

Legal Design through AI in banking contracts

Legal Design attraverso l'intelligenza artificiale nei contratti bancari

[LUCILLA GATT](#) 

Full Professor of Private Law, ReCEPL Director
University of Naples Suor Orsola Benincasa

[ILARIA AMELIA CAGGIANO](#) 

Full Professor of Private Law, ReCEPL Vice-Director
University of Naples Suor Orsola Benincasa

[MARIA CRISTINA GAETA](#) 

Ph.D., Lecturer in Private Law, ReCEPL Scientific Secretary
University of Naples Suor Orsola Benincasa

[LIVIA AULINO](#) 

Post-Doc, Research Fellow in Private Law, ReCEPL Senior Researcher
L'Orientale University of Naples

[EMILIANO TROISI](#) 

Post-Doc, Research Fellow in Private Law, ReCEPL Senior Researcher
University of Naples Suor Orsola Benincasa

[LUIGI IZZO](#) 

Ph.D. (c) in Private Law, ReCEPL Junior Researcher
University of Naples Suor Orsola Benincasa

[ALESSANDRA FABROCINI](#) 

Ph.D. (c) in Earth Observation, ReCEPL Junior Researcher
Sapienza University of Rome – Vanvitelli University of Campania

DANIELE MARINO

Financial Service Consultant
VISA

[CHRISTIANCARMINE ESPOSITO](#) 

Associate Professor of Computer Science
University of Salerno

* The paper is the result of the work of a selected team of researchers of the Research Centre in European Private Law (ReCEPL), coordinated by the ReCEPL Director Prof. Lucilla Gatt and ReCEPL Vicedirector Prtof.ssa Ilaria A. Caggiano. The work was presented at the IEEE International Conference 'Metrology for eXtended Reality, Artificial Intelligence, and Neural Engineering' (MetroXRINE), St Albans, London, October 21-23, 2024, and published in the IEEE MetroXRINE 2024 Proceedings, 1236 – 1241.

Abstract

Consumer protection in banking is a particularly relevant issue, especially in light of the increasing complexity of banking transactions and the related legal reference cases. For this reason, the adoption of pre-contractual disclosures and contractual texts as complete as possible has been mandated to enable the consumer to be fully aware of the characteristics of the contractual relationship. This has led to the creation of contracts that are particularly detailed and full of content, with graphics designed to reduce the size of the relevant documents but inadequate to allow an understanding of these documents. It is therefore necessary to change the paradigm in the drafting of contractual texts and pre-contractual disclosures through the adoption of legal design methodologies. In particular, added value could be provided by adopting AI and metrology techniques for measuring the level of clarity of contractual texts and subsequently creating a more user-friendly version of these.

La tutela del consumatore in ambito bancario è un tema particolarmente rilevante, soprattutto alla luce della crescente complessità delle transazioni bancarie e delle relative casistiche giuridiche di riferimento. Per questo motivo, è stata imposta l'adozione di informative precontrattuali e di testi contrattuali il più possibile completi, per consentire al consumatore di avere piena consapevolezza delle caratteristiche del rapporto contrattuale. Questo ha portato alla creazione di contratti particolarmente dettagliati e ricchi di contenuti, con una grafica pensata per ridurre le dimensioni dei relativi documenti, ma inadeguata a consentirne la comprensione. È quindi necessario cambiare il paradigma nella redazione dei testi contrattuali e delle informative precontrattuali attraverso l'adozione di metodologie di legal design. In particolare, un valore aggiunto potrebbe essere fornito dall'adozione di tecniche di IA e di metrologia per misurare il livello di chiarezza dei testi contrattuali e successivamente creare una versione più facile da usare di questi testi.

Keywords: Legal Design; AI Act; regulatory perspectives; legal-ethical compliance by design; metrics; banking activities; contracts

Summary: [1. Introduction and background of the research.](#) – [2. Methodology and background.](#) – [3. Objectives.](#) – [4. Technical analysis of contract readability.](#) – [5. Model creation and training.](#)

1. Introduction and background of the research.*

The complexity of contracts causes a high cognitive load for the user and

* The paper is the result of the work of a selected team of researchers of the Research Centre of European Private Law (ReCEPL) coordinated by the ReCEPL Director Prof. Lucilla Gatt and ReCEPL Vicedirector Prof.ssa Ilaria Amelia Caggiano.

