop the idea further. The idea of collaborative app (logic) design by communication is against the hard coding of organizational principles in app logic as we know it. Valueflows is designed for a democratic economy.

The foundational principles are implemented on various levels of organizational logic. Each principle needs to be considered on its own, and in context of the regarding processes.

1. Long term commitments
   can be well accomplished with the *Commitments* of the *Contributors* made during *Agreeing*, see section 4.6.4.

2. Principle of cost recovery
   is mainly modeled during the *Planning* process. The process of collecting the needed resources

for production and gathering them from the *Contributors* **is** the recovery of the production costs by the *Contributors*.

3. Transparency
   It becomes clear already in the registration process, that all involved *Agents* actually have access to all organizational information. The more difficult question still to solve is, whether the modeled access control possibilities in the *Resource coordination* process work and respect privacy issues sufficiently.

4. Paying for the production, not the product
   From the modelers perspective this is very similar to point 2. The costs for the whole production is considered in the *Planning* process. It is not calculated per kilogram carrots.

5. Reasonable enterprise size
   Valueflows is made for economic networks. Economic growth is envisioned in Solawi realms as cooperative, network like. Already on the value system level *Solawi Partners* are introduced as an critical agent group for Solawi operation.

6. Bidding rounds
   Bidding have not been modeled specifically, but are anticipated in the model for the *Agreeing* Business process. The support of solidary financing is more general and not confined to the bidding round idea, as the model allows commitments of the *Contributors* of any kind.

7. Co-production
   is fully implemented due to the union of producer and consumer in *Contributor*, see section 4.3.1.

8. Participative decision making
   The main agreement on production happens during the *Agreeing* Business process. Other fundamental decisions can be envisioned with the communicative app design idea. An open question is how much formalization these decision making processes need (CFA/CFC). The concrete design of the current working process is up to the domain maintainers, the involved workers.

9. Common property
   The maintenance of property is modeled on the value chain level as an own Business process. But also means of production owned by *Contributors*, like the cargo bike, are welcome for common production.

10. Self-controlled technology
    That the future of Solawi is not to buy the newest farm bot from industry to do the weeding but rather to self build and maintain a Aggrozouk[41] or similar is meant by *Maintenance*. Of course, valueflows is freely licensed and hence under public control.

11. Education
    In the sense of experiencing other living and working environments through cooperation, this is modeled by the obligatory cooperative work example. More official forms of education are beyond the scope of this work.

[41] `https://www.latelierpaysan.org/The-Aggrozouk`

5.2 Completeness of model

Valueflows proved to provide sufficient vocabulary to model the foundational principles of Solawi. Especially the long term commitments and the sharing of the harvest are well presented. More difficult cases are access rights and obligatory inner-organizational behavior of roles. Proposals had been developed during this work to address these fields.

As currently no automated check of the valueflow syntax exists, each example needs to be retraced manually. This is normally done by visualizing the example with pen an paper, or a graph drawing application like `draw.io`. A automated checker and visualizer for the example yamls would hence be of great use.

Not all processes mentioned in the value chain level have been exemplified. Whether the *Recipe* related valueflow concepts would fit crop planning and agricultural record keeping needs for the *Conversion* process, has to remain an open question for future research, as its complexity is way beyond the scope of this work. *Maintenance* is a similar case, it needs to be determined first, on which complexity level the modeling should be done. To just schedule maintenance actions would be trivial, to assist on these actions themselves with mechanical advice and to store retrievable experiences, is another story, and only very little related to the economic particularities of Solawi.

The experimental modeling showed that with the already implemented valueflow constructs *Intent*, *Proposal*, *Commitment* and *Agreement* basic conversations for coordinating the collaboration can be accomplished.

The main contribution of this work is the division of the various involved business processes on the value chain level. Whether it makes sense to combine some of them into standalone apps needs to be considered by practical experience. The granularity of this model stops before the task level. To create task level workflows would be a further step towards app development.

5.3 Would this be possible with plain REA?

Valueflows has the big advantage that it contains wisdom from decades of practical modeling experience. At first it seems to be overly complex compared to the super basic vocabulary in the spearhead of current academic REA research like presented in Laurier, Kiehn, and Polovina 2018. This is based on the same primitives like first presented by McCarthy 1982 as in figure 3. But these basic constructs can only represent entities at the observation level, for Solawi apps the planning and knowledge level are indispensable, as these levels are directly derivable from the foundational principles (think of long term commitments).

For a practical guidance handbook on model driven app design Hruby summarized in 2006 additions to REA regarding the knowledge and policy level, the ontological levels defined as “thirdness” (mediating) by John Sowa in 1999 (Geerts and McCarthy 2002). Dunn, Gerard, and Grabski state in 2016 REA being a “design theory that encompasses all business processes”. In the long term the cooperation with partners will become even more important for Solawi farms, or, in other words, their compatibility with a new, distributed (thus democratic) economic network. This compatibility will be facilitated by a common economic language, which is envisioned to be a formalisation of REA. Laurier’s formalisation of the basic REA constructs is a great step in this direction, but it’s not yet usable for practical Solawi modeling, as the crucial concept of *Commitment* is not contained in the formalisation (Laurier, Kiehn, and Polovina

2018, section 9.1).

For starting practical application modeling there are just no other comprehensive formalisations of the REA design theory at hand. The additions of valueflows to REA proofed practicability during the example creation. To model very basic CFA the concept of *Intent* is crucial. The concept of recipes seem to be useful for detailed crop planning, although this still needs to be researched.

5.4 Proposed completions to valueflows

Makeshift additions to the valueflows ontology were needed wenn modeling the behavior of groups of people. This was needed in two cases: The initial commitment when entering a group (section 4.6.3) and when modeling group specific access rights (section 4.6.6). For the first, the addition of the `agreedIn` linking `RoleBehavior` to `Agreement`, for the second, the addition of `controls/controlledBy` to associate `RoleBehavior` with `ResourceSpecification` was proposed. It would have also been possible to solve the second problem with the solution of the first, but as the second uses only constructs from the knowledge level, it can be used more flexibly. (Winter and Foster 2020; Winter, Foster, and Haugen 2020b)

6 Conclusion

It was possible to model all constructed example user stories with valueflows. Only minor additions to the vocabulary in the context of role behavior were necessary. As there is just no other comparable ontology available, valueflows seems to be the vocabulary of choice to build upon the next generation of software for a democratic economy.

The independence of valueflows from monetary logic and the envisioned collaborative app design by conversation open unknown possibilities for creating a “open app ecosystem” for a distributed economic network. How this will look like, und how much Solawi-like conceptuality will be contained, cannot be foreseen with this truly digital native approach. Hopefully it will have a more humanistic face and will be less profit oriented, but in the end all software is controlled by the user. Valueflows approach of autonomy of each economic group, seem to secure from abuse, but it can bring only little independence from currency systems. In conclusion, this independence needs to be fostered by other means, like cryptocurrencies and (blockchain based) timebanks, which are approached in breathtaking speed.

A tool for creating, checking and visualizing examples was sorely missed during the modeling process. Whether the examples comply with the specification, can thus not be guaranteed. For presenting the possibilities of the ontology this would be very helpful. Due to the complexity of the matter, and because of the very limited resources of the developer community, code generation from valueflow models appear not to be in tangible proximity. But that is not very problematic as the implementations in holo and CommonsPub will provide usable valueflows frameworks in near future.

Zusammenfassung

Die vorliegende Arbeit untersucht mittels experimenteller Modellierung von ökonomischen Prozessen die Möglichkeiten der konzeptuellen Darstellung des Prinzips Solawi unter Nutzung einer formalisierten Ontologie. Die grundlegenden Prinzipien von Solawi werden auf Basis von existierenden Forschungsarbeiten im Kontext von historisch, globalen Entwicklungen weiter konkretisiert und erläutert. Als greifbare Vorlage für die Modellierung dient die örtliche Solawi Freudenthal, die mittels eines Interviews dargestellt wird.

Die “Resource - Event - Agent (REA)” Theorie wird als Möglichkeit beschrieben, wirtschaftliche Prozesse mehrdimensional abzubilden, d.h. auch nicht-finanzielle Eigenschaften von wirtschaftlichen Vorgängen digital zu spiegeln. Es wird herausgearbeitet, weshalb die REA-Formalisierung Valueflows die passende Grundlage für die Modellierung ist. Dieses Vokabular entsteht momentan im Zusammenhang der Schaffung eines Ökosystems von quelloffenen Anwendungen (Open App Ecosystem) für ein verteiltes, Technologie agnostisches, Netzwerk der peer-to-peer Ökonomie. Die innerhalb Solawi stattfindenden Prozesse scheinen als Vorlage für derartige Anwendungen gut geeignet. Die ökonomischen Vorgänge von Solawi werden systematisch analysiert und funktional kategorisiert. Dadurch ergeben sich Cluster (“Business processes”) innerhalb des Modells, aus denen sich eigenständige Software Module (Apps) ableiten lassen können. Die von den Clustern jeweils verwendeten Bereiche der Valueflows Ontologie werden einzeln in UML-ähnlichen Diagrammen dargestellt.

Die Vollständigkeit der Valueflows Ontologie wird mittels ausgedehnter experimenteller Modellierung durchgeführt. Typische Abläufe innerhalb von Solawi, werden so prägnant wie möglich sprachlich beschrieben und formal mittels des Valueflows Vokabulars ausgedrückt. Daraus ergibt sich ein umfangreicher Anhang mit yaml-code, eine Grundlage für weitere, zukünftige Modellierung auf der Aufgaben Ebene (Task level), für letztliche Gestaltung der Controller Schicht der prognostizierten Apps.

Es konnten keine wesentlichen Fehlstellen in der Ontologie entdeckt werden. Nur zwei Begriffe für Objekteigenschaften im Kontext der Darstellung von Rollenverhalten scheinen zu fehlen, und wurden der Entwicklergemeinschaft zur Aufnahme vorgeschlagen. Auch für die Abbildung von wirtschaftlichen Abstimmungs-Prozessen innerhalb der Solawi, etwa der Bieterunde, scheint Valueflows vollständig zu sein. Aufgrund des begrenzten Umfangs der Arbeit konnten die Möglichkeiten der Abbildung von Anbauplanungen nicht weiter untersucht werden. Das Valueflows-Konzept der “Rezepte (Recipes)” scheint dafür allerdings geeignet. Außerhalb der Arbeit ist auch die Untersuchung von Entscheidungsfindungsprozessen im weiteren Sinne, also etwa das Festhalten von Entscheidungen innerhalb der betreffenden Domänen. Auch das Konzept “Währung” wird nicht direkt von Valueflows behandelt, und ist daher nicht Teil dieser Arbeit.

