

Beyond the wall of contract text

Visualizing contracts to foster understanding and collaboration within
and across organizations

Stefania Passera



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collaboration within and across organizations

Stefania Passera

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Abstract

In an increasingly networked world, contracts are the glue of business. Contracts are not only legal safeguarding instruments to limit parties' opportunism, as argued by transaction cost economics (TCE). They can be managerial tools to create shared understanding and cooperation among the cross-professional stakeholders who plan, negotiate, and implement contracts – within and across organizations. However, contract documents often do not work well for this purpose: they are long, complex, and hard to understand. As a result, costly misunderstandings arise, since contracts are not optimized for their everyday users: business and technical audiences. The proactive law approach stresses the importance of clear cross-professional communication through contracts to prevent legal problems and seek win-win opportunities. A practical manifestation of this principle is contract visualization – the use of diagrams, images, and visually structured layouts to make contracts more searchable, readable, and understandable. The aim of this study is to provide empirical understanding of the emerging concept and practice of contract visualization – by rigorously testing the propositions about its benefits, by exploring it as a practice unfolding in real life, and by identifying viable approaches for managers and legal counsel to engage with visualization. I chose a mixed methods approach to explore this emerging topic. The quantitative component of the research comprises three experiments, which show that visualized contracts support superior comprehension performance (speed, accuracy) and user preference, compared to informationally equivalent textual contracts. The qualitative component of the research – a single case study – explores how and why an operation and maintenance service sales team decided to employ visualization in their contracts: visualization was sought as a solution to cross-professional, inter-organizational and temporal knowledge gaps, as it allows information to be clarified and positively frames the emerging business relationship. Two conceptual studies exploring visualization approaches (design pattern libraries and automation) complement the empirical studies. The research contributes to the scarce and insufficiently rigorous empirical literature on contract visualization, and to the literature on the psychological effects of contracts and microdynamics of contracting. Theoretically, it suggests a theoretical shift from a TCE-view of contracts to a knowledge-based view of contracts, where the knowledge created and shared through contract documents is a source of competitive advantage. Moreover, it extends the application of cognitive load theory beyond the educational psychology field. The research also has practical implications for global business: visualization was found to especially improve contract comprehension among non-native speakers of English.

Keywords Contracts, Contract Design, Knowledge Visualization, Design Patterns, Communication, Cognitive Load, Affordance, Framing, Proactive Law

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Firstly, I would like to thank Helena Haapio – co-author, business partner, source of inspiration, and friend. Her curious mind, extensive expertise, and passion for making contracts work were contagious. Meeting her set me on a challenging and satisfying research journey, and gifted me with the unique opportunity to test and develop my design skills in a field where not many designers dare to tread. Our countless discussions, brainstorming sessions, shared projects, co-authored papers and presentations, email messages and phone calls testify to the deep influence Helena had on my thinking – and I can only hope to continue this fruitful collaboration for still many years.

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publications included in this dissertation. Moreover, I would like to thank Prof. Thomas D. Barton, for his kindness, acumen, and consistently good advice whenever I needed it; and Soile Pohjonen, for her radical thoughts and infectious cheerfulness. A big thank you also goes to co-authors Katja Koskelainen, Suvi Anttila, Marika Salo, Pirjo-Leena Forsström, Maiju Aikala, and James Hazard.

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List of Abbreviations and Symbols

α	Cronbach's alpha
ANOVA	Analysis of Variance
B2B	Business-to-Business
B2C	Business-to-Consumer
B2G	Business-to-Government
BELF	Business English as a Lingua Franca
Cf.	Compare
CI	Confidence Interval
CLT	Cognitive Load Theory
χ^2	Pearson's Chi-Squared
df	Degrees of Freedom
GCC	Global Communicative Competence
E	Efficiency
ELF	English as a Lingua Franca
F	F-statistic (result of an ANOVA or regression analysis)
HCI	Human-Computer Interaction
HED/UT	Hedonic/Utilitarian Scale
HR	Human Resources
IACCM	International Association for Contract and Commercial Management
IP	Intellectual Property
I-PANAS-SF	International Positive and Negative Affect Schedule Short Form
JYSE	Julkisten hankintojen yleiset sopimusehdot [<i>General Terms of Public Procurement in Service Contracts</i>]
M	Mean

N	Total sample size
n	Subsample size
n.s.	Non (Statistically) Significant
NS	Native Speaker
NNS	Non-Native Speaker
O&M	Operation & Maintenance
OSIVQ	Object-Spatial Imagery and Verbal Questionnaire
p	P-value
PANAS	Positive and Negative Affect Schedule
PPL	Proactive and Preventive Law
pt	Point (typographic unit of measure)
R ²	R-Squared (coefficient of determination)
R&D	Research & Development
RQ	Research Question
SD	Standard Deviation
t	T-statistic (result of a t-test)
TCE	Transaction Cost Economics
T&C's	Terms & Conditions
U	Mann-Whitney's U
UX	User Experience
WM	Working Memory
±	Plus/Minus

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List of Publications

This doctoral dissertation consists of a summary and of the following publications which are referred to in the text by their Roman numerals

I. Haapio, H. & Passera, S. (in press). Contracts as interfaces: Exploring visual representation patterns in contract design. In M. J. Katz, R.A. Dolin & M. Bommarito (Eds.) *Legal Informatics*, Cambridge, UK: Cambridge University Press. Published ahead of print, 37 pages.

II. Passera, S. (2015). Beyond the wall of text: How information design can make contracts user-friendly. In: A. Marcus (Ed.), *Design, User Experience, and Usability: Users and Interactions* (pp. 341–352). Lecture Notes in Computer Science. Cham, Switzerland: Springer International Publishing.

III. Passera, S. (in press) Flowcharts, swimlanes, and timelines – Alternatives to prose in communicating legal-bureaucratic instructions to civil servants. *Journal of Business and Technical Communication*. Published ahead of print, 32 pages.

Publication III is based on

Passera, S., Pohjonen, S., Koskelainen, K. & Anttila, S. (2013). User-Friendly Contracting Tools – A Visual Guide to Facilitate Public Procurement Contracting. In: J. Chittenden, ed., *Proceedings of the 2013 IACCM Academic Forum for Integrating Law and Contract Management: Proactive, Preventive and Strategic Approaches*. Ridgefield, CT: The International Association for Contract and Commercial Management, 74–94

IV. Passera, S., Kankaanranta, A. & Louhiala-Salminen, L. (2017). Diagrams in contracts: Fostering understanding in global business communication. *IEEE Transactions on Professional Communication*, 60(2). Advance online publication: <https://doi.org/10.1109/TPC.2017.2656678>

V. Passera, S., Smedlund, A., & Liinasuo, M. (2016). Exploring contract visualization: Clarification and framing strategies to shape collaborative business relationships. *Journal of Strategic Contracting and Negotiation*, 2(1–2), 69–100. <https://doi.org/10.1177/2055563616669739>

Publication V is based on

Passera, S., Smedlund, A., Liinasuo, M. & Aikala, M. (2015). *Designing boundary objects for the sales of industrial services: How to support value co-creation through user experience* (Working Paper). Rochester, NY: Social Science Research Network. Available: <http://dx.doi.org/10.2139/ssrn.2648148>

VI. Passera, S., Haapio, H. & Curtotti, M. (2014). Making the meaning of contracts visible – Automating contract visualization. In E. Schweighofer, F. Kummer & W. Hötzenborfer (Eds.), *Transparency. Proceedings of the 17th International Legal Informatics Symposium IRIS 2014* (pp. 443–450). Wien, Austria: Österreichische Computer Gesellschaft

Author's Contribution

Publication I: Haapio, H. & Passera, S. (in press). Contracts as interfaces: Exploring visual representation patterns in contract design. In M. J. Katz, R.A. Dolin & M. Bommarito (Eds.) *Legal Informatics*, Cambridge, UK: Cambridge University Press. Published ahead of print, 37 pages.

The idea for this book chapter was developed collaboratively with Haapio. I was responsible for developing the initial outline of the chapter, the categorization of contract visualization patterns and visual representation patterns, and creating their descriptions and examples. The writing process was collaborative, and I took main responsibility over sections 5, 6, 7 (which constitute circa 55% of the chapter), and commenting/partially contributing to the other sections. Haapio, likewise, commented and edited the sections I was mainly responsible for. She also acted as corresponding author.

Publication II: Passera, S. (2015). Beyond the wall of text: How information design can make contracts user-friendly. In: A. Marcus (Ed.), *Design, User Experience, and Usability: Users and Interactions* (pp. 341–352). Lecture Notes in Computer Science. Cham, Switzerland: Springer International Publishing.

I was solely responsible for research design, data gathering, data analysis, write-up, and presenting the paper at the 2015 HCI International Conference in Los Angeles.

Publication III: Passera, S. (in press) Flowcharts, swimlanes, and timelines – Alternatives to prose in communicating legal-bureaucratic instructions to civil servants. *Journal of Business and Technical Communication*. Published ahead of print, 32 pages.

This article is based on a previous conference paper, where my co-authors helped me in data gathering and with English-Finnish translations. I was solely responsible for research design and data analysis. I wrote the conference paper as first author (with the collaboration of Pohjonen), and presented it at the IACCM Academic Forum 2013 in Phoenix. I am the sole author of the current version of this article.

Publication IV: Passera, S., Kankaanranta, A. & Louhiala-Salminen, L. (2017). Diagrams in contracts: Fostering understanding in global business communication. *IEEE Transactions on Professional Communication*, 60(2). Advance online publication: <https://doi.org/10.1109/TPC.2017.2656678>

I was solely responsible for research design, data gathering, and data analysis. In light of the results, I invited Kankaanranta and Louhiala-Salminen to contribute to the write-up with their knowledge on English as a Business Lingua Franca and global communicative competence. I retained, however, main responsibility in writing this article.

Publication V: Passera, S., Smedlund, A., & Liinasuo, M. (2016). Exploring contract visualization: Clarification and framing strategies to shape collaborative business relationships. *Journal of Strategic Contracting and Negotiation*, 2(1–2), 69–100. <https://doi.org/10.1177/20555636166669739>

I was responsible for research design and data gathering, with the help of Smedlund in the very early phases (interviews and creation of service blueprints). I carried out data collection in successive phases, and also helped to create the visualizations used at CartaFirm. The data was discussed on several occasions with Smedlund and Liinasuo, in search of an interesting analytic perspective. Smedlund and Liinasuo contributed to create the initial outline of the first draft of this article, and I took main responsibility in writing it (that version is now published as a working paper). I was solely responsible for the actual data analysis (coding, developing themes...) on which the current version of this article is built, and had main responsibility in writing it.

Publication VI: Passera, S., Haapio, H. & Curtotti, M. (2014). Making the meaning of contracts visible – Automating contract visualization. In E. Schweighofer, F. Kummer & W. Hötendorfer (Eds.), *Transparency. Proceedings of the 17th International Legal Informatics Symposium IRIS 2014* (pp. 443–450). Wien, Austria: Österreichische Computer Gesellschaft

The idea for this conference paper was collaboratively developed by all three co-authors. I was responsible for creating the mock-ups for the visualizations and wizard interfaces of the demo. Curtotti was responsible for the technical implementation of the demo. All co-authors took part in the write-up in different measures. I took the lead as first author and contributed significantly to the central section of the paper (where the demos are presented) and the conclusions. I was also responsible for presenting the paper at the 17th International Legal Informatics Symposium IRIS 2014 in Salzburg.

1. Introduction

1.1 Background

This study focuses on *contract visualization* – a novel practice defined as the use of diagrams, images, and visually structured layouts to make contracts more searchable, readable, and understandable – and its role in facilitating the complex cognitive tasks and knowledge interactions taking place during inter-firm contracting processes.

In an increasingly interconnected and global business environment, contracts function as the glue of business. Yet contracts may be losing their grip on facilitating economic exchange and business relationships. Most contract documents are intricate, mirroring the complexity of the business transactions they seek to describe. At the same time, contracts are used within a complex and multidisciplinary network of professionals, which spans within and across the two (or more) contracting organizations: for instance, lawyers, purchase and sales managers, supply chain managers and engineers, executives, product/service owners and other subject-matter specialists, project managers, HR personnel, financial analysts and controllers. For business goals to be achieved, these diverse professionals need to cooperate and communicate clearly during each of the stages of the *contracting lifecycle* (Nystén-Haarala, Lee & Lehto, 2010): planning, negotiating, signing, implementing, monitoring, and eventually exiting the agreement. Often, real collaboration is required to envision the goals and scope of the contract, and to determine the parties' actual responsibilities and obligations. This information is not readily available to the parties: it requires exchanging, creating, and jointly transforming the knowledge of the various actors involved, so as to create mutual understanding and goal alignment. Ideally, this knowledge and other relevant information are accurately captured in contract documents, so that a permanent referent of what was agreed is available for the parties to deliver on their promises (and eventually helps to resolve any controversy that may arise).

How well do contract professionals – here defined as any organizational actor routinely creating, commenting, reviewing, negotiating, implementing, managing, and monitoring contracts, in a non-adversarial scenario – deal with complex contracts? Studies conducted by the International Association for Contract and Commercial Management (IACCM, 2015a; 2015b) – the only contract-related professional association operating globally – show that contract documents do not work as intended by their users. Most contract professionals find contracts hard to read or understand. Moreover, they find that

current contracts are of little practical relevance to project managers and teams tasked with implementing contracts.

According to Hagedoorn and Hesen (2009), the complexity of contract documents (e.g. interdependency of clauses, amount of appendices, overall length) increases the information-processing costs associated with reviewing and understanding them. In this situation, contract users may easily experience cognitive overload, as human working memory is limited in its processing capacity (e.g. Cowan, 2001; Baddeley, 2003). Comprehension errors and slower processing are typical symptoms of cognitive overload (Jarrett, Redish, Summers & Straub, 2010), and constitute a problem in the field of contracting, where shared understanding and accurate execution are essential in delivering what was promised. In fact, at least in the US, contract interpretation remains the principal source of litigation between firms (Schwartz & Scott, 2010), or at least the most evident cause of controversy in contract disputes (Dilts, 2005; Posner, 2005).

Haapio, in her doctoral dissertation, provides a convincing account of the reasons behind these problems, arguing that they arise from a traditional paradigm in legal thinking and scholarship which tends to react *ex post* to possible problems arising between contracting parties (2013a). In this paradigm, the only recognized function of contracts is legal safeguard and enforcement. It follows that contract documents are written with specific users and scenarios of use in mind: for lawyers and judges in court, involved in adversarial proceedings *after* problems between the parties have arisen and completely escalated. It also follows that contract enforceability and completeness are valued above all other qualities. Aiming at fulfilling these criteria affects contract style, which tends to be lengthy, syntactically complex, highly technical and archaic. These factors, all together, instigate *contract dysfunctionality* (Haapio, 2013a), which manifests in these typical scenarios:

- the managerial functions of contracts (Table 1.1) are de-emphasized, and the needs and scenarios of use of business and technical personnel using contracts in day-to-day, non-adversarial settings are neglected;
- managers and subject-matter experts – who ideally must be involved early in contract creation because of their better knowledge of key business-related issues (Argyres & Mayer K., 2007) – do not feel engaged with contracting and do not fully understand contracts;
- managers and subject-matter experts avoid and delegate anything contract-related to lawyers, but delegating all contract ownership to lawyers then strengthens the belief that contracts are solely *legal tools*, rather than *managerial-legal tools*, and that only lawyers are able or even entitled to draft contracts;
- it follows that lawyers continue to draft contracts as they always have, relying on and reusing pre-existing contract templates in new transactions, thus losing the opportunity to create contracts that are optimized for business and managerial purposes;

- “legalese” and document complexity – the means lawyers rely on to create iron-clad contracts that minimize the risk of losing in court – introduce a different set of risks: a complex and long contract is harder to review for inconsistencies, ambiguities, and mistakes; is harder to be interpreted in the intended way; and makes it harder to know if a shared intended way to interpret the contract has actually been reached¹.

Table 1.1: The managerial functions of contracts (adapted from Haapio & Haavisto, 2005, as cited and translated in Haapio, 2013a, p.29)

Contracts are tools for:	
1.	Coordinating and managing business, projects and commitments
2.	Creating, allocating and protecting value, and realizing benefits
3.	Communication, motivation, and control
4.	Sharing, minimizing, and managing risk
5.	Preventing problems, and controlling and resolving disputes

An alternative to this contract paradigm is offered by Proactive and Preventive Law (PPL) (e.g. Brown L. 1950; 1986; Brown L. & Dauer, 1978; Barton, 2012a; 2012b; Berger-Walliser, 2012; DiMatteo, Siedel & Haapio, 2012; Haapio, 2013a; 2006a; 2006b; Haapio & Siedel, 2010; Siedel, 2002; Siedel & Haapio, 2011), which take an *ex ante* perspective to legal thinking and practice, with the goal of preventing legal problems *before* they arise and preventing conflict. This stance leads PPL scholars to de-emphasize legal doctrine (Pohjonen, 2006), and rather seek to understand the phenomena and consequences of legal documents and systems in relation to the needs, abilities, and activities of their end-users (Barton, 2012) – in the case of contracts, managers, engineers, and in-house legal counsel in a business-as-usual scenario. Haapio (2013a) describes how a paradigm shift from reactive to proactive law helps to break away from contract dysfunctionality by setting a new mindset and new priorities:

- contracts are to be conceptualized as managerial-legal tools rather than purely legal tools, and they should be created thinking primarily about business, and secondarily about the eventuality of court proceedings;
- the managerial functions of contracts (Table 1.1) are recognized and maximized; safeguarding becomes only one function among many;

¹ An exemplary case is offered by the infamous “One Million (Canadian) Dollar Comma” –case (Austen, 2006, 25th October), in which two Canadian firms, Rogers Telecom and BellAliant went through a bitter (and expensive) 18-months’ dispute over the meaning of the last comma in the following sentence: “*Subject to the termination provisions of this Agreement, this Agreement shall be effective from the date it is made and shall continue in force for a period of five (5) years from the date it is made, and thereafter for successive five (5) year terms, unless and until terminated by one year prior notice in writing by either party.*” BellAliant believed it had the right to terminate the contract at any time during either the initial or option period by giving one month’s notice. Rogers disagreed, believing it had entered into a fixed five-year deal. These terms were not drafted by either party, but were imposed by the Canadian Radio-television and Telecommunications Commission (CRTC), and each party believed they accurately understood the terms.

- contract design is carried out as a multidisciplinary endeavor, since lawyers, managers, and other subject-matter experts closely collaborate in contract planning and creation;
- the content and style of contracts is primarily optimized for the needs of multidisciplinary organizational audience: criteria such as information clarity, concision, and actionability become as important as legal enforceability and precision;
- taking full advantage of the principle of the freedom of contract – according to which contracting parties are free to choose contract content, style, and format (e.g. even a verbal contract may be valid, although it may also be hard to enforce) – contract documents are not limited to textual expression and unformatted, dense layouts: *visual representations are to be used whenever useful for explanatory and disambiguation purposes.*

Contract visualization can be seen as a practical manifestation of PPL principles and goals: shared cross-professional understanding, clarity, and effective communication in and through contracts are prerequisites for developing collaborative, mutually valuable business relationships and smoothing out problems (Berger-Walliser, Bird & Haapio, 2011). This study focuses on the last point of the PPL agenda, and on how to expand our understanding of contract visualization practices and effects.

In recent years scholarly and professional interest in contract visualization has grown, particularly in regards to the potential of this novel practice to improve contract comprehension (e.g. Kay & Terry, 2010; Passera, 2012; Passera, Pohjonen, et al., 2013; Mamula & Hagel, 2015; Haapio & Barton, 2016), improve perceptions and relationships between the parties (e.g. Barton, Berger-Walliser & Haapio, 2013; Waller, Waller, Haapio, Crag & Morriseau, 2016), and support cross-professional and inter-firm collaboration and knowledge sharing (e.g. Barton et al., 2013; Rekola & Boucht, 2011; Berger-Walliser et al., 2011; Plewe & de Rooy, 2016; Pohjonen & Koskelainen, 2012). This past research has so far been mostly conceptual, with only a minority of studies aimed at building empirical evidence on the theorized benefits of contract visualization.

At the same time, contracts and contracting have also been subjects of keen interest within organizational studies. While no research stream in this discipline has specifically addressed contract visualization, it has however recognized the importance of contract-related communication, knowledge sharing, and contract design² in regards to business success.

² Within organizational research, the definition of contract design depends on the theoretical underpinnings of different authors. In scholarship dominated by transaction cost economics, contract design is mostly intended as the choice and matching of safeguard, incentive, and enforcement mechanisms in relation to the attributes of the transaction at hand (e.g. complexity, temporal horizon, asset specificity ownership involvement) (cf. Schepker, Oh, Martynov & Poppo, 2014, p. 197). In more recent scholarship interested in the psychological effect of contract documents in shaping relationships, contract design is also intended to include the choice of specific provisions, and how they are framed and actually written (Weber & Mayer K., 2011; Weber et al., 2011; Bertrandias et al., 2010). In this study, I further extend these concepts by defining contract design as including – in addition to strategic and content choices – actual doc-

For instance:

- Argyres and Mayer K. (2007) found that clear and implementable contract terms are crucial in building successful relationships.
- Goo and Huang (2008) found that well-structured and well-developed agreements foster relational quality.
- Parties who are in long-term successful relationships tend – as a result of learning – to increase and strengthen contract clauses over time that address communication, role clarification, and mutual expectations (Mayer K. & Argyres, 2004; Ryall & Sampson, 2009).
- The language and content used in contract documents have psychological effects on the parties, influencing their cognition, decision-making capacity, and behavior:
 - When clauses associated with control and coordination are present, they affect the formation of emotional and rational judgments differently about the other party and its behavior, and influence levels of trust (Malhotra & Lumineau, 2011; Lumineau, 2014) and conflict (Schilke & Lumineau, 2016).
 - Framing the same contract provision in different ways (e.g. promotive vs. preventive frames) influences whether the parties' relationship will be cooperative and value-maximizing or arms-length and transactional (Weber & Mayer K., 2011). Framing also affects trust levels between the parties (Bertrandias, Fréchet & Lumineau, 2010) and negotiation outcomes (Galsky, Leonardelli, Okhuysen & Mussweiler, 2005; Ariño, Reuer, Mayer K & Jané, 2014).