The work was presented at the IEEE International Conference 'MetroXraïne', held in St Albans, London, 21-23 October 2024, and published in 2024 IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence and Neural Engineering (MetroXRAINE), 1236-1241.

reduces their ability to comprehend their texts. The use of complex language and intricate structures is not only unnecessary but also a source of risks for the actors involved in legal relations.¹

Even though the principles of transparency, clarity and conciseness of legal texts are fundamental in European Law and National legal systems, and in the field of consumer law, banking law,² and personal data protection,³ the current level of comprehensibility of contracts between professionals and consumers remains low, while litigation on the subject is high.⁴

Among the instruments that can contribute to the simplification of contractual texts there is Legal Design, an interdisciplinary approach, which applies human-centred design to the world of law and promotes the usability and comprehensibility of legal texts, and contracts, thus enforcing transparency in B2C activities.⁵

Legal design⁶ is a discipline that aims to achieve the correct and efficacious drafting and visualisation of a legal content,⁷ to favour:

- communication and comprehension using textual, para-textual and contextual elements,⁸
- the visualisation of information (so-called Information Visualisation),⁹ carefully evaluated according to the methodologies proper to the subject matter.

The principles of transparency and clarity represent the foundations of an understandable text, textual elements appear crucial for the correct representation of complex legal concepts that can then be further made usable through images.¹⁰

¹ S Passera, *Visualization in commercial contracts, Clearer Legal Information* (Aalto University and Mind Space, 2014).

² A Barengi, 'Appunti sulla trasparenza bancaria, venticinque anni dopo', [2017] *Questione Giustizia*; AA Dolmetta, *Trasparenza dei prodotti bancari. Regole* (Zanichelli, 2014) 88 ff.

³ A Davola, *Algoritmi decisionali e trasparenza bancaria* (Utet, 2020).

⁴ L Gatt, R Montanari and IA Caggiano, 'Consenso al trattamento dei dati personali e analisi giuridico-comportamentale. Spunti di riflessione sull'effettività della tutela dei dati personali', [2017] *Politica del diritto*, 339 ff.

⁵ IA Caggiano, 'Misurare la trasparenza: l'interpretazione del contratto alla prova delle nuove tecnologie', in E Corbi, TE Frosini, P Villani (eds.) *Parhesis in Dialogo tra saperi, Studi per Lucio d'Alessandro*, vol. I (Editoriale scientifica, 2024), 377-387.

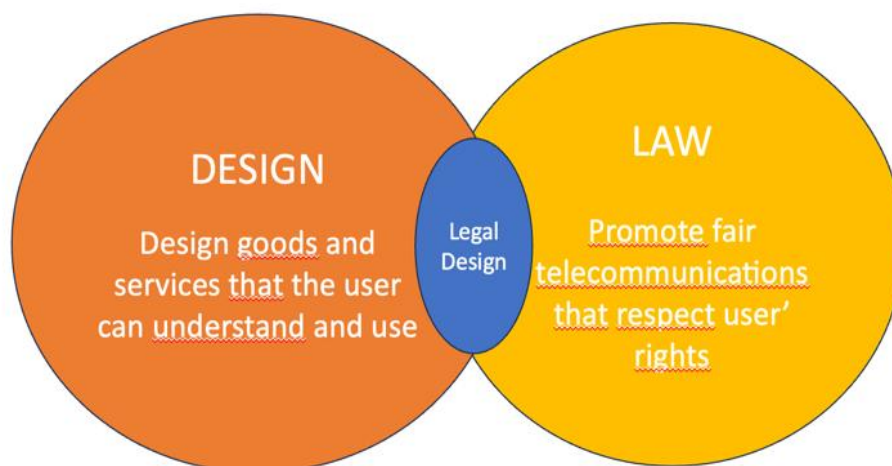
⁶ M Hagan, 'Law by Design', in <www.lawbydesign.co/en/home>, Retrieved March 2018.

⁷ TD Barton, H Haapio, S Passera, *Innovating Contract Practices: Merging Contract, Design with Information Design* (University of Vaasa, 2013).

⁸ A Santosuosso, 'Legal design, il diritto attraverso le immagini: cos'è e le abilità richieste', in <<https://www.agendadigitale.eu/documenti/legal-design-il-diritto-attraverso-le-immagini/>>, 2021.

⁹ G Berger-Walliser, TD Barton, H Haapio, 'From Visualization to Legal Design: A Collaborative and Creative Process' (2017) 54(2) *American Business Law Journal*, 347-392.

¹⁰ S Passera, H Haapio, M Curtotti, 'Making the Meaning of Contracts Visible – Automating Contract Visualization', in Erich Schweighofer et al. (eds.) *Transparency. Proceedings of the 17th International Legal Informatics Symposium IRIS 2014* (Österreichische Computer Gesellschaft OCG, 2014) 443 - 450.