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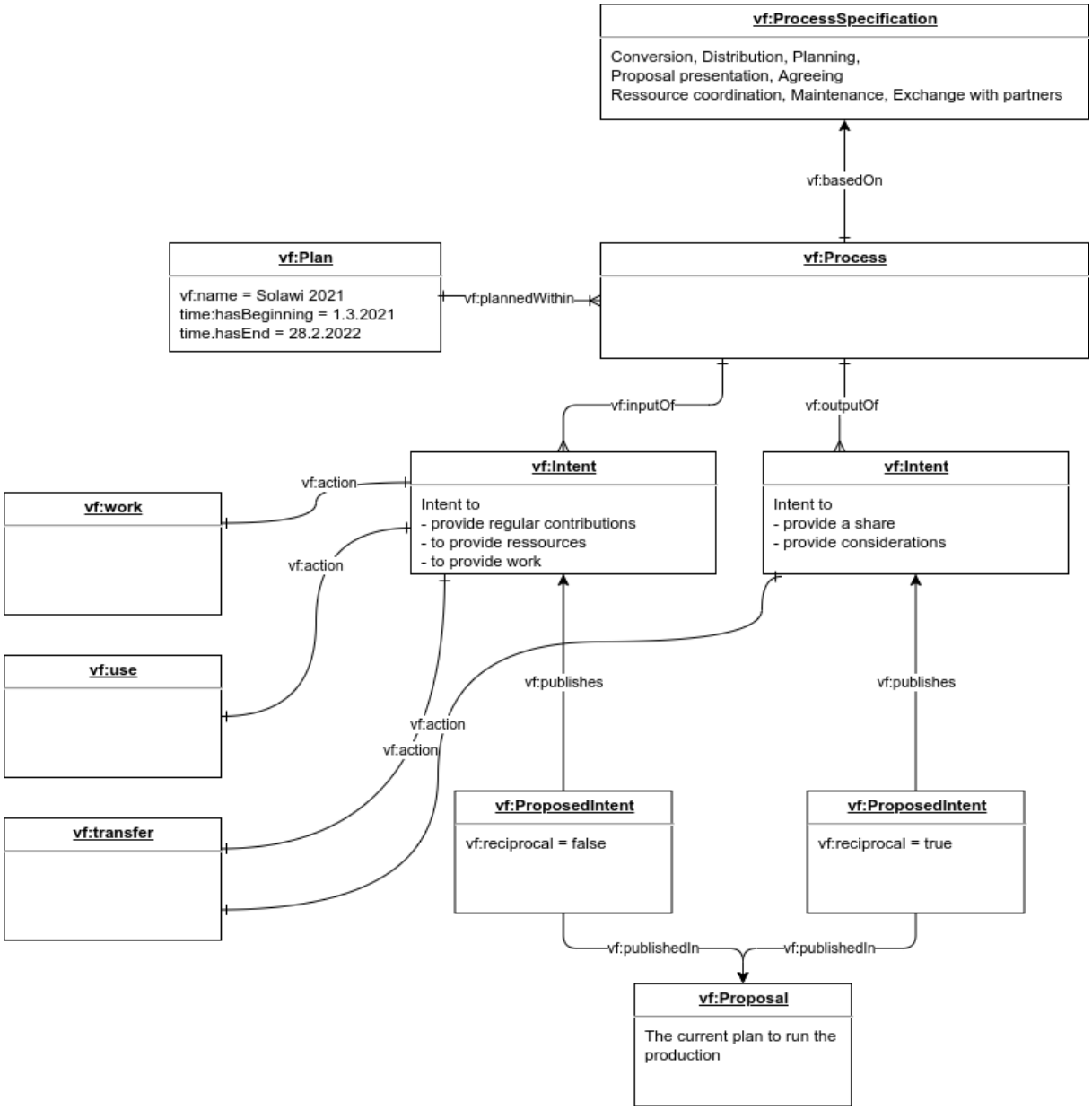
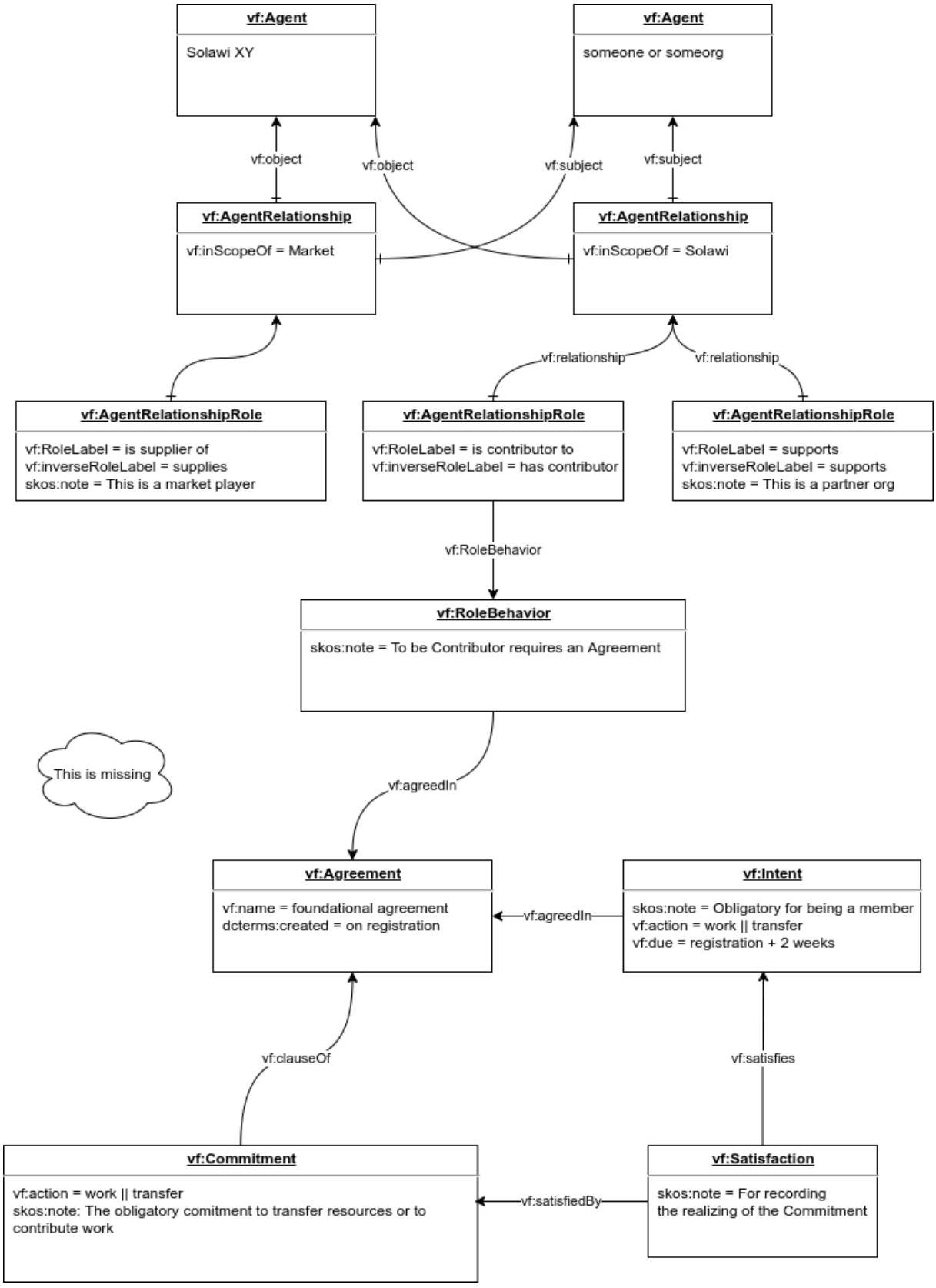
Appendices

