Czech Science Foundation – Part C Project Description

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Between Reciprocity and Reflexivity: The Case of Czech Reciprocal Constructions

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Reciprocity – generally understood as a complex of forms and patterns of mutuality, exchange and symmetry – represents a substantial factor determining human behavior. It is believed to lie at the very root of social organization and ethics and as such its study is prominent for many research domains, (König, 2011). Even within a single research field such as linguistics, reciprocity is relevant to a wide range of subdisciplines: lexical semantics, word formation, morphology, (both deep and surface) syntax as well as discourse and pragmatics. Recently, cross-linguistic manifestations of reciprocity have attracted much attention within language typology (Nedjalkov, 2007b; König and Gast, 2008; Evans et al., 2011).

From the linguistic point of view, reciprocity can be characterized by the fact that two (or sporadically more) participants of the situation denoted in the sentence enter into symmetry. Reciprocal structures thus portray complex events which are characterized as involving two propositions projected onto a single clause (Evans et al., 2007). These complex events are manifested by plural meaning of participants, their symmetrical relation and double or even multiple mapping of participants onto morphosyntax.

Reciprocity represents a productive process applicable to verbs allowing for mutual actions. As such, reciprocity is, on the one hand, lexically conditioned, and thus its applicability must be indicated for each relevant lexical unit in the lexicon. On the other hand, reciprocity is associated with lexical and morphosyntactic changes which are regular enough to be captured by rules. As a result, reciprocity should be treated in the grammar as well.

For example, in the reciprocal sentence *Martin a Ida se potkali v divadle.* 'Martin and Ida met in the theater.', the two participants *Martin* and *Ida* are put into symmetry; at the same time, both these participants are mapped onto two valency complementations: 'Actor' and 'Patient'. 'Actor', expressed by the coordination (*Martin a Ida* 'Martin and Ida'), occupies the subject position. Further, reciprocity is encoded here by the reflexive *se* (the status of the reflexive is still under discussion due to its high ambiguity, see below). As a result, this reciprocal construction can be interpreted as involving two propositions: *Martin potkal Idu v divadle a zároveň Ida potkala Martina v divadle.* 'Martin met Ida in the theater and at the same time Ida met Martin in the theater.'

Despite its large variability, reciprocity belongs to one of understudied language phenomena in the Czech linguistics. This project thus aims at providing a comprehensive theoretical account of Czech reciprocal constructions, advancing the knowledge of this complex phenomenon.

1   State of the Art

Reciprocity represents an operation where two or more participants involved in the situation denoted by a verb enter into symmetry. The following properties are generally acknowledged as essential for reciprocity, see esp. (Dalrymple et al., 1998; König, 2011):

(i) *plurality* of participants involved in the reciprocal relation;

(ii) *double or multiple mapping of participants* onto valency complementations;

(iii) *symmetry* expressed by the predicate;

(iv) *a joint action* or *a plurality of events*, depending on the lexical meaning of the predicate and on the strategy chosen.

One of the principal issues in the description of reciprocity stems from the fact that reciprocal structures are not associated with a uniform semantic interpretation. For example, the reciprocal structures *Larry, Monty and Garfield know each other.* and *Larry, Monty and Garfield are following each other into the room.* differ in their interpretation: while in the former structure, each participant of the situation knows the other two participants, in the later one, the arrangement of

the participants is linear. A detailed formal logical representation of a wide range of interpretations within reciprocal structures is given, e.g., in (Dalrymple et al., 1998).

So far the primary interest of linguists has been devoted especially to the variety of expressive means used to encode reciprocity both in individual languages and across different languages. Recently, a large collective monograph on reciprocals has been published (Nedjalkov, 2007b); it combines in-depth studies on reciprocals in three hundred world languages with typological surveys (Nedjalkov, 2007a; Haspelmath, 2007). See as well (König and Gast, 2008) and (Evans et al., 2011).

The study of reciprocity in different languages gives evidence that there is an affinity between the reciprocal meaning on the one hand and the reflexive, sociative, or iterative meaning on the other. As a result, language means marking reciprocity are highly polysemous. In many European languages, reciprocal marking is attested to be historically related to the domain of reflexivity (Maslova, 2008). As a consequence, the means encoding reciprocity are often formally identical with those that express reflexivity.