Im. n. 1 – Interdisciplinarity in Legal Design

2. Methodology and background.

The research originates from the results of a project on the simplification of a banking contractual text addressed to consumers that was simplified according to the criteria of Legal Design,¹¹ and where special attention was dedicated to linguistic simplification of the text,¹² an aspect that is often not explored in depth in usual legal design studies.¹³

The research therefore intends to use the outputs of this research for the development of automation tools aimed to automatically simplify complex juridical texts through some steps:

- assess transparency through empirical research;
- derive uniform and suitable parameters to analyse contractual transparency,
- use these parameters for the development and training of an artificial intelligence tool to be used on large scales.

This tool would not only analyse the complexity of legal texts, but also automatically simplifying them substituting large and complexes tenses with simpler and clearer ones.

This means that an artificial intelligence could be useful to rapidly analyse such contracts, highlighting their most critical points according to the benchmark and outline a new draft of the examined contract.

However, it should be considered that, for the purposes of further advancement of the project, an essential role will be played precisely by the training of artificial intelligence, since it will be necessary to train it -partly using

¹¹ R Ducato, A Strowel, *Legal design perspectives. Theoretical and practical insights from the field* (Ledizioni, 2021).

¹² B De Muro, M Imperiale, *Legal design: bla bla come bla bla bla il design bla può bla bla bla semplificare bla bla bla il diritto bla bla bla* (Giuffrè, 2021).

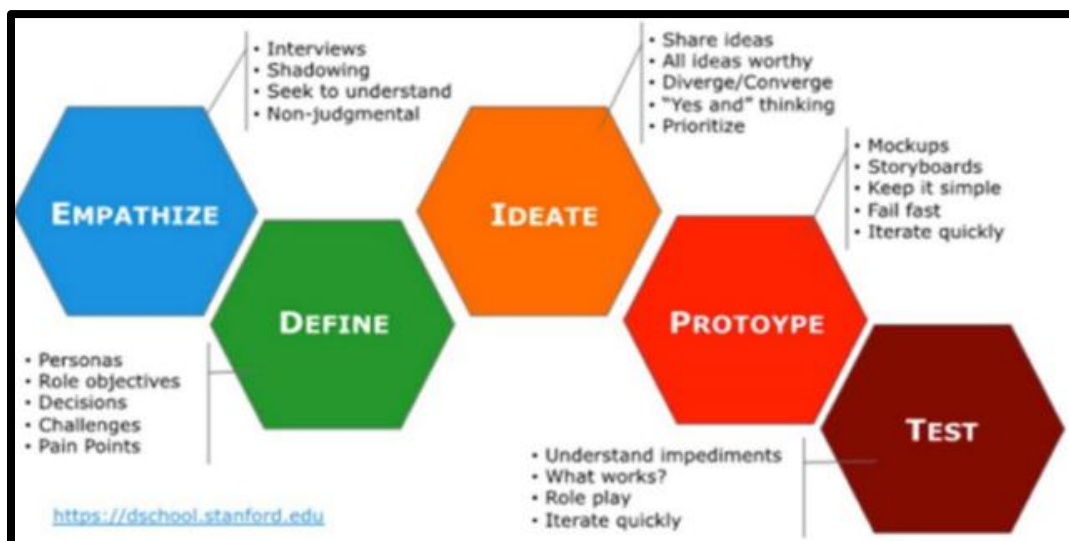
¹³ H Haapio, 'Lawyers as Designers, Engineers and Innovators: Better Legal Documents Through Information Design and Visualization', in Erich Schweighofer et al. (Eds.) *Transparency. Proceedings of the 17th International Legal Informatics Symposium IRIS 2014* (Österreichische Computer Gesellschaft OCG, 2014), 451–458.

human "trainers" - to assess the transparency and comprehension of contractual texts using precisely the contractual model already created in the project activities as a benchmark for the tool to be designed and built.

An important aspect, moreover, will be that relating to the choice of the LLM to be used for the purpose of creating the AI software, since it will be necessary for it to be trained in the understanding of the Italian language and of the specifics of legal language.

The project "LeDiBank: Legal Design in Banking Contracts" bases its workflow and research on User Experience (UX) methodologies and Interaction Design techniques applied to the design of banking forms and contracts.

These methodologies, applied to the legal and legally binding acts compartment in combination with the traditional skills of jurists, take on the name of "Legal Design," a discipline that has taken hold especially in Central and Northern European countries, as well as in Anglo-Saxon countries. Mention is made of the Legal Design Lab at Stanford Law School, inspired by Margaret Hagan.



Im. n. 2 – The overall process of Design Thinking (Stanford Design School)

In that research centre, different approaches have been experimented with, either with designers and lawyers on the team or with only lawyers with additional design skills. The first of the two approaches is the one taken within the LeDiBank project, which features a team of jurists from the ReCEPL Research Center and a team of designers and graphic designers from the ReLAB company.