A Commented valueflow subsets

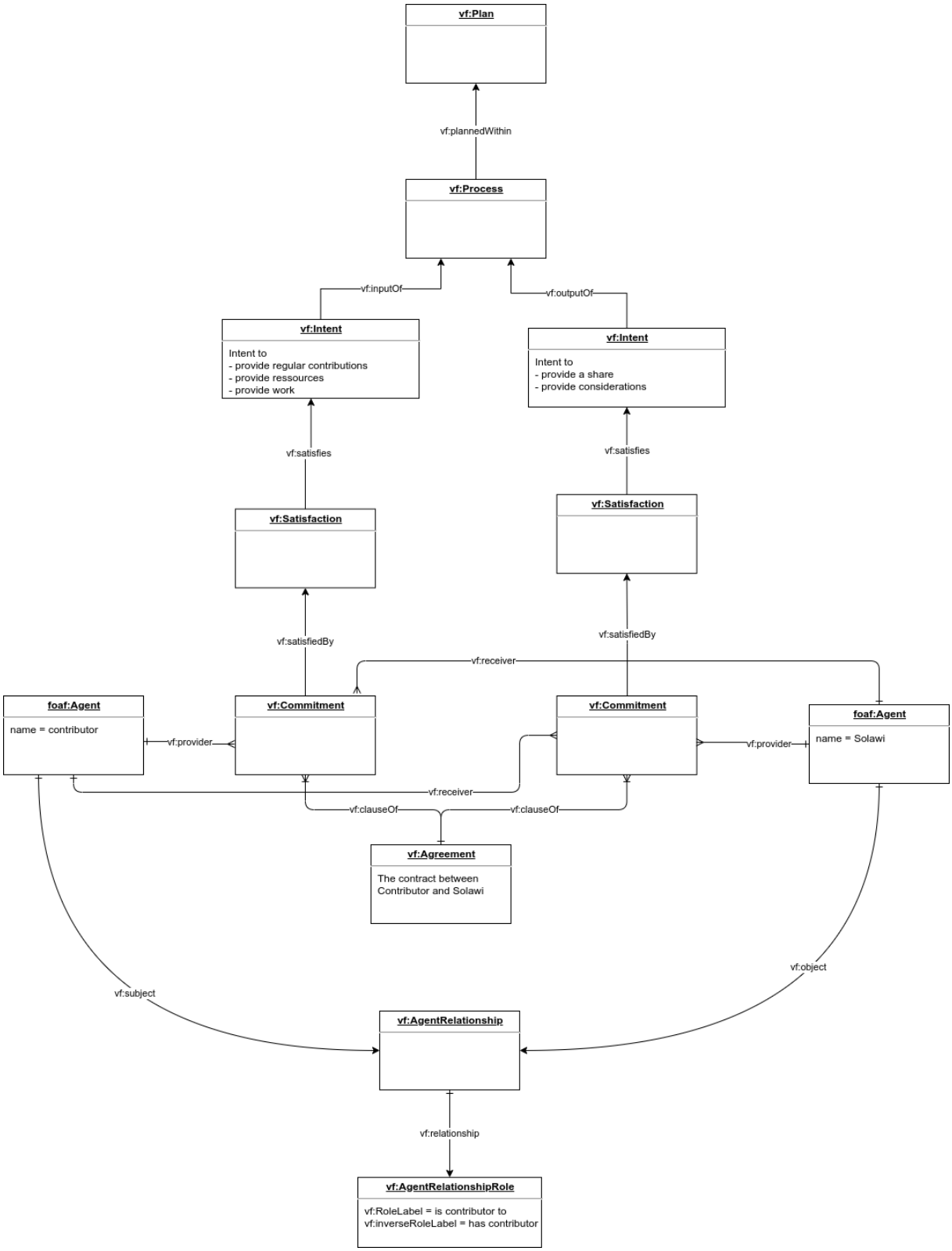
A.1 Planning



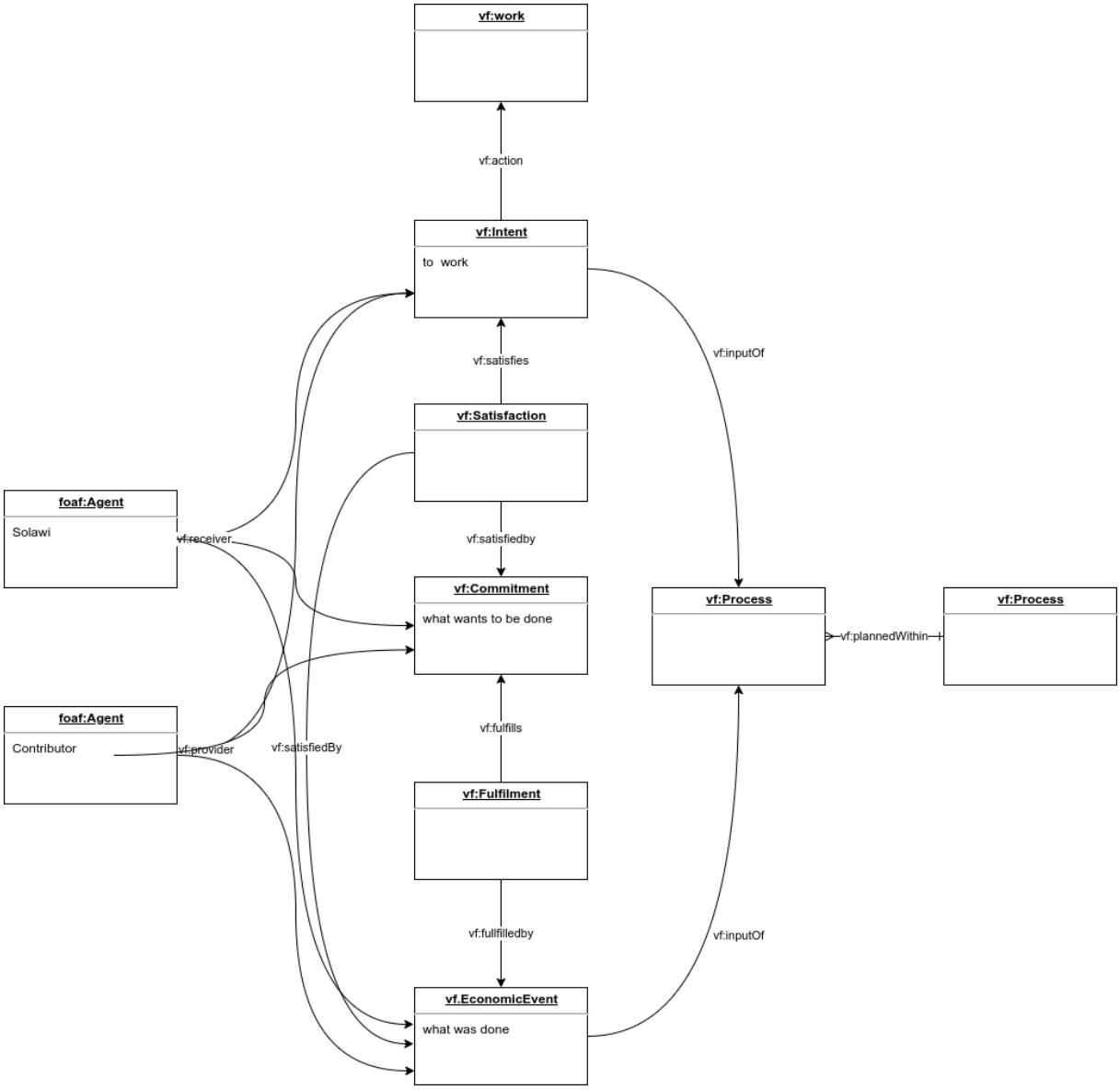
A.2 Registration



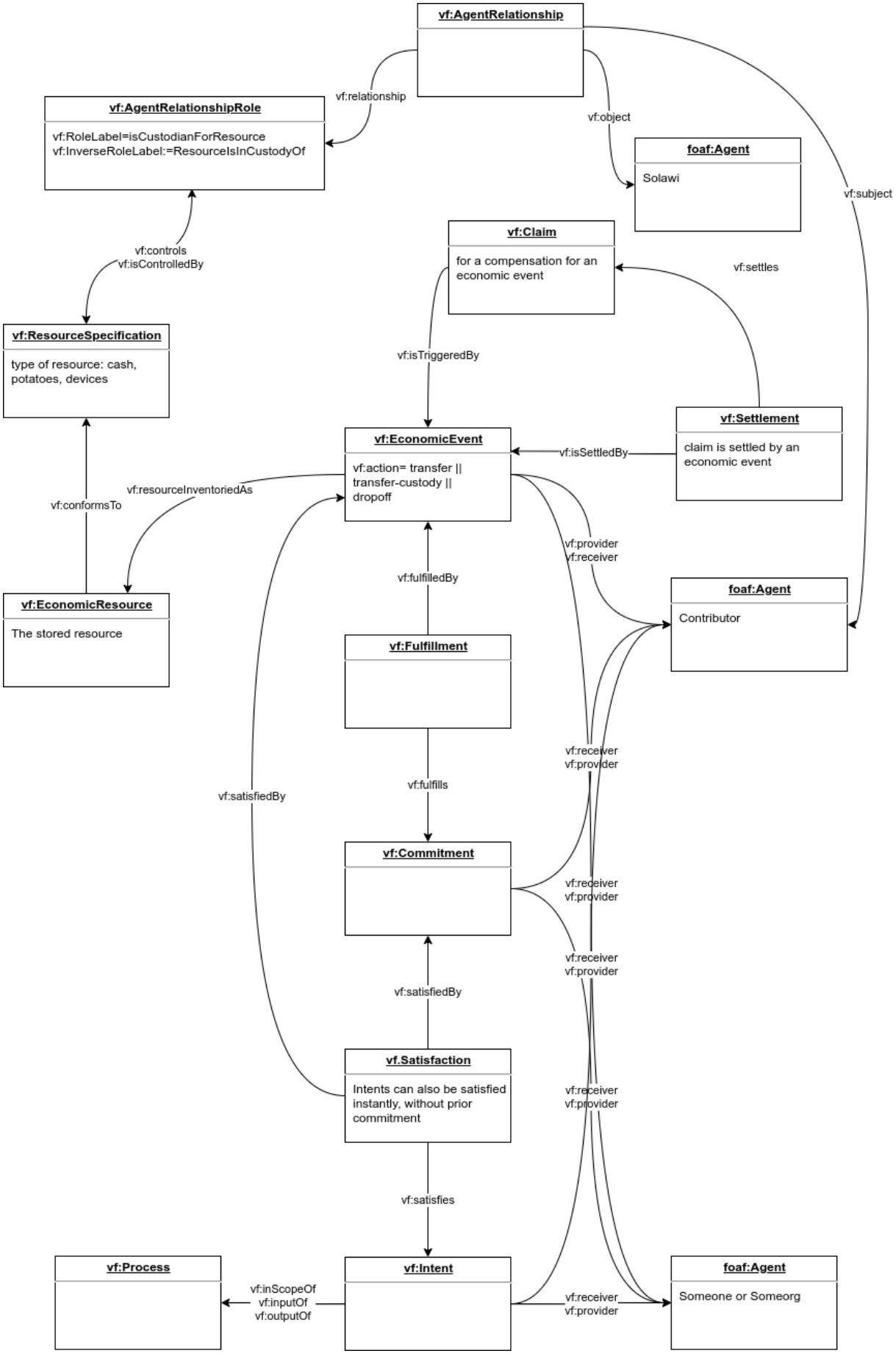
A.3 Agreeing


vf:Plan
vf:plannedWithin
vf:Process
vf:inputOf
vf:outputOf
vf:Intent
Intent to
- provide regular contributions
- provide ressources
- provide work
vf:Intent
Intent to
- provide a share
- provide considerations
vf:satisfies
vf:satisfies
vf:Satisfaction
vf:Satisfaction
vf:satisfiedBy
vf:satisfiedBy
vf:receiver
foaf:Agent
name = contributor
vf:provider
vf:Commitment
vf:Commitment
vf:provider
foaf:Agent
name = Solawi
vf:receiver
vf:clauseOf
vf:clauseOf
vf:Agreement
The contract between
Contributor and Solawi
vf:subject
vf:object
vf:AgentRelationship
vf:relationship
vf:AgentRelationshipRole
vf:RoleLabel = is contributor to
vf:inverseRoleLabel = has contributor