While the study of reflexivity has a long-standing history in syntax, reciprocity has not received much attention from the syntactic point of view. For instance, in the transformational generative grammar, reflexivity has been intensively studied under the Governing and Binding Theory, see esp. (Reinhart and Reuland, 1993; Reinhart and Siloni, 2005), for Czech reflexives (Medová, 2009). Reciprocity has been, however, rather exempt from this investigation. This gap has been partly filled by works on reciprocity written by Dalrymple et al. (1998), Reuland (2008) and Siloni (2008, 2012).

In dependency-oriented syntactic theories, reciprocity has not been extensively addressed either. A primary role in the description of reciprocity is played here by the concept of valency; reciprocity, as one of the language phenomena changing the valency structure of verbs, is usually treated as a rather peripheral type of diatheses, see esp. (Mel'čuk, 1988; Chrakovskij, 1981). Although diatheses (usually characterized as relations between different surface manifestations of the same deep structure of a verb) have received much attention in dependency frameworks, reciprocity still remains an understudied phenomenon here.

The studies on reciprocity in Czech are relatively limited both in their number and in their scope, see esp. (Daneš et al., 1987; Růžička, 1995; Karlík et al., 2016). This language phenomenon has been mostly elaborated within the Functional Generative Description (Panevová, 1999, 2007; Panevová and Mikulová, 2007; Panevová et al., 2014) where it has been characterized as a syntactic process whose treatment is relevant to both grammar and lexicon. On the one hand, it represents a productive grammatical process – as such, it should be described within the grammar. On the other, it is also lexically conditioned – only verbs the lexical meaning of which allow for mutual action create reciprocal structures (e.g., *Martin a Ida se hádali.* 'Martin and Ida argued.' vs. **Martin a Ida se absolvovali.* *'Martin and Ida have undergone each other.'). Reciprocity must be thus indicated for each lexical unit in the lexicon as well.

Within FGD, the first attempts to formulate rules describing morphosyntactic changes brought about by reciprocity have been made by Skoumalová (2001), Urešová (2011) and Kettnerová et al. (2012b). Recently, formal rules for two types of reciprocity have been elaborated in some detail: (i) the rules for reciprocity involving the ACT and ADDR valency complementations, which represents a prototypical case of reciprocity involving the subject position, and (ii) the rules for reciprocity involving the PAT and EFF valency complementations, i.e., reciprocity within the object position (Lopatková and Kettnerová, 2016; Lopatková et al., 2016). Though formulated on the basis of a small number of Czech verbs, these studies form a solid basis for further research.

Reciprocity in Language Resources. Being mostly treated as a productive grammatical process the description of which entirely relies on the grammar alone, an explicit representation of reciprocity is still missing in most contemporary lexical resources.

For example, despite being based on Levin's classification of verbs within which reciprocity of English verbs is described in detail (Levin, 1993), *VerbNet*[1] does not explicitly distinguish between

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[1]http://verbs.colorado.edu/verb-index/vn/reference.php

reciprocal structures and unreciprocal ones. *PropBank*,[2] another important lexical resource for English, does not explicitly describe reciprocity either.

As an exception, *FrameNet*[3] introduces the information on reciprocity in the form of the non-lexical semantic frame 'Reciprocality'. However, a systematic way for deriving reciprocal structures is not provided here.

The situation is different for Czech as the Functional Generative Description (see above), which serves as the theoretical background of several lexical resources, postulates the necessity to capture the information on reciprocity in the lexicon. Although reciprocity is not explicitly marked in PDT-Vallex (Urešová, 2011),[4] the lexicon associated with the Prague Dependency Treebank,[5] it can be (at least to some extent) extracted from the treebank data. The Valency lexicon of Czech Verbs VALLEX (Lopatková et al., 2016),[6] represents the first (still very tentative) attempt to explicitly capture reciprocity within the lexicon: roughly 2 thousand verbal lexical units were preliminarily marked as candidates for reciprocity (Lopatková and Kettnerová, 2016). However, the information on reciprocity captured in VALLEX has been neither tested with respect to data consistency and adequacy, nor verified with respect to corpus data yet.