Through such methodologies, the layout and content of banking area contracts are intervened upon, facilitating the compilation operations, reducing the possibility of user error, and making explicit to users the most relevant constraints, clauses, and contractual burdens in the mutual interest of

the contractors.^{14 15 16}

However, as much as the project aimed to apply Legal Design methodology, it still had the objective of carefully weighing the choices to be made when applying design techniques, to make a clarification of contracts but without affecting the complex of rights and protections.

To achieve this result, the team involved adopted a workflow based not only on a careful separation of expertise (nevertheless integrated into a single research group) but included a series of work steps, structured as follows:

- 1) identification of the contracts to be redesigned;
- 2) clarification of the legal language;
- 3) reformulation of text content;
- 4) design of the layout of the new contract;
- 5) creation of a standardized database of graphic materials;
- 6) prototyping of the new contract;
- 7) creation of a multimedia medium to accompany the contract;
- 8) analysis of the effectiveness of the new contract.

Consider that the various phases involve the intervention first of the legal team, which is later taken over by the graphics and design team. This makes it possible not only to have a product that adheres as closely as possible to the objectives set, but also to make the most of all the skills brought into the system.

3. Objectives.

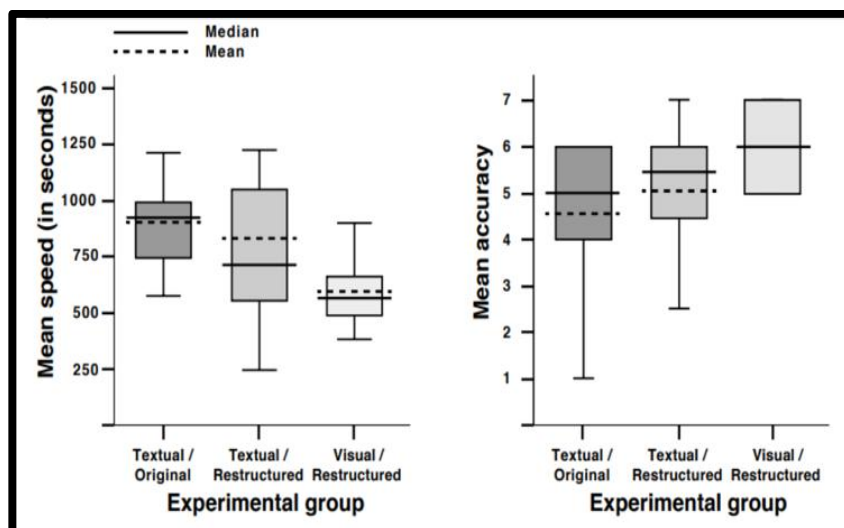
With reference to textual simplification, considering measurement, the project is aimed at:

1. measuring the level of clarity and transparency of the contractual texts;
2. automatically simplifying the legal language of contractual documents, supporting in the clarification of the contractual text which presents a low level of clarity (about the banking sector).

¹⁴ H Haapio, R Derooy, TD Barton, 'New Contract Genres', in Erich Schweighofer et al. (eds.), *Data Protection / LegalTech. Proceedings of the 21th International Legal Informatics Symposium IRIS 2018* (Editions Weblaw, 2018), 455–460.

¹⁵ H Haapio, D Plewe, R Derooy, 'Contract Continuum: From Text to Images, Comics, and Code', in Erich Schweighofer et al. (eds.), *Trends and Communities of Legal Informatics. Proceedings of the 20th International Legal Informatics Symposium IRIS 2017*.

¹⁶ S Passera, H Haapio, 'Transforming Contracts from Legal Rules to User-Centered Communication Tools: A Human-Information Interaction Challenge' (2013) *Communication Design Quarterly*, 38–45.



Im. n. 3 - Example of measuring some variables regarding different contract models. Passera, S. (2015)

However, about point 1, there are some tools that have not been fully developed for specialized legal language, while no advanced tools are available for automatically simplifying contractual texts (point 2).

To better understand this specific point, consider that there already is a tool that analyses the understandability of a written text, named DyLan TextTools V2.1.9.

As you can see in the following image, it is possible to provide a text to be analysed to obtain a measurement of the complexity and readability of said text.

The screenshot shows the DyLan TextTools v2.1.9 interface. At the top, there is a navigation bar with the logo and user options (guest | logout | help | italiano | english). Below this is a menu of analysis tools: Text to analyze, Sentence splitting, Tokenization, Part of speech tagging, Annotation, Readability analysis, and Readability projection. A note states: "Note: each carriage-return represents a sentence interruption. Please pay attention to text copied from pdf documents." The main text area contains a sample legal text in Italian. At the bottom, there is a language selection dropdown set to 'ITALIAN' and a 'Run text analysis...' button.