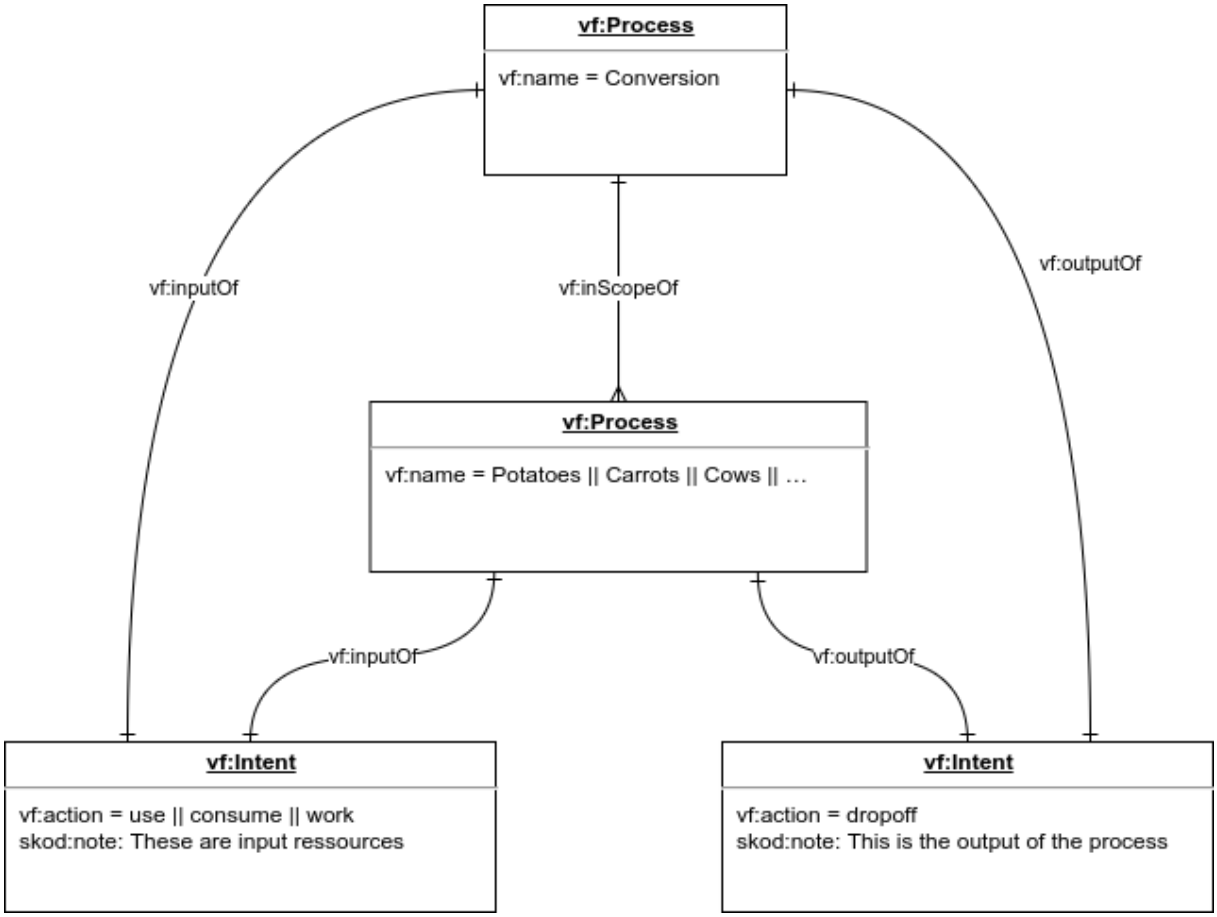
A.4 Work coordination



A.5 Resource coordination



A.6 Conversion



B YAML examples

B.1 Planning

```yaml
# Example: Several intents for paid and obligatory work, the use and transfer of
# resources on the two processes "conversion" and "distribution" planned within
# the Solawi production

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - solawi: https://solawi.example/
  - wd: https://www.wikidata.org/wiki/
'@id': lab:solawi-planning.yaml
'@graph':
  - '@id': solawi:c69e4c6a-f15b-4b92-86c4-bd0291d639e5 # proposal lead gardener
    '@type': Proposal
    name: Proposal for lead gardener work
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  - '@id': solawi:77078b22-c5fc-41f5-8d92-d0abcd1a31c0 # proposal share
    '@type': Proposal
    name: Proposal for standard shares
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  - '@id': solawi:1b831d46-f701-4d9a-9ecd-113332c95774 # proposal bike
    '@type': Proposal
    name: Proposal for share for bike
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
```

```yaml
- '@id': solawi:0a2eb6e1-d07d-4fa2-94c6-d0c3ed531e0a
  '@type': Plan
  name: Plan for 80 shares
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00


- '@id': solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  '@type': Process
  name: Conversion
  plannedWithin: solawi:0a2eb6e1-d07d-4fa2-94c6-d0c3ed531e0a

- '@id': solawi:bc62445b-0977-44f3-ad30-fb14b0bc2fec # distribution
  '@type': Process
  name: Distribution
  plannedWithin: solawi:0a2eb6e1-d07d-4fa2-94c6-d0c3ed531e0a


- '@id': solawi:a6ca8edc-20a2-4471-a819-201b74ea31bc # Lead gardener work
  '@type': Intent
  inputOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  name: Lead gardener work
  skos:note: Will be responsible for crop management
  action: work
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q758780 # gardener
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 60*4*11
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:8c21e8c8-2df8-4f75-89fe-7fc24d367e3b # Cooperative work, conversion
  '@type': Intent
  inputOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  name: Cooperative conversion work
  skos:note: Will contribute to the conversion process
  action: work
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q20204892 # contributor
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 10*4*12
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:8cbae776-36af-4242-9d70-f50b000e27f6 # Cooperative work, distribution
  '@type': Intent
  inputOf: solawi:bc62445b-0977-44f3-ad30-fb14b0bc2fec # distribution
  name: Cooperative distribution work
  skos:note: Will do the distribution, needs driver license
  action: work
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q20204892 # contributor
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 10*4*11
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

  # resources conversion consumed compensation
- '@id': solawi:cb56ad62-0610-4b32-9635-21da174de73f
  '@type': Intent
  inScopeOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  name: Consumed resources, conversion
  skos:note: Will be used to do the necessary payments
  action: transfer
  receiver:---   someone or someorg---
  provider: solawi
```

```
  resourceClassifiedAs: wd:Q4916 # €uros
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 40000
  # This assumes €50000 of estimated costs of additional resources in conversion.
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

  # resources conversion consumed
- '@id': solawi:91ca11ef-86e6-4912-bcbd-6e4160edebda
  '@type': Intent
  inScopeOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  name: Consumed resources, conversion
  skos:note: Will be used to do the necessary payments
  action: consume
  provider:---  someone or someorg---
  receiver: solawi
  resourceClassifiedAs: wd:Q16798631 # equipment
  resourceQuantity: sufficient
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

  # resources conversion used compensation
- '@id': solawi:e4fb72a1-a9ff-41f5-81b6-5563c5773e8b
  '@type': Intent
  inScopeOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  name: Rented resources, conversion
  skos:note: Will be used to do the necessary payments
  action: transfer
  receiver:---  someone or someorg---
  provider: solawi
  resourceClassifiedAs: wd:Q4916 # €uros
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 10000
  # This assumes €50000 of estimated costs of additional resources in conversion.
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:8127c4e9-6a31-46be-b14f-67141ebc6394 # resources conversion used
  '@type': Intent
  inScopeOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  action: use
  name: Rented resources, conversion
  skos:note: Will be used to do the necessary payments
  action: transfer
  provider:---  someone or someorg---
  receiver: solawi
  resourceClassifiedAs: wd:Q16798631 # equipment
  resourceQuantity: sufficient
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:5f62b814-3d64-4a2e-8d1a-f3f77f549d8a # resources conversion
  '@type': Intent
  name: Consumed resources, conversion
  skos:note: Will be used to do the necessary payments
  action: transfer
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q4916 # €uros
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 50000
  # This assumes €50000 of estimated costs of additional resources in conversion.
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:f171dd93-dabc-432f-a06b-d9a93da2b078 # Lead gardener costs
  '@type': Intent
  name: Lead gardener salary - costs
  skos:note: Intent to provide livelihood for lead gardeners
  action: transfer
```

```
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q4916 # €uros
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 60*4*12*20 # 1 month vacation , €20/hour
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:929be6db-7426-47a5-aa05-345c47764f80 # Lead gardener payments
  '@type': Intent
  name: Lead gardener salary - payments
  skos:note: Livelihood for lead gardeners
  action: transfer
  receiver: solawi:groups/contributors   # lead gardeners
  provider: solawi
  resourceClassifiedAs: wd:Q4916 # €uros
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 60*4*12*20 # 1 month vacation, €20/hour
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:e98a20bf-6d59-41d7-bce1-96d4ec50f295 # produce harvest
  '@type': Intent
  name: Produce harvest
  skos:note: Produce veggies
  action: dropoff
  inputOf: solawi:bc62445b-0977-44f3-ad30-fb14b0bc2fec # distribution
  outputOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
  resourceClassifiedAs: wd:Q213753 # harvest
  resourceQuantity:
    om2:hasUnit: om2:each
    om2:hasNumericalValue: 1
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:254745fe-cbd8-4754-9ffd-682e4294237c # share harvest
  '@type': Intent
  name: Share harvest
  skos:note: Divide it up
  action: dropoff
  outputOf: solawi:bc62445b-0977-44f3-ad30-fb14b0bc2fec # distribution
  resourceClassifiedAs: Share of harvest # maybe create wikidata entry
  resourceQuantity:
    om2:hasUnit: om2:each
    om2:hasNumericalValue: 80
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:a5bb9907-ab08-4ce2-b94b-4bb4ded15158 # share of the harvest
  '@type': Intent
  name: Share of the harvest
  skos:note: Will be distributed to contributors
  action: transfer
  receiver: solawi:groups/contributors
  provider: solawi
  resourceClassifiedAs: Share of harvest # maybe create wikidata entry
  resourceQuantity:
    om2:hasUnit: om2:each
    om2:hasNumericalValue: 80 # number of shares. This is the main scaling factor.
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:d607ed5e-13c2-41c8-aae1-ed6aaf6e1ffa # cargo bike
  '@type': Intent
  inputOf: solawi:bc62445b-0977-44f3-ad30-fb14b0bc2fec # distribution
  name: Cargo bike
  skos:note: Will be used to distribute harvest
  action: use
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q573863 # freight bicycle
```

```
    resourceQuantity:
      om2:hasUnit: pieces
      om2:hasNumericalValue: 1
    hasBeginning: 2021-03-01T08:00:00-1:00   # maybe sequences would be useful here
    hasEnd: 2022-02-28T17:00:00-1:00


  - '@id': solawi:7026f054-7b3f-44ff-8c5a-a1460d15d515
    '@type': ProposedIntent
    publishedIn: solawi:c69e4c6a-f15b-4b92-86c4-bd0291d639e5 # proposal lead gardener
    publishes: solawi:a6ca8edc-20a2-4471-a819-201b74ea31bc # lead gardener work
    reciprocal: false

  - '@id': solawi:f16f3d5b-90d4-4ae5-a574-aec2ac63a608
    '@type': ProposedIntent
    publishedIn: solawi:77078b22-c5fc-41f5-8d92-d0abcd1a31c0 # proposal share
    publishes: solawi:8c21e8c8-2df8-4f75-89fe-7fc24d367e3b # conversion contributor
    reciprocal: false

  - '@id': solawi:a84940f8-fb52-445c-8ebe-20fae104c342
    '@type': ProposedIntent
    publishedIn: solawi:77078b22-c5fc-41f5-8d92-d0abcd1a31c0 # proposal share
    publishes: solawi:8cbae776-36af-4242-9d70-f50b000e27f6 # distribution contributor
    reciprocal: false

  - '@id': solawi:6241cb96-f87f-4435-a03b-6d17ffe5d6b3
    '@type': ProposedIntent
    publishedIn: solawi:77078b22-c5fc-41f5-8d92-d0abcd1a31c0 # proposal share
    publishes: solawi:5f62b814-3d64-4a2e-8d1a-f3f77f549d8a # exchange medium resources conversion
    reciprocal: false

  - '@id': solawi:0e4fcd4b-b7e9-4a4b-b49c-f9a5bee6c68b
    '@type': ProposedIntent
    publishedIn: solawi:77078b22-c5fc-41f5-8d92-d0abcd1a31c0 # proposal share
    publishes: solawi:f171dd93-dabc-432f-a06b-d9a93da2b078 # lead gardeners costs
    reciprocal: false

  - '@id': solawi:47061261-2358-432b-b456-381e8294b2ed
    '@type': ProposedIntent
    publishedIn: solawi:c69e4c6a-f15b-4b92-86c4-bd0291d639e5 # proposal lead gardener
    publishes: solawi:929be6db-7426-47a5-aa05-345c47764f80 # lead gardeners salary
    reciprocal: false

  - '@id': solawi:932d478d-6e5a-4f3a-8c20-b386d17fb204
    '@type': ProposedIntent
    publishedIn: solawi:1b831d46-f701-4d9a-9ecd-113332c95774 # proposal bike
    publishes: solawi:d607ed5e-13c2-41c8-aae1-ed6aaf6e1ffaa # cargo bike
    reciprocal: false


  - '@id': solawi:03797327-0042-472c-9c76-a0f502357cb4
    '@type': ProposedIntent
    publishedIn:
      - solawi:c69e4c6a-f15b-4b92-86c4-bd0291d639e5 # proposal lead gardener
      - solawi:77078b22-c5fc-41f5-8d92-d0abcd1a31c0 # proposal share
      - solawi:1b831d46-f701-4d9a-9ecd-113332c95774 # proposal bike
    publishes: solawi:a5bb9907-ab08-4ce2-b94b-4bb4ded15158 # share of the harvest
    reciprocal: true

  - '@id': solawi:f171dd93-dabc-432f-a06b-d9a93da2b078
    '@type': ProposedIntent
    publishedIn: solawi:c69e4c6a-f15b-4b92-86c4-bd0291d639e5 # proposal lead gardener
    publishes: solawi:929be6db-7426-47a5-aa05-345c47764f80 # Livelihood lead gardeners
    reciprocal: true
```