2   Project Description: Goals, Conceptual and Methodological Principles, Main Research Tasks and Outputs

2.1   Goals of the Project, Its Impact and Topicality

As was briefly sketched above, reciprocity, despite its wide range, belongs to understudied language phenomena in Czech linguistics. The **goals of the proposed project** are thus threefold:

(i) It aims at *deepening the theoretical insight into the linguistic description of reciprocity*; our goal is to provide a comprehensive theoretical account of reciprocity, advancing knowledge of this complex phenomenon in Czech. Special attention will be paid especially to the relation between reciprocity and reflexivity.

(ii) The findings of theoretical research will be used as a basis for developing *a formal model of the representation of reciprocity in both lexicon and grammar* aiming at its economic and theoretically well-founded description.

(iii) The proposed model will be used in the *syntactic and lexicographic description of reciprocity of Czech verbs within a lexicon*, namely the Valency lexicon of Czech verbs VALLEX. We are convinced that the description of a large amount of language data substantially contributes to refining the proposed representation as well as to verifying the results of the theoretical findings. The lexicon, substantially qualitatively and quantitatively enhanced, will be released as a publicly available electronic language resource, which will form a solid basis for further theoretical research and its possible integration into Natural Language Processing (NLP) tasks.

Impact and Topicality of the Project. As has been discussed above, so far the main focus of most linguists studying reciprocity has laid on the description and comparison of the language means encoding reciprocity. As a result, ample literature is devoted to the expression of reciprocity in various languages. However, reciprocity *has not received much attention in syntax*, although it constitutes a highly productive syntactic process. A comprehensive systematic theoretical account of reciprocity, as a syntactic operation, is thus still missing.

The urgency of such account is given by the fact that reciprocity brings about specific changes in surface syntactic expressions of the participants involved in symmetry. As such, reciprocity (be-

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[2] http://propbank.github.io/
[3] http://framenet2.icsi.berkeley.edu
[4] http://lindat.mff.cuni.cz/services/PDT-Vallex/
[5] http://ufal.mff.cuni.cz/prague-dependency-treebank
[6] http://ufal.mff.cuni.cz/vallex

sides, e.g., passive diathesis) represents one of substantial sources of differences in surface syntactic structures.

This project thus attempts to fill this theoretical gap with the aim to design *a formal model* allowing for *derivation of reciprocal structures of Czech verbs*. A language description based on a formally defined framework has many advantages, esp. the possibility to check the inner consistency and (relative) completeness of the proposed model as well as the possibility of comparison with other models or with pure descriptive approaches.

The topic of the proposed project is highly relevant with respect to the current linguistic research: at present, language phenomena at the lexicon-grammar interface – i.e., those phenomena that despite being regular enough to be treated in the grammar, are still lexically conditioned – have attracted much attention of the international linguistic community. Although reciprocity belongs to such phenomena, it has not been focused so far.

The proposed formal mechanism will be applied in the lexicographic representation of reciprocity of Czech verbs. The application of theoretical results to a large amount of language data, which allows for their verifying and possible further refining, is the backbone of the current linguistics.

2.2 Conceptual and Methodological Principles

As discussed above, the description of reciprocity is relevant for both lexicon and grammar. It leads us to make use of the time-tested division of the language description between a lexical and a grammar component, as it was proposed in the VALLEX lexicon and implemented for grammaticalized and lexicalized alternations (Kettnerová et al., 2012a; Lopatková et al., 2016).[7] An economic and linguistically well-informed description of complex language processes has proved to highly benefit from a close cooperation between grammatical rules and a valency lexicon.

The theoretical background of our research is constituted the Functional Generative Description (FGD) – a stratificational dependency-oriented approach, see esp. (Sgall et al., 1986). Our representation of reciprocity is anchored in the valency theory, one of the pillars of FGD, see esp. (Panevová, 1994), and benefits from the available studies, esp. (Panevová, 1999, 2007; Panevová and Mikulová, 2007; Kettnerová et al., 2012a; Kettnerová and Lopatková, 2014; Lopatková and Kettnerová, 2016).