Im. n. 4 – The DyLan TextTools home screen

After analysing the text, it then provides an evaluation that, in global terms, focuses on four key parameters (see image no. 5).

Text to analyze	Sentence splitting	Tokenization	Part of speech tagging	Annotation	Readability analysis	Readability projection
readability index		difficulty level				
READ-IT Base		98,9%				
READ-IT Lexical		87,2%				
READ-IT Syntactic		100,0%				
READ-IT Global		100,0%				
readability index		ease level				
GULPEASE		39,2				
[+] [-] Features extracted from text						
[+] Profilo di base						
[+] Profilo lessicale						
[+] Profilo sintattico						

Im. n. 5 – The DyLan TextTools analysis of a specific contractual clause

As is evident, the currently available analysis system performs its task very well in relation to linguistic profiles (grammar, vocabulary, syntax) but does not use a contract as a benchmark and does not consider Legal Design methodologies.

Simply put, it is not specifically designed to be used in the legal sphere, nor can it provide indications for the modification of contractual texts following analysis. In fact, it merely highlights the performance of texts on the linguistic level but does not indicate whether the content of specific contractual clauses should not only be reformulated, but also better distributed in clauses of more homogeneous content.

For this reason, we intend to redesign an analysis system from scratch, but using as benchmarks:

- the contractual model on a Legal Design basis as described in fig. 2;
- the lexicon specific to the legal profession, to be contrasted with the lexicon of an ordinary person.

Through the combination of these parameters, it may be possible to measure the actual readability of the contract and automatically obtain possible solutions to meet the set parameters.

In addition, reference will be made to the standard UNI 11482:2013 *Structural elements and linguistic aspects of written communications of organisations*, which concerns professional texts in general. The standard defines how to structure a text and how to simplify sentences and words.

From the point of view of textuality, to give a few examples:

- the title must define the subject so that the recipient understands whether the text is of interest to him/her and so that the text can be distinguished from all the others, in particular from those that precede it on the same subject;

- the partitions (Part, Chapter, Paragraph, Sub-paragraph) must be at least two at each level and numbered with Arabic numerals;
- the notes may contain: bibliographical references, long quotations, collateral content and comments, references to other parts of the text.

A few examples from a syntactic point of view.

The standard prohibits the verb in the present participle, the future deontic and the enclitic 'it is', and recommends that:

- periods should not exceed 40 words;
- the main sentence should precede secondary sentences;
- the number of incisors should be reduced to a minimum;
- the ratio between the number of verbs and the number of indirect complements should not exceed 1:4.

As far as vocabulary is concerned, the standard prohibits obsolete words and phrases and recommends that:

- technical terminology be translated into a glossary if the addressees might not understand it;
- words in common use be given preference over bureaucratic, archaic, etc. words and phrases.

All the prescriptions and recommendations of the standard will have to be evaluated with respect to the banking contract, which is likely to require some adaptation (e.g. in contracts the length of the sentence can easily and necessarily exceed 40 words).

The automatic measurement of these indications is not always possible or easy to achieve. For some of them, data already exist:¹⁷

- an excess of indirect complements is found every 129 words in administration texts, every 154 words in business texts and every 87 words in lawyers' defence writings;
- excessively long periods are found every 581 words in administration texts, every 717 words in business texts and every 726 words in lawyers' defence writings.

To automatically calculate the length of periods and the ratio between verbs and indirect complements, see Acerboni 2023.¹⁸

It is reasonable to assume that the announced ISO standard *Plain language, Part 2: Legal communication*, will be issued during the project, which will naturally be taken into account.

in order to meet the requirements of Legal Design and contractual transparency regulations.

On the contrary, should the contract to be analysed be characterised by a particularly low readability and a structure that makes it difficult to navigate between the clauses, then it will be necessary to intervene radically to modify it.

¹⁷ G Acerboni, A Panunzi, 'La scrittura professionale', in Benedetta Baldi (eds.) *Comunicare ad arte. Per costruire contenuti e promuovere eventi* (Zanichelli, 2020), 221-236.

¹⁸ G Acerboni, *Metodo per calcolare automaticamente con l'AI limiti dimensionali, sintesi e chiarezza degli atti processuali*, (Youcanprint, 2023).