The communicative dimension of contract documents (of which contract visualization is an aspect) is an under-researched phenomenon, theoretically situated between the PPL approach in legal studies and the recent stream of organizational studies on the psychological effects of contract documents (e.g. Weber & Mayer K., 2011; Weber, Mayer K. & Macher, 2011; Lumineau, 2014; Bertrandias et al., 2010). If contracts are to be useful and usable tools for their users, contract creators need to understand how these tools are to be optimally designed – not only as legal-economic mechanisms, but also as *actual artifacts*, constituted by specific contents and their *presentation*, which are used in the context of complex knowledge interactions across professions and firms.

1.2 Objectives of this Study

My perspective and research interests (being a graphic and information designer by training) are fully aligned with Haapio's, as she argues that:

ument design choices (e.g. layout, typography, document structure, presence of visualizations) aimed at supporting user tasks and comprehension (cf. Haapio & Passera, in press).

“*contract design* is (even though it is often not considered to be) about *design*. It involves, among other things, communication design, information design, and document design” (2013a, p.9)

This study generally aims at providing empirical evidence on the benefits of contract visualization, which have been proposed in previous proactive law literature. In doing so, I seek also to address two methodological issues. Firstly, within the proactive law research stream there is a lack of empirical studies on contract visualization, and the few existing ones lack rigor. Secondly, there is a lack of variety of research questions and approaches in research on contracting in organizational studies, where “retrospective” methods such as correlational studies and surveys based on *past* contracts and contracting situations are favored (cf. Lumineau, Fréchet & Puthod, 2011; Smith & King, 2009).

Theoretically, I also seek to illustrate how transaction cost economics (TCE) is not the only viable perspective for organizational scholars to study contracts and contracting, even though it has so far been predominant. By introducing the proactive and preventive law paradigm – of which contract visualization is one practical manifestation – and finding affinities and potential synergies with the recently emerged psychological view of contracts in organizational study, I seek to study contracts at a micro-level of analysis: *material contract documents* in interaction with their users, rather than *abstract contracts*, intended as safeguarding mechanisms. I look at contracts as artifacts and tools, the design of which has psychological and social consequences for their users. Contracts (and consequently, contract visualizations) do not exist in a vacuum: they are used within cognitively and socially complex contracting processes between organizations – which are knowledge-intensive endeavors. In this study, I position my research under what I call a “*knowledge-based view of contracts*”, which, in contrast with a “*TCE view of contracts*”, enables a closer interfacing between organizational and PPL research. The knowledge-based view calls for an understanding of the firm “*grounded in the concept of organizational advantage*” rather than in market failure and opportunism (Nahapiet & Ghoshal, 1998, p.256). This orientation is perfectly mirrored in the PPL agenda: transforming contracts from legal instruments of safeguard and prevention to managerial-legal tools to secure competitive advantage by enhanced goal alignment, understanding, and collaboration (Siedel & Haapio, 2010; 2011; Haapio, 2006a). Moreover, this positioning allows an exploration of what contract visualization *is* and *does* within an organizational setting. By contextualizing “contract visualizing” as a knowledge practice and “contract visualizations” as knowledge artifacts, it is possible to draw on the well-developed literature on the role of objects and artifacts within organizational practices (e.g. Carlile, 2002; 2004; Nicolini, Mengis & Swan, 2012; Ewenstein & Whyte, 2009), and knowledge visualization (e.g. Eppler & Burkhard, 2007; Eppler, 2011; Bresciani, 2011; Bresciani, Blackwell & Eppler, 2008).

My design background further affects the stances and theories I bring into this study, in addition to legal and organizational studies (Figure 1.1). All design disciplines are focused on ensuring that what is being designed is useful, usable, meaningful, and delightful for those who are supposed to use it. *How*

exactly we design something affects whether the solution is successful: for instance, the materials, proportions, and shapes employed in designing a chair will clearly affect whether the chair is comfortable, ergonomic, beautiful, and correctly priced for its intended user (as well as practical for the intended scenario of use – say, indoor or outdoor use). In the endeavor to create a product, a service, an interface, *or a document* the designer needs to create useful *affordances* (action possibilities or limitations) and *signifiers* (the perceptual means to communicate to the users what can be done or not with the design) (Gaver, 1991; Norman, 1988/2013). *Affordance theory* sheds light on the importance of the material world, and how it exerts its agency on humans, while humans act upon it.

On the other hand, design disciplines look at users and their abilities, needs, tasks, and contexts of action to establish a contextualized and user-centric understanding of what “useful, usable, meaningful, and delightful” may be in the case at hand. Given the existing struggles in comprehending contracts, it is important to consider the existing limits of the human cognitive architecture, and how to present information in ways that do not overload it. *Cognitive load theory* (e.g. Sweller, 1994; Paas, Renkl, & Sweller, 2003; Paas, van Gog & Sweller, 2010) provides criteria to present information in ways that optimize learning and understanding, and provides experimental methods and measures to evaluate the effectiveness of different solutions.

To accomplish my research goals, I chose a mixed methods approach, which I carried out in two steps. Firstly, I quantitatively tested the predicted benefits of contract visualization experimentally, and explored potential case limits of application. Secondly, once I had actually found these beneficial effects, I took contract visualization outside the laboratory and explored its role and development qualitatively as a practice within a real-life organizational setting.

Rather than adopting a fixed theoretical vantage point and choosing to study phenomena and questions to further a certain theory, my starting point is a strong interest in the phenomenon itself – the emerging practice of contract visualization. Different theoretical perspectives and methodologies are then applied, in a pragmatic manner, to expand as much as possible the breadth of the research questions that can be asked and the explanations that can be generated, with the purpose of gaining a deeper understanding of the phenomenon.

Given that PPL is a perspective deeply entrenched within business law, this study is oriented towards – and mostly limited to – business-to-business (B2B) and business-to-government (B2G) commercial contracting scenarios³.

³ This delimitation of the research is apparently inconsistent with the study reported in Publication II, which does not focus on B2B/B2G contracts. However, as I clarify in section 4.2 of this study, I had a number of reasons for this choice: firstly, thoroughness, as it allowed me to test all main categories of contracts (B2B, B2G, and business-to-consumer – B2C), Secondly, convenience: working at a university, it is relatively easy to organize a study involving Master’s students, but the contract to be tested needed to be something Master’s students would actually use (a tenancy agreement). Thirdly, a future orientation: Master’s students are just steps away from entering their professional lives, and they are the workforce of the future. Any possible difference in understanding, communication styles, and preferences would have offered an interesting comparison with the research participants described in Publications III and IV – who were on average significantly older.

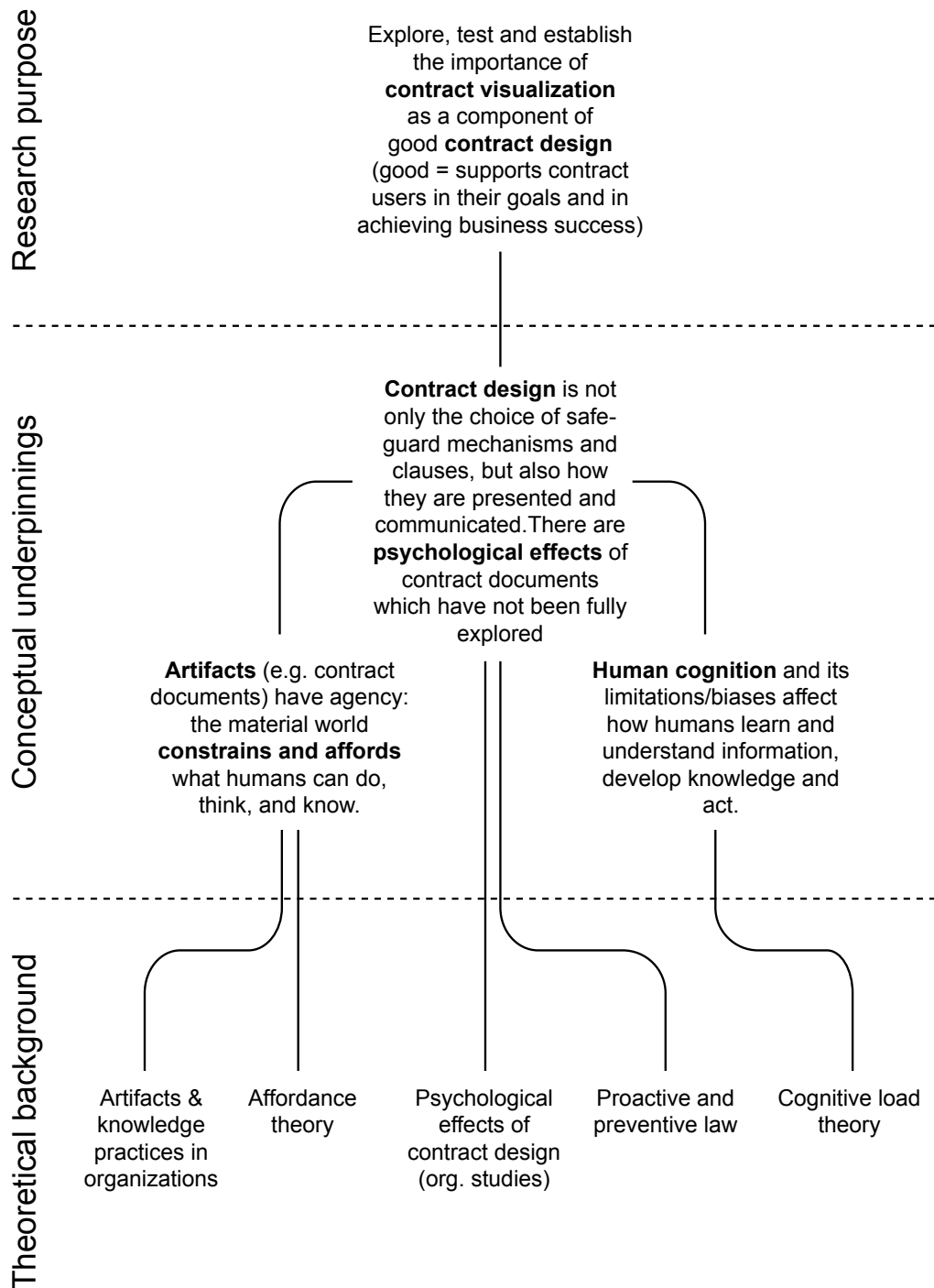


Figure 1.1. Framework of this dissertation

In this setting, issues of clear communication, cognitive overload, and knowledge creation, sharing, and transfer are to be seen in terms of their effect on collaboration (across professions and between the parties) and ultimately in terms of competitive advantage. Even commercial contracts, which are transactional in nature and do not assume inter-organizational collaboration at a structural level between buyer and supplier, *do* require collaboration to succeed, especially if complex goods and services are exchanged (e.g. industrial equipment, outsourced industrial services). Contract planning, negotiation, implementation, and monitoring are a collective achievement of various contract users and stakeholders, all belonging to different professional communities (legal, sales, financial). This achievement is built through their actions and knowledge interactions, within and across each contracting organization.

1.3 Research Questions

To give direction to my research objectives, I developed a number of focused research questions.

RQ 1 *What types of visualization are suitable for representing the types of information encoded in contracts?*

Among the many visualization techniques and design patterns, which ones are *good* for contracts? To visualize contracts, it is necessary to first understand what types of information are encoded in contract documents, and which common problems of understanding are associated with each. A suitable contract visualization technique is determined by both the information to be encoded and the knowledge/information need of its users. The first goal is thus to identify contract visualization techniques which are potentially:

- *accurate* – the visualization can represent specific contractual information/knowledge accurately and appropriately;
- *effective* – the visualization is perceptually clearer and can be more easily interpreted than informationally equivalent text, and better aids its intended users in achieving their cognitive, collaborative, and communicative tasks
- *context-appropriate* – the visualization is familiar, recognizable, and interpretable by its “everyday” users (managers, engineers, and in-house counsel); it can be produced with common and inexpensive software available in an organizational context; and it can be applied and repeated across several contract documents.

RQ 2 *To what extent do visualizations enhance the comprehension of contract documents among their intended users operating in an everyday, non-adversarial organizational scenario?*

- RQ 2.1** *What individual characteristics of contract users (e.g. expertise, educational background, cognitive style...) may affect the possible comprehension benefits of visualizations in contracts, and to what extent?*
- RQ 2.2** *Do contextual characteristics, such as contract type and contracting situation, affect the possible comprehension benefits of visualizations in contracts, and to what extent?*
- RQ 2.3** *To what extent do those same visualizations improve the perception and experience of interacting with contracts among their intended users?*

The second set of research questions addresses whether contract visualizations are effective in supporting the accuracy and speed of comprehension. Do such effects exist, and can they be attributed solely to the presence of visualizations? How powerful are such effects, and, by contrast, what is the baseline comprehension level of text-only, traditional contracts? Do contract users experience cognitive overload when reading and interpreting contracts?

In addition to investigating the overall effects of contract visualization, the limits of applicability and whether visuals are equally useful to individuals with different characteristics are also important. Moreover, even though contract visualization may be beneficial in terms of comprehension, this does not mean that its intended audience would automatically accept it and prefer it to traditional contracts: the experiential aspects of using a novel format of contract are worthy of investigation.

RQ 3 *How and why do contract creators use contract visualizations in contract documents (or as a support for the contracting process, and in explanatory guides and materials about contract documents)?*

- RQ 3.1** *What knowledge-related problems are contract creators trying to solve by employing visualizations in contracts?*

The third research question shifts the attention from contract readers to contract creators. Although contract visualization may bring significant cognitive and experiential benefits – which in return should improve engagement with contracts, diminish the time spent reviewing and reading them, and avoid misunderstandings – there may be organizational constraints in changing current contracting practices. Conversely, there may be other motivations apart from “better understanding” to adopt contract visualization, which cannot be observed or understood in an experimental setting as they arise from contextual needs and social interactions. Collaborating and negotiating in a cross-professional situation is challenging, as knowledge creation and exchange may be hindered by a lack of common ground, difficulties in speaking the same professional language, and understanding what exigencies, goals, and priorities

others may have. Creating the right type of relationship within such uncertainty – that is, the relationship most suited to achieve the parties’ goals – is also an important concern for sales and purchase managers, as relational factors can support (or hinder) business performance (Dyer, 1997). This research question is thus focused on understanding the role of contract visualization within the complex reality of contracting processes, and determining in what ways and for what purposes contract creators may decide to adopt this practice.

RQ 4 *What approaches can facilitate contract creators in selecting, creating, modifying, and deploying visualizations in contracts?*

This research question emerged after I had set the first three, and it is grounded in the needs of contract professionals with whom I interacted in the course of my research. The biggest hurdle to the adoption of contract visualization was not, as one might have assumed, traditional lawyers and legal departments unwilling to change their practices and renegotiate their “ownership” of contract templates. The potential of contract visualization in supporting communication and knowledge creation during the contracting lifecycle was understood and welcomed inside and outside the legal department. However, given that the typical background of contract professionals (creators, stakeholders, and implementers) is law, business, and engineering, many felt that the biggest problem was *how* to visualize – and how to do so in a way that would not require too great an investment in terms of effort, time, money, or acquiring new skills.

Given the novelty of contract visualization practices, answering this question requires a mix of conceptual work, qualitative research, and a hands-on “design science” approach (Hevner, March, Park & Ram, 2004; van Aken, 2005; Holmström, Ketokivi & Hameri, 2009) – that is, materially engaging with idea exploration and problem-solving to identify and frame interesting goals and solutions. This may take the form of prototypes, demos, and pilots.

1.4 Structure of this Study

This study comprises six publications, which have been published (or have been accepted to be published) in peer-reviewed journals, conferences, and in an edited book, as well as an introductory section, which consists of five chapters.

Chapter 2 (Theoretical Background) introduces the research streams on which my research is based: first, contracting literature in legal and organizational studies; second, psychology theories (affordance theory, cognitive load theory, and cognitive styles). The latter establishes the importance of designing the communicative aspects of contracts, and provide criteria for design as well as methods and measures to carry out a quantitative evaluation. Lastly, based on the insights from these research streams, I conclude the chapter by proposing a “*knowledge-based view of contracting*” as a theoretical home for my research, stressing the importance of materiality in informing, mediating, affording, and constraining knowledge interactions in organizations. In this

sub-section, I touch upon concepts which are useful in eventually studying contract visualization qualitatively and “in the field”, discussing the role of knowledge visualization and of other objects and artifacts in organizations.

Chapter 3 (Methodology) introduces the mixed methods approach I chose to answer my research questions, as well as the pragmatic philosophical underpinnings that inform my approach. I introduce, study by study, the research designs, data collection and data analysis methods employed in the quantitative and qualitative components of the study. Three studies have been carried out as controlled experiments (which address RQ 2 and its sub-questions), and another performed as a qualitative single case study (which address RQ 3, and partially, RQ 4). The remaining two publications (which address RQ 1 and RQ 4) are conceptual, and are thus not elaborated upon. Figure 1.2 summarizes how each study contributes to answering the research questions.

Chapter 4 (Summary of the Results) presents the main arguments and empirical results of each study.

Chapter 5 (Discussion and Conclusions) elaborates on the findings in light of the research questions, discussing their theoretical and practical implications. Limitations and avenues for future research are discussed.

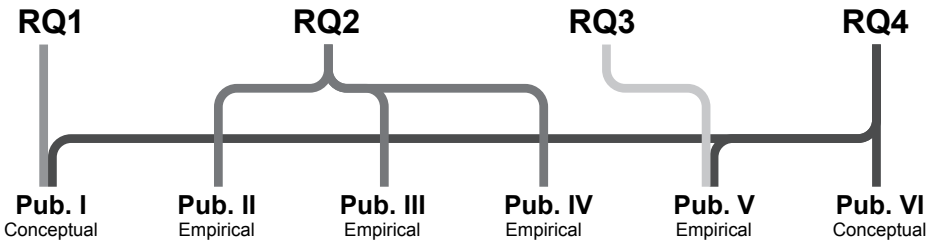


Figure 1.2. How the findings of this study provide answers to the research questions

2. Theoretical Background

In this section, I review several streams of literature that contribute to framing my work. Given the multidisciplinary nature of my research, my thinking needs to touch upon several fields of knowledge: legal scholarship, organizational studies, design, and psychology.

Firstly, I examine key streams in contracting literature, focusing in particular on:

1. The tenets of *Proactive and Preventive Law* (PPL), a business-oriented perspective in legal studies that has strongly influenced my view of contracts and gave rise to the bulk of the contract visualization research stream – which can be seen as a manifestation in practice of proactive and preventive law principles.
2. *Contracting research in organizational studies*, which has historically been influenced by Transaction Cost Economics (TCE) and by the debate on the role of formal and relational contracts, and which recently saw the emergence of a *cognitive and psychological perspective on contracting*.

Secondly, I introduce literature that contributes to our understanding of how easily comprehensible (contract) documents should be designed. Rather than engaging in a “graphic design 101” chapter focused on basic perceptual and compositional principles of good design, I review three streams of psychological research that have been influential in shaping the assumptions and practices within the information and interaction design fields:

1. *Affordance theory*, which argues that the natural (and designed) material world possesses characteristics that enable and constrain human action, and spurs learning. Human agency and learning develops as affordances are discovered and acted upon. For designers it is thus important to imbue their solutions with the most useful action possibilities, and create understandable visible signs and interfaces that guide users to learn about such functionalities and use effortlessly.
2. *Cognitive load theory* (CLT), which postulates the importance of reducing cognitive load by means of design to support understanding and learning – and the closely related *cognitive theory of multimedia learning* (CTML), which stresses the role of dual coding (presenting in-

formation in visual *and* verbal formats simultaneously) in enhancing cognition.

3. Research on the *visual and verbal dimensions of cognitive style* – an individual’s preferred approach to thinking, learning, organizing and representing information. While the core of my research is not about cognitive style, it needs at least to be taken into consideration and operationalized as a control variable when comparing the effectiveness of text-only and visually enhanced documents, as different styles may influence how an individual understands information presented in a certain format.

These three research streams provide criteria for designing understandable contracts that integrate visualization – and, more importantly, methodologies and measures to evaluate whether they better support cognition in comparison to text-only contracts.

Lastly, I go back to the field of organizational studies. Since I am looking at contract documents as managerial tools and instruments for communication, it is necessary to find frameworks and concepts that describe what contracts – and in particular contract visualizations – are, how they work, and their role in the firm. I suggest an alternative theoretical place for contracts in organizational studies, and a shift from a “TCE-view of contracts” to a “knowledge-based view of contracts”, which casts the knowledge created, shared, and transferred through contract documents and the contracting process as sources of competitive advantage. This valuable knowledge, however, does not come into existence automatically just by creating any contract. By taking a sociomaterial and practice-oriented stance, I suggest that *how* contracts are materially designed influences their functionality and usefulness within the complex knowledge interactions in which they are used. To translate the essence and role of contract visualizations into general analytical categories used within this knowledge-oriented stream of organizational research, I review literature on:

1. The role of *objects and artifacts* in organizations
2. *Knowledge Visualization (KV)* – the use of visualization in conveying knowledge and amplifying cognition, communication and collaboration in organizational settings.

2.1 Contracting Literature

2.1.1 Proactive and Preventive Approaches to Contracting and Law (PPL)

The proactive approach to contracting and law originated in the Nordic countries in the late 1990s, initiated by a small group of Finnish scholars⁴ such as

⁴ The earliest works in this literature stream are in Finnish language (Pohjonen, 2002; 2005; Haapio & Haavisto, 2005). While I did not review these works because of language barriers, I invite the willing (and able) readers to look up the original thoughts formulated in these foundational works.