B.2 Registration

```
# Example:
# Judy registers to Solawi as Contributor. On registration a commitment to
# contribute a cooperative share of €250 is due.

'@context':
  - https://git.io/vf-examples-jsonld-context
```

```
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - solawi: https://solawi.example/
  - wd: https://www.wikidata.org/wiki/
  - judy: https://judy.example/
'@id': lab:solawi-registration.yaml
'@graph':
  - '@id': solawi:492213f6-3f68-473d-ac55-dca031a7c429 # Contributor
    '@type': AgentRelationshipRole
    roleLabel: is contributor to
    inverseRoleLabel: has contributor
    RoleBehavior: solawi:2439f686-d83f-431d-a813-b268be895851 # custodians-car behavior

  - '@id': solawi:87cf3c23-2ea6-4796-b369-5670aa9fef47
    '@type': AgentRelationship
    subject: judy
    relationship: solawi:492213f6-3f68-473d-ac55-dca031a7c429 # Contributor
    object: solawi

  - '@id': solawi:bd650c43-0a1a-457e-9f2c-449b9f4a9d79 # Contributor's behavior
    '@type': RoleBehavior
    name: contributors
    agreedIn: solawi:aa633ff0-afaa-44fb-93dc-6c3bc8464fce

  - '@id': solawi:aa633ff0-afaa-44fb-93dc-6c3bc8464fce
    '@type': Agreement

  - '@id': solawi:ceed77f2-c8ec-4616-8428-47d7849588dd
    '@type': Intent
    agreedIn: solawi:aa633ff0-afaa-44fb-93dc-6c3bc8464fce
    name: cooperative-share
    skos:note: Will be used to do the necessary payments
    action: transfer
    provider: judy
    receiver: solawi
    resourceClassifiedAs: wd:Q4916 # Euros
    resourceQuantity:
      om2:hasUnit: om2:euro
      om2:hasNumericalValue: 250

  - '@id': solawi:69910e4a-7550-4aba-a240-48b7f3587cba
    '@type': Commitment
    action: transfer
    provider: judy
    receiver: solawi
    resourceClassifiedAs: https://www.wikidata.org/wiki/Q4916 # Euros
    resourceQuantity:
      om2:hasUnit: om2:euro
      om2:hasNumericalValue: 250
    hasBeginning: date(registration)
    hasEnd: date(registration) + 2 weeks
```

B.3 Agreeing by working contract

```
# Example: Joe contracts to 30h/week of gardener work to Solawi
# plan specified in lab:solawi-planning.yaml

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - om2: http://www.ontology-of-units-of-measure.org/resource/om-2/
  - solawi: https://solawi.example/
  - joe: https://joe.example/

'@id': lab:solawi-agreeing-working-contract.yaml

'@graph':
  # Joe commits to 30h/week of gardening work
  - '@id': solawi:12a616ec-424d-43ea-b2db-dc1807ebf4d7
    '@type': Commitment
    action: work
    provider: joe
    receiver: solawi
```

```
    resourceClassifiedAs: wd:Q758780 # gardener, derived from Intent
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 30*4*11
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:9c9400c9-863e-48ea-af35-aa2df6db0e58

  - '@id': solawi:0eb3fa1f-98c9-4ba9-8418-df377e3ed857
    '@type': Satisfaction
    satisfies: solawi:a6ca8edc-20a2-4471-a819-201b74ea31bc # Lead gardener work
    satisfiedBy: solawi:12a616ec-424d-43ea-b2db-dc1807ebf4d7
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 30*4*11 # derived from Commitment

  - '@id': solawi:678a7262-7575-4a89-abad-c195df6bf0e1 # Commitment to pay joe
    '@type': Commitment
    action: transfer
    provider: solawi
    receiver: joe
    resourceClassifiedAs: https://www.wikidata.org/wiki/Q4916 # €uros
    resourceQuantity:
      om2:hasUnit: om2:euro
      om2:hasNumericalValue: 30*4*12*20 # 1 month vacation , €20/hour
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:9c9400c9-863e-48ea-af35-aa2df6db0e58

  - '@id': solawi:0eb3fa1f-98c9-4ba9-8418-df377e3ed857
    '@type': Satisfaction
    satisfies: solawi:929be6db-7426-47a5-aa05-345c47764f80 # Lead gardener payments
    satisfiedBy: solawi:678a7262-7575-4a89-abad-c195df6bf0e1
    resourceQuantity:
      om2:hasUnit: om2:euro
      om2:hasNumericalValue: 30*4*12*20 # 1 month vacation , €20/hour

  - '@id': solawi:cdff4109-ab36-45e3-85a2-0e6f3277647b # A share of the harvest for joe
    '@type': Commitment
    action: transfer
    provider: solawi
    receiver: joe
    resourceClassifiedAs: Share of harvest # maybe create wikidata entry
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:9c9400c9-863e-48ea-af35-aa2df6db0e58

  - '@id': solawi:778a5b6d-21ff-45a0-9efa-16d9084642a4
    '@type': Satisfaction
    satisfies: solawi:a5bb9907-ab08-4ce2-b94b-4bb4ded15158 # share of the harvest
    satisfiedBy: solawi:cdff4109-ab36-45e3-85a2-0e6f3277647b
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1

  - '@id': solawi:9c9400c9-863e-48ea-af35-aa2df6db0e58 # Working contract of Joe
    '@type': Agreement
```

B.4 Agreeing by committing to work for share

```
# Example: Greg commits to work a day (5h) / week in return for a share
# plan specified in lab:solawi-planning.yaml

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - solawi: https://solawi.example/
  - greg: https://greg.example/

'@id': lab:solawi-agreeing-work-for-share.yaml
```

```
'@graph':
  # Greg commits to 5h/week for distribution
  - '@id': solawi:1138dc39-1935-4c75-a225-9361cb37c94b
    '@type': Commitment
    action: work
    provider: greg
    receiver: solawi
    resourceClassifiedAs: https://www.wikidata.org/wiki/Q20204892 # contributor, derived from Intent
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 5*4*11
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:ec3887e1-110f-4a41-a41a-30e7016052ca

  - '@id': solawi:7c51a5ee-e790-40d5-a29e-d8a6c53cfdba
    '@type': Satisfaction
    satisfies: solawi:8cbae776-36af-4242-9d70-f50b000e27f6 # Cooperative work, distribution
    satisfiedBy: solawi:1138dc39-1935-4c75-a225-9361cb37c94b
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 5*4*11 # derived from Commitment

  - '@id': solawi:4eb9962c-3129-4010-87eb-07d72bf01936
    '@type': Commitment
    action: transfer
    provider: solawi
    receiver: greg
    resourceClassifiedAs: Share of harvest # maybe create wikidata entry
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:ec3887e1-110f-4a41-a41a-30e7016052ca

  - '@id': solawi:611438a0-b426-4649-a1b0-82dce898e022
    '@type': Satisfaction
    satisfies: solawi:a5bb9907-ab08-4ce2-b94b-4bb4ded15158 # share of the harvest
    satisfiedBy: solawi:4eb9962c-3129-4010-87eb-07d72bf01936
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1

    # Agreement of work for share with Greg
  - '@id': solawi:ec3887e1-110f-4a41-a41a-30e7016052ca
    '@type': Agreement
```

B.5 Agreeing by committing to monetary contribution

```
# Example: Alex and Beth commit to monetary contributions of different height
# and cooperative work. They receive a share of the harvest in return

# the commitments are recorded in agreements

# plan specified in lab:solawi-planning.yaml

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - solawi: https://solawi.example/
  - alex: https://alex.example/
  - beth: https://beth.example/

'@id': lab:solawi-agreeing-monetary-contribution.yaml

'@graph':
  - '@id': solawi:2b2b8758-9ef9-447e-a8bb-bdaef4efc7d8 # Alex commits to contribute €700/month
    '@type': Commitment
    action: transfer
    provider: alex
    receiver: solawi
```

```
  resourceClassifiedAs: https://www.wikidata.org/wiki/Q4916 # €uros
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 700*12
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00
  clauseOf: solawi:8eb5475a-75a6-49f7-91d0-7c043091ee47 # Alex' agreement

- '@id': solawi:2d458684-5de0-4f96-9ac1-295e741a474a # Beth commits to contribute €30/month
  '@type': Commitment
  action: transfer
  provider: beth
  receiver: solawi
  resourceClassifiedAs: https://www.wikidata.org/wiki/Q4916 # €uros
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 30*12
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00
  clauseOf: solawi:72c296dc-0cb8-47bf-8cc0-85cdfb8ef4ef # Beth' agreement

- '@id': solawi:f9943ddc-bb5b-4d74-afe5-654bc3929edb
  '@type': Satisfaction
  satisfies: solawi:f171dd93-dabc-432f-a06b-d9a93da2b078 # Lead gardener costs
  satisfiedBy: solawi:2b2b8758-9ef9-447e-a8bb-bdaef4efc7d8
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 700*12

- '@id': solawi:efd404f0-85b5-4b11-8bf3-61d23bc60c35
  '@type': Satisfaction
  satisfies: solawi:f171dd93-dabc-432f-a06b-d9a93da2b078 # Lead gardener costs
  satisfiedBy: solawi:2d458684-5de0-4f96-9ac1-295e741a474a
  resourceQuantity:
    om2:hasUnit: om2:euro
    om2:hasNumericalValue: 30*12


# Two half working days are obligatory
- '@id': solawi:fd80aee7-d87a-4b1d-92b7-c1a419959bf8
  '@type': Commitment
  action: work
  provider: alex
  receiver: solawi
  resourceClassifiedAs: https://www.wikidata.org/wiki/Q20204892 # contributor, derived from Intent
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 10
  hasBeginning: 2021-03-01T08:00:00-1:00 #the exact date still needs to  be specified
  hasEnd: 2022-02-28T17:00:00-1:00
  clauseOf: solawi:8eb5475a-75a6-49f7-91d0-7c043091ee47 # Alex' agreement

- '@id': solawi:901f80a1-8e2a-43c3-922d-3e6b2526cbd4
  '@type': Commitment
  action: work
  provider: beth
  receiver: solawi
  resourceClassifiedAs: https://www.wikidata.org/wiki/Q20204892 # contributor, derived from Intent
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 10
  hasBeginning: 2021-03-01T08:00:00-1:00 #the exact date still needs to  be specified
  hasEnd: 2022-02-28T17:00:00-1:00
  clauseOf: solawi:72c296dc-0cb8-47bf-8cc0-85cdfb8ef4ef # Beth' agreement

- '@id': solawi:a2f44c4f-b29e-4475-99cc-a595990523b0
  '@type': Satisfaction
  satisfies: solawi:8c21e8c8-2df8-4f75-89fe-7fc24d367e3b # Cooperative work, conversion
  satisfiedBy: solawi:fd80aee7-d87a-4b1d-92b7-c1a419959bf8
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 10 # derived from Commitment
```

```
  - '@id': solawi:5049a172-f476-4972-95e9-e08fe0af47b8
    '@type': Satisfaction
    satisfies: solawi:8c21e8c8-2df8-4f75-89fe-7fc24d367e3b # Cooperative work, conversion
    satisfiedBy: solawi:901f80a1-8e2a-43c3-922d-3e6b2526cbd4
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 10 # derived from Commitment

  # Solawi commits to provide a share in reciptrocity
  - '@id': solawi:2876dcb9-c188-4bac-b85a-92a640a9d73f
    '@type': Commitment
    action: transfer
    provider: solawi
    receiver: alex
    resourceClassifiedAs: Share of harvest # maybe create wikidata entry
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:8eb5475a-75a6-49f7-91d0-7c043091ee47 # Alex' agreement

  - '@id': solawi:a5730022-e459-4661-9dcc-a88155cae7b6
    '@type': Commitment
    action: transfer
    provider: solawi
    receiver: beth
    resourceClassifiedAs: Share of harvest # maybe create wikidata entry
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:72c296dc-0cb8-47bf-8cc0-85cdfb8ef4ef # Beth' agreement

  - '@id': solawi:cf9cd77d-f54d-464c-aac0-7ce5fc5f78b7
    '@type': Satisfaction
    satisfies: solawi:a5bb9907-ab08-4ce2-b94b-4bb4ded15158 # share of the harvest
    satisfiedBy: solawi:2876dcb9-c188-4bac-b85a-92a640a9d73f
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1

  - '@id': solawi:4d59c025-9873-4867-b047-862711f086b6
    '@type': Satisfaction
    satisfies: solawi:a5bb9907-ab08-4ce2-b94b-4bb4ded15158 # share of the harvest
    satisfiedBy: solawi:a5730022-e459-4661-9dcc-a88155cae7b6
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1


  - '@id': solawi:8eb5475a-75a6-49f7-91d0-7c043091ee47 # Alex' agreement
    '@type': Agreement

  - '@id': solawi:72c296dc-0cb8-47bf-8cc0-85cdfb8ef4ef # Beth' agreement
    '@type': Agreement
```