SOMMARIO		Definizioni	
Sommario		Definizioni	
Definizioni art. 1	pag. 4	Art. 01 Definizioni	
I Sezione Contenuto e conclusione del contratto art. 2-5	pag. 6	1. Il Consumatore/Cedente è la persona che sottoscrive il contratto di finanziamento da restituire a rate, pagate da proprio datore di lavoro al Finanziatore al quale il consumatore ha ceduto il diritto a quote della propria retribuzione o pensione;	
II Sezione Requisiti del finanziamento art. 6	pag. 8	2. Il Finanziatore/Intermediario del credito/Cessionario è l'ente che concede il Finanziamento al Consumatore ed al quale vengono ceduti i crediti del Consumatore verso il Datore di lavoro al fine del pagamento delle rate;	
III Sezione Diritti e obblighi del finanziatore art. 7-11	pag. 9	3. Il Datore di lavoro del Consumatore/Ceduto è qualsiasi Ente pubblico o privato che corrisponde al Consumatore la retribuzione e paga al Finanziatore le rate del Finanziamento;	
IV Sezione Diritti e obblighi del consumatore art. 12-18	pag. 11	4. Il Contratto di lavoro è il contratto tra il Consumatore e il suo Datore di lavoro;	
V Sezione Diritti e obblighi del datore di lavoro art. 19-22	pag. 14	5. La Cessione della quota della retribuzione o della pensione è l'attribuzione al Finanziatore dei diritti di credito a tali quote di cui il Consumatore è titolare nei confronti del Datore di lavoro;	
VI Sezione Rimborso anticipato del finanziamento art. 23-26	pag. 16	6. La Cessione del contratto di finanziamento è il trasferimento da parte del Finanziatore dei diritti e obblighi derivanti dal contratto medesimo in favore di un terzo;	
VII Sezione Prenanziamento art. 27-30	pag. 18	7. Il Documento informativo è il documento denominato "Informazioni europee di base sul credito ai consumatori" (SECCI), consegnato prima della conclusione del contratto di finanziamento, di cui è parte integrante;	
VIII Sezione Assicurazioni e imposte obbligatorie art. 31-32	pag. 20	8. L' Importo totale del credito o Finanziamento è il limite massimo a somma totale degli importi messi a disposizione del Consumatore, come indicato nel Documento informativo, decurtato dagli interessi e dalle commissioni a vario titolo dovuti al Finanziatore ed espressamente indicati nel Documento informativo;	
IX Sezione Disposizioni finali art. 33-34	pag. 21	9. L' Importo erogato è l'Importo Totale del Credito, decurtate le somme dovute per eventuali Prenanziamenti e per l'estinzione di precedenti prestiti o di finanziamenti in corso di ammortamento;	
I Allegato Comunicazioni e tutela del consumatore	pag. 22	10. L' Importo lordo o importo totale dovuto dal Consumatore al Finanziatore si intende la somma totale dell'Importo Totale del Credito e degli interessi e costi connessi al finanziamento;	
		11. Il Prenanziamento è un contratto che consente di ottenere un'anticipazione del finanziamento.	

Sezione I		Sezione I-II	
I Sezione Contenuto e conclusione del contratto		Art. 04 Perfezionamento del contratto	
Art. 02 Oggetto del contratto		1. Il Contratto è concluso quando il Consumatore ha conoscenza dell'accettazione della sua richiesta di finanziamento da parte del Finanziatore mediante sottoscrizione del presente contratto o altri mezzi equipollenti.	
1. Il presente contratto (di seguito anche solo "Contratto") ha ad oggetto un finanziamento (importo totale del credito), erogato dal Finanziatore/Intermediario del credito al Consumatore .		Art. 05 Dichiarazioni del Consumatore	persona fisica che, in qualità di consumatore, sottoscrive un contratto di finanziamento, cedente al Finanziatore i propri crediti verso il Datore di lavoro.
2. Il Consumatore (Cedente) si obbliga a rimborsare il finanziamento oltre interessi e costi connessi al credito (importo totale dovuto) mediante cessione al Finanziatore/Intermediario (cessionario) di quota della propria retribuzione mensile o prestazione previdenziale, che gli viene versata dal Datore di lavoro o dall'Ente previdenziale (ceduti) .		1. Il Consumatore dichiara che sono veri tutti i dati a lui riferiti presenti nel contratto e s'impegna a comunicare al Finanziatore ogni loro variazione fino all'estinzione del contratto.	
3. In caso di mancato pagamento della prestazione previdenziale, il Consumatore (cedente) resta obbligato al rimborso nei confronti del Finanziatore/Intermediario (cessionario) (cessione salvo buon fine con gli effetti previsti dagli articoli 1198 e 1260 del Codice civile).		2. Il Consumatore dichiara di aver ricevuto prima di concludere il Contratto: a) il Documento informativo; b) i termini e le condizioni del finanziamento; c) i chiarimenti necessari per valutare se il contratto proposto è adeguato rispetto alle proprie esigenze e situazione finanziaria; d) le conseguenze in caso di mancato pagamento anche di una sola rata del finanziamento.	
Rimborso del Finanziamento Rate da pagare		3. Il Consumatore dichiara che il Finanziatore ha reso disponibili: 1) il documento contenente i Tassi Effettivi Globali Medi (TEGM) (L.108/96); 2) la Guida sull'Arbitro Bancario Finanziario (ABF); 3) la Guida sul Credito ai consumatori.	
Art. 03 Condizioni economiche del contratto		II Sezione Requisiti del finanziamento	
1. Le condizioni economiche del contratto sono contenute nel Documento informativo denominato "Informazioni europee di base sul credito ai consumatori" (SECCI), a cui il presente contratto rinvia integralmente.		Art. 06 Requisiti per l'erogazione del finanziamento e poteri del Finanziatore	
2. Il Consumatore (Cedente) è debitore nei confronti del Finanziatore/intermediario (Cessionario) dell'importo lordo del finanziamento (importo totale dovuto), previsto nel Documento.		1. Il finanziamento (Importo) - della consegna da parte e/o necessari per la validità quote di retribuzione, - della verifica della documentazione prodotta dal Consumatore da parte del Finanziatore ; - della regolare notifica al Datore di lavoro della cessione delle quote della retribuzione o della pensione in favore del Finanziatore o del ritegno da parte del Datore di lavoro	Ente che concede il Finanziamento con restituzione in favore del Consumatore e al quale vengono ceduti i crediti del Consumatore. Nota: documenti richiesti Finanziatore dei diritti sulle