Helena Haapio, Soile Pohjonen, Vaula Haavisto, and Soili Nystén-Haarala (Haapio, 2013a; Berger-Walliser & Shrivastava, 2015; University of Eastern Finland, 2008) Closely related to US streams of research such as preventive law (e.g. Brown L. 1950; 1986; Brown L. & Dauer, 1978; Barton, 2012a; 2012b) and law for competitive advantage (e.g. Siedel, 2002; DiMatteo, 2010; Siedel & Haapio, 2010; Bird, 2008; 2011), the proactive approach is defined as:

“... a future-oriented approach to law placing an emphasis on legal knowledge to be applied before things go wrong. It comprises a way of legal thinking and a set of skills, practices and procedures that help to identify opportunities in time to take advantage of them – and to spot potential problems while preventive action is still possible. In addition to avoiding disputes, litigation and other hazards, Proactive Law seeks ways to use the law to create value, strengthen relationships and manage risk.” (Nordic School of Proactive Law, n.d.)

Given the similarities between proactive law and preventive law, and the numerous collaborations between scholars who subscribe to either definition, I refer to the research in this field with the umbrella term “Proactive and Preventive Law (PPL)”, a term used, for instance, by Berger-Walliser, Barton & Haapio (2017).

PPL is born of real-life needs, and “*belongs to legal approaches which emphasize the many-sided, varied, and interactive nature of human reality*” over legal doctrine applied in the court (Pohjonen, 2006, p.54). The focus is on the end-users of legal systems and documents (citizens, businesses, etc.), rather than the expert users and creators of the system (lawyers and judges) (Barton, 2012b).⁵

This approach was developed out of dissatisfaction with traditional legal thinking and scholarship (Berger-Walliser, 2012, p.19; Taskinen, 2006), which views contracts as merely reactive, *ex post* instruments to be used in court when a dispute arises, underpinned by a “flight or fight” (settle or litigate) approach to solving legal and business problems (Siedel, 2002, p.6; Siedel & Haapio, 2011, pp. 4-5). According to this critique, the traditional approach does not serve business well enough because it overly focuses on reacting to past failures of the parties, rather than helping organizations to plan and strategize successful transactions and manage risk (Siedel & Haapio, 2011, p.11). In fact, “*the typical law school education reinforces the notion that litigation is the very core of lawyering*” (Haapio, 2006b, p.175). Conversely, the PPL approach is an *ex ante* foundation to envision and use contracts and the law outside court, as instruments to prevent problems and achieve business success (Haapio, 2013a). This is a practice of future-oriented lawyering, in which “legal foresight” (Siedel & Haapio, 2011, p.11), “contract literacy” (Haapio, 2003;

⁵ The attention to the issue of making legal knowledge work for business is well expressed by an anecdote from Haapio (2006a, p.24). When seeking to find a name for the approach in Finnish and Swedish language, the Finnish pioneers of the approach thought to use a translation of the adjective “preventive”. However, when they tested the term with a business audience, it was rejected, as it suggested the ideas of “deal-prevention” and “business-prevention”, which is something business people often accuse lawyers of causing. After trial and error, the term “proactive” was chosen, as it resonated well with business audiences and stressed the idea of lawyering as a practice actively seeking to create added value for business.

Haapio & Siedel, 2013, p. 29), and “legal astuteness”(DiMatteo, Siedel & Haapio, 2012) are used not only to avoid problems, but to create and sustain competitive advantage (Siedel, 2002; Siedel & Haapio, 2010; DiMatteo, 2010). According to Dauer (2012, p. 185), proactive law is the first step in legal scholarship towards a “generalized theory of conflict prevention”.

PPL is enshrined in business law, as it focuses principally on contracting⁶ and other related managerial-legal issues, such as risk management (e.g. Siedel & Haapio, 2011; Haapio & Siedel, 2013) and project management (e.g. Henschel, 2012; Kujala, Nystén-Haarala & Nuottila, 2015; Nuottila, Kauppila & Nystén-Haarala, 2016). However, this perspective has also expanded to policy and regulation development (e.g. Schartum, 2006; Berger-Walliser & Shrivastava, 2015). Remarkably, the European Economic and Social Committee (EESC)– a consultative body that shapes EU-level policies by advising the European Commission, the European Parliament, and the Council of Europe – expressed a formal opinion to consider adopting a proactive approach to produce better EU regulation (EESC, 2009).

At the core of PPL are the two concepts of *prevention* and *promotion* (Haapio, 2013a). The idea of *prevention* has been borrowed from Louis M. Brown, a US law professor whose 1950s treatise *Preventive Law* and subsequent works (e.g. 1986; Brown L. & Dauer, 1978) earned him the title of “Father of Preventive Law”. His work introduces a shift of mindset in legal scholarship. While in reactive law the focus is on predicting what the judge will say, in proactive and preventive law lawyers need to understand what people will do, and use their skills to prevent disputes because “*it usually costs less to avoid getting into trouble than to pay to get out of trouble*” (Brown L., 1950, p.3). Following an analogy with preventive medicine, preventive lawyering prevents the “disease” of legal troubles (Haapio, 2006a; Siedel & Haapio, 2010; Wexler, 2000), since it tries to eliminate causes of conflict, intervenes early on negative effects, and seeks to minimize the damage of claims that cannot be completely avoided (Dauer, 1988; 2012; Haapio, 2006b). The idea is mirrored also in Higgins’ Regulatory Focus Theory (1997; 1998), which sees prevention as a motivational principle that steers behavior so as to avoid undesirable outcomes.

The idea of *promotion* has also been borrowed from Higgins (1997; 1998), who defined it as a motivational principle to seek what is desirable. The PPL approach understands the need to balance prevention with promotion, because avoiding trouble is not, per se, the goal of businesses: successful performance is. A focus on opportunities, success, and gains for both parties – rather than coercion – is thus crucial. This orientation requires three adjustments: managers need to understand the impact of legal issues on their business, and develop basic contractual literacy that allows them to translate legal concerns into business concerns, and vice versa (e.g. DiMatteo et al., 2012). Secondly, legal departments need to let go of iron-clad “perfect” contracts that seek to

⁶ In fact, the concept of proactiveness emerged first in relation to contracts, firstly in Haapio’s seminal paper “*Quality Improvement through Proactive Contracting: Contracts Are Too Important to Be Left to Lawyers!*” (1998), and then it was further established in *Ennakoiva Sopiminen* (“Proactive Contracting”), a Finnish anthology edited by Soile Pohjonen (2002).

cover every possible contingency, which tend to increase the transaction costs and effort associated with negotiating, drafting, and monitoring them (Passera & Haapio, 2011b; Berger-Walliser, Bird & Haapio, 2011). Lastly, managers and lawyers need to learn to collaborate and see the big picture, in a strategic way, so as to avoid creating *dysfunctional contracts* which are not aligned with business and relational objectives (Haapio, 2013a).

PPL is a reaction to poor contracting, which is believed to be a widespread problem, and to scholarly paradigms that impede practical improvements in contracting capabilities. On one side, it is a reaction to traditional legal scholarship which focuses on legal rules governing contracts, rather than studying contracts themselves (Smith & King, 2009), and is concerned with case law and contract interpretation by lawyers and judges in court, rather than by organizational actors outside court. On the other side, it is a reaction to economical theories such as Transaction Cost Economics⁷ (Williamson, 1979; 1985; 1991), which have stressed their control and enforcement functions above all else (Nuottila et al., 2016), even though it inspired empirical research on contracts. Lastly, PPL shares many points of contact with relational contract theory⁸, but also criticizes a certain interpretation of such literature, which led to de-emphasizing contract documents per se, and focused instead on non-contractual social norms that complement or substitute formal governance mechanisms (Haapio, 2006b, p.179; Haapio, 2013a, p.31).

These influential streams of literatures do not seem to problematize the formal contract document itself (Suchman, 2003): the focus of interest has almost always been on *something else*, whether contract doctrine or transactional attributes and governance mechanisms. At best, the contract is a “documentary artifact” (Suchman, 2003) or a “legal reminder of the transaction terms” (Schepker, Oh, Martinov & Poppo, 2014). The PPL approach challenges this view and expresses a keen interest in communication, and on how both the content and presentation of contracts can be designed strategically to create and sustain relationships.

PPL sees contracts as *business plans* (Pohjonen & Koskelainen, 2012), *blueprints for performance* (DiMatteo et al., 2012), *readable roadmaps of how to proceed* (Haapio, 2006b), and *communication systems* (Barton, 2012b). Haapio adds that contracts are always a *tool* to achieve profit, and they should be designed so as to always translate into concrete actions (2006b). Clarity and actionability for business users of contracts, in an everyday operational setting, are thus crucial exigencies. Using contracts proactively requires documentation (Haapio, 2006b), and not only extra-contractual relational interactions:

⁷ More on transaction cost economics and contract literature in organizational studies is presented in section 2.1.2

⁸ Works by Macaulay (e.g. 1963a; 1963b; 2003) and Macneil (e.g. 1974; 1975; 1985) are frequently cited as key references by proactive law scholars. Haapio acknowledges the contribution of preventive law and relational contract scholars as follows: “There are some notable exceptions in legal literature: Louis M. Brown, Edward Dauer, Stewart Macaulay, and Ian Macneil were among the first to break the lawyers’ traditional way of looking at the past. Their work on the use and nonuse of contracts as well as on planning (by lawyers) in general and in contract planning in particular, even though several decades old now, is still valid” (Haapio, 2006b, p.165). “Their work offers a practice -oriented theoretical foundation for contract planning, one of the key building blocks of Proactive Contracting” (Haapio, 2006b, p. 167).

on one hand, the process of creating such documents ensures shared understanding. On the other hand, the outcome – the contract document itself – is necessary to share knowledge within and across organizations, functioning as an explicit, common reference (Haapio, 2006b).

Clear communication is also instrumental in complying with conflict-prevention principles, which according to Dauer (2012) are 1) aligning between expectation and reality, 2) discovering which party can better bear a certain risk so that it can be allocated to it, 3) allowing venues for grievance and redress before they escalate, and 4) designing compliance around pre-existing culture, rather than on imposed rules (which are always overridden by culture). Cross-professional, “sincere” and “empathic” communication is an indispensable skill for the proactive practitioner (Sorsa, 2012), since preventive and promotive strategies require coordination and knowledge sharing between lawyer and customer (Barton, 2012b; Barton, Berger-Walliser & Haapio, 2013), within and between different professional groups involved in contracting (Barton, 2012b; Sorsa, 2012; Barton et al., 2013; Kujala et al., 2015;), and between the parties (Barton, 2012b; Barton et al., 2013). This reflects the view that while contracts have *also* a legal function, it is hardly the main core functionality from the contract users’ perspective: the purposes that matter the most to business actors are allocating tasks and responsibilities, aligning expectations, defining outcomes, helping to plan a successful transaction, and building the appropriate relational frame to make it happen (Haapio, 2006b). Contracts are puzzles where legal terms (describing “*what if something goes wrong?*”) are just one piece, along with technical (“*what solution is being sold?*”), implementation (“*who does what, where and how?*”), and financial terms (“*who pays whom, when, where, how, and why?*”), which need to be coordinated through strategy, communication and good information architecture (Haapio, 2006b; 2013a).

Contract design is then seen as an exercise in balance: balance between managerial and legal functions of contracts, but also between technical precision and effective communication. Haapio (2014) suggests that contract quality should be assessed in terms of how users react to the content, structure, language, and design of a contract in terms of emotional, cognitive and behavioral responses (that is, how they engage with the contract, what they understand, and how they act upon it). The goal, as always is effective contract implementation and successful business results, which can be achieved only through concrete action: “*Contracts do not make things happen – people do*” (Haapio, 2013a, p. 68).

2.1.1.1 Legal Design and Contract Visualization

When contracts are seen as something to be deliberately designed, the issue of best practices and tools becomes important. Haapio and Hagan (2016) propose a pattern approach to develop contract design: using design patterns – repeatable solutions to recurrent problems. Patterns are better than strict rules as they allow adaptation to specific contextual needs. Moreover, several families of patterns provide solutions in regards to different aspects of contracts. So far, Haapio and Hagan (2016) proposed four possible “shelves” for a developing contract design pattern library: one about the process of crafting, finalizing

and implementing a contract (process patterns), and three about the crafting of the document itself (layout composition patterns, clause text patterns, and visualization patterns).

Berger-Walliser, Barton and Haapio (2017) suggest that shifting from mere *contract drafting* to full-fledged *contract design* also requires a change of mindset and a merging of legal thinking with design thinking⁹. This perspective mirrors the emerging discourse of *legal design* – “*the application of human-centered design to the world of law, to make legal systems and services more human-centered, usable, and satisfying*” (Hagan, 2016). It is important to note that legal design is not a synonym for contract visualization and contract document design: rather, the latter are a sub-discipline of legal design (marked as “information design” in Figure 2.1). The same user-centered methodology can be applied to solve other problems within the legal domain, by designing tools, services, processes and systems (Figure 2.1). Legal design shares a number of basic assumptions with the design thinking problem-solving methodology (cf. Berger-Walliser et al., 2017; Hagan, n.d.; Legal Design Jam, n.d., Legal Design Lab, n.d.), such as:

- user-centeredness as the starting point for problem-solving;
- multidisciplinary collaboration as the way to achieve meaningful innovations;
- visual communication as a tool to clarify, model, and communicate complex ideas;
- prototyping as a mean to learn and elicit users’ knowledge.

Since the foundational principle of legal design is centering solutions around users’ needs, it follows that the quality of legal documents, services, and processes should be evaluated also in terms of usability

“the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use” (International Organization for Standardization, 1998)

and user experience

“the entire set of affects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning), and the feelings and emotions that are elicited (emotional experience)” (Hekkert, 2006, p.160).

⁹ Design thinking is “a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos” and which uses “the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity” (Brown T., 2008, p.86). Design thinking, in this definition, does not describe how professional designers think and act – a “designerly ways of thinking” – (Cross, 1982; 2011), but rather describes a broader approach to innovation and problem-solving, inspired by expert design practice, that can be applied outside traditional design problems (e.g. business, social innovation) (Brown T., 2008).

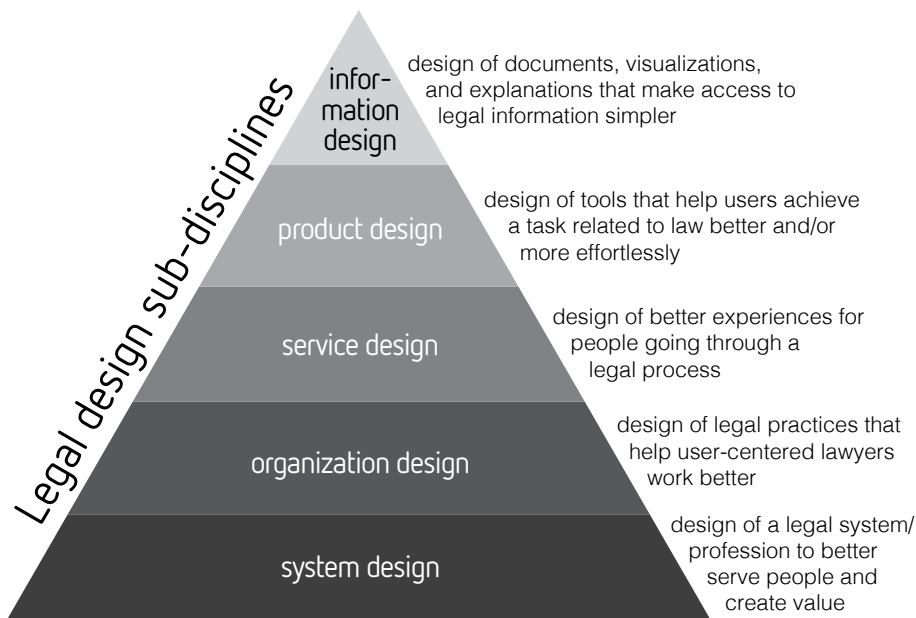


Figure 2.1. Conceptualization of the field of legal design (adapted from Hagan, 2016)

The attention to clear and actionable communication as part of proactive and preventive contracting, as well as the emerging discourse of legal design, has led several scholars to advocate for a greater use of visual communication in contracts and contracting processes (e.g. Berger-Walliser et al., 2011; Berger-Walliser et al., 2017; Barton et al., 2013; Rekola & Boucht, 2011; Rekola & Haapio, 2009; 2011)¹⁰. Berger-Walliser and colleagues (2011) describe the role of visualization in contracts and its significance within PPL contracting as follows:

“A prerequisite for achieving these common goals is a true, shared understanding between the business partners of both the technical and the legal implications of their contractual relationship. Proactive contracting therefore seeks to provide clarity and cross-professional understanding. In order to achieve this common understanding, it is necessary that all stakeholders in the contracting process actually read and comprehend the underlying contractual provisions. However, traditional contracts typically are written by lawyers for lawyers, and non-lawyers—the people who need to implement these contracts—find them hard to understand and ambiguous and, therefore, sometimes even refrain from reading them. [...] we introduce the idea of legal visualization to foster this interdisciplinary understanding of contracts, which, to us, is a crucial element for a successful proactive business relationship.” (Berger-Walliser et al., 2011, p. 67)

¹⁰ In addition to the valuable works of other scholars, I have contributed to this literature stream with several conference papers, as first author and co-author, as early as 2011 (see Passera & Haapio, 2011a; 2011b; 2013a; 2013b; Passera, Haapio & Barton, 2013; Passera, Pohjonen, Koskelainen & Anttila, 2013; Haapio & Passera, 2012; Passera, 2012). For clarity's sake, since a literature review should provide the basis upon which further work has been developed, I mention these earlier works in this section, but leave out the articles and conference papers which constitute the contribution of this study.

The practice of contract visualization can be seen as a manifestation of the PPL paradigm. However, while contract visualization features prominently in the scholarship of PPL researchers and their co-authors, its possibilities to clarify reasoning and communication have also been explored outside this paradigm (e.g. Mitchell, 2013; 2016; Conboy, 2014). To provide a more comprehensive picture of the current discourse ¹¹, I selected studies based on their contribution, and not based on their affiliation with PPL.

Few definitions of “contract visualization” can be explicitly found in literature:

- *“The description of [contracts’] scope and terms through visual means rather than the written word”* (Berger-Walliser et al., 2011, p.58)
- *“Contract visualization – the use of charts, images, and interactive interfaces to help non-lawyers quickly grasp contract essentials”* (Wong, Haapio, Deckers & Dhir, 2015, p. 505)
- *“Visualization techniques add images to words. Such techniques could be used directly in a contract, as part of the drafting process. On the other hand, visualization can be about a contract, a separate document that assists all those who are involved in the planning, review, or approval of a contract or in monitoring or implementing its terms. Whether inside a contract or alongside it, visualization could supplement contract language through dia-*

¹¹ It is also to be duly noted that, within legal scholarship, there have been other streams of research that focused on visual communication and representation, even though with perspectives and purposes that are different from contract visualization (for a review, see Brunschwig, 2014).

Several studies have focused on visual legal rhetoric and the persuasion of materials *used in court*, such as briefs, judicial opinions, pieces of evidence, and jury instructions – and how visibility may affect the process of deliberation and legal reasoning (e.g. Miles & Cottle, 2000; Sherwin, 2007; 2011; Santee, 2012; Rosman, 2013; Porter, 2014). Mostly, legal scholars have concentrated on understanding and contextualizing existing visual practices from a legal discourse perspective. For instance, Sherwin (2007) illustrates how visual culture and multimodal communication necessarily affect the content and meaning of the law, and encourages courts in shedding their “technophobia” since “as goes popular discourse, so goes legal rhetoric”. Similarly Brunschwig, starting from her pioneering work on the possibilities of visualizing legal norms (2001), has devoted her later research to conceptualizing multisensory law, examining how diverse stimuli affect meaning-making and communication in law (2013). Hibbits (1994) discusses the role of visual metaphors in legal thought and reasoning, while Murray stresses the importance of finding ethical grounds for the use of visual rhetoric in law (2016), as he sees visual communication as a tool for enhancing communication in an increasingly multicultural and multimedial world (2015).

Others have focused on images as the subject matter of law (for instance, Tushnet (2012) focuses on courts’ difficulties in assessing copyrightability and infringement for visual works), while others take the opposite road, focusing on how images can be a source of law independently from words – as in road signs (e.g. Wagner, 2006), or zoning maps in city planning (e.g. Moroni & Lorini, 2016).

Within the legal informatics discourse, the possibilities of visualization have instead been explored in terms of conceptual modeling and meta-modeling, with the goal of increasing the degree of formalization of legal communication making it more easily computable, accessible, logical, and unambiguous in both processes of creation of law and application of law (e.g.; Becker, Eggert, Heddier & Knackstedt, 2012; Curtotti & McCreath, 2012; Curtotti, McCreath & Sridharan, 2013; Curtotti, 2016; Fill, 2012; 2015; Knackstedt, Heddier & Becker, 2014). For instance, Curtotti & McCreath (2012) reported that online legislation websites in various countries now resort to visualization to support public access, exploration, and understanding of legislation. Plenty of research on legal visualization in legal informatics has been conducted in German language, and it can be retrieved as part of the annual proceedings of the IRIS Symposium, which has traditionally dedicated a conference track to legal visualization (an online archive of the proceedings, dating back to 2005, is available at <http://jusletter-it.weblaw.ch/issues/2016.html>).

grams, images, maps, timelines, decision trees, charts, icons, clip art, sketches, drawings, symbols, or photographs” (Barton et al., 2013, p.48)

Firstly, it emerges that “visualization” is conceptualized rather widely, so as to cover as many types of visual communication techniques as possible, spanning from layout design and typography (Butterick, 2015; Tsygankova, 2016) to future possibilities such as interactive visual representation and graphical user interfaces (Plewe, 2013; Wong et al., 2015). Secondly, different applications for contract visualization are envisioned. In addition to Barton and colleagues suggestions of visualizations *in* contracts, and visualizations *about* contracts (2013), Haapio, Plewe and de Rooy (2016) proposed two new categories: visualizations *for* contracts, meaning sketches, interfaces, and visual templates that support cognition and communication during contract planning, negotiation, and creation; and visualizations *as* contracts, where a highly visual narrative – for instance a comic – constitutes the actual, legally binding contract document.