The following **methodological approaches** will be adopted within the project implementation:
(i) As a starting point of the theoretical research on reciprocity, available linguistic literature on this phenomenon will be studied in depth. This inquiry will be combined with the traditional method of collecting linguistic evidence, using advanced tools for corpora searching.
(ii) Based on the language evidence, a formal model for reciprocity will be formulated, verified and refined – the model should cover semantic, deep and surface syntactic aspects of reciprocity, separately as well as in their interplay. Our research, following the tradition of FGD, will define and employ testable criteria, with an emphasis on adequacy and economy of the language description.
(iii) An application of the theoretical findings to a large amount of data is a key requirement allowing for their verifying and possible further refining as well as for revealing possible inadequate postulates that deserve more thorough explanation.
(iv) When creating language resources, a thorough testing and evaluation of data consistency as well as an inter-annotator agreement belong to standard requirements in the NLP community – the annotated data will be thus manually and semi-automatically evaluated with respect to their consistency and adequacy.

2.3 Research Tasks

The main goal of the proposed project is to deepen the theoretical description of reciprocity in Czech and to develop an adequate framework for its description; such a framework will be applied in lexicographic processing of language data as well as in formulating formal grammatical rules

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[7]VALLEX, version 3.0 was prepared and publicly released in 2015 within the project GA P406-12-0557.

describing productive aspects of reciprocity. The following eight areas will be addressed in the project.

Task 1. Czech Reciprocal Verbs with respect to the Lexicon and the Grammar. Two main types of reciprocals have been distinguished (Nedjalkov, 2007a): grammatical (or derived) and lexical reciprocals. In line with this categorization, Czech verbs allowing for reciprocity have been subcategorized into three types (Panevová, 2007): *Inherent reciprocal verbs* are intransitive verbs bearing the semantic feature of reciprocity in their lexical meaning (e.g., *bojovat* 'to fight', *setkat se* 'to meet'). *Derived reciprocal verbs* are derived from their unreciprocal transitive counterparts by means of the reflexives *se/si*; as a result, their lexical meaning gains the reciprocity feature (e.g., *potkat → potkat se* 'to meet', *vyprávět → vyprávět si* 'to tell'). *Lexically non-reciprocal verb* are verbs the lexical meaning of which does not imply reciprocity; however, they allow their participants to stand in symmetry (e.g., *bít* 'to beat', *pomoci* 'to help').

In this task, both lexicographic and grammatical aspects of reciprocity will be addressed with respect to the above discussed types of Czech verbs allowing for reciprocity. The representation of different categories of Czech reciprocal verbs will be proposed. In designing this representation, the main emphasis will be laid on the theoretical adequacy and at the same time economy of the description.

Task 2. Between Reciprocity and Reflexivity. In Czech, similarly as in other European languages (Maslova, 2008), grammatical markers of reciprocity are the clitic reflexives *se/si* and the strong forms of reflexives *sebe/sobě/sebou*. However, due to their ambiguous character (Karlík et al., 2016) – the Czech reflexives encode also reflexivization as a derivational process (e.g., *rozčílit* 'make angry' → *rozčílit se* 'get angry'), syntactic reflexivity (e.g., *Martin se myje. (= Martin myje sám sebe.)* 'Martin washes himself.'), and deagentive diathesis (only the clitic form *se*) as well (e.g., *Škola se staví.* 'A school is being built.') – verbs allowing for reciprocity and one (or more) of the given phenomena often form ambiguous constructions. Criteria for their distinguishing thus should be established. Especially, the distinction between reciprocal and reflexive structures is of a high relevance; e.g., the sentence *Jan a jeho manželka o sobě soudci lhali.* can be interpreted either as reciprocal ('John and his wife lied to the judge about each other.'), or as reflexive ('John and his wife lied to the judge about themselves.'); its ambiguity can be eliminated by the presence of some of lexical markers of reciprocity (e.g., *vzájemně* 'each other').

In the proposed project, the questions related to a possible combination of reciprocity and syntactic reflexivity within a single sentence as well as a choice of possible disambiguating lexical markers will be thus addressed.

Task 3. Deep Syntactic Aspects of Reciprocity. Reciprocity in Czech – similarly as diatheses – represents a language phenomenon which results in different surface syntactic structures of the same lexical unit of a verb while preserving its deep syntactic structure, i.e., the number, type and obligatoriness of valency complementations of a verb is the same in unreciprocal and reciprocal structures. However, although the deep syntactic structure of verbs in reciprocal structures remains unchanged, reciprocal structures are characterized by double or even multiple mapping of participants of verbs onto valency complementations.