Im. n. 6 – Contract prototype and benchmark for the AI tool

In fact, it is intended to operate by assuming a value scale between 1 and 10, whereby the highest available result in terms of understanding the contractual text (10) is directly related to the use of a contract comparable to the model indicated as a benchmark while the lowest result (1) refers to a contract written as obscurely as possible.

However, one is also aware that it will be necessary to set not only a

minimum limit in terms of readability - which would be equal to the use of the model contract - but also an upper limit, to avoid the use of contracts that are more akin to children's books rather than contractual texts.

The research aims, then, to design an automated tool capable of realizing these objectives, identifying the deployment phases of the tool and implement it.

Through the identification of said parameters and the development of a dedicated AI,¹⁹ the aim is also to cut down on the time required to analyse the texts themselves, making the use of capital and resources (in the banking activities aimed at consumer protection) more sustainable.^{20 21}

The pursuit of the above objectives aims to implement in the best possible way the banking regulations on transparency and clarity of contractual texts. The principles of transparency and clarity represent the regulatory prerequisites of this project, the enhancement of visual and textual elements is its operational tool and the goal, depending on the implementation of clarity and comprehensibility of information and the enhancement of the customer's freedom of decision-making.

The application of the Human-Centered Design approach to the legal field,²² and in the specifically of banking contracts and forms, therefore, represents a valuable opportunity to deepen research in this domain and to generate new concepts and new paradigms of interaction between intermediary and client.

4. Technical analysis of contract readability.

According to current legislation, contracts need to be written comprehensively and concisely. However, in most of the available contracts, the used text may be ambiguous and not readable, and disputes may occur and be dealt with by leveraging arbitration, an extrajudicial procedure used to resolve civil or commercial disputes. This causes a loss of money and reputation, so it is of utmost importance to have a way to improve the readability of contracts, detect sources of ambiguity, and resolve them. In the current literature, the first way to approach such an issue is to make a linguistic and statistical analysis of the text and define a readability index. In Italian, the most used tool has been developed by the Linguistic Institute of CNR. It is named DyLan, where the user can copy and paste the text to be analyzed and obtain the analysis result on the number of sentences, tokens, their characterization in linguistic terms, and the computation of a readability index. The most known of those indexes is the Flesch–Kincaid readability tests²³ for text in English. In contrast, the Gulpease index, defined as part of the research of the GULP (University Linguistic Pedagogical Group), is a readability index

¹⁹ L Viola, *Interpretazione della legge con modelli matematici* (Diritto Avanzato, 2017).

²⁰ G Ludovici, 'Un modello matematico per l'esegesi del contratto', (2021) 3 *La Nuova Procedura Civile*, 1.

²¹ D Jackson, 'Human-Centered Legal Tech: Integrating Design in Legal Education', (2016) 50(1) *Law Teacher*, 82–97. <<http://www.nulawlab.org/view/human-centered-legal-tech-integrating-design-in-legal-education>>.