When used in documents, scholars do not advocate for completely substituting contract texts with images, but rather complementing them (e.g. Rekola & Boucht, 2011; Rekola & Haapio, 2011; Berger-Walliser et al., 2017), so as to make best use of the relative strengths of both modes of communication. Visualizations and traditional text are envisioned to co-exist in multimodal documents, designed with the deliberate goal of supporting clear and actionable communication between the parties. Haapio and Passera (2012) analyzed several examples of contract visualizations, and suggested that often the semiotic role of the visual element is to elaborate and enhance the message carried by the text, as well as engage and motivate the audience.

The “clarity” and “engagement” themes are in fact recurrent in the literature. Analyzing how different authors envision the purposes of contract visualization, we can summarize their arguments in the following propositions (see also Table 2.1):

1) Contract visualization supports comprehension. One of the main purposes of visualization is to clarify the meaning of contracts, especially for non-lawyers. In a business-to-business environment, “non-lawyers” are conceptualized as lawyers’ clients (Jones & Oswald, 2001; Conboy, 2014), managers, engineers, financial and HR specialists and executives involved with negotiating, commenting on, approving, or implementing the contract (Haapio, 2013c; Haapio & Barton, 2016; Passera & Haapio, 2011b), the parties at the negotiating table (Haapio, Plewe & deRooy, 2016; Plewe, 2013; Plewe & de Rooy, 2016; Wong et al., 2015). In a public organization, non-lawyers mean civil servants and subject-matter experts involved in the public procurement process or tasked with monitoring contract implementation after the award (Passera, Pohjonen, et al., 2013; Pohjonen & Koskelainen, 2012). Lawyers, however, also face cognitive challenges due to the complexity of their work, and likewise resort to visualization to envision difficult issues and plan transactions, clarify and organize their thoughts, and communicate them to others (Berger-Walliser et al., 2011; Conboy, 2014; Mitchell 2013; 2016; Mahler, 2013). Visualization is seen as a tool to support and enable proactive lawyering by means of more effective and focused communication, and thus avoids

Table 2.1. Summary of contract visualization literature review

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Jones & Oswald, 2001	Flowcharts	<ul style="list-style-type: none"> Analyze and break down a deal in terms of business and process points Improve communication between lawyer and client during deal planning and contract drafting Get approval and input more easily from different specialists by summarizing the issues they are concerned with Speed up transactions by means of faster understanding and more effective counseling Speed up orientation and education of implementation personnel 	Business-to-business	Yes	Empirical (case study)
Jones, 2009	Flowcharts, grids, system illustrations	<ul style="list-style-type: none"> Reduce overall time to conclude a contract Reduce cycles of team effort to define the deal Communicate more effectively with novice or international colleagues Assist contract implementation 	Business-to-business	Yes	Conceptual
Rekola & Haapio, 2009	Flowcharts, mindmaps	<ul style="list-style-type: none"> Clarify, simplify, and standardize service offerings and their modules Promote understanding of the contract across different professional groups Sell service ideas internally and externally 	Business-to-business (service contracts)	No	Conceptual
Kay & Terry, 2010; Kay, 2010	Typographic interventions, pull- quotes and factoids, comic-like vignettes, icons	<ul style="list-style-type: none"> Provide a clear information hierarchy Capture and retain attention longer Reduce the cognitive demands imposed on readers by lengthy agreements Assist skimming and content integration strategies Communicate to readers that an effort to communicate with them is being made 	Business-to-consumer (end user license agreements, EULAs)	Yes	Empirical (experimental evaluation)
Berger-Walliser, Bird, & Haapio 2011	Flowcharts, decision trees, illustrations, process maps, mindmaps, graphs	<ul style="list-style-type: none"> Clarify possible risk Highlight possible opportunities Reduce uncertainty and misinterpretation Facilitate implementation and monitoring Support cross-professional understanding Organize ideas in individual planning work Persuade other stakeholders 	<ul style="list-style-type: none"> Business-to-business commercial contracts Employment contracts 	No examples of contracts, but it shows an example of policy visualization	Conceptual

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Haapio, 2011	Flowcharts, timelines, other diagrams, visual metaphors	<ul style="list-style-type: none"> • Make decision-making and contract implementation more effective by increasing the clarity of contract documents • Make information easier to find and understand • Support cognition • Leverage an emotional response from the contract reader • Help the visualization's author to think through the issue, organize thoughts, and communicate them clearly • Illustrate the presence of invisible and implied terms 	Business-to-business commercial contracts	Examples are taken from earlier publications (cf. Passera & Haapio 2011a)	Conceptual
Passera & Haapio, 2011a	Timelines, flowcharts	<ul style="list-style-type: none"> • Reduce contract complexity and the ensuing cognitive overload • Reduce uncertainty and misinterpretation • Support content navigation • Enhance manageability and implementation of contracts • Help generate and organize contract information systematically 	• Business-to-business	Yes	Conceptual
Passera & Haapio, 2011b	Flowcharts, timelines	<ul style="list-style-type: none"> • Map and align expectations and goals in the pre-contract stage • Make decision-making and contract implementation more effective by increasing the clarity of contract documents • Facilitate cross-professional understanding and collaboration around contracts • Make the contracting process more efficient, effective, and empathic for those involved • Save time and money in negotiation 	• Business-to-business	Yes	Conceptual
Rekola & Boucht, 2011	A combination of drawings, charts, texts and photographs	<ul style="list-style-type: none"> • Clarify service content and responsibilities during sales negotiations • Conceptualize service descriptions • Engage and communicate more effectively with non-lawyers, motivate them • The process of visualizing is as important as the visualization outcome itself in terms of enhancing understanding 	• Business-to-business (service contracts)	No examples	Empirical (case-study)
Rekola & Haapio, 2011	No specific techniques are mentioned	<ul style="list-style-type: none"> • Help productize and modularize service concepts, and communicate them to customers • Make service descriptions tangible • Support the creation of common ground among people who do not speak the same language (literally or professionally) • Make contracts more suitable to be used as management tools 	• Business-to-business (service contracts)	No examples	Conceptual

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	• Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Haapio & Passera, 2012	Icons, timelines, flowcharts, photographs, color-coding	<ul style="list-style-type: none"> • Enhance comprehension of contracts • Decrease cognitive load • Elaborate, enhance and expand the meaning of text 	<ul style="list-style-type: none"> • Business-to-business commercial contracts • Public procurement 	Yes	Conceptual
Passera, 2012	Charts, timelines, flowcharts, color-coding, typographic and layout interventions	<ul style="list-style-type: none"> • Enhance comprehension of contracts • Support faster reading of contracts • Provide a more positive user experience (in terms of document preference and anticipated ease of use) • Provide more positive expectations about the author of the contract • Elicit more positive brand image 	Business-to-business commercial contracts	Yes	Empirical (experimental evaluation)
Pohjonen & Koskelainen, 2012	Flowcharts, diagrams, maps	<ul style="list-style-type: none"> • Act as a boundary object and facilitate knowledge sharing and transformation • Support a holistic comprehension of complex information (e.g. tendering processes, delivery processes, service delivery) • Reframe contract information so that it is presented in a format that can be easily and timely applied in a given context by those who need to act upon the information • Support collaboration 	Public procurement	Yes	Conceptual
Barton, Berger-Walliser & Haapio, 2013	Diagrams, maps, timelines, decision trees, charts, icons, clip art, sketches, drawings, symbols, photographs	<ul style="list-style-type: none"> • Identify physical objects of exchange • Represent and explain sequences of events, responsibilities, and relationships in service business • Depict contractual and legal concepts • Depict contract structure and order of application • Depict and clarify possible risks • Conceptualize "invisible terms" of contracts • Elicit desirable relational expectations 	Business-to-business commercial contracts	No examples	Conceptual
Haapio, 2013b	Timelines, swimlanes, process maps	<ul style="list-style-type: none"> • Communicate with multiple user groups and varying information needs • Articulate crucial contract requirements more clearly (e.g. responsibilities, steps...) • Support customers in contract implementation 	Business-to-business commercial contracts	Partially. An example is taken from earlier publications (cf. Passera 2012)	Conceptual

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Haapio, 2013c	Flowcharts, swimlanes, icons, color-coding, highlighting	<ul style="list-style-type: none"> • Enhance the usability and user experience of contracts across cultures and disciplines • Change how contracts are perceived by non-lawyers • Coordinate legal and managerial perspectives • Enhance dialogue with management and subject-matter experts in contract planning and implementation • Articulate crucial contract requirements more clearly (e.g. responsibilities, steps...) • Give salience to key contract content 	Business-to-business contracts	Partially. Some examples are taken from earlier publications (cf. Passera & Haapio, 2011a; Passera & Haapio, 2013a)	Conceptual
Mahler, 2013	Icons, diagrams, "formal diagrams" (created with a standard method, e.g. the Universal Modeling Language)	<ul style="list-style-type: none"> • Increase the user-friendliness of legal texts • Enhance the understandability of legal texts • Encourage and motivate users to read legal texts • Classify and disambiguate norms and concepts in legal logic • Communicate legal logic, norms, and concepts in a simple way, understandable also to non-lawyers 	Contracts and legal texts in general	Yes	Conceptual
Mitchell, 2013	Typographic and layout interventions, visuals (undefined)	<ul style="list-style-type: none"> • Communicate more effectively with non-lawyers • Make documents more accessible and useful • Organize information so it is more salient, easily searchable and findable • Optimize document use for specific users, with specific needs, in a specific context • Make content accessible to users with different abilities (e.g. novices workers, low-literacy persons...) • Anticipate and answer recurrent questions 	Legal documents in general	No examples of contracts, but it shows an example of other redesigned governance documents	Conceptual
Passera & Haapio, 2013a	Charts, timelines, flowcharts, color-coding, typographic and layout interventions	<ul style="list-style-type: none"> • Enhance comprehension of contracts • Support faster reading of contracts • Provide a more positive user experience (in terms of document preference and anticipated ease of use) • Provide more positive expectations about the author of the contract • Elicit more positive brand image 	Business-to-business commercial contracts	Partially. An example is taken from earlier publications (cf. Passera 2012)	Empirical (experimental evaluation)

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Passera & Haapio, 2013b	Timelines, Gantt charts, diagrams	<ul style="list-style-type: none"> Facilitate information finding Enhance comprehension Support memorization and recalling Elicit positive perceptions about contract usability Elicit positive user experience Contextualize contract terms in terms of actual business processes Facilitate negotiations Audit the logic and clarity of the contract while drafting and negotiating, support clearer thinking 	Business-to-business	No original examples. Examples are taken from earlier publications (cf. Passera 2012; Passera & Haapio, 2013a)	Empirical (case study)
Passera, Haapio & Barton, 2013	Icons, diagrams, maps, flowcharts, typographic and layout interventions	<ul style="list-style-type: none"> Provide salience to key issues, support strategic reading Make explicit the logic and structure of the document for easier navigation and comprehension Support analytic thinking in regards to complex information Make information processing more efficient (more accurate and faster) Reduce cognitive load Enhance user experience and elicit positive emotions and perceptions Engage stakeholders in negotiation and implementation Help articulate and externalize tacit assumptions Reduce uncertainty and misinterpretation 	<ul style="list-style-type: none"> Business-to-business commercial contracts Public procurement 	Partially. An example is taken from earlier publications (cf. Passera & Haapio 2013a)	Conceptual
Passera, Pohjonen, Koskelainen & Anttila, 2013	Flowcharts, timelines, icons, bullseye diagram	<ul style="list-style-type: none"> Enhance comprehension of contracts Support faster reading of contracts Elicit a positive subjective perception of usability Elicit a positive user experience in terms of increased positive affect, decreased negative affect, and increased perception of pleasantness 	Public procurement	Yes	Empirical (experimental evaluation)
Plewe, 2013	Graphical user interfaces/dashboards, visual metaphors, graphs	<ul style="list-style-type: none"> Display, prioritize, and align parties' goals during negotiation Facilitate interest-based negotiation and conflict resolution by showing the interdependences between parties' high-level preferences, mid-level goals, and actual contract terms Differentiate between standard and amended clauses Support understanding of the contract terms 	<ul style="list-style-type: none"> Business-to-business (online) Business-to-consumer (online) 	Yes	Conceptual

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Conboy, 2014	Diagrams of various kinds (e.g. timelines, flowcharts, mapping through symbols, line thickness and color- coding)	<ul style="list-style-type: none"> • Illustrate or explain a thing quickly and concisely • Show a before/after view of the deal • Depict steps of a transaction • Indicate relationships among persons and legal entities • Facilitate readers' comprehension • Help the visualization's author to think through the issues, organize thoughts, and communicate them clearly 	Business transactions (including contracting process)	Yes	Conceptual
Haapio, 2014	Icons, charts, tables, images, typographic and layout interventions, layering	<ul style="list-style-type: none"> • Provide salience to key information and improve readability • Support readers' understanding and actions • Elicit positive emotional responses • Create layers of information according to different user needs or content type (overview/detail) • Invite collaboration of different stakeholders during document drafting 	Legal documents in general (including contracts)	No examples of contracts, but it shows an example of policy visualization	Conceptual
Mamula & Hagel, 2015	Timelines, typographic and layout interventions	<ul style="list-style-type: none"> • Enhance comprehension of contracts • Support faster reading of contracts • Provide a more positive user experience (in terms of document preference and anticipated ease of use) 	Business-to- business, commercial contracts	Yes	Empirical (experimental evaluation)
Wong, Haapio, Deckers & Dhir, 2015	Graphical user interfaces/dashboards, graphs, sliders, capitalization tables, icons, formulas	<ul style="list-style-type: none"> • Understand the implication of decisions and contract terms • Explore alternative scenarios (e.g. investor-friendly vs entrepreneur-friendly) • Quantify and compare alternative outcomes of an investment term • Negotiate agreements more collaboratively and efficiently 	Business-to- business, startup investing deals	Yes	Conceptual
Esayas, Mahler & McGillivray, 2016	Icons	<ul style="list-style-type: none"> • Reduce consumers' information overload • Enhance understanding • Empower consumers' choices • Increase transparency 	Business-to- consumer data protection	Yes	Conceptual
Haapio & Barton, 2016	Flowcharts, timelines, layering, icons, decision trees	<ul style="list-style-type: none"> • Make contracts easier to negotiate and implement • Make contracts more business-friendly through concision, clarity, and empathic communication with the users • Support cross-professional collaboration and understanding 	Business-to- business commercial contracts	Examples are taken from earlier publications (cf. Passera, Haapio & Barton, 2013)	Conceptual

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Haapio & Hagan, 2016	Icons are mentioned as an example, but several other visualization methods are implied to be suitable	<ul style="list-style-type: none"> Contract visualizations can be framed as patterns – repeatable and adaptable solutions to recurrent communication problems. As patterns, they help develop best practice, enhance communication, and become reusable 	Contracts in general	No examples	Conceptual
Haapio, Plewe & DeRooy, 2016	Graphical user interfaces/dashboards, comics	<ul style="list-style-type: none"> Visualizations can be used in four ways: <ol style="list-style-type: none"> They can be added <i>in</i> contracts to clarify its meaning They can be used in materials <i>about</i> contracts, to provide guidance on how to use and interpret them They can be tools <i>for</i> contracting, to support the parties in negotiating and aligning goals They can be used <i>as</i> contracts: the visualization itself (e.g. a comic strip) is the only binding artifact constituting the agreement Visualizations as contracts enhance the relevance, understanding and moral commitment of the parties – especially if one of the parties is vulnerable (e.g. low literacy, intellectual disability) 	Contracts in general (even though the authors' background leads them to use several B2B examples)	Partially. An example is taken from earlier publications (cf. Plewe 2013)	Conceptual
Keating & Andersen, 2016	Comics	<ul style="list-style-type: none"> Communicate contract terms and responsibilities clearly to non-lawyers Avoid misunderstandings Help parties understand their choices in regards to different issues (e.g. scope of collaboration, intellectual property, etc.) Support clear communication in multi-lingual and multicultural contexts 	<ul style="list-style-type: none"> Non-disclosure agreement IP allocation agreement 	Yes	Conceptual / Empirical (case-study)
Mitchell, 2016	Sketches, diagrams, checklists, tables	<ul style="list-style-type: none"> Explain (e.g. entities, relationships, movement, passage of time, detail VS. overview) Collaborate (e.g. facilitating conversation; making use of embodied communication; revising ideas) Think, plan, and keep track of the project (e.g. planning transactions; envisioning processes and “calendars”; dealing with abstractions; prototyping ideas; supporting limited mental resources through externalized visual cognition) “Develop advice” for customers by assessing the situation, identifying potential strategies/interventions, and envisioning information architecture for documents and document families 	<ul style="list-style-type: none"> Business to business transactions 	Yes	Conceptual

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Plewe & DeRooy, 2016	Graphical user interfaces/dashboards, visual metaphors, graphs, comics	<ul style="list-style-type: none"> • Support sensemaking and goal alignment during negotiation and pre-negotiation of contracts • Envision clearly points of agreement and disagreement more clearly during negotiations • Keep track of the progress of negotiations • Enhance comprehension of contract terms 	<ul style="list-style-type: none"> • Business-to-business commercial contracts • Employment contracts 	Examples are taken from earlier publications (cf. Plewe 2013; Haapio, Plewe & DeRooy 2016)	Conceptual
Tsygankova, 2016	Typographic and layout interventions (choice of typeface, line length, color, highlighting, boldface, italics, underlining, capitalization)	<ul style="list-style-type: none"> • Increase readability and accessibility so that contracts are more usable • Improve clarity • Make information easier to find and comprehend • Signal that an effort to communicate clearly is made and provide a suitable "tone of voice" in the communication 	Contracts in general	No examples	Conceptual
Waddell, Auriemma & Sundar, 2016	Typographic and layout interventions, layering/chunking the content in several windows	<ul style="list-style-type: none"> • Capture and retain attention longer • Improve comprehension • Elicit more positive attitudes towards the agreement 	Business-to-consumer (end-user license agreements, EULAs)	Yes	Empirical (experimental evaluation)
Waller, Waller, Haapio, Crag & Morriseau, 2016	Typographic and layout interventions, icons, timelines, maps, check-boxes, color-coding	<ul style="list-style-type: none"> • Support strategic reading • Explain and disambiguate complex textual content • Elicit user response and action • Support readers' engagement • Support relationship-building between the parties by making the tone of voice of the communication less formal, and more direct and practical 	Business-to-business commercial contracts	Yes	Empirical (case study)

Publication (in chronological order)	Type(s) of visualization considered suitable for contracts and contracting	Purpose of contract visualization	Field(s) of application	Does the study show original examples of contract visualization?	Type of contribution
Berger- Walliser, Barton & Haapio 2017	Icons, diagrams (e.g. flowcharts, timelines, tree diagrams), tables, charts, photographs, images, videos, typographic and layout interventions, visual metaphors	<ul style="list-style-type: none"> Define project goals/support legal function: <ul style="list-style-type: none"> Support legal problem solving and clearer reasoning Help clients understand the solutions offered to them Concretize ideas, "prototype" alternative scenarios and outcomes Communicate effectively through simplified language: <ul style="list-style-type: none"> Clarify, simplify, and supplement textual information Persuade Affect perceptions (e.g. the author of the document can be seen as more credible and concerned) and enhance user experience Adapt to audiences with different abilities and needs, and without legal training: <ul style="list-style-type: none"> Make thought and organization processes visible Assist users in processing information Support memorization Support collaboration and understanding between various stakeholders 	Legal documents in general (including contracts)	Examples are taken from earlier publications (cf. Passera, Pohjonen, Koskelainen & Anttila, 2013; Mahler, 2013; Haapio, 2011; 2014)	Conceptual
Botes, in press	Comics	<ul style="list-style-type: none"> Enhance comprehension of contracts Suitable to communicate inclusively with heterogeneous audiences (various backgrounds, language spoken, levels of literacy ...) Educate and empower consumers 	Business-to-consumer	Yes	Empirical (experimental evaluation)

several typical contracting pitfalls (Haapio & Barton, 2016) – such as protracted negotiations focusing on the wrong issues, lack of clarity among the parties in regards to contract scope, goals and responsibilities, and a contract document so complex that it not only feels irrelevant to business stakeholders, but is also ambiguous and hard to put into practice (IACCM, 2015b). These concerns mirror Hagedoorn and Heslen’s insight (2009) that the cognitive load imposed by the contract on the parties using it should be considered an important dimension of contractual complexity. Reducing – or, at least, managing – complexity has been a key exigency behind contract visualization, as complexity leads to the contracting pitfalls mentioned above if not met with adequate contracting practices (Haapio & Barton, 2016) and ‘contractual literacy’ (Berger-Walliser et al., 2011). Empirical evidence suggests that organizational actors understand business contract documents faster and more accurately when they include visualizations (Passera, 2012; Passera & Haapio, 2013a; Passera, Pohjonen, et al., 2013; Mamula & Hagel, 2015).

Other authors take instead a non-organizational perspective, and focus on the individual and the right to understand one’s own rights and obligations in different contexts of life – for instance as a consumer (Kay, 2010; Kay & Terry, 2010; Waddell, Auriemma & Sundar, 2016; Botes, in press), or as an employee (Haapio et al., 2016). However, since contracts are long, off-putting, and require considerable reading time, they are often not read carefully enough, or not understood. In the case of online end user license agreements, almost everyone clicks the “I Agree” button without reading at all. Empirical evidence shows that visualization increases the attention and time that people dedicate to reading online contracts (Kay, 2010; Kay & Terry, 2010), and generally improves comprehension accuracy (Kay, 2010; Kay & Terry, 2010; Botes, in press).

Another important theme is that of empowerment through understanding, as visualization is seen as a way to communicate across literacy levels, language proficiency, and background (Botes, in press). For instance, employment contracts in the format of a comic were used to help people with low literacy levels to understand their employment terms (Plewe & de Rooy, 2016; Haapio et al., 2016).

2) Contract visualization improves perceptions and relationships.