B.6 Successful multi-agent agreement

```
# Example: Successful intent - commitment matching is declared by the group agent
# committing to produce and share the harvest

# plan specified in lab:solawi-planning.yaml

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - om2: http://www.ontology-of-units-of-measure.org/resource/om-2/
  - solawi: https://solawi.example/

'@id': lab:solawi-agreeing-complete.yaml
```

```
'@graph':
    # Declaration of successful intent-commitment matching
  - '@id': solawi:ade6fc9a-9fc8-45d7-b5ce-967368bba8f7
    '@type': Commitment
    action: dropoff
    provider: solawi
    receiver: solwi:groups/contributors
    resourceClassifiedAs: wd:Q213753 # harvest
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  - '@id': solawi:ac940cde-e5a1-49c4-bbdf-7f569bff821e
    '@type': Commitment
    action: dropoff
    provider: solawi
    receiver: solwi:groups/contributors
    resourceClassifiedAs: Share of harvest # maybe create wikidata entry
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 80
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  - '@id': solawi:4e7e68ea-2a01-4e29-9103-748f1f28630b
    '@type': Satisfaction
    satisfies: solawi:e98a20bf-6d59-41d7-bce1-96d4ec50f295 # produce harvest
    satisfiedBy: solawi:ade6fc9a-9fc8-45d7-b5ce-967368bba8f7
    resourceClassifiedAs: wd:Q213753 # harvest
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  - '@id': solawi:6dff907e-83b8-4ae1-ab9c-44a9204f152f
    '@type': Satisfaction
    satisfies: solawi:254745fe-cbd8-4754-9ffd-682e4294237c # share harvest
    satisfiedBy: solawi:ac940cde-e5a1-49c4-bbdf-7f569bff821e
    resourceClassifiedAs: Share of harvest # maybe create wikidata entry
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 80
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
```

B.7 Work shift calendar refinement

```
# Example: The intents for professional gardener work are refined. Joe's coarse
# grained commitment is adapted accordingly

# plan specified in:
# lab:solawi-planning.yaml

# commitments added in:
# lab:solawi-agreeing-working-contract.yaml

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/diagrams/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - om2: http://www.ontology-of-units-of-measure.org/resource/om-2/
  - solawi: https://solawi.example/
  - joe: https://joe.example/


'@id': lab:solawi-work-coordination-refinement.yaml

# this graph is deleted:
'@graph1':
  - '@id': solawi:a6ca8edc-20a2-4471-a819-201b74ea31bc # Lead gardener work
```

```
    '@type': Intent
    inputOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
    name: Lead gardener work
    skos:note: Will be responsible for crop management
    action: work
    receiver: solawi
    provider: solawi:groups/contributors
    resourceClassifiedAs: wd:Q758780 # gardener
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 60*4*11
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  # All commitments to this intent need to be adapted to
  - '@id': solawi:12a616ec-424d-43ea-b2db-dc1807ebf4d7
    '@type': Commitment
    action: work
    provider: joe
    receiver: solawi
    resourceClassifiedAs: wd:Q758780 # gardener, derived from Intent
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 30*4*11
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
    clauseOf: solawi:9c9400c9-863e-48ea-af35-aa2df6db0e58

  - '@id': solawi:0eb3fa1f-98c9-4ba9-8418-df377e3ed857
    '@type': Satisfaction
    satisfies: solawi:a6ca8edc-20a2-4471-a819-201b74ea31bc # Lead gardener work
    satisfiedBy: solawi:12a616ec-424d-43ea-b2db-dc1807ebf4d7
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 30*4*11 # derived from Commitment

# this graph is created. Example for the first 2 days of a week. Will be
# (semi-) automatically generated for effortQuantity of original intent / commitment
'@graph2':
  - '@id': solawi:541dfd5b-5fc2-42ff-a6a8-fc221517e0c8 # Lead gardener work, 6h shift, 1h break
    '@type': Intent
    inputOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
    name: Lead gardener work
    skos:note: Will be responsible for crop management
    action: work
    receiver: solawi
    provider: solawi:groups/contributors
    resourceClassifiedAs: wd:Q758780 # gardener
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 12
    hasBeginning: 2021-03-01T09:00:00-1:00
    hasEnd: 2021-03-01T16:00:00-1:00

  - '@id': solawi:5a075117-90b1-4241-b2ff-b92ac33bf9cc # Lead gardener work, 6h shift, 1h break
    '@type': Intent
    inputOf: solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
    name: Lead gardener work
    skos:note: Will be responsible for crop management
    action: work
    receiver: solawi
    provider: solawi:groups/contributors
    resourceClassifiedAs: wd:Q758780 # gardener
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 12
    hasBeginning: 2021-03-02T09:00:00-1:00
    hasEnd: 2021-03-02T16:00:00-1:00

  - '@id': solawi:41a6b635-a4bc-49f8-9913-0ab63f5e54b7
    '@type': Commitment
    action: work
    provider: joe
```

```
    receiver: solawi
    resourceClassifiedAs: wd:Q758780 # gardener, derived from Intent
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 6
    hasBeginning: 2021-03-01T09:00:00-1:00
    hasEnd: 2021-03-01T16:00:00-1:00
    clauseOf: solawi:9c9400c9-863e-48ea-af35-aa2df6db0e58

  - '@id': solawi:8bb9af56-8aad-4073-94f1-2e014f412e6f
    '@type': Commitment
    action: work
    provider: joe
    receiver: solawi
    resourceClassifiedAs: wd:Q758780 # gardener, derived from Intent
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 6
    hasBeginning: 2021-03-02T09:00:00-1:00
    hasEnd: 2021-03-02T16:00:00-1:00
    clauseOf: solawi:9c9400c9-863e-48ea-af35-aa2df6db0e58

  - '@id': solawi:18a73c93-661b-4e01-ad39-b7a9717feca0
    '@type': Satisfaction
    satisfies: solawi:541dfd5b-5fc2-42ff-a6a8-fc221517e0c8 # Lead gardener work
    satisfiedBy: solawi:41a6b635-a4bc-49f8-9913-0ab63f5e54b7
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 6 # derived from Commitment

  - '@id': solawi:388ab47d-4c86-4a8d-bf49-699512c9603a
    '@type': Satisfaction
    satisfies: solawi:5a075117-90b1-4241-b2ff-b92ac33bf9cc # Lead gardener work
    satisfiedBy: solawi:8bb9af56-8aad-4073-94f1-2e014f412e6f
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 6 # derived from Commitment
```

B.8 Work shift calendar usage

```
# Example: Farm party bar shift calendar

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - solawi: https://solawi.example/
  - judy: https://judy.example/

'@id': lab:solawi-work-coordination-farm-party.yaml
'@graph':
  - '@id': solawi:a423b92f-9ec1-4534-a877-d433e5fd5ef4
    '@type': Plan
    name: Party plan
    hasBeginning: 2021-10-31T16:00:00-1:00
    hasEnd: 2021-11-01T02:00:00-1:00

  - '@id': solawi:0bd238d3-85e3-49ee-8e18-d83c9510f78b # bar
    '@type': Process
    name: Juice Bar
    plannedWithin: solawi:a423b92f-9ec1-4534-a877-d433e5fd5ef4
    hasBeginning: 2021-10-31T16:00:00-1:00
    hasEnd: 2021-11-01T02:00:00-1:00

  - '@id': solawi:07226b91-df46-4313-a635-5f17608ad082 # Bar keeper shift #1
    '@type': Intent
    inputOf: solawi:0bd238d3-85e3-49ee-8e18-d83c9510f78b # bar
    name: Bar keeper
    skos:note: Will be responsible for bar
    action: work
    receiver: solawi
    provider: solawi:groups/contributors
    resourceClassifiedAs: wd:Q20204892 # contributor
```

```
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 4
  hasBeginning: 2021-10-31T16:00:00-1:00
  hasEnd: 2021-10-31T20:00:00-1:00

- '@id': solawi:aebde2da-6922-4524-b71d-8d28f0496adc # Bar keeper shift #2
  '@type': Intent
  inputOf: solawi:0bd238d3-85e3-49ee-8e18-d83c9510f78b # bar
  name: Bar keeper
  skos:note: Will be responsible for bar
  action: work
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q20204892 # contributor
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 4
  hasBeginning: 2021-10-31T20:00:00-1:00
  hasEnd: 2021-10-31T24:00:00-1:00

- '@id': solawi:f3d8b9c6-2313-4a70-adc1-41c4aca83b25 # Bar keeper shift #3
  '@type': Intent
  inputOf: solawi:0bd238d3-85e3-49ee-8e18-d83c9510f78b # bar
  name: Bar keeper
  skos:note: Will be responsible for bar
  action: work
  receiver: solawi
  provider: solawi:groups/contributors
  resourceClassifiedAs: wd:Q20204892 # contributor
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 2
  hasBeginning: 2021-11-01T00:00:00-1:00
  hasEnd: 2021-11-01T02:00:00-1:00

- '@id': solawi:e299278d-0dee-4942-a648-c90b671cbb0b  # judy commits to shift #2
  '@type': Commitment
  action: work
  provider: judy
  receiver: solawi
  resourceClassifiedAs: wd:Q20204892 # contributor, derived from Intent
  effortQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 4
  hasBeginning: 2021-10-31T20:00:00-1:00
  hasEnd: 2021-10-31T24:00:00-1:00

- '@id': solawi:747b2591-f660-4ba8-a84a-7c3fbca6ca8c # Judy  does shift #2
  '@type': EconomicEvent
  inputOf: solawi:0bd238d3-85e3-49ee-8e18-d83c9510f78b # bar
  action: work
  provider: judy
  receiver: solawi
  resourceClassifiedAs: wd:Q20204892 # contributor, derived from Intent
  resourceQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 4
  hasBeginning: 2021-10-31T20:00:00-1:00
  hasEnd: 2021-10-31T24:00:00-1:00

- '@id': solawi:747b2591-f660-4ba8-a84a-7c3fbca6ca8c # Judy  does shift #3
  '@type': EconomicEvent
  inputOf: solawi:db9a24ca-7e4f-446d-8af7-55879176edde # bar
  action: work
  provider: judy
  receiver: solawi
  resourceClassifiedAs: wd:Q20204892 # contributor, derived from Intent
  resourceQuantity:
    om2:hasUnit: om2:hour
    om2:hasNumericalValue: 2
  hasBeginning: 2021-11-01T00:00:00-1:00
  hasEnd: 2021-11-01T02:00:00-1:00
```

```
  - '@id': solawi:e481521e-799f-46c3-aa9c-638d09d923c5
    '@type': Satisfaction
    satisfies: solawi:aebde2da-6922-4524-b71d-8d28f0496adc # Bar keeper shift #2
    satisfiedBy: solawi:e299278d-0dee-4942-a648-c90b671cbb0b  # judy commits to shift #2
    resourceQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 4

  - '@id': solawi:71aa8cfd-8d1e-4a22-85eb-53070c5f469f
    '@type': Fulfillment
    fulfills: solawi:e299278d-0dee-4942-a648-c90b671cbb0b  # judy commits to shift #2
    fulfilledBy: solawi:747b2591-f660-4ba8-a84a-7c3fbca6ca8c # Judy  does shift #2
    effortQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 4

  - '@id': solawi:4b36301e-875e-498e-9b66-d418cc133560
    '@type': Satisfaction
    satisfies: solawi:f3d8b9c6-2313-4a70-adc1-41c4aca83b25 # Bar keeper shift #3
    satisfiedBy: solawi:747b2591-f660-4ba8-a84a-7c3fbca6ca8c # Judy  does shift #3
    resourceQuantity:
      om2:hasUnit: om2:hour
      om2:hasNumericalValue: 2
```