In this task, the description of the complex mapping between situational participants and valency complementations in Czech reciprocal constructions, including their coreferential relations, thus will be addressed and the lexicographic representation of this mapping will be proposed.

Task 4. Surface Syntactic Aspects of Reciprocity. The description of changes in the surface expression of valency complementations involved in reciprocity represents another substantial task covered in the project. The hypothesis that (as in case of diatheses) these changes are regular enough to be described by formal syntactic rules will be verified. In the formulation of these rules, esp. the role of the complex mapping of participants onto valency complementations in the surface syntactic structure formation of Czech reciprocal constructions will be addressed, namely, (i) the

plural meaning of valency complementations (including collectives, e.g., *třída se rozhádala* 'the class fell out' (= they fell out with each other)), (ii) the reflexive pronoun[8] and possible haplology of the clitic reflexives; (iii) the possible surface ellipsis of the valency complementations involved in reciprocity; (iv) consequences to the expression of other valency complementations, see e.g. the change of the morphemic form of EFF from the accusative into the nominative in the following example *Martin hodnotil Daniela jako skvělého herce*$_{EFF-acc}$. 'Martin assessed Daniel as an excellent actor.' – *Martin a Daniel se (vzájemně) hodnotili jako skvělí herci*$_{EFF-nom}$. 'Martin and Daniel assessed each other as excellent actors.'.

Task 5. Syntactic Structures with Reciprocal Nouns. There is a limited number of studies focused on reciprocity of Czech verbs and even a much smaller number of studies devoted to reciprocity of other parts-of-speech. However, the study of reciprocal nouns is highly relevant as well. One of the tasks of the proposed project thus represents the description of reciprocity of nouns, esp. of those derived from verbs. This task will include the following issues: (i) systemic differences between reciprocal nouns and their respective base verbs in encoding reciprocity (e.g., *Babiš jedná s Ježkem.* 'Babiš is holding talks with Ježek.' – *Babiš a Ježek spolu jednají.* 'Babiš and Ježek are holding talks.' vs. *jednání Babiše s Ježkem* 'talks of Babiš with Ježek' – *jednání Babiše a Ježka* 'talks of Babiš and Ježek' – *jednání mezi Babišem a Ježkem* 'talks between Babiš and Ježek'); (ii) deep syntactic aspects of plurality of participants and their double and multiple mapping onto valency complementations with reciprocal nouns; (iii) surface syntactic expression of the participants involved in reciprocity with nouns, esp. with respect to specific shifts in their morphemic forms (Kolářová, 2014) (e.g., *důvěra rodičů k učitelům* 'the trust of parents in teachers' vs. *důvěra mezi rodiči a učiteli* 'the trust between parents and teachers' and *důvěra mezi partnery* 'the trust between partners'); (iii) the role of the reflexive pronoun in encoding reciprocity with nouns (e.g., *Martinovo podezření vůči Danielovi* 'Martin's suspicion of Daniel' vs. *?Martinovo a Danielovo podezření vůči sobě* 'Martin's and Daniel's suspicion of each other'); (iv) the role of lexical markers of reciprocity with nouns (e.g., *vzájemné napadení Martina a Pavla* 'mutual attack of Martin and Daniel').

Task 6. Reciprocity and Diatheses. Czech allows for combining reciprocity with diatheses (Panevová, 2007, 2013), as can be illustrated by the example *O tom se mezi námi dvěma nikdy nemluvilo.* 'We have never talked about it.', which results from the interaction between reciprocity of ACT and ADDR of the verb *mluvit* 'talk' and the deagentive diathesis. The combination of reciprocity of PAT and EFF involving the direct object position with resultative diathesis can be illustrated, e.g., by the sentence *Když máme smíchány všechny suroviny dohromady, …* 'When we have mixed all ingredients, …' .

An interplay between reciprocity and diatheses has not been explored yet. The interactions between reciprocity and different types of diatheses thus represent another important task of the proposed project. In this task, the following issues will be addressed: (i) possible combinations of reciprocity with different types of diatheses; (ii) specific changes in surface syntactic expression of reciprocalized participants esp. with respect to different types of diatheses; (iii) specific changes in morphemic forms of reciprocalized participants in different types of marked structures of diatheses.