Another key purpose of visualization is to reframe how contracts are perceived (reactive legal tools to be used in case of a dispute, lawyer-to-lawyer communication) by changing their look and feel. This change leads to more positive perceptions of the document, as readers perceive it as more pleasant to use and more useful (Passera, Pohjonen et al., 2013). Moreover, such positive perceptions are projected onto the contract author: for instance, empirical evidence suggests that a company using contract visualization is perceived by contract readers as trustworthy, respectful of its counterparty, collaborative, and appreciative of honesty and clarity in business (Passera 2012).

A “design-free” contract conveys the impression that no effort was put into communicating clearly and empathically with the reader (Tsygankova, 2016): it is invariably formal, cold, slightly threatening communication, because the lack of a personal, unique tone of voice prevents the communication of implicit

values and expectations. According to Barton and colleagues (2013) visualizations act as a more direct conduit for emotions, and parties can deliberately use them to reinforce the implicit messages about what they want to achieve and how – for instance, by fostering a climate of open and transparent communication, they can signal their desire for a collaborative relationship. Anderson and Keating (2016) describe a case in which comics-contracts on intellectual property and confidentiality were used to decrease the threatening aura of these documents, as it was deemed counterproductive in the given context of use (university students developing innovative solutions for industry partners). De Rooy's employment comics-contracts (Cape Times IOL, 14 July 2016; CNBC Africa, 29 July 2016), developed to be more comprehensible for multi-lingual, semi-literate workers, were also interpreted as a sign of a more equitable and honest employment relationship and garnered positive reactions from work unions. A remarkable case study reported by Waller, Waller, Haapio, Crag & Morriveau (2016) illustrates how a Canadian oil and gas company used contract visualization (e.g. icons, timelines, maps) to gain and develop a trusted relationship with potential contractors belonging to local Aboriginal communities in British Columbia – who traditionally are wary of overly formal, “colonial” communication.

These experiential and relational effects of contract visualization explain why its proponents believe that plain language, although absolutely necessary, is not enough, by itself, to transform how people perceive and engage with contracts (Passera, Haapio & Barton, 2013; Haapio & Barton, 2016). Even though a contract would be written clearly, in plain language, it would still look like any other contract; conversely, graphics do not “look legal” (Passera & Haapio, 2011b) and are customarily used by engineers and managers in their work (Rekola & Boucht, 2011). Thus, visualizations can help form an impression of contracts as managerial rather than purely legal tools (a necessary transformation to enable strategic and proactive contracting, cf. DiMatteo et al., 2012), and engage anew those users and stakeholders who have been previously alienated by contracts in the past (Passera, Haapio & Barton, 2013). However, it is to be kept in mind that visualizations are never used for beautification purposes, but to increase functionality and appropriateness for the benefit of the users (Berger-Walliser et al., 2017; Mitchell, 2013; 2016; Passera & Haapio, 2011b).

3) Contract visualization supports cross-professional and inter-firm collaboration.

In an organization, an effective contract can only be produced and implemented by involving different stakeholders, with different roles, goals, and educational backgrounds, as different types of knowledge are required. At minimum, the “contract puzzle” needs technical knowledge of the solution, contextual knowledge of the customer's needs, knowledge on how to perform and deliver what is promised, business and financial knowledge to make sure that the deal is beneficial, legal and risk management knowledge to avoid trouble, as well as contract management and project management knowledge as a glue to keep it all together (Haapio, 2011). By enhancing comprehension and engagement, contract visualization supports cross-professional

and inter-firm collaboration, as different stakeholders can more easily realize the impact of the contract from their own perspective, and take suitable decisions and actions in response (Haapio, 2001; Passera & Haapio, 2011b). For instance, teams tasked with implementing a contract are often not involved in its conceptualization and negotiation in earlier phases, and thus need clear contracts and contract guides to deliver what was promised (Berger-Walliser et al., 2011). Visual, quickly understandable contracts can be used internally to sell issues and get buy-in from key stakeholders, even though there may be language, professional and cultural barriers (Rekola & Haapio, 2011).

Plewe and de Rooy (2016) suggest that visualizations are a tool to make contract negotiations more transparent and direct: as the parties are facilitated in externalizing their goals, values and negotiating positions, they have better chances to verify that their interests are aligned and can engage in joint problem-solving to maximize value for both. Visualization is also particularly important in conceptualizing and discussing service offerings, as they remain intangible until when they are implemented, and require collaboration between customer and service provider – grounded in the common understanding of activities, processes, and responsibilities (Barton et al., 2013; Rekola & Boucht, 2011; Pohjonen & Koskelainen, 2012; Passera, Pohjonen et al., 2013). Another way to foster collaboration is to visualize the responsibilities and obligations of each party (or department) so that different professionals can more easily coordinate and accomplish their tasks – and collaboratively discuss and solve problems, if the need arises (Rekola & Boucht, 2011). This can be done, for example, by using swimlane charts, which help represent areas of shared and exclusive responsibilities (Passera, Pohjonen et al., 2013).

Given their role in facilitating collaboration, coordination and knowledge sharing, some authors (e.g. Pohjonen & Koskelainen, 2012; Passera & Haapio, 2013b) have conceptualized contract documents and contract visualizations as *boundary objects*¹². Boundary objects are artifacts that support coordination and translation among different knowledge domains, because they are flexible enough to be used and contextualized in different ways by different actors, but also retain a “robust” common meaning for all (Star & Griesemer, 1989). Boundary objects are crucial to organizational life, as they allow different actors to externalize and share their knowledge, as well as jointly integrate and transform it into common, shared knowledge (Carlile, 2002; 2004). Contracts, given their role in the organization, have the potential to be boundary objects, but they can only play this role if they, in fact, succeed in supporting and mediating collaboration and knowledge sharing: to become boundary objects *in use*, contracts must be deliberately designed to satisfy the cognitive, information, and contextual needs of their users (Passera & Haapio, 2013b). Effective contract design thus is not only a matter of content and transactional attributes, but also of actual design: language, information structure, and visual information display (Passera, Haapio & Barton, 2013; Haapio, 2014).

¹² The topic of boundary objects is explored more thoroughly in section 2.3.2.1

Missing so far empirical evidence specific to contracts, the argument for visualization as a facilitating collaboration tool has been put forward on the basis of research on knowledge visualization¹³ – “*all graphic means that can be used to construct and convey insight [and] experiences, attitudes, values, expectations, perspectives, opinions, and predictions, and in this way [...] enable someone else to re-construct, remember and apply these insights correctly*” (Eppler & Burkhard, 2004, p.3).

2.1.2 Contracts and Contract Design in Organizational Studies

In this section, I touch upon the key theories, concepts, and streams of research on contracts in organizational studies, and look at how (if at all) different perspectives conceptualize the meaning of “contract design”.

A good starting point to systematize this vast literature is offered by Schepker and colleagues’ thorough review of inter-firm contracting (2014). The authors propose that there are two approaches to researching contracts: the more traditional structural approach, and the chronologically newer functional approach. The structural approach “*highlights how optimal governance choices – those that best safeguard investments and minimize transaction costs – depend on transactional attributes*” (Schepker et al., 2014, p. 204). This perspective sees contracts as tools to limit opportunism and risk, and thus allow inter-firm exchange. The functional approach instead challenges the idea that the only function of contracts is to create safeguards (Schepker et al., 2014), since firms have different reasons to engage in various forms of inter-organizational cooperation (Parmigiani & Rivera-Santos, 2011) and these reasons affect contract design choices. This approach points out that different parts of contracts (and not only contracts as a whole) can have different functions – which coexist, some imposing safeguards and some creating collaboration and communication mechanisms (Lumineau, 2014; Malhotra & Lumineau, 2011).

The structural approach has been strongly shaped by transaction cost economics (TCE), which sees contracts as governance mechanisms envisioned to diminish transaction costs (Williamson, 1979) – the costs incurred during economic exchange, such as search and information costs in regards to what is available in the market at what cost; bargaining and decision costs incurred during sales and contract negotiation; and policing and enforcement costs to make sure that the other party upholds its part of the deal (cf. Dahlman, 1979). The goal of contracts is thus to “*align transactions, which differ in their attributes, with governance structures, which differ in their costs and competencies*” (Williamson, 1991, p.279). Such defining attributes of transactions have been more classically identified¹⁴ as:

¹³ The topic of knowledge visualization is explored more thoroughly in section 2.3.2.2

¹⁴ Schepker et al. (2014), after having analyzed contracting literature, identified and suggested two more transactional attributes: environmental/contractual complexity and bilateral interdependence between transacting partners.

- Uncertainty: the lack, ambiguity, or mutability of information regarding various factors e.g. the transacting environment and the behavior of competitors and exchange partners (Williamson, 1985)
- Frequency of transaction: whether transactions take place on a one-time, occasional, or recurrent basis (Williamson, 1979)
- Asset specificity: whether an investment required by a transaction is specific to that transaction or it can be used as a resource in other transactions (Williamson, 1979).

To understand this focus on governance and safeguards, it is important to understand three assumptions about the nature of the contracting parties:

- Opportunism: parties' behavior guided by self-interest maximization, either in an active form – such as deliberate misrepresentation or taking a course of action that breaches – or in a passive form – such as withholding efforts or breaching implicit relational rules (Williamson, 1979; Wathne & Heide, 2000)
- Bounded rationality: parties' intended rational behavior is hindered by the cognitive limitations of human mind and limited knowledge of all possible contingencies (Williamson, 1979; originally in Simon, 1957; cf. also the concept of “satisficing” in Cyert & March, 1973)
- Bounded reliability: parties' failure to make good on a commitment because of situational changes that instigate reprioritization or scaling back on overcommitments (Verbeke & Greidanus, 2009; Kano & Verbeke, 2015).

TCE predicts that transaction costs increase in more complex transactions, which demand specific investments over a long-term horizon, so that vertical integration may become preferable and less costly over a certain threshold (Williamson, 1991). However, other scholars point out that relational norms and trust can create governance mechanisms outside formal contracts. In this way, relational mechanisms help contain transaction costs, so that they do not necessarily increase in more complex transactions. Dyer (1997) proposes that an increase in trust, information sharing, goodwill and a demonstrated commitment to future interaction are inversely correlated with transaction cost, as they lend credibility to the promise between the parties. In fact, he found that Japanese car manufacturers, even though they had committed to higher transaction-specific investments than their US-based counterparts, incurred lower transaction costs because of their reliance on extra-contractual governance (Dyer, 1997). Prior (successful) interactions between parties engender trust and decrease reliance on “hard” safeguards such as sanctions and contractual obligations in repeated, long-term business (Uzzi, 1997), and equity arrangements in alliances (Gulati, 1995). There may be, in fact, a mutual causality between increases in trust and information sharing, which end up not only reducing transaction costs but also creating value for the parties (Dyer & Chu, 2003). Since it is impossible to specify all contingencies in complex agreements in advance, in-

formal relational mechanisms tend to compensate or substitute formal contractual governance over time – as long as the parties do not violate commitments and relational norms (Ring & Van de Ven, 1994). Ghoshal and Moran (1996) go as far as labeling TCE “bad for practice”, suggesting that formal, rational means of control against opportunism signal distrust and end up inducing the negative behavior they were designed to prevent (while increasing costs). People who are strictly monitored feel that they are not trusted to behave appropriately, and this erodes their motivation and commitment (Ghoshal & Moran, 1996). On the other hand, cooperation – which is indispensable in complex, changing situations – can be promoted by relying on social norms, such as reciprocity, mutual care, and stressing that long-term pay-offs may be more conspicuous than short-term rewards (Axelrod, 1984). The tensions between TCE and relational contract literature opened an important debate on whether contracts and relational norms are substitutive (Granovetter, 1985; Ring & Van de Ven, 1994; Gulati, 1995; Uzzi, 1997; Dyer & Singh, 1998) or complementary (Poppo & Zenger, 2002; Zheng, Roehrich & Lewis, 2008; Goo, Kishore, Rao & Nam, 2009; Cao & Lumineau, 2015) safeguarding mechanisms – with recent empirical findings lending support to the second hypothesis.

Within the structural perspective, contract design may be thus seen, especially in TCE, as the process of choosing and matching safeguard and incentive mechanisms to the attributes of the transaction at hand. Relational contracting does stress the importance of effective communication in successful inter-firm exchange, but “*interpersonal interactions – negotiations, dialogue and other coordination activities (Ring and Van de Ven, 1994) – rather than contractual documents appear as the locus of communication and sense-making*” (Passera, Smedlund & Liinasuo 2016, p. 70). Moreover, this stream of research still implies governance and safeguarding as the ultimate goal of contracting. Conversely, leading scholars have called for “*moving opportunism to the back seat*” (Foss & Weber, 2016; Lumineau & Verbeke, 2016), since conceptualizing contracts as tools for control appears to be too narrowly focused and insufficient to account for different contractual choices and needs (Schepker et al., 2014; Duplat & Lumineau, 2015). Parmigiani and Rivera-Santos (2011) posit that the most important characteristic of an inter-organizational relationship is not the form it takes, but the intent of such a relationship – what the parties are trying to achieve through their exchanges. The implication is that contracts should be analyzed in terms of their functions, and whether desired functions are adequately supported and made salient through the right communication choices.

The functional perspective on contracts opens new possibilities as to what the role of contracts can be, and what contract design means. Contracts are seen as management tools, necessary to actively achieve business success (Barringer & Harrison, 2000; Saxena, 2008; Liinamaa et al., 2016). This perspective provides a fertile ground for multidisciplinary crossovers between legal and organizational studies. In the same way as organizational scholars point out that optimal contract design cannot be explained only in terms of safeguarding, proactive and preventive law scholars (e.g. Haapio, 2013a) propose that “contract dysfunction-

ality” can only be overcome by designing contracts with managerial functions in mind, and not only for legal functionality (e.g. winning in court).

Contracts (and specific contract clauses) can in fact play several roles: in addition to safeguarding, scholars have identified other key functions, such as adaptation – helping the parties to respond and adapt to changed circumstances – and coordination – helping the parties to collaborate effectively – (Schepker et al., 2014; Liinamaa et al., 2016). Another function, identified by Mayer K. and Mondal (2011), is to foster innovative and creative outcomes – for instance, via suitable payment mechanisms and task descriptions that focus on the goal but not on the means of how to achieve it. Poppo and Zhou (2014) suggest that promoting fairness should also be considered a possible contract function, as fairness is an important determinant of business performance.

There is in fact great variety among contracts in regards to the number, complexity, and flexibility of both “control” and “coordination” provisions¹⁵ (Lumineau & Henderson J., 2012; Reuer & Ariño, 2007). This suggests, firstly, that different functions, such as control and coordination, should not be considered as polar opposites on a continuum, but are distinct dimensions that can coexist (Schilke & Lumineau, 2016); and secondly that contracts’ form and functions do not only develop to match transaction characteristics. Different organizational actors – lawyers, managers, engineers – need to become involved in contract creation, as different professional communities are better equipped with the knowledge needed to create the right provisions for the right goal (Mayer K. & Argyres, 2004; Argyres & Mayer K., 2007). The participation of different actors affects contract complexity and the type of provision the document tends to include. For instance, Duplat and Lumineau (2015) showed that involving external legal experts in drafting technology-transfer contracts increases their complexity and the inclusion of monitoring clauses, while involving external technical experts increases the inclusion of coordinating clauses. Bercovitz and Tyler (2014), in their study of industry-university collaboration agreements, found that involving different professional communities in multiple contract negotiations over time affects their design: contract administrators’ primacy leads to more detailed contract enforcement, IP allocation, and monitoring terms, while these decrease in contracts where the principal scientist and the sponsor had previously engaged in research together – and probably already figured out suitable knowledge sharing and coordination practices. *Learning to contract* is in fact a capability that can be developed: Mayer K. and Argyres (2004) demonstrate that firms – over repeated contractual interactions – add, modify, or eliminate provisions over the long term for purposes of communication, codification, and governance. In this sense, contracts, over time, become repositories of knowledge, externalizations

¹⁵ Other scholars propose similar categorizations of contract clauses by their function. For instance, Vaneste and Puranam (2010) distinguish between *technical detail* and *legal detail*. Similarly, Argyres and Mayer K. (2007) separate between content better developed by lawyers (contingency planning and dispute resolution), by managers and engineers (roles/responsibilities, decision/control rights, communication), and cooperatively (contingency planning). Ryall and Sampson (2009) instead identify 1) *contract detail clauses* about rights and obligations of the parties, 2) *monitoring clauses* that facilitate performance assessment, and 3) *penalty clauses* that provide enforcement mechanisms.

and formalizations of a firm's learnt ability to successfully contract – which constitutes a potential source of competitive advantage (Mayer K. & Argyres, 2004; Argyres & Mayer K., 2007; Vanneste & Puranam, 2010).

Recent research takes into consideration the different functions of contracts in revisiting the debate on how formal contracts and relationships influence each other. Understanding this mutual influence precisely can explain why and how contracts and relationships act as complements, and with what effects in terms of business performance. For instance, a cooperative relationship is indispensable in project contracts, but also the choice of the right contract type contributes to achieving “win-win” goal alignment between parties (Turner J. & Simister, 2001). The interplay of contracts and relationships also matters in public procurement: Zheng and colleagues (2008) observed that parties relied more on contracts when trust was still to be built (or had been breached), while they relied more on relationships when flexibility and dialogue were needed to resolve critical incidents.

2.1.2.1 Contract Design and the Psychological Effects of Contracts

Of particular interest is the research on the psychological effects of contracts. Research by Lumineau and colleagues offers a more nuanced analysis of how control and coordination clauses affect relational norms formation in different ways. In this line of research, contracts are seen as information-processing systems that influence interpretation and decision-making (Lumineau, 2014). For instance, coordination clauses:

- increase competence-based trust – based on the expectation that the other party has the ability to perform as promised (Malhotra & Lumineau, 2011);
- increase the positive outcomes of trust by influencing both rational and emotional judgments – by supporting transparency and repeated social interaction (Lumineau, 2014);
- conversely, diminish distrust – by preventing conflicts and misunderstandings, and signaling willingness to adapt and compromise (Lumineau, 2014).

On the other hand, control clauses have different effects:

- they increase competence-based trust but diminish goodwill-based trust – based on the expectation that the other party has the intention to behave in a trustworthy manner (Malhotra & Lumineau, 2011);
- they influence rational judgments, increasing the positive outcomes of both trust (by reducing uncertainty) and distrust (by encouraging scrutiny) (Lumineau, 2014);
- excessive control influences emotional judgments, diminishing the positive outcomes of trust and increasing the negative outcomes of distrust (by signaling and strengthening suspicion) (Lumineau, 2014);

- in case of a dispute, control clauses will diminish the chance of a cooperative dispute resolution strategy, while coordination clauses will increase it (Lumineau & Henderson J., 2012).

Closely related are studies on the psychological effect of contracts on relationship formation, focusing on “contract framing” (Bertrandias, Fréchet & Lumineau, 2010; Weber & Mayer K., 2011; 2014; Weber, Mayer K. & Macher, 2011; Schilke & Lumineau, 2016). The concept of framing, borrowed from Tversky A. and Kahneman (1981), refers to:

“ [A] decision maker’s conception of the acts, outcomes, and contingencies associated with a particular choice. The frame that a decision-maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision-maker.” (p.453)

Tversky A. and Kahneman (1981) discovered that preferences and decisions may be systematically affected, and even reversed, by changing how problems are presented. Different ways to frame a problem give salience to different information and aspects of an issue. The same information can be framed, for instance, in terms of gains or losses, or certain versus risky outcomes, influencing people’s interpretation, and ultimately their choices and behavior. Scholars have proposed and demonstrated that framing effects are also at play in contracts (Bertrandias et al., 2010; Weber et al., 2011; Weber & Mayer K., 2011) and during contract negotiations (Galinsky et al., 2005; Ariño et al., 2014). Building on Higgins’ Regulatory Focus Theory (1997; 1998), this line of research proposes that contracts can be framed to signal a promotion frame or a prevention frame, which in turn affects how the parties interpret the contract and their relationship, and how they emotionally and behaviorally respond to the situation at hand ¹⁶.

A promotion frame is guided by positive reference values, as it focuses on a possible desired outcome, and involves self-regulating cognition, emotions, and behavior so as to progress towards this ideal state (Higgins, 1998). As a consequence:

“Under a promotion frame, parties view the same goal as maximal (something that would be ideal if reached). If a maximal goal is missed, low-intensity negative emotions are experienced, whereas if a maximal goal is reached, high-intensity positive emotions are induced. Thus, in an effort to reach the maximal goal and avoid sins of omission, parties display more flexible and creative behavior. Promotion contracts focus on positive behavior in the exchange, inducing positive emotions, which set the stage for closer ongoing relationships” (Weber & Mayer K., 2011, p.54)

¹⁶ As mentioned in section 2.1, proactive law also refers to Higgins’ Regulatory Focus Theory to define the concepts of “prevention” and “promotion” in contracts, even though that stream of literature does not fully explore the concept of “framing”.

Conversely, a preventive frame is guided by negative reference values, as it focuses on the risk of an undesirable outcome, and involves self-regulating emotions, and behavior so as to avoid it (Higgins, 1998). As a consequence:

“A prevention frame leads to an interpretation of a goal as minimal (something that must be met), which induces high-intensity negative emotions if the goal is not achieved and low-intensity positive emotions if the goal is met. Thus, under a prevention contract frame, both parties display vigilant behavior in the exchange in an effort to avoid missing the minimal goal. The focus on detecting negative behavior in the exchange leads to neutral to negative emotions, which form the basis of arm’s-length relationships.” (Weber & Mayer K., 2011, p.54)

While Higgins points out that learning and behavioral research on motivation mostly focus on promotive frames and positive values, since “a negative reference value is inherently unstable and relatively rare” (Higgins, 1998, p. 2), research on contracts seems to have taken the opposite turn – an exception being proactive contracting literature, which is grounded in the concept of promotion. Weber and Mayer K. (2011) argue that contracts have mostly been seen, traditionally, as prevention-framed devices designed to prevent opportunistic behavior and to meet minimal stated goals. However, framing is an activity that can be deliberately undertaken by managers: foregoing the opportunity to choose between promotive and preventive frames, in light of the exchange situation at hand, seems a strategic mistake.