B.9 Access group cash

```
# Example:
# Anna is allowed to do bank transactions:
# -   Anna is in the group of contributors that is allowed for cash transactions (custodians-cash)
# -   Solawi transfers custody of wallet to Anna

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - solawi: https://solawi.example/
  - anna: http://anna.example/

'@id': lab:solawi-access-groups.yaml
'@graph':
  - '@id': solawi:bae0b84f-d84c-4d1d-afd0-c88f16b4c421 #custodians-cash
    '@type': AgentRelationshipRole
    roleLabel: is custodian for cash
    inverseRoleLabel: cash is in custody of
    RoleBehavior: solawi:96e296df-4e7b-41ac-bb96-090691547566 # custodians-cash behavior

  - '@id': solawi:4f496033-f366-484d-99a0-14992320fb76
    '@type': AgentRelationship
    subject: anna
    relationship: solawi:bae0b84f-d84c-4d1d-afd0-c88f16b4c421 #custodians-cash
    object: solawi

  - '@id': solawi:96e296df-4e7b-41ac-bb96-090691547566 # custodians-cash behavior
    '@type': RoleBehavior
    name: custodians-cash
    note: may control cash
    controls: solawi:72f7a3d6-a3e6-445c-90f6-b666c1d2cc3f # community cash

  - '@id': solawi:72f7a3d6-a3e6-445c-90f6-b666c1d2cc3f # community cash
    '@type': ResourceSpecification
    name: Community cash
    note: These are cash like resources the Solawi controls
    isControlledBy: solawi:96e296df-4e7b-41ac-bb96-090691547566 # custodians-cash behavior

  - '@id': solawi:bfd3f527-30c2-490c-a471-cbabdc2db5ba # Solawi's cash wallet
    '@type': EconomicResource
    name: Cash wallet
    conformsTo: solawi:72f7a3d6-a3e6-445c-90f6-b666c1d2cc3f # community cash
    classifiedAs: wd:Q131740 # wallet

    # This should alert if receiver is not in custodians-cash
  - '@id': solawi:8e837319-2f5b-4b69-9d45-155688bd5c21
```

```
    '@type': EconomicEvent
    action: transfer-custody
    provider: solawi
    receiver: anna
    resourceInventoriedAs: solawi:bfd3f527-30c2-490c-a471-cbabdc2db5ba # Solawi's cash wallet
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00
```

B.10 Access group car

```
# Example:
# - The lead gardeners and Greg are allowed to use the distribution vehicle.
# - Beth enters the wish to use the distribution vehicle on Sunday.

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - solawi: https://solawi.example/
  - anna: http://anna.example/
  - greg: http://greg.example/
  - beth: http://beth.example/

'@id': lab:solawi-access-group-car.yaml
'@graph':
  - '@id': solawi:c7602028-57ef-4410-a423-3710109362f0 #custodians-car
    '@type': AgentRelationshipRole
    roleLabel: is custodian for car
    inverseRoleLabel: car is in custody of
    RoleBehavior: solawi:2439f686-d83f-431d-a813-b268be895851 # custodians-car behavior

  - '@id': solawi:49c8ae2e-7fb8-45e2-a40f-ad61bbb4ef76
    '@type': AgentRelationship
    subject:
      - solawi:groups/lead-gardeners
      - greg
    relationship: solawi:c7602028-57ef-4410-a423-3710109362f0 #custodians-car
    object: solawi

  - '@id': solawi:2439f686-d83f-431d-a813-b268be895851 # custodians-car behavior
    '@type': RoleBehavior
    name: custodians-car
    note: may control car
    controls: solawi:9bef1d58-97d5-4aa8-be8c-7fdb9c6522ea # community car

  - '@id': solawi:9bef1d58-97d5-4aa8-be8c-7fdb9c6522ea # community car
    '@type': ResourceSpecification
    name: Community car
    note: This is the delivery vehicle
    isControlledBy: solawi:2439f686-d83f-431d-a813-b268be895851 # custodians-car behavior

  - '@id': solawi:d827dae2-2b95-4f4b-acaa-8642c0e40334 # Solawi's delivery vehicle
    '@type': EconomicResource
    name: Pritsche
    conformsTo: solawi:9bef1d58-97d5-4aa8-be8c-7fdb9c6522ea # community car
    classifiedAs: wd:Q1420 # motor car

  - '@id': solawi:3e5e5675-4318-471c-bca2-69257a14eeda #Beth intends to use the car
    '@type': Intent
    action: transfer-custody
    provider: solawi
    receiver: beth
    resourceInventoriedAs: solawi:d827dae2-2b95-4f4b-acaa-8642c0e40334 # Solawi's delivery vehicle
    hasBeginning: 2021-10-03T08:00:00-1:00
    hasEnd: 2021-10-03T17:00:00-1:00

    # Greg commits for Solawi the custody transferal of the car to beth
  - '@id': solawi:27f71945-5776-40c0-b7e2-d422bde92d6c
    '@type': Commitment
    action: transfer-custody
    provider: greg
    receiver: beth
    note: This should alert if receiver is not in custodians-cash, Greg can force this action
```

```
    hasBeginning: 2021-10-03T08:00:00-1:00
    hasEnd: 2021-10-03T17:00:00-1:00

    # Satisfaction of Beth' intent by Greg's commitment
  - '@id': solawi:cea02051-ab90-48a5-9b72-cf50b8806958
    '@type': Satisfaction
    satisfies: solawi:3e5e5675-4318-471c-bca2-69257a14eeda #Beth intends to use the car
    satisfiedby: solawi:27f71945-5776-40c0-b7e2-d422bde92d6c # Greg's commitment

    # Fulfillment of Solawi's commitment by Beth' usage of car
  - '@id': solawi:476e0b27-7885-493b-891c-902247f6270a
    '@type': Fulfillment
    fulfills: solawi:27f71945-5776-40c0-b7e2-d422bde92d6c # Greg's commitment
    fullfilledBy: solawi:8e837319-2f5b-4b69-9d45-155688bd5c21 # Beth' usage of car


  - '@id': solawi:8e837319-2f5b-4b69-9d45-155688bd5c21 # Beth' usage of car
    '@type': EconomicEvent
    action: transfer-custody
    provider: solawi
    receiver: beth
    note: This should alert if receiver is not in custodians-cash
    resourceInventoriedAs: solawi:d827dae2-2b95-4f4b-acaa-8642c0e40334 # Solawi's delivery vehicle
    hasBeginning: 2021-10-03T08:00:00-1:00
    hasEnd: 2021-10-03T17:00:00-1:00
```

B.11 Buy molasses

```
# Example:
# Anna buys some molasses:
# -   Anna orders molasses from molasses seller
# -   Molasses seller sends molasse and invoice
# -   Molasses is inventoried
# -   Molasses seller has claim for cash
# -   Anna transfers cash to molasses seller
# -   Molasses 'sellers claim for cash is settled

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - solawi: https://solawi.example/
  - anna: http://anna.example/
  - sugar-inc: http://sugar-inc.example

'@id': lab:solawi-buy-molasses.yaml
'@graph':
  - '@id': sugar-inc:dfd22628-e60b-4418-8647-fb0e569d4fe8 # order at sugar-inc
    '@type': Agreement
    note: Anna orders molasses from molasses seller

  - '@id': sugar-inc:5c87cb06-b8b0-4ea2-921d-891c4937df6d # Commitment to deliver molasses
    '@type': Commitment
    action: transfer
    provider: sugar-inc
    receiver: solawi
    resourceQuantity:
      om2:hasUnit: om2:liter
      om2:hasNumericalValue: 50
    clauseOf: sugar-inc:dfd22628-e60b-4418-8647-fb0e569d4fe8 # order at sugar-inc

  - '@id': solawi:b3533086-3921-4046-b640-4a722090a08d # Commitment to transfer cash
    '@type': Commitment
    action: transfer
    provider: solawi
    receiver: sugar-inc
    resourceQuantity:
      om2:hasUnit: om2:euro
      om2:hasNumericalValue: 150
    clauseOf: sugar-inc:dfd22628-e60b-4418-8647-fb0e569d4fe8 # order at sugar-inc

  - '@id': sugar-inc:652767ae-9439-45a0-a487-598f61d78664 # All molasses arrived?
    '@type': Fulfillment
```

```
    fulfills: sugar-inc:5c87cb06-b8b0-4ea2-921d-891c4937df6d # Commitment to deliver molasses
    fullfilledBy: sugar-inc:3d3bd57d-dab6-46e6-b20f-12a85379bb52 # Deliver molasses

  - '@id': solawi:3d3bd57d-dab6-46e6-b20f-12a85379bb52 # Deliver molasses
    '@type': EconomicEvent
    action: transfer
    provider: sugar-inc
    receiver: solawi
    note: Molasses is delivered and inventoried
    resourceQuantity:
      om2:hasUnit: om2:liter
      om2:hasNumericalValue: 50
    toResourceInventoriedAs: solawi:d6119f00-c5b4-4efb-9c3f-980f9767f2ba

  - '@id': solawi:d6119f00-c5b4-4efb-9c3f-980f9767f2ba # Solawi's molasses stock
    '@type': EconomicResource

  - '@id': sugar-inc:cf12a997-2a98-4795-bc35-9660c6bd8ab5 # Claim for cash
    '@type': Claim
    triggeredBy: sugar-inc:3d3bd57d-dab6-46e6-b20f-12a85379bb52 # Deliver molasses
    agreedIn: sugar-inc:dfd22628-e60b-4418-8647-fb0e569d4fe8 # order at sugar-inc
    note: This materializes with the invoice

  - '@id': solawi:975829cf-92bb-445a-89e8-79617f602b6d # transfer cash
    '@type': EconomicEvent
    action: transfer
    provider: anna
    receiver: sugar-inc
    note: Solawi pays invoice, Anna is in custody of the wallet
    resourceQuantity:
      om2:hasUnit: om2:euro
      om2:hasNumericalValue: 150

  - '@id': solawi:77f9f281-9ed7-4698-a6be-8a1bc334a2a4 # Claim is settled
    '@type': Settlement
    settles: sugar-inc:cf12a997-2a98-4795-bc35-9660c6bd8ab5 # Claim for cash
    settledBy: solawi:975829cf-92bb-445a-89e8-79617f602b6d # transfer cash

  - '@id': solawi:8f9959bb-d41c-43dc-af92-eb9c3d21d11d # Commitment is fulfilled
    '@type': Fulfillment
    fulfills: solawi:b3533086-3921-4046-b640-4a722090a08d # Commitment to transfer cash
    fulfilledBy: solawi:975829cf-92bb-445a-89e8-79617f602b6d # transfer cash
```