Task 7. Reciprocity within Complex Predicates with Light Verbs. The syntactic structure formation of complex predicates with light verbs represents a complex process. In light verb constructions, reciprocity, being licensed by the predicative noun, can be expressed as well, representing another source of changes in surface structure of verbs. In fact, the study of these phenomena partly fall into the previous Task 5 and Task 6; however, due to the complexity of light verb constructions, their examination deserves a specific treatment.

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[8]FGD, following (Komárek et al., 1986), interprets the reflexive clitics *se/si* in reciprocal constructions as positional variants of the strong forms of the reflexive pronoun *sebe/sobě* (e.g., *Martin a Ida se potkali v divadle.* 'Martin and Ida met each other in the theater.' vs. *Sebe Martin a Ida v divadle potkali (ale maminku už ne).* 'Martin and Ida met each other in the theater (but not their mum).'), see esp. (Panevová, 2001) (contrary to, e.g., Karlík, 2000; Oliva, 2001 or Siloni, 2012).

Whereas the VALLEX lexicon will cover frequent complex predicates with light verbs in its version 3.1,[9] their specific behavior in reciprocal structures has not been focused so far. It thus will be included in the proposed project, esp. with respect to the following issues: (i) employing reciprocalized participants of nouns in the surface structure of light verb constructions (e.g., in the light verbs construction *Rusko a Československo navázalo oficiální styky v roce 1922.* 'Russia and Czechoslovakia made official relations in 1922.', the reciprocalized participants are expressed on the surface as the verbal ACT, not as nominal one); (ii) the expression of reciprocalized participants in light verb structures marked with diatheses, esp. in passive light verb structures (e.g., in the example *Dosud nebyla uzavřena dohoda válčících stran.* 'An agreement of warring parties has not been made yet.', the reciprocalized participants are expressed on the surface as the nominal ACT, not as verbal one); (iii) changes in morphemic forms of the participants involved in reciprocity characteristic of light verb structures.

Task 8. Reciprocity in VALLEX. As stated above, preliminary rules for two types of reciprocity were proposed within the *grammar component of the VALLEX lexicon.* However, these rules were formulated on the basis of a small number of Czech verbs, their consistency and completeness were not tested with respect to corpus data. The theoretical outputs of the proposed project thus form an excellent basis for enhancing the grammar component with rules covering all core types of reciprocity of Czech verbs.

Moreover, the inventory of lexical units allowing for individual types of reciprocal constructions will be refined and indicated in the *data component of the VALLEX lexicon*; special attention will be paid to massive semiautomatic consistency checking.

As the part of the VALLEX lexicon comprising Czech nouns is under construction, we take advantage of this annotation and encode the possibility to create reciprocal constructions also with lexical units of nouns.

The VALLEX lexicon enhanced with the information on reciprocity in the data component and with a system of rules for deriving reciprocal constructions in the grammar component will be publicly released as an on-line lexicon.
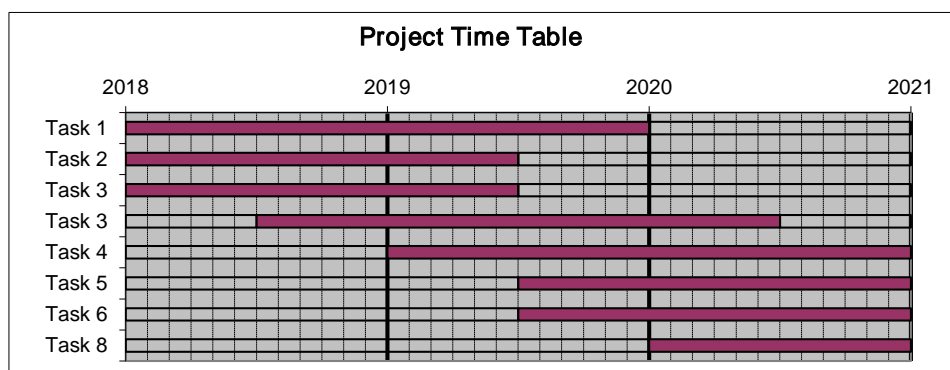
2.4 Expected Outputs

Theoretical and methodological results of the project will be published in journals dedicated to Czech and other Slavic languages (1 article of category Jneimp and 2 articles of category Jrec (or higher) are estimated as minimal project outputs). In addition, these results will be presented at international and Czech conferences focused on both theoretical and computational linguistics (especially at those with proceedings monitored in the WoS and/or Scopus databases (category D) and those with contributions published in thematic anthologies or as chapters of monographs (category C); 4 outputs of these categories are estimated).