Bertrandias and colleagues (2010) demonstrate that contract framing has an effect on trust formation, since a promotive frame fosters a higher level of trust than a preventive-framed contract. Moreover, framing moderates how contractual completeness is interpreted: as a sign of competence and willingness to share information under a promotive frame, and as a sign of control and rigidity under a preventive frame. Similarly, promotion framing counterbalances the negative effects of perceived control on trust, as the parties can stipulate strict specifications, milestones and processes, without the risk of them being interpreted as signs of distrust.

Weber and colleagues (2011) investigated the effects of framing of termination clauses. The same payoffs, decision points, and temporal horizon for collaboration can either be presented under a promotive (extendibility clause, in which the latter part of the contract term is seen as a maximal goal) or preventive frame (early termination clause, in which the latter part of the contract term is seen as a minimal goal). It is suggested that framing can reduce issues in contracting and transactions, as it can help align transactional attributes to the optimal type of relationship needed to succeed in such a transaction (Weber et al., 2011). Ariño and colleagues (2014) also found a learning effect developed over time in regards to termination clauses, which leads to shorter negotiation time under a certain threshold of transactional complexity. They argue that “*discussing termination of the relationship before it starts risks setting the wrong initial conditions to begin a partnership*” (Ariño et al., 2014, p.380). This suggests that giving salience to certain issues at the wrong moment, or in the wrong fashion, may trigger negative framing effects – with

counterproductive effects on negotiation time and relationship building. Thus, managers need to be knowledgeable and deliberate in their contract design choices and how they communicate them.

Poppo and Zhou (2014) explore the effects of framing on the ability of the parties to achieve mutual gains, identifying “fairness frames” (in contrast to a mere “incentivizing frame” underpinned by safeguarding needs) as a way to drive better performance. Their study proposes, for instance, that socializing is not necessarily a good management practice, and monitoring a bad one: it all depends whether these behaviors are consistent with how a contract is designed, and thus whether the overall exchange feels fair. Detailed clauses and monitoring, as long as there is great transparency, will enhance perceptions of procedural fairness; conversely, socialization and less complex contracts are better suited for repeated, long-term business, where a perception of distributive fairness (getting one’s fair share of gains over time) fosters flexible and cooperative behaviors.

Cornelissen and Werner (2014), however, point out that the concept of framing in micro-level organizational research would benefit from a more nuanced analysis. Two among their suggestions seem, in particular, consequential for research on contracts. Firstly, they encourage making a distinction between equivalence frames (presenting the same information in a positive or negative light) and issue frames (giving salience to one particular aspect of an issue), rather than simply applying the concept of framing as an umbrella term to possibly different phenomena. Depending on the situation (and information) at hand, managers can avail themselves of either approach. This distinction, for instance, allows a more nuanced interpretation of the different managerial framing choices illustrated in Publication V of this thesis – which features examples of both kinds of framing. Secondly, Cornelissen and Werner (2014) stress the importance of making more explicit the links between a cognitive and a social view of framing, and the role of this interplay between micro and macro levels of analysis in the creation of inter-subjective common ground between different organizational and inter-organizational actors. Contract documents do not exist in a vacuum, but are artifacts embedded in the interaction between different groups, within and across organizations. While ensuring individual understanding is important, contracts also need to work as tools for knowledge sharing, collective sensemaking and coordination in a social environment (more about these issues is discussed in section 2.3. of this literature review).

Contract design then is not simply the choice of appropriate safeguards, but the choice of the optimal functional balance between safeguard, collaboration and adaptation (Lumineau, 2014; Lumineau & Henderson J., 2012; Malhotra & Lumineau, 2011; Mayer K. & Argyres, 2004; Ryall & Sampson, 2009), and the psychological and communication strategies – such as specific framing – needed to better prioritize and implement such functions (Bertrandias et al., 2010; Weber & Mayer K., 2011; Weber et al., 2011; Lumineau, 2014). Formal contracts and relational norms are not only complements in terms of governance and means to decrease transaction costs, but are also complementary in

how they frame and shape the parties' expectations, behaviors, and reactions to contingencies.

This perspective opens the way to study how contracts and specific clauses are communicated and framed through deliberate language and design choices – and not only which contract clauses are chosen – as envisioned by proactive and preventive law proponents. The focus is on the consequences of contract design (Ariño et al., 2014; Schepker et al., 2014), and what communicative resources are available to ensure that they are positive consequences.

2.1.3 Section Summary and Research Gaps

In this first part of the literature review, I provide an account of current research on contracts, focusing on the organizational perspective on one hand, and on the proactive and preventive approach to contracts in business law on the other. I also introduce the emerging research on contract visualization, which has mostly been spearheaded by PPL scholars and their co-authors.

Looking at these streams of research, we can see a common methodological challenge: studying contracts in real life, in the present moment, is very difficult. Contracts are highly sensitive and confidential materials, and companies are wary of providing access to researchers. The same can be said in regards to observing contract negotiations in real life: the stakes are high, and parties may not want to have any external distraction.

For this reason, and because of somewhat a lack of tradition in empirical research in legal scholarship, PPL literature has remained mostly conceptual. While its propositions are addressing important issues and showing a way to reconceptualize and improve contracting practices, more empirical evidence would be needed. The topic of contract visualization, in particular, cannot be furthered and deepened without generating empirical knowledge. While experimental evaluations have begun to appear and provide initial evidence as to the effects of contract visualization, their methodology is insufficiently rigorous – for instance, sample sizes are too small and statistical analysis either missing (Passera, 2012; Mamula & Hagel, 2015; Botes, in press) or superficial (Passera & Haapio, 2013a; Passera, Pohjonen et al., 2013). Methodological issues are present also in case studies (Jones & Oswald, 2011; Rekola & Boucht, 2011), where a lack of a transparent qualitative data collection and analysis leaves evidence at the anecdotal level.

On the other hand, most studies belonging to the organizational perspective have been quantitative, resorting to past contract documents and surveys as data sources. Smith and King (2009) point out that the range of research questions has remained narrow and primarily TCE-inspired. With a “retrospective” method focused on documents and survey responses the thoughts and the motivations of the creators of those documents have not however been observed and revealed: were they really deliberate about the contract design choices they were making? Lumineau, Fréchet and Puthod (2011) have called for more research on the microdynamics of contracting – which could be explored either through experiments (so as to find causal relationships between contract design manipulations and cognitive/behavioral responses) or through case

studies (so as to enrich the understanding of the contextual factors, motives, and processes involved in inter-organizational contracting).

Conceptually, there has been increasing attention to contract design, at the actual document level, in both streams of literature. Legal and organizational scholars alike have begun to develop an interest in contract functionality and in contracts-as-managerial-tools, leaving behind the respective traditions of their fields (contract law principles and case law on one side, and governance forms and transaction costs on the other) to explore other kinds of research questions. Further synergies between these bodies of research would be beneficial in creating research that can influence and support contracting practices for the better. For instance, more research is needed to understand how the different design aspects of contract documents (language, content, content structure, visual design) influence information processing and knowledge sharing – and how these aspects can be harnessed to support contract functionality and create a relational climate conducive to successful exchanges.

This study seeks to provide empirical evidence about the effects of contract visualization, avoiding the methodological weaknesses of the past, as well as to constitute a link between visualization in PPL and the issues of framing and psychological effects of contract design in organizational literature.

2.2 How to Design Human-Centered Documents

In this section, I review three streams of research in psychology which explain why otherwise literate people may struggle in interacting with, comprehending, and acting upon complex information – and what could be done to enhance understanding and learning: affordance theory, cognitive load theory, and research on cognitive styles.

Perhaps surprisingly, I have chosen not to discuss particular visualization techniques and their merits and composition rules, the perceptual and rhetorical importance of typography and layout, nor to provide a summary of the gestalt principles or color theory. There are two reasons for this choice.

Firstly, this dissertation is not a study about how to correctly apply the correct design techniques, nor about the development of a new technique. Designing documents “in the right way” obviously matters in practice – and that is what I try to do when I am not in my researcher role. But this research is not trying to make a contribution in the field of information design or information visualization¹⁷, and is not pushing any theoretical or practical boundary of the field. Even though visualized contracts may be unusual, none of the designs I present in my research are groundbreaking, from an information design perspective.

¹⁷ Excellent resources to gain an understanding of the field and practice of information design are Schrивer's book *Dynamics in Document Design* (1997), the technical papers published by the Simplification Centre (n.d.), and the edited volumes *Information Design: Research and Practice* (Black, Luna, Lund & Walker, 2017) and *Information Design as Principled Action* (Frascara, 2015). For key sources on information visualization see *The Functional Art* (Cairo, 2013), *Design for Information* (Meirelles, 2013), *Information Visualization. Perception for Design* (Ware, 1999/2013), and Edward Tufte's classics *The Visual Display of Quantitative Information* (1983), *Envisioning Information* (1990), *Visual Explanations: Images and Quantities, Evidence and Narrative* (1997), and *Beautiful Evidence* (2006).

Secondly, while a review of design would certainly be interesting in shedding light on how one can design user-friendly documents, it would not help in providing the theories and measures needed in my empirical studies. Design is fundamentally an applied discipline, and any deep enough theoretical explanation as to why a certain designed solution works in a certain way ends up relying on theories from other fields, such as psychology, sociology, and applied linguistics.

2.2.1 Affordance Theory

The attention I dedicate to the communicative and design aspects of contracts is motivated by the fact that artifacts can support or hinder human learning and action. Humans live in interdependence with the materials they create, and while humans have agency in shaping the world, the world also has agency in shaping how we feel, think, learn, and act (Latour, 1992; Orlikowski & Scott, 2008; Carlile, Nicolini, Langley & Tsoukas, 2013; Rafaeli & Pratt, 2006). Thus, designing user-centered documents means in the first instance to understand the fundamental characteristics of human cognition, the characteristics that documents should have so as to be processed with ease, and the interaction between the two.

The affordance theory, first proposed by J.J. Gibson (1977; 1979/2015) in the field of ecological psychology and later popularized in the fields of design and human-computer interaction (HCI) by Norman (1988/2013), constitutes a learning theory that focuses on how the world is perceived in terms of action possibilities. An affordance is a possibility of action offered by the environment and other living beings to the individual, and it is a relational property, determined both by the characteristics of the environment and the being (Gibson J., 1977): for example, a knee-high horizontal, sturdy surface *affords* seating, but since knee-high depends on the height of the individual some surfaces afford seating to adults and not to children, and viceversa. At the same time, affordances are also objective properties of the environment, since the actions that objects and environment afford do depend on some of their specific, measurable properties (e.g. height, weight, shape, color, etc.) (Gibson J., 1977, p. 129). All in all, Gibson rejects any form of dualistic distinction – mind/body, mind/matter, natural/man-made – and sees the world and the human as co-determining action possibilities: humans are constrained and empowered by the environment, and they change, act upon, and build it to increase what it affords them

It is fairly obvious how affordance theory, applied to man-made artifacts rather than to the environment, has had an impact on the design field – as it considers both the individual and the artifact, and their interactions – and it answers the question of “*how do people know how to act when confronted with a novel situation*” (Norman, 1988/2013, Loc. 531). Gaver (1991) further clarifies the concept of affordance by making a distinction between affordances themselves and the perceptual information that signals them (Figure 2.2): this means that action possibilities of artifacts, to be useful and usable, need to be apparent, discoverable, and understandable. For instance, a hidden affordance

will not be acted upon because people do not understand that there is an action possibility (e.g. a hidden button), while a false affordance will induce behavioral errors (e.g. a door handle may signal that a door should be pulled to be opened, while it should be pushed). Norman (1988/2013, Loc. 268–269) similarly distinguishes between affordances, “*what actions are possible*”, and signifiers, “*how people discover those possibilities: signs, perceptible signals of what can be done.*” He also argues that “*signifiers are of far more importance to designers than are affordances*” (1988/2013, Loc. 269) because all that matters in design is whether users understand how and are able to interact with products and systems.

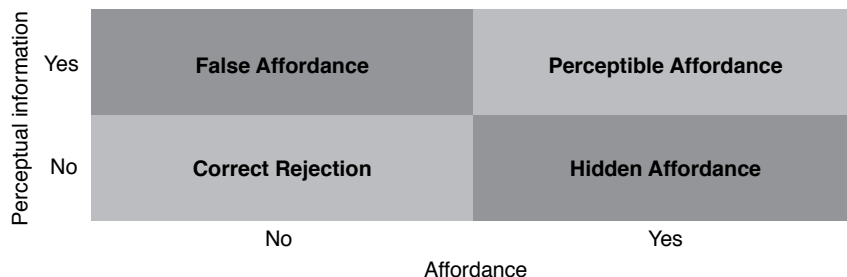


Figure 2.2. Framework on the separation of affordances from the perceptual information that signals them (adapted from Gaver, 1991)

The distinction between affordances and signifiers helps us to understand the difference between mere *functionality* (what the artifact can do) and *usability* (whether the users can actually interact with it, with ease) (Torenvliet, 2003). It also follows that usability is not an all-or-nothing property of artifacts, but resides in how well the features of the artifact fit with the users, their needs and goals, and the context of use (Cockton, 2014). The skills and abilities of users (Gaver, 1991; Bonderup-Dohn, 2009) as well as familiarity, culture, and history (Turner P., 2005; Bonderup-Dohn, 2009; Norman, n.d.), affect action possibilities, whether they are recognized, and how they should be visibly signaled.

In terms of learning, affordance theory provides two key insights:

- Affordances are what guide learning, for children and adults alike, as we tend to notice objects and develop our behavior around them in terms of what actions they invite and constrain (Gibson J., 1977, p.134);
- Exploration is key in discovering the meaning of artifacts and how to use them, as perception of affordances is not always direct and immediate (Gaver; 1996; Gibson E. & Pick, 2000); this establishes the need to design systems of signifiers that guide correctly and decrease the effort in such process (Gaver, 1991). Perceivability and discoverability (Norman, n.d.; Vicente & Rasmussen, 1990; McGrenere & Ho, 2000), as well as consistency and predictability (Still & Dark, 2013; Gaver,

1996), and following existing conventions (Norman, 1999) become important design principles to support users in achieving their goals.

While affordance theory establishes the importance of considering user characteristics, needs, and context in designing artifacts that support action, its application in regards to learning has been limited to explaining – in psychology – child development (e.g. Gibson E. & Pick, 2000), and – in the field of design – how users learn to intuitively perceive, use, and respond to interactive systems and products (e.g. Norman, 1988/2013; Vicente and Rasmussen, 1990; Gaver, 1991). The bulk of literature has thus concentrated on interaction design applications, spanning from consumer products and services to complex control room interfaces, but less attention has been devoted to the application of the concept to complex, non-interactive interfaces – such as documents. Moreover, while the concept of affordance helps to develop a holistic understanding of what is required to make designs work for their users, and puts the focus on designing for use, it does not provide ready-made measures to evaluate the effectiveness of different ways of presenting information.

2.2.2 Cognitive Load Theory and Cognitive Theory of Multimedia Learning

A complementary perspective that can contribute further insights in this sense is offered by cognitive load theory (CLT) (Sweller, 1994; Paas, Renkl, & Sweller, 2003; Paas, van Gog & Sweller, 2010) and the closely related cognitive theory of multimedia learning¹⁸ (CTML) (Mayer R., 2009; Mayer R. & Moreno, 2003), which aim at providing an explanation of the phenomenon of cognitive overload, how it affects cognition, and what design principles should be followed to maximize understanding and learning.

Similarly to affordance theory, CLT and CTML posit that successful performance is enabled by a good fit between the user and the information to be used, but these theories rather focus on a cognitive interpretation of the phenomenon: optimal learning happens when information is structured and presented in a way that fits best with the human cognitive architecture.

CLT and CTML postulate that, in order to learn and understand, we have to avoid overloading the working memory (WM) system, a short-term cognitive system that *“temporarily maintains and stores information, [and] supports human thought processes by providing an interface between perception, long-term memory and action”* (Baddeley, 2003, p.829). The problem of WM is that it is limited in processing capacity, in average, to circa three to five elements of information (Cowan, 2001) when encountering novel information. When a considerable amount of WM resources is dedicated to simply process

¹⁸ Although the word “multimedia” refers to the expression through one medium, and is most commonly associated with interactive media integrating text, image, audio, and video (and certainly many scholars have taken their research in that direction), Richard Mayer (2009, p.5) opts for a minimalistic definition, pointing out that the most basic example of a multimedia artifact is a textbook comprising printed text and images: *“I define multimedia instruction as the presentation of material using both words and pictures, with the intention of promoting learning. [...] What I call multimedia is more accurately called dual-mode, dual-format, dual-code, or dual-channel learning.”*

information, less is available for other higher-order processes such as schema building or inference making, negatively affecting learning and understanding (Sweller, 1988). Comprehension errors and slower reading and completion of tasks are typical symptoms of cognitive overload (Jarrett et al., 2010). In addition to this “*limited capacity assumption*”, CLT and CTML also share a “*dual channel assumption*” (Mayer R. & Moreno, 2003), based on the notion that WM comprises different processing systems, each with its capacity, for different types of information: it follows that information is more efficiently processed when it is presented and distributed in different channels, e.g. verbal and visual (Clark & Paivio, 1991; Baddeley, 2003). A third key assumption – the *active processing assumption* – states that learning requires substantial cognitive activities in scanning, organizing and integrating information from different channels (Mayer R. & Moreno, 2003). It follows that information should be presented to learners in ways that facilitate information search and integration. Moreover, motivation (Paas, Tuovinen, van Merriënboer & Darabi, 2005; Schnotz, Fries & Horz, 2009), users’ goals (Schnotz & Bannert, 2003), and users’ control over their learning (Bannert, 2002), should be taken into consideration, as they affect the effort required to actively process information, and how much effort the learner is willing to expend.

At the core of CLT and CTML, there are three separate components of cognitive load: intrinsic, extraneous, and germane load (Sweller, 1994; Sweller et al., 1998; van Merriënboer & Sweller, 2005). *Intrinsic cognitive load* is generated by the intrinsic complexity and conceptual difficulty of the information. Sweller (1994) suggests that the difficulty arises from both the amount of information to be processed and from the degree to which key concepts need to be assimilated simultaneously, instead of one at a time, in order to generate understanding (a characteristic called “element interactivity”, or “connectedness”). Other sources of intrinsic difficulty have been identified in the presence of conflicting information or when learners misunderstand the essence or ontology of a concept (de Jong, 2009). Intrinsic load cannot be affected by the way in which information is presented, but it is however a factor relative to the learner’s previous knowledge and expertise (Sorden, 2013): while novices may see a problem as an ensemble of highly interactive elements, experts may process the same problem as just as one element in working memory, as relevant knowledge is already available to them in the form of a schema (van Merriënboer & Sweller, 2005).

Extraneous cognitive load is instead generated by the way in which information is presented, and is not necessary for learning. Its reduction, by means of appropriate information presentations, has been the central goal of instructional design research (de Jong, 2009), since extraneous and intrinsic cognitive loads are additive and both impose on the limited resources of WM (Sweller, 1994; Paas et al., 2003a; Paas, Tuovinen, Tabbers, & Van Gerven, 2003; van Merriënboer & Sweller, 2005). Extraneous cognitive load thus interferes with learning and understanding, making them more effortful and less effective.

Lastly, *germane cognitive load* refers to the cognitive resources dedicated to schema acquisition and long-term learning (Sweller et al., 1998). Germane cognitive load can also be affected by means of appropriate instructional design, even though the aim is to promote this type of processing rather than to diminish it (Bannert, 2002; Van Merriënboer & Sweller, 2005), as it is conducive to learning. However, the concept of germane load is controversial among researchers, since it is not necessary to explain some of the main effects predicted by CLT (Kalyuga, 2011; Debue & van de Leemput, 2014), and might as well be redundant as it is difficult to distinguish empirically from intrinsic load and extraneous load.

CLT and CTML have been addressing how to present information and design instructional experiences in ways that limit demands on learners' WM, thus facilitating understanding and learning. Through numerous empirical studies, CLT and CTML have identified typical impediments to learning created by poorly designed information, and have tested and developed principles for effective instruction. In their monograph on CLT, Sweller and colleagues (2011) provide an exhaustive review of effects caused by cognitive load, reviewing empirical evidence as well as the instructional implications and boundary conditions of application (see Table 2.2). Mayer R. (2009) also crystallized the evidence and suggestions from past studies in twelve central principles to inform effective instructional design under CTML (Table 2.3).

Table 2.2. Cognitive load effects in CLT (adapted from Sweller et al., 2011)

Effect	Explanation
Goal-free effect	Goal-free tasks impose lower cognitive load on learners compared to problems with a specific goal
Worked example effect	Worked examples, which provide step-by-step solutions, are more effective in teaching the appropriate schema to learners
Expertise reversal effect	Some information presentation methods which are effective with novices may be ineffective with experts, and vice versa, because current information may interfere with previous knowledge schemata (or may be unhelpful because of a lack of such schemata).
Guidance fading effect	Guidance in worked examples should progressively decrease as expertise increases for optimal learning. Experienced learners can learn better from alternatives to worked examples e.g. completion tasks, imagining problem solution procedures, and providing self-explanations of examples (task-completion effect; imagination effect; self-explanation effect).
Split-attention effect	Learning is less effective when learners need to divide their attention among key sources of information separated spatially or temporally
Modality effect	Learning is more effective when information is distributed along different modalities and channels (e.g. auditory and visual) rather than provided all through one channel (e.g. all printed text)
Redundancy effect	Learning is less effective when the same information is repeated through different sources (e.g. a diagram and an explanatory text), each perfectly understandable on its own.
Element inter-activity effect	Cognitive overload is usually experienced only when there is high interactivity of elements (i.e. when learning can happen only when two or more concepts are learned and/or applied at the same time instead of one at a time).
Transient information effect	Learning is impaired if the source of information disappears too early, before the learner has had a chance to fully understand it (e.g. in video, audio, presentation).
Collective working memory effect	For complex tasks, group learning is more effective than individual learning because the cognitive load can be shared among different individuals.