B.12 Pay Joe

```
# Example:
# Joe gets paid in June
#  - Anna transfers the agreed monthly sum
#  - Solawis commitments is fulfilled partly

# Working contract is imported from lab:solawi-agreeing-working-contract.yaml

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
    solawi: https://solawi.example/
    anna: http://anna.example/
    joe: http://joe.example

'@id': lab:solawi-pay-joe.yaml
'@graph':
  - '@id': solawi:f2c5cdcc-c69a-4e8d-ab49-7a292df62b57 # transfer cash
    '@type': EconomicEvent
    action: transfer
    provider: anna
    receiver: joe
    note: Joe gets paid, simplified without social insurance, Anna is in custody of the wallet
    resourceQuantity:
      om2:hasUnit: om2:euro
      om2:hasNumericalValue: 30*4*20

    # Settlement of Solawi's commitment to pay Joe
```

```
  - '@id': solawi:642929b1-ad4a-4cd5-aa9d-9ab23336b1a4
    '@type': Fulfillment
    resourceQuantity: 30*4*20*4 # 4 out of 12 months are paid
    fulfills: solawi:678a7262-7575-4a89-abad-c195df6bf0e1 # Commitment to pay joe
    fulfilledBy: solawi:f2c5cdcc-c69a-4e8d-ab49-7a292df62b57 # transfer cash
```

B.13 Harvest Potatoes

```
# Example:
# It was intended to distribute 1t of potatoes but 1.5t had been harvested.

# Conversion process importet from lab:solawi-conversion.yaml


'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - wd: https://www.wikidata.org/wiki/
  - solawi: https://solawi.example/
'@id': lab:solawi-potato-harvest.yaml
'@graph':
  - '@id': solawi:6fe33ebb-48ca-4ff4-a774-4e7e6d722c46 # potatoes are harvested
    '@type': EconomicEvent
    outputOf: solawi:b07942a7-7e5d-4885-a9ba-a0ecc533718b # potato process
    action: dropoff
    resourceClassifiedAs: wd:Q10998 # potato
    resourceQuantity:
      om2:hasUnit: om2:ton
      om2:hasNumericalValue: 1.5
    resourceInventoriedAs: solawi:c07f05f1-9b2b-4640-a91f-cbf51efad20a # potatoes in stock

  - '@id': solawi:c07f05f1-9b2b-4640-a91f-cbf51efad20a # potatoes in stock
    '@type': EconomicResource
    name: Potatoes
    state: fresh
    resourceQuantity:
      om2:hasUnit: om2:ton
      om2:hasNumericalValue: 1.5 # derived from event

  - '@id': solawi:6df33e5c-34ff-49de-8d1a-8007dd562bf1
    '@type': Fulfillment
    resourceQuantity:
      om2:hasUnit: om2:ton
      om2:hasNumericalValue: 1.5 # derived from event
    fulfills: solawi:22610a57-6b4c-4291-b70f-512b28875490 # commitment to potatoes
    fulfilledBy: solawi:6fe33ebb-48ca-4ff4-a774-4e7e6d722c46 # potatoes are harvested
```

B.14 Conversion

```
# Example: Super simple conversion process refinement

# Basic Commitment from lab:solawi-agreeing-complete.yaml to grow veggies is
# replaced with Commitments to grow potatoes and carrots

# Solawis commitment to dropoff harvest need to be refined, too.

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - solawi: https://solawi.example/
  - wd: https://www.wikidata.org/wiki/

'@id': lab:solawi-conversion.yaml
'@graph1': # This is removed
  - '@id': solawi:ade6fc9a-9fc8-45d7-b5ce-967368bba8f7 # solawi commitment for harvest

'@graph2': # This will be added
  - '@id': solawi:b07942a7-7e5d-4885-a9ba-a0ecc533718b # potato process
    '@type': Process
    name: Grow potatoes
    plannedWithin: solawi:0a2eb6e1-d07d-4fa2-94c6-d0c3ed531e0a
    inScopeOf:  solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion
```

```
  - '@id': solawi:4eb5a809-8d02-474f-a114-ae571e3461ef # carrot process
    '@type': Process
    name: Grow carrots
    plannedWithin: solawi:0a2eb6e1-d07d-4fa2-94c6-d0c3ed531e0a
    inScopeOf:  solawi:74fdcb2d-5cf7-4f26-966f-65c2fa354350 # conversion

    # commitment to potatoes
  - '@id': solawi:22610a57-6b4c-4291-b70f-512b28875490
    '@type': Commitment
    outputOf: solawi:b07942a7-7e5d-4885-a9ba-a0ecc533718b # potato process
    action: dropoff
    resourceClassifiedAs: wd:Q10998 # potato
    resourceQuantity:
      om2:hasUnit: om2:ton
      om2:hasNumericalValue: 1

    # Commitment to carrots
  - '@id': solawi:167d4e1c-9141-4133-9456-f6171917cd1b
    '@type': Commitment
    outputOf: solawi:4eb5a809-8d02-474f-a114-ae571e3461ef # carrot process
    action: dropoff
    resourceClassifiedAs: wd:Q81 # carrot
    resourceQuantity:
      om2:hasUnit: om2:ton
      om2:hasNumericalValue: .5


  - '@id': solawi:4e7e68ea-2a01-4e29-9103-748f1f28630b
    '@type': Satisfaction
    satisfies: solawi:e98a20bf-6d59-41d7-bce1-96d4ec50f295 # produce harvest
    # The commitment to harvest is replaced by this two:
    satisfiedBy:
      - solawi:22610a57-6b4c-4291-b70f-512b28875490 # commitment to potatoes
      - solawi:167d4e1c-9141-4133-9456-f6171917cd1b # commitment to carrots
    resourceClassifiedAs: wd:Q213753 # harvest
    resourceQuantity:
      om2:hasUnit: om2:each
      om2:hasNumericalValue: 1
```

B.15 Distribution

```
# Example:
# Simple distribution process
#   - harvest gets divided
#   - It gets delivered to three deposits

'@context':
  - https://git.io/vf-examples-jsonld-context
  - lab: https://lab.allmende.io/yova/bachelor/-/raw/master/model/process%20level/examples/
  - solawi: https://solawi.example/
  - wd: https://www.wikidata.org/wiki/

'@id': lab:solawi-distribution.yaml
'@graph':
  - '@id': solawi:f0633bdf-babb-4a25-a165-5e50c993c4d4 # consume harvest
    '@type': EconomicEvent
    action: consume
    inputOf: solawi:bc62445b-0977-44f3-ad30-fb14b0bc2fec # distribution
    resourceInventoriedAs: solawi:7f12e726-58b0-4188-8203-6b5b5e0db014 # produced harvest
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  - '@id': solawi:312dc13a-7955-4878-8f9a-d9d0e1614f76 # divide the harvest
    '@type': EconomicEvent
    action: dropoff
    outputOf: solawi:bc62445b-0977-44f3-ad30-fb14b0bc2fec # distribution
    resourceInventoriedAs: solawi:1d0339b2-b5ae-46b7-8b24-7d8d4f2af23b # divided harvest
    hasBeginning: 2021-03-01T08:00:00-1:00
    hasEnd: 2022-02-28T17:00:00-1:00

  - '@id': solawi:1d0339b2-b5ae-46b7-8b24-7d8d4f2af23b # divided harvest
    '@type': EconomicResource
    resourceQuantity:
```

```
    om2:hasUnit: om2:one
    om2:hasNumericalValue: 80

- '@id': solawi:15b1ce11-e496-491f-b6a2-c88a6e9cac55 # transfer ownership of harvest
  '@type': EconomicEvent
  action: move
  atLocation: Deposit 1
  resourceInventoriedAs: solawi:1d0339b2-b5ae-46b7-8b24-7d8d4f2af23b # divided harvest
  resourceQuantity:
    om2:hasUnit: om2:one
    om2:hasNumericalValue: 10
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:15b1ce11-e496-491f-b6a2-c88a6e9cac55 # transfer ownership of harvest
  '@type': EconomicEvent
  action: move
  atLocation: Deposit 2
  resourceInventoriedAs: solawi:1d0339b2-b5ae-46b7-8b24-7d8d4f2af23b # divided harvest
  resourceQuantity:
    om2:hasUnit: om2:one
    om2:hasNumericalValue: 10
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:15b1ce11-e496-491f-b6a2-c88a6e9cac55 # transfer ownership of harvest
  '@type': EconomicEvent
  action: move
  atLocation: Deposit 3
  resourceInventoriedAs: solawi:1d0339b2-b5ae-46b7-8b24-7d8d4f2af23b # divided harvest
  resourceQuantity:
    om2:hasUnit: om2:one
    om2:hasNumericalValue: 60
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:15b1ce11-e496-491f-b6a2-c88a6e9cac55 # transfer ownership of harvest
  '@type': EconomicEvent
  action: transfer
  resourceInventoriedAs: solawi:1d0339b2-b5ae-46b7-8b24-7d8d4f2af23b # divided harvest
  hasBeginning: 2021-03-01T08:00:00-1:00
  hasEnd: 2022-02-28T17:00:00-1:00

- '@id': solawi:441e47e3-55c9-49bb-8ef3-faa360730038
  '@type': Fulfillment
  fulfills: solawi:a5bb9907-ab08-4ce2-b94b-4bb4ded15158 # share of the harvest
  fulfilledBy: solawi:15b1ce11-e496-491f-b6a2-c88a6e9cac55 # transfer ownership of harvest
```