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[9]VALLEX 3.1, currently being prepared for public release in 2017 within the project GA 15-09979S of the Czech Science Foundation, provides their representation both in the data component and in the rule component.

year	plan of publication activity
2018	1 conference article prepared and published
	1 journal article under preparation (expected submission: early 2019)
2019	2 conference articles prepared and published
	1 journal article under preparation (expected submission: mid 2019)
	1 journal article under preparation (expected submission: early 2020)
2020	1 conference article prepared and published
	data preparation for public release

The main applied output of the project is both a qualitatively and quantitatively enhanced valency lexicon of Czech verbs – the lexicon will provide explicit description of reciprocity in the data component as well as in the grammar component in the form of formal grammatical rules. An emphasis will be laid on both human and machine-readability; thus both linguists and developers of applications within the NLP domain can make use of this lexical resource. The lexicon will be published as an on-line freely available lexicon (software, category R).

3 Research Team and Preparedness of the Institution

The applicant and her co-workers employ their long term experience with formal description of the Czech language. Semantic and syntactic properties of Czech verbs (including a preparatory study of reciprocity) belong to their core research interests and this is also reflected in an ample list of publications; they also have extensive experience with lexicographic description of valency. These activities clearly prove their interest and preparedness for the tasks involved in the proposed project.

The applicant **doc. RNDr. Markéta Lopatková, Ph.D.** is one of the main authors of the concept of the valency lexicon VALLEX. She will coordinate the project and she will participate in all the research areas described in Section 2.3. In particular, she will be responsible for the close interplay between theoretical research and its application in the lexicon, and she will participate in the annotation process as well (involvement: 20% FTE).

Prof. PhDr. Jarmila Panevová, DrSc. is specializing in the contemporary Czech grammar, esp. syntax. Within the project, she will focus primarily on the syntactico-semantic classification of reciprocal verbs. She will also guarantee the adequacy of the proposed theoretical solution (involvement: 10% FTE).

Mgr. Václava Kettnerová, Ph.D., a senior researcher with master degree in Czech studies and PhD degree in computational linguistics, will be responsible for the theoretical research and the formal model of lexicographic representation of reciprocity, she will also conduct the annotation process (involvement: 40% FTE).

RNDr. Eduard Bejček, Ph.D., a senior researcher with master degree in computer science and PhD degree in computational linguistics, will be responsible for the development of the formal model as well as for its implementation, and for the design and implementation of automatic and semiautomatic data processing (involvement: 20% FTE).

The research team also contains one PhD student of computational linguistics **Mgr. Anna Vernerová** (master degrees in logic and mathematics); she will be responsible primarily for the design and implementation of suitable data formats and partially will also participate in the design and implementation of automatic data processing (involvement: 20% FTE).

The members of the research team have already shown their competence in linguistic research, in theoretical as well as technological tasks related to the lexicographically oriented projects. They also proved their ability to fruitfully cooperate within grant projects, including research projects funded by the Czech Science foundation, esp. projects GA P406/12/0557 (years 2012-15) and GA 15-09979S (years 2015-17).

The project will be carried out at the *Institute of Formal and Applied Linguistics*, Faculty of Mathematics and Physics. The Institute is well equipped with both hardware and software. The project will profit from the availability of a computer network, printers, copying machines etc. No additional technical facilities are necessary for successful project implementation.

Foreign Cooperation. The Institute of Formal and Applied Linguistics, as an active partner in a number of international projects, has established a close cooperation with tens of research institutes, and the project research team highly profits from this international scope.

The team also profits from a long-term cooperation with prof. Patrice Pognan from INALCO (Institut National des Langues et Civilisations Orientales), France. A close and fruitful cooperation with Slovak linguists, esp. with Martina Ivanová (associate professors at the University of Prešov in Prešov), has been established as well.

The proposed project will also make use of the CLARIN European research infrastructure (its national node, *LINDAT/CLARIN Centre for Language Research Infrastructure*, is hosted by the home institute). This infrastructure provides technical background and assistance with sharing, creating and modernizing tools and data in linguistics or related research fields, as well as an open digital repository and archive open to all academics.

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