Table 2.3. Basic principles for effective instructional design in CTML (adapted from Mayer R., 2009)

Principle	Explanation	Goal
Coherence	Learning is supported when extraneous materials and unnecessary information are removed.	Reducing extraneous processing (= extraneous load)
Signaling	Learning is supported when there are visual cues that signal the organization and the logic of the information.	
Redundancy	Learning is supported when redundant material is eliminated (e.g. a message that is provided both as text and speech).	
Spatial contiguity	Learning is supported when related pictures and texts are presented near each other on the page or screen, rather than far apart.	
Temporal contiguity	Learning is supported when related pictures and texts are presented at the same time, rather than separately in succession.	
Segmenting	Learning is supported when information is presented in segments that users can pace at wish, rather than all at once.	Managing essential processing (= intrinsic load)
Pre-training	Learning is supported when learners have already been made familiar with the name and characteristics of key concepts included in the material.	
Modality	Learning is supported when, in a video, words are presented together with images as speech, rather than as on-screen text.	
Multimedia	Learning is supported when information is presented both as pictures and words, rather than as words alone.	Fostering generative processing (= germane load)
Personalization	Learning is supported when texts are in a conversational, plain style, rather than formal.	
Voice	Learning is supported when audio information is presented by a natural, friendly human voice, rather than a machine-like voice.	
Image	Learning is not necessarily deeper when, in a multimedia presentation, the lecturer's image is visible on screen rather than not.	

In regards to the use of visual elements in static documents, CTML in particular is grounded in the principle that “*people learn better from words and pictures than from words alone*” (Mayer R., 2009, p.4). Mayer R. and Gallini (1990) found out that diagrams illustrating parts and steps helped in recalling conceptual knowledge and creative problem-solving, but not verbatim retention, especially for novice learners. Visual knowledge maps were also found to help novices remember lessons better, compared to lists of key terms (Lambiotte & Dansereau, 1992). Moreover, the presence of images was shown to lead to better recall in the case of online news (Debue & van de Leemput, 2014), while it negatively affected learning when included in materials for children who were learning to read (Torcasio & Sweller, 2010).

Several studies concentrate on *diagrams*, as they are often used in teaching materials and instructions. Since different concepts may need to be integrated in a mental schema before understanding can take place, diagrams can aid understanding, as they provide a representation of such schema that can be simply read off, thus requiring less cognitive effort (Marcus, Cooper & Sweller, 1996; Schnotz & Bannert, 2003). Cognitive load is reduced, in particular, when diagrams provide information in an already integrated way, preventing split-attention effects: in fact, diagrams support better understanding when annotations, captions, and labels are integrated together with visual elements, rather

than simply adjacent (Chandler & Sweller, 1991; Mayer R., Steinhoff, Bower & Mars, 1995). Scaife and Rogers (1996) propose that the effectiveness of graphical representation in aiding understanding and inference making can be explained not only in terms of *computational offloading* (reading off an external representation is less cognitively taxing than mentally building the same representation), but also in terms of *re-representation* (different systems of representation of the same concepts affect how easily they can be used, e.g. Roman versus Arabic numerals) and *graphical constraining* (visual representation can simplify understanding by constraining the possible inferences that a learner may make, addressing them towards more useful problem representations and solutions). They also suggest that “good” diagram design is not good in absolute terms, but depends on the type of task the diagram is used for (thus, what inferences should be suggested) and the previous knowledge of learners (Scaife & Rogers, 1996).

Finally, several authors point out that, despite considerable research on animations, researchers found that they are inferior to or no better than static images (Mayer R., Hegarty, Mayer S. & Campbell, 2005; Tversky B., Morrison & Betrancourt, 2002; Sorden, 2013)

In terms of measurements and instruments, CLT and CTML rely on approaches that aim at making causal claims on the effectiveness of a given instructional design or information display format (Sorden, 2013). The approaches can be summarized as follows:

- Reliance on quantitative experimental evaluations, in which participants are randomly assigned to perform comprehension, problem-solving, retention and/or learning transfer tasks using different versions of the same instructional materials (Mayer R., 2009; Sorden, 2013).
- Measuring levels of cognitive load in different experimental conditions, to establish a causal relationship between cognitive load and performance. Most typically, cognitive load is self-reported using a one-dimensional, one-item, nine-points scale (de Jong, 2009), because this method balances reliability and sensitivity well (Paas, 1992; Paas, van Merriënboer & Adams, 1994) with ease of application (Paas et al., 2003b). Alternatively, cognitive load has been measured through physiological indicators, such as pupillary dilation (Beatty & Lucero-Wagoner, 2000; Van Gerven, Paas, van Merriënboer & Schmidt, 2002), eye tracking (Skuballa, Schwonke & Renkl, 2012), heart rate and blood pressure (Fredericks, Choi, Hart, Butt & Mital, 2005) and neuro-imaging (Jaeggi et al., 2007). A third way to assess cognitive load is through a secondary task approach, in which worse performance on a secondary task is taken to indicate a higher cognitive load experienced in completing the primary task (Marcus et al., 1996; Brünken, Plass & Leutner, 2003).
- Since neither performance or cognitive load alone allow us to establish which instructional design is better (e.g. better performance can simply

result from exerting a greater effort, and not from a better design), scholars have been providing a measure, called efficiency (Paas & van Merriënboer, 1993) or effectiveness (de Jong, 2009), that takes into consideration both performance and cognitive load scores obtained under a certain condition. Such measures can follow a two-dimensional approach (effort during training *or* testing, and test performance; e.g. Paas & van Merriënboer, 1993; Marcus et al., 1996; Kalyuga, Chandler & Sweller 1998), or a three-dimensional approach (training effort, testing effort, and test performance; e.g. Tuovinen & Paas, 2004).

CLT and CTML scholars have also identified a number of individual characteristics of learners that affect instructional effectiveness and its measurement – for instance:

- level of expertise (Kalyuga et al., 1998; Kalyuga, 2007; Kalyuga, Rikers & Paas, 2012)
- age (Van Gerven et al., 2002; 2004)
- positive affect (Um, 2008; Hoogereide & Paas, 2012)
- motivation (Paas et al., 2005; Schnotz et al., 2009)
- cognitive styles (Strehler, 2008).

Given the *dual channel assumption* at the basis of CLT and CTML – which postulates that verbal/textual and visual information are essentially processed by different elements of human cognitive architecture – it seems warranted to consider in particular verbal and visual cognitive styles as possible individual characteristics affecting optimal learning and understanding.

2.2.3 Verbal and Visual Cognitive Styles

Cognitive styles are “*an individual’s preferred and habitual approach to both organizing and representing information*” (Riding & Rayner, 1998, cited in Riding, 1991/1998, p.1) which influence an individual’s perceptual and intellectual activities. Cognitive styles have been considered important in the field of education on the grounds of the *attribute-treatment interaction hypothesis* (Massa & Mayer R., 2006) or *meshing hypothesis* (Pashler, McDaniel, Rohrer & Bjork, 2008), according to which optimal learning requires materials to be designed and tailored to match the cognitive style of each learner.

In their reviews of studies around cognitive styles Riding and Cheema (1991) and Rayner and Riding (1997) concluded that, despite researchers using several labels to describe cognitive styles, they can mostly be subsumed into two principal dimensions because of the similarities in their conceptualization and assessment: the wholist-analytic and the verbal-imagery style dimensions. Riding (1991/1998, p.1) defines the wholist-analytic style dimension as to “whether an individual tends to organize information into wholes or parts”, and the verbal-imagery style dimension as to “whether an individual is inclined to *represent* information during thinking verbally or in mental pictures”. Strehler (2006, p.39) points out that most of theory development has

been carried out around these two dimensions of cognitive styles. However, different conceptualizations of other dimensions of cognitive styles exist, for instance:

- Field Dependence/Field Independence (Witkin, Moore, Goodenough, & Cox, 1977)
- Reflectivity/Impulsivity (Kagan, 1966)
- Intuition/Analysis (Allinson & Hayes, 1996)
- Leveling/Sharpening (Holzman & Gardner, 1960)
- Serialist/Holistic approach (Pask & Scott, 1972)
- Diverging/Converging and Accommodating/Assimilating learning styles (Kolb A. & Kolb D., 2005).

This list is not exhaustive (for a more complete summary, see e.g. Coffield, Moseley, Hall & Ecclestone, 2004; Kozhevnikov, Evans & Kosslyn, 2014), but this variety in approaches already hints at a few key issues that have attracted criticism about cognitive style research. Firstly, the abundance of models and conceptualizations found in literature (e.g. Coffield et al., 2004), which points at the difficulty in characterizing and assessing the relevance of individual thinking differences (Kozhevnikov, et al., 2014). Secondly, the confusion and sometimes interchangeability of concepts such as “cognitive style” (mostly used in psychology), “learning style” (mostly used in education), and “decision-making style” or “personality types” (mostly used in management) (Kozhevnikov et al., 2014). Thirdly, the contrasting views about what cognitive (or learning) styles exactly are: fixed and inherited traits, features of individual cognitive and abilities, a component of personality, or simply approaches and strategies flexibly influenced by choice and context (Mayer R. & Massa, 2003; Coffield et al., 2004).

In the remainder of this review, I will not attempt to clarify these controversies (which have baffled scholars much more knowledgeable than I am). I prefer to introduce how the understanding of visual cognition has been conceptualized in relation to learning and processing information, and how this has evolved. The question is whether individual differences and abilities – conceptualized for convenience as cognitive styles – should be taken into consideration when studying visual elements as aids to understand complex content better.

Research on the verbal-visual dimension of cognitive style started gaining momentum on the basis of work from Paivio (1969) and Richardson (1977), who proposed that individuals can be categorized as either verbalizers (people who habitually rely primarily on analytic-verbal strategies to process information) or visualizers (people who habitually rely on imagery to process information). Paivio was the first to develop an instrument, in 1971, to assess these differences, the Individual Difference Questionnaire (IDQ) (Paivio & Harshman, 1983). This was developed further by Richardson into the Verbalizer–Visualizer Questionnaire (VVQ) (1977), who chose to maintain only the fifteen items of IDQ that displayed the most predictiveness. Further early work was carried out, for instance, by Paivio and Harshman (1983), who validated the IDQ through a factor analy-

sis; and by Kirby, Moore and Schofield (1988), who further developed the VVQ by suggesting that its single bipolar dimension should be substituted by two distinct dimensions, one for verbal and one for visual ability.

Riding provided a central status to the verbal-visual dimension by integrating it into his model as one of the two key dimensions of cognitive style (Riding & Cheema, 1991; Rayner & Riding, 1997; Riding & Rayner, 1998), and creating a popular measurement called the Cognitive Styles Analysis (CSA) (Riding 1991/1998). Despite the findings from Kirby et al. (1988) – and similar ones from Alesandrini (1981) and Green & Schroder (1990), showing that VVQ scores do not correlate to scores on visual-spatial tasks – Riding conceptualized visual and verbal ability as polar opposites of the same dimension. However, doubts were raised about the reliability and validity of the CSA in general (e.g. Rezaei & Katz, 2003; Parkinson et al., 2004), and of its verbal-visual subtest in particular (Mayer R. & Massa, 2003; Massa & Mayer R., 2006; Peterson et al., 2003a; 2003b; 2005; Rezaei & Katz, 2003).

Peterson and colleagues (2005) attributed these reliability and consistency issues of the verbal-visual subtest of CSA to its ambiguously framed tasks, and tried to address the problem by developing an alternative subtest for verbal–imagery cognitive style (VICS). Leutner and Plass (1998) instead suggested that better predictive power can be obtained through direct observation of preferential choices and behaviors in realistic learning settings, rather than psychometric tests, and developed an instrument called the Visualizer/Verbalizer Behavioral Observation Scale (VV-BOS). A different approach was taken by Kozhevnikov and colleagues (Kozhevnikov, Hegarty & Mayer R., 2002; Kozhevnikov, Kosslyn & Shepard, 2005; Vannucci, Cioli, Chiorri, Grazi & Kozhevnikov, 2006; Blazhenkova & Kozhevnikov, 2010). According to this line of research, imagery should be considered a multidimensional construct to resolve the “the problem of predictive validity of self-report cognitive style instruments” which affected past measurement scales (Blazhenkova & Kozhevnikov, 2009, p. 657. Cf. Blajenkova, Kozhevnikov & Motes, 2006). This suggestion is grounded in behavioral experiments (e.g. Baddeley, 1992; Gorgorió, 1998; Kozhevnikov et al., 2002; Kozhevnikov et al., 2005; Chabris et al., 2006), as well as neuroscientific evidence for the existence of different pathways processing different types of visual information (e.g. Levine, Warach & Farah, 1985; Farah et al., 1988; Cabeza & Nyberg, 2000).

In this reconceptualization, there are two different types of visualizers: object visualizers – who are “good in constructing vivid, pictorial, and detailed images of individual objects” – and spatial visualizers – who instead “excel in creating images that represent spatial relations among objects and in imagining spatial transformations” (Kozhevnikov et al., 2005, p. 712). The two visual cognitive styles describe abilities that are independent from each other, as well as from verbal ability, marking a departure from the previous conceptualization of visual and verbal abilities as polar opposites on a continuum. For instance, Kozhevnikov and colleagues (2002) observed that people who have been traditionally classified as visualizers cleanly split into two groups: those with high spatial ability and those with low spatial ability, with just a scant

minority in the middle. Conversely, verbalizers usually display an average spatial ability. In another study, where visualizers were assigned both spatial imagery tasks (assessing the ability to mentally rotate and integrate shapes) and object imagery tasks (assessing the ability to form vivid mental pictures), one group excelled in the former and struggled in the latter, and a second group displayed the opposite pattern (Kozhevnikov et al., 2005). Moreover, no correlation has been found between people's preferences for object and spatial information processing (Chabris et al., 2006), further strengthening the idea that the anatomic and functional separation of visual cognition processes is expressed also in terms of different cognitive styles. Based on these findings, Blazhenkova and Kozhevnikov (2009) reconceptualized the construct of verbal-visual cognitive style as comprising three independent dimensions – one verbal and two visual (object and spatial) – and also developed and validated a new instrument, the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ), to assess them appropriately.

While there is evidence for individual differences in modality-specific processing abilities, it remains open whether presenting information in a way that matches these strengths actually leads to more effective learning and understanding (Coffield et al., 2004). Massa and Mayer R. (2006) found that there is no significant evidence to support the attribute x treatment interaction hypothesis, and suggest that learning in complex, realistic environments should instead take into consideration learners' preferences and aptitudes within specific situations, in which the nature of the task and the information presented may also play a role (Mayer R. & Massa, 2003). On the other hand, Kozhevnikov and colleagues (2002) found that object visualizers struggled in understanding diagrams, schemes, and graphs, since they interpreted the materials as pictures rather than as abstract representations.

In my discussions with contract professionals over the years I have often heard the objection "*I am not a visual person*", either to justify why they would be unwilling to produce contract visualizations, or to express skepticism about visualizations as a comprehension aid. While matching mode of presentation of information to individual characteristics may be unwarranted in the educational field, people may still *believe* themselves to be comparatively better or worse with certain modes of expression. For this reason, assessing and controlling for verbal, object-visual and spatial-visual cognitive styles while testing the effectiveness of a particular way to present information may still be the reasonable way to go. Firstly, the results of the assessment could help dispel incorrect self-beliefs about one's own skills (many research participants were genuinely interested to know how they scored on the OSIVQ scales, and I provided them with their results as an additional small reward for participating in my studies). Secondly, being able to exclude attribute x treatment interaction effects can have positive practical implications: if people – whichever their cognitive style – consistently understand better contracts containing visuals or a mix of text and visuals, we can more confidently assume that there is a more suitable way to format and design contracts – and it is not simply a matter of personal preference.

2.2.4 Section summary and research gaps

In this section, I firstly introduce the concept of affordance, which constitutes a nexus between psychology, design and – as the next chapter will show – a sociomaterial view of organizational knowledge and knowing. Secondly, I review the CLT and CTML literature, which further establishes the importance of design in supporting comprehension and provides:

- 1) a set of criteria to design documents that impose the least amount of cognitive load on their users, enhancing understanding and learning;
- 2) measures to evaluate and compare alternative formats of information presentation (performance accuracy and speed measures; cognitive efficiency); and
- 3) a list of known effects and factors which may interfere with optimal learning and cognitive load reduction strategies (e.g. level of expertise, and cognitive styles – which were further investigated in a dedicated sub-section).

While my research does not explicitly explore issues or research gaps in these research domains, it extends the application of these theories in a domain outside educational psychology – namely, learning from a complex information source in a real-life scenario, and understanding how to act upon it. These theories also help explain the results of my quantitative studies, and why a change in information presentation – rather than content – can cause changes in understanding.

2.3 Knowledge Practices in Organizations: the Role of Artifacts and Visualization

The first part of this literature review establishes the importance of understandable and actionable contracts in organizations. The inter-organizational contracting process – spanning from contract planning to implementation – is a multidisciplinary endeavor, cognitively and socially complex, where ignoring the importance of collaboration and mutual understanding creates risks of failure. It is not simply a matter of choosing the right transaction type and encoding it into legally sound clauses. On the contrary, at every step of the process, the involved actors try to create, access, share, validate, and apply knowledge – for instance about their mutual goals (know-why), the appropriate division of responsibilities and obligations (know-who, know-what), and the most appropriate reactions and problem-solving strategies in case of contingencies (know-when, know-how).

It is, however, necessary to find another theoretical home for contracts and contracting practices in organizations, if we are to contextualize the contribution of this research in terms of organizational studies. Despite its merits, a TCE-informed paradigm is not a suitable tool for this particular task, as it does not touch upon the social and material aspects of contracting. What is needed is a knowledge-based and practice-oriented perspective, which recognizes, on one hand, the strategic

importance of knowledge creation, transfer and application in terms of competitive advantage; and reveals, on the other hand, the influence of the material characteristics of the tools through and with which we interact and collaborate.

2.3.1 Knowledge-Based View of the Firm

The knowledge-based view of the firm has emerged in the 1990s (e.g. Kogut & Zander, 1992; Grant, 1996; Spender, 1996a; 1996b; Nonaka & Takeuchi, 1995), partially extending a resource-based view of the firm, by seeing knowledge as a resource needed to achieve competitive advantage (Alavi & Leidner, 2001). The success of a firm is a function of its knowledge resources – or “intellectual capital” – and the ability of the firm to make use of such knowledge (embedded into its human, social, and relational capital) in its operations and processes (Nahapiet & Ghoshal, 1998). Firms exist because they are more efficient systems than markets in making use of specialized knowledge, which is the key and defining resource behind all human productivity or technology (Grant, 1996). In opposition to TCE, the knowledge-based view of the firm does not see organizations arising purely out of economic factors, market failures, and the need to keep in check transaction costs and opportunism (Kogut & Zander, 1992; 1993; Nahapiet & Ghoshal, 1998):

“[W]hat determines what a firm does is not the failure of a market, but the firm’s efficiency in this process of transformation relative to other firms. It is the difference in knowledge and the embedded capabilities between the creator and the user (possessed with complementary skills) which determine the firm boundary, not market failure itself.” (Kogut & Zander, 1993, p.631)

Competitive advantage is thus explained in terms of knowledge, even though scholars have provided alternative accounts of what firms need to do with their knowledge to succeed: some focus on *knowledge creation* (e.g. Kogut & Zander, 1992; Nonaka, 1994; Nonaka & Takeuchi, 1995) as concerted action and innovation in a competitive and changing environment can only be sustained by creating new knowledge, rather than by simply processing information. Others argue that *knowledge integration* is the crucial mechanism enabled by firms, as it is more efficient for experts to coordinate and cooperate without fully sharing all their individual knowledge (e.g. Grant, 1996), even though it is not effortless: changing environments require negotiating the specialized-yet-interdependent knowledge of different groups and transforming it into something applicable to the changed circumstances (Carlile & Reberntisch, 2003). When work is performed across disciplinary boundaries and in face of a significant level of novelty we are thus talking about *knowledge transformation* (Carlile, 2002; 2004). Other scholars acknowledge the central role of *both new and pre-existing knowledge* in maintaining competitive advantage, stressing the need to employ different strategies to make the most of a firm’s knowledge (e.g. Von Krogh, Nonaka & Aben, 2001). A topic of great interest has been that of *knowledge transfer*, “the process through which one unit (e.g., group, department, or division) is affected by the experience of another” (Argote & In-

gram, 2000, p.151), as the consolidation, sharing, and reuse of knowledge and best practices across the firm is seen as a basis for competitive advantage. Knowledge transfer is usually seen as a challenging activity. Issues in knowledge transfer arise because of the “stickiness” of knowledge (the incremental cost/effort required to transfer such knowledge outside the locus where it has been created), which depends on the nature of the knowledge itself, of its source, of its recipient, and of the context in which the transfer takes place (Szulanski, 1996; Von Hippel, 1994; 1998). Another challenge is posed by the embeddedness of knowledge in people, roles, practices, and culture (e.g. Blackler, 1995), which hinders knowledge transfer to different contexts which are too dissimilar from the originating one (Argote & Ingram, 2000; Brown J. & Duguid, 2001). Considerable research has been dedicated to understand and overcome specific factors that affect knowledge transfer (for an overview see e.g. Van Wijk, Jansen & Lyles, 2008; Cabrera E. & Cabrera A., 2005; Argote, McEvily & Reagans, 2003; Nidhra, Yanamadala, Afzal & Torkar, 2013).

According to Cook & Brown J. (1999) “organizations are better understood if explicit, tacit, individual and group knowledge are treated as four distinct and coequal forms of knowledge (each doing work the others cannot)”, echoing a typical classification of knowledge types found in literature along the individual/collective and tacit/explicit axes (e.g. Alavi & Leidner, 2001; Spender, 1996; Nonaka, 1994).