²² M Pennasilico, *Contratto e interpretazione* (Giappichelli, 2021), 22

²³ JN Farr, JJ Jenkins, DG Paterson, 'Simplification of Flesch Reading Ease Formula' (1951) 35 (5) *Journal of Applied Psychology*, 333–337. doi: 10.1037/h0062427

calibrated to the Italian language.²⁴ Compared to others, this index has the advantage of using the length of words in letters rather than syllables, simplifying automatic calculation. However, these simple indexes are based on simple formulas, heuristics, and word counts, so they fail to consider the linguistic complexity of the chosen words properly. Moreover, these indexes are meant to be used in longer-form explanations, like those found in textbooks, and are unreliable in shorter formats, such as the one in contracts. Therefore, more advanced indexes have been formulated, such as READ-IT,²⁵ available in Dylan. It does not test the readability of the text but also identifies places of complexity. It is based on a multi-level linguistic analysis of the text conducted with state-of-the-art tools, such as "AnIta", a widely known platform of methods and tools for the automatic processing of Italian text developed at the "Antonio Zampolli" Institute of Computational Linguistics (ILC-CNR).

Generally, all the available related works fall within the category of traditional Natural Language Processing (NLP) models, rule-based or statistical models designed to perform specific tasks, in this case, readability analysis. An alternative approach is to use classifiers to assess the readability level of a given text in a contract based on the judgment of experts. However, a novel technology was recently developed and found to be of incredible success: Large Language Models (LLM).²⁶ They are massive neural network architectures characterized by millions or billions of parameters, such as GPT (Generative Pre-trained Transformer) models, that can be trained to understand language unsupervised by processing vast amounts of text data. In the current market, we are witnessing a flourishing of various LLM solutions, both public and private, and users extensively exploit them to perform NLP tasks,²⁷ such as text generation or analysis. There are critical differences between traditional NLP tools and LLMs:

1. Traditional NLP tools are devices around predefined rules and features; however, LLMs learn representations from raw text data.
2. LLMs are characterized by better adaptability due to transfer learning, making them more effective on various NLP tasks without incurring expensive and time-consuming retraining. Researchers use prompt engineering to improve the capacity of LLMs on a specific task, starting from a pre-trained LLM in a particular language.
3. LLMs can easily and with comparable latency to traditional NLP tools glimpse complex linguistic structures.

²⁴ P Lucisano, *Gulpease: una formula per la predizione della leggibilità di testi in lingua italiana. Scuola e città*, (1988), 110-124.

²⁵ F Dell'Orletta, S Montemagni, G Venturi, 'Read it: Assessing Readability of Italian Texts with a View to Text Simplification', in *proceedings of the Workshop on Speech and Language Processing for Assistive Technologies (SLPAT 2011)*, Edinburgh, July 30, 73-83, <<http://aclweb.org/anthology/W/W11/W11-2308.pdf>>.

²⁶ S Minaee, T Mikolov, N Nikzad, M Chenaghlu, R Socher, X Amatriain, J Gao, 'Large language models: A survey' (2024) arXiv preprint, arXiv:2402.06196.

²⁷ L Qin, Q Chen, X Feng, Y Wu, Y Zhang, Y Li, PS Yu, 'Large Language Models Meet NLP: A Survey, 2024', arXiv preprint, arXiv:2405.12819.

Therefore, a recent line of research is Prompt-based metrics for text readability as complements to existing statistics metrics.^{28 29} These prompts use the general language understanding features of LLMs and have started to be used for educational content or other applications but not for contracts or specific language applications.

5. Model creation and training.

As first step, the datasets need to be collected to start the training and testing of the model, using the indicators of text complexity previously mentioned, which are necessary to evaluate whether a sentence in a contract needs to be simplified or not. These data need to be preprocessed, including word segmentation, noise removal and tokenization, to facilitate model training. Then, according to the specific task requirements and data characteristics, the appropriate translation model is chosen, we identified the use of LLMs APIs as the most effective way to achieve this goal.

The pre-processed data is used to train the selected model, which involves determining the model architecture, setting hyperparameters, and updating the model parameters using optimization algorithms. Then, the model performance is optimized by iterative training and adjusting model parameters. The trained model is then evaluated using an independent test dataset, and the translation results are compared with reference translations to obtain an evaluation of the model's performance. Based on the evaluation results, the model is adjusted and improved, such as adjusting the model architecture, adding training data, and adjusting hyperparameters to further improve translation quality. Finally, the trained translation model is applied to the translation task.³⁰ Through the above steps, artificial intelligence translation technology can be applied in translation teaching to continuously optimize the quality of translation.

²⁸ G Marvin et al., 'Prompt Engineering in Large Language Models' in *International Conference on Data Intelligence and Cognitive Informatics* (Springer Nature Singapore, 2023).

²⁹ S Gobara, H Kamigaito, T Watanabe, 'Do llms implicitly determine the suitable text difficulty for users?', (2024) arXiv preprint, arXiv:2402.14453.

³⁰ Y Yuxiu, 'Application of translation technology based on AI in translation teaching' (University of Sanya, 2024). <https://www.sciencedirect.com/science/article/pii/S2772941924000012#sec0005>.