The influential concepts of explicit and tacit knowledge were initially proposed by Polanyi (1962; 1966), in regards to individual, personal knowledge. Explicit knowledge is codifiable and transmissible in formal and systematic language (Nonaka, 1994). Explicit knowledge has a declarative and generalized nature, as it is readily known to the individual (Spender 1996): it can be articulated, verbalized and communicated in other symbolic forms (Alavi & Leidner, 2001). Conversely, tacit knowledge is hard to formalize and communicate, as it has a personal quality and it is rooted in action, experience, and context (Alavi & Leidner, 2001). Tacit knowledge provides the foundation from which explicit knowledge can be developed: for instance, Nonaka (1994) explains that mental models, schemata, and beliefs, which constitute the perspective through which the world is perceived and interpreted, are part of our tacit knowledge. In addition to this cognitive dimension, tacit knowledge also possesses a technical quality – the know-how and skills, often embodied, on which we are relying when we are *doing* something (Nonaka, 1994). According to Grant (1996), a difference between tacit and explicit knowledge is that the former is revealed through application, while the latter is revealed through communication. However, tacit and explicit knowledge are often used in concert, and their boundaries may be blurred, as people need to know what to do but also how to do it at the same time (Brown J. & Duguid, 1998; 2001; Cook & Brown J., 1999), or need a heuristic understanding, usually generated through action and experience, on how to act appropriately in a given context (Tsoukas & Vladimirou, 2001).

The impression, throughout the literature, is that explicit knowledge is considered as comparably less important than tacit knowledge. It is just “the small communicable cap of the iceberg” (Spender, 1996a, p.54), somehow easier to

store and transfer, to the point that it risks being appropriated and imitated (Grant, 1996). Other authors argue that explicit knowledge depends on a substratum of contextual tacit knowledge, and its worth and meaning are thus limited outside specific contexts and practices (Brown J. & Duguid, 2001). However, as the example of contracts illustrates well, explicit knowledge is not unproblematic: just because it can be codified, transmitted and stored more easily, it does not mean that these activities are done effectively and properly, keeping in mind users' capabilities and needs. The mundane and material aspects of knowledge matter: a badly designed document will be misunderstood or not even used; messy repositories where valuable resources are buried under unclear interfaces and haphazard information architectures will prevent users from finding what they are searching for; unclear user flows and poor user experiences demotivate users from following through the whole process to completion. All these challenges have nothing to do with theoretical knowledge taxonomies, but are practical, material design problems, which are nonetheless critical because they *do* have very real repercussions on how knowledge is created, shared, and used – and whether organizational actors succeed in their patterns of action.

A second distinction is made between individual and collective knowledge. Following a close reading of Polanyi (1962), some authors argue that *all* knowledge has an individual and personal character (e.g. Grant, 1996; Tsoukas & Vladimirou, 2001). Conversely, others argue that collective knowledge exists in its own right, in addition to individual knowledge, as it does an epistemologically different “job” from individual knowledge (Cook & Brown J., 1999), and remains embedded in a firm's organizing principles and practices even if individual employees leave (Kogut & Zander, 1992). Collective knowledge, for instance, exists in the actions and practices of groups (Nonaka, 1994; Brown J. & Duguid, 1998), and such knowledge gains legitimacy because a community, rather than an individual, deems it appropriate and acceptable (Cook & Brown J., 1999). While concepts and skills belong to the individual knowledge domain, Cook and Brown (1999) suggest that stories and genres constitute examples of collective knowledge. Stories help to explicitly share how to get the work done, and what constitutes failure or success (e.g. Orr, 1996). Genres of physical and social artifacts (e.g. “internal memo”, “email”, “team meeting”, “mission statement” etc.) tacitly provide an interpretive structure for the meaning, purpose, and appropriateness of the ongoing communicative actions (Orlikowski & Yates, 1994). In addition to stories and genres, other types of collective knowledge have been recognized in literature, such as routines – recognizable and repeatable patterns of collective actions, “functional events” which emerge or are designed to make a group accomplish a certain outcome (Pentland & Feldman, 2008). Another example is the concept of objectified knowledge, which is embodied in repositories, documents and artifacts – and, to be used, it needs to be re-embedded and re-contextualized in specific ongoing processes (Spender, 1996b).

While the knowledge-based view of the firm establishes the key role of knowledge and knowing for the success of organizations, it often does not problematize the role of artifacts within the ongoing knowledge dynamics. Given the interest of this research in contract documents and contract visualization, this is

an issue. The material aspects of sensemaking, cooperation and decision-making seem often inconsequential, or at best an institutionalized material trace of the ongoing social practices. In this “over-socialized” view of knowledge, there is a marked preference towards linguistic and conversational aspects of how beliefs, interpretations, and common goals (which, I argue, are types of knowledge) are collectively negotiated and enacted (Stigliani & Ravasi, 2012). However, as well illustrated by the psychology, educational and design literature reviewed in the second part of this chapter, the material world has very real consequences on human perception, cognition and behavior, as it affords and constrains our possibilities for action – and for knowing.

“Arguably, indeed, organizations are built and maintained around partially shared, partially fragmented and partially disputed objects.” (Engeström & Blackler, 2005, p. 310)

At the other extreme, an “under-socialized” view of knowledge also has pitfalls, as it tends to be blinded by technology. By focusing only on technological solutions for knowledge management, this view basically conflates knowledge with (digital) information and on how to best store, retrieve and share it (Tsoukas & Vladimirou, 2001; Pentland & Feldman, 2008). This view tends to ignore the human factor – the needs, capabilities, motivations, values, and practices of the people involved – leading to the creation of organizational systems and tools that fail, because they are not modeled around the real practices and activities that are taking place in the organization.

A virtuous middle path is needed, and it is offered by a stream of literature, called “practice-based studies” (Nicolini, Mengis & Swan, 2012) or “practice theory” (Feldman & Orlikowski, 2011).

2.3.2 From Knowledge to Knowing – Focusing on Practices and Materiality in Organizational Life

This approach analyzes people practices and activities as central to organizational outcomes, and how these practices are produced, reinforced, and changed (Feldman & Orlikowski, 2011). A practice orientation rejects dualisms, for instance between cognition and action, or subjective and objective, but focuses instead on relationality and mutual constitution between the agents in a system and the social system itself (Feldman & Orlikowski, 2011). This view is complemented by a sociomaterialistic stance, influenced by approaches such as actor network theory (Law, 1992; Latour, 1992; Latour, 2005) and activity theory (e.g. Engeström, 1999; Kaptelinin & Nardi, 2006). Sociomaterialism sees materiality as constitutive of organizing (Orlikowski, 2007): practice is the result of how material aspects (physical objects, artifacts, technologies, systems, spaces, human bodies) are entangled with social aspects (language, human interactions, human relationships, culture, beliefs) (Orlikowski & Scott, 2008). Moreover, it reconfigures agency as something that is not inherent and exclusive to humans (Orlikowski, 2007). While people shape matter, creating tools and delegating work and functions to nonhuman agents,

the design and physical structure of the material world also pushes back on people, determining and compelling human actions (Latour, 1992): this mutual “disciplining” of action results in a *distribution of competences* and tasks between humans and nonhumans. Human action is thus always mediated (Engeström, 1999), afforded (Cook & Brown J., 1999) and scaffolded (Orlikowski, 2006) by the artifacts surrounding them.

When a practice lens is applied to the study of knowledge in organizations, it reframes knowledge from something that is *possessed* to something that is instead *enacted*: knowledge is seen as a tool that is used in the *practice of knowing*, which is the interaction between the knower and the physical and social worlds (Cook & Brown J., 1999; Blackler, 1995; Whyte, Ewenstein, Hales & Tidd, 2008). Sociomaterialism also informs the practice of knowing, which is never intended as an intellectual, disembodied phenomenon (Feldman & Orlikowski, 2011):

“Practice-based approaches to knowledge view it as a social accomplishment, situated in ongoing interactions between people and objects. Through these interactions the meaning of words, actions, situations and material artifacts are negotiated. Learning takes the form of a ‘conversation with materials’.” (Whyte et al., 2008, p.75)

The concept of affordance – so crucial in terms of interaction design – unsurprisingly re-emerges in the context of knowledge and hints towards a pragmatic epistemology, which sees knowledge as constructed not in the human mind, but in the interaction between human and the world¹⁹. Cook & Brown J. (1999) introduce the concept of dynamic affordance to explain how the act itself of knowing – seen as a purposeful inquiry where humans *make use* of intellectual and material knowledge resources – can open up action possibilities. Let us consider an example pertaining to contract visualization: for instance, a timeline representing contract duration *affords* the parties to externalize their thoughts about the issue and have a dialogue about their converging or diverging preferences and goals; at the same time that dialogue *dynamically affords* the acquisition of knowledge about each other’s understanding, and the generation of new knowledge about a mutually agreeable solution. While artifacts may not directly generate, transfer or transform knowledge, they instigate, support, and open up the possibility for such actions.

An interest in studying practices in organizations goes hand in hand with an interest in the artifacts used and produced in those contexts, because

“organizational sensemaking, cognition, knowledge, learning, and perceiving, just to mention a few ‘mental’ activities in organizations, are not merely situated in the ideational realm but deeply implicate sociomaterial practices through which they are enacted” (Carlile et al., 2013, p.2).

In particular, the role of artifacts has been investigated in terms of facilitating and obstructing knowledge practices, such as knowledge creation (e.g. Lehto-

¹⁹ A pragmatist stance, in fact, informs my research, and is further explained in Chapter 3 “Methodology”.

nen, 2014), sharing (Bechky, 2003), and transformation (Carlile, 2002; 2004), and how these in return facilitate and obstruct collaboration and coordination (e.g. Lee, 2007; Nicolini, 2007; Nicolini et al., 2012; Yakura, 2002).

In the next two sub-sections, I first discuss and categorize the roles of artifacts in supporting collaborative and knowledge work within organizations. Secondly, I introduce research on knowledge visualization.

2.3.2.1 Artifacts and Objects in Organizational Life

There are different types of objects in organizational life (Nicolini et al., 2012; Ewenstein & Whyte, 2009; Lee, 2007), which can be distinguished on the basis of the use that actors make of them in practice (Table 2.4).

A broad distinction, suggested by Nicolini et al (2012), divides artifacts into three categories. Firstly, there are *primary objects* – objects that provide a motivation for joint social action and sustain the desire to collaborate around a common interest. The function of these objects is teleological, as it provides a motive for action to a social community around a shared motive and interest. At a more fine-grained level, we can ascribe to this category the concepts of *epistemic object* – originally developed in the analysis of knowledge practices in the scientific community (Rheinberg, 1997; Knorr-Cetina, 2001) – and *object of activity* – a key concept in activity theory, a framework to study the actions and interactions of humans with the world in a given context (Kaptelinin, 2014). Both types of object share an unfinished, ever-unfolding nature, as they constitute a horizon towards which the involved actors are working (Virkkunen & Kuutti, 2000; Ewenstein & Whyte, 2009). Literature on epistemic objects, in particular, underlines their fluid nature, which evolves to enable evolving knowledge practices over time (Schatzki, 2001; Ewenstein & Whyte, 2009). The issue of materiality of these objects also exists along a continuum: for instance, an object of activity can span from a concrete blueprint to a vague common idea of a plan (Virkkunen & Kuutti, 2000). Epistemic objects, instead, exist more as objects of interest, even though, in practice, social actors manage to interact with them and sustain their knowledge work through the particular material instantiations and representations of such epistemic objects: a good example is offered, in architectural work, by the ever-evolving and linked “cascades” of sketches and blueprints used throughout a building project (Ewenstein & Whyte, 2009; Whyte, Tryggestad, & Comi, 2016). Without these particular representations, the social actors would not be able to manipulate and evolve the epistemic object (Rheinberg, 1997; Ewenstein & Whyte, 2009). What matters in both cases is not much the effective degree of materiality of these objects, but their affordances – whether they allow for manipulation and transformation by social actors (Virkkunen & Kuutti, 2000), and whether these actions dynamically afford the direction of the knowledge work of a community towards its shared objective.

Table 2.4. The role of objects in organizations, according to “practice-based view of knowledge” - literature.²⁰

Primary Objects Provide a motivation for joint action and trigger and sustain the desire to collaborate			
Type	Definition(s)	Role	References
Objects of activity	<p>“The key element of an activity system is the object of that activity. The object is the societal motive of the activity, it defines the activity and separates activities from each other. The object can be a material thing, but it can also be less tangible (like a plan) or totally intangible (like a common idea) as long as it can be shared for manipulation and transformation by the participants of the activity. Contrary to individuals' actions, which have a clear and finite objective, the object of an activity is never finite and exactly determined. It can be better characterized as a horizon of possibilities and possible objectives for the actors, something that unfolds in the process of the activity” (Virkkunen & Kuutti, 2000, p.301)</p>	Teleological; provide the motive for the activity system; constrain and direct human activities	Virkkunen and Kuutti, 2000; Kaptelinin & Nardi, 2006; Nicolini et al., 2012
Epistemic objects	<p>“Epistemic objects are abstract in nature: they are the objects of inquiry and pursuit. Hence, they are characterized by lack and incompleteness. As they appear in temporary instantiations, they are defined at once by what they are and what they are not (or not yet)” (Ewenstein & Whyte, 2009)</p> <p>““Epistemic objects’ [are] characterized by an incompleteness of being and the capacity to unfold indefinitely. Because such objects point toward further explorations and unfoldings, they, together with the libidinal structuring of wanting they determine, govern the advance of practice” (Schatzki, 2001 p.22)</p>	Teleological; generate a basis for collaboration and belonging by acting as a motivator of activity	Rheinberg, 1997; Knorr-Cetina, 2001; Schatzki, 2001; Miettinen & Virkkunen, 2005; Ewenstein & Whyte, 2009

²⁰ The categorization into primary, secondary and tertiary objects is based on Nicolini et al., 2012. The references listed in this table are not exhaustive, and are to be intended as exemplary and illustrative. In most cases, they include the original work where the concept was first introduced, along with other central literature. In regards to concepts belonging to activity theory (objects of activity and mediating artifacts), I have chosen examples of references that offered an accessible explanation. The literature on activity theory is extensive, and has evolved in at least three waves: 1) the early pioneering work of Vygotsky and Leont'ev, virtually unknown outside Soviet Russia until the 1980s; 2) the internationalization and development of activity theory in the 1980s-1990s, especially by Yrjö Engeström and other Scandinavian authors; 3) the application of activity theory in HCI and Computer-Supported Collaborative Work communities by Nardi, Kaptelinin, and other scholars from the mid-1990s onwards (Kaptelinin & Nardi, 2006). For this reason, I favored clarity over the search for “the” original definition or oldest source.

Secondary Objects Facilitate, support, and enable collaborative work			
Type	Definition(s)	Role	References
Boundary objects	<p>"Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds. (Star & Griesemer, 1989, p. 393)</p>	<p>Act as knowledge translation and transformation device across cross-disciplinary boundaries; allow the construction of a shared meaning, enabling coordination; allow collaboration without deep sharing</p>	<p>Star & Griesemer, 1989; Carlile, 2002; 2004; Star, 2010</p>
Boundary-negotiating artifacts	<p>"[Boundary negotiating] artifacts can serve to establish and destabilize protocols themselves and that artifacts can be used to push boundaries rather than merely sailing across them" (Lee, 2007, p. 308)</p> <p>"Boundary negotiating artifacts:</p> <ul style="list-style-type: none"> • Are surrounded by sets of practices that may or may not be agreed upon by participants; • Facilitate the crossing of boundaries (transmitting information); • Facilitate the pushing and establishing of boundaries (dividing labor); • May seem "effortful" in use as opposed to effortless; • Are fluid: (1) a boundary negotiating artifact can change from one type to another when the context of use changes; and (2) a boundary negotiating artifact can sometimes also simultaneously be physically incorporated or transformed into another artifact; • Can be largely sufficient for collaboration; • Are possible predecessors of boundary objects." <p>(Lee, 2007, pp.333–334)</p>	<p>Allow collaboration in and across communities that lack pre-existing standards; make uneasy collaboration possible</p>	<p>Lee, 2007</p>
Conscription devices	<p>"Conscription devices [...] enlist group participation and are receptacles for knowledge created and adjusted through group interaction aimed toward a common goal. To participate at all in the design process, actors must engage one another through the visual representation of the conscription device. They focus their attention and their communications with</p>	<p>Somewhat between that of an epistemic and a boundary object, as they facilitate collaboration, but also provide focus on a specific goal; provide means to participate in constructing knowledge;</p>	<p>Henderson K., 1991; Hölttä, 2013</p>

	<p>one another by referring to it. The conscriptive quality of these visual representations is so strong that participants find it difficult to communicate about the design at all without them. If a visual representation is not brought to a meeting of those involved with the design, someone will sketch a facsimile on a white board (present in all engineering conference rooms) when communication begins to falter, or a team member will leave the meeting to fetch the crucial drawings so group members will be able to understand one another.” (Henderson K., 1991, p.456)</p>	<p>facilitate externalization, reasoning and sensemaking in collaborative projects; encourage to generate and correct practices</p>	
Intermediary objects (of design)	<p>““Snapshots” of the project’s configuration at given moments (sketches, prototypes, descriptive documents and pilot implementations), embedded in some tangible form that can be circulated and acted upon by the project team. [...] Sequences of IODs [are] the supporting media of sensemaking in projects [as they] associate and combine during the project lifecycle to convey some types of action or to reduce multiple interpretations.” (Papadimitriou & Pellegrin, 2007, pp. 438–439)</p>	<p>Act as representations, traces and outputs of the collaborative process that progressively restrict the margin of interpretation allowed to the participating actors; reduce equivocality; support the materialization and objectification of concepts into an end results</p>	<p>Vinck & Jeantet, 1995; Boujut & Blanco, 2003; Papadimitriou & Pellegrin, 2007</p>
Mediating artifacts/tools	<p>“An essential feature of artifacts is that they have a mediating role. Relations between elements of an activity are not direct but mediated; for example, an instrument mediates between an actor and the object of doing; the object is seen and manipulated not “as such” but within the limitations set by the instrument” (Kuutti, 1996, p.26)</p> <p>“The idea is that humans can control their own behavior – not ‘from the inside’, on the basis of biological urges, but ‘from the outside’, using and creating artifacts” (Engeström 1999, p.29)</p>	<p>Direct and channel human action on the object of activity; mediate individual and collective action in respect to individual and collaborative tasks and permitted social interactions</p> <p><u>Note:</u> Depending on the specific case, a mediating tool could be categorized as either a secondary or a tertiary object.</p>	<p>Kuutti, 1996; Engeström, 1999; Virkkunen and Kuutti, 2000; Kaptelinin & Nardi, 2006</p>

Tertiary Objects Provide the “mundane” structure and tools that allow for collaborative work			
Type	Definition(s)	Role	References
Technical objects	“Technical objects provide a frame for the objects of inquiry, and involve the taken-for-granted equipment and tools. The focus of scientific work is on turning epistemic objects into technical objects. [...]The term ‘technical object’ emphasizes the unquestioned, static nature of the material object once it is no longer evolved and changed through epistemic work”. (Ewenstein & Whyte, 2009, pp.9–10)	Provide stable reference points; work as concrete, unproblematic instruments to carry out knowledge work	Rheinberg, 1997; Miettinen & Virkunen, 2005; Ewenstein & Whyte, 2009
Objects as infrastructure or scaffolds	<p>“Only rarely do objects take center stage in discussion. Most of the time, in fact, they remain in the shadow of other practices. [...]Yet without [them], collaboration would be much more difficult. Taken alone [an object] seems insignificant, but when considered as a part of the complex ecology of objects that supports the daily work of the group, its work becomes more apparent” (Nicolini et al., 2012)</p> <p>“Most infrastructures, such as the room, become present only when they stop performing their supporting functions. In sum, although infrastructural objects may have a relatively marginal and indirect impact on cross-disciplinary collaboration, they cannot be completely ignored” (Nicolini et al., 2012)</p> <p>“In this sense of augmenting human activity, scaffolds include physical objects, linguistic systems, technological artifacts, spatial contexts, and institutional rules - all of which structure human activity by supporting and guiding it, while at the same time configuring and disciplining it” (Orlikowski, 2007)</p>	Structure, constrain, and enable action in collaborative work	Star & Ruhleder, 1996; Orlikowski, 2007; Nicolini et al., 2012; Alexander E. et al., 2013

The second category – *secondary objects* – is perhaps the most widely explored in research on artifacts in organizations. Secondary objects are characterized by their role in facilitating, mediating, and enabling collaborative practices within and across discipline-specific boundaries and communities.

The most influential concept in this category – used to describe practices in organizational contexts²¹ as different as product development (Carlile, 2002; 2004; Bechky, 2003), innovation (Koskinen, 2005; Scarbrough, Panourgias & Nandha-

²¹ The concept of “boundary object” has also been widely used in other research fields, such as sociology of science, sociology of design, and computer supported collaborative work (for a review, see Trompette & Vinck, 2009). I do not touch upon these bodies of literature, for concision's sake.

kumar, 2015), strategy (Spee & Jarzabkowski, 2009), project management (Yakura, 2002; Sapsed & Salter, 2004), and contract negotiations (Koskinen & Mäkinen, 2009) – is that of *boundary object*,

“objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star & Griesemer, 1989, p. 393).

Boundary objects are defined by their ability to serve as bridges between intersecting yet different communities, as collaboration is made difficult by the existence of *boundaries* – “*socio-cultural differences that lead to discontinuities in action and interaction*” (Hölttä, 2013, p.20). Boundaries can be described, in order of complexity, as *syntactic boundaries*, where a common language to represent knowledge is missing, *semantic boundaries*, where different interpretations and meanings exist and generate ambiguity, or *pragmatic boundaries*, where differences reside in the interests of different actors, as their specific knowledge is invested in specific practices (Carlile, 2002; 2004). This means that boundaries do not only pose barriers to coordination, but also to learning and knowledge creation and integration.

Solving the collaboration challenges across different boundaries requires different strategies: syntactic boundaries can be resolved by supporting knowledge transfer, while semantic boundaries additionally require strategies to support knowledge translation and the creation of shared meanings (Carlile, 2004). In addition to transfer and translation, pragmatic boundaries also require knowledge transformation, an activity where involved actors engage in negotiation and joint problem solving to deal with differences and dependencies and create common interests and practices (Carlile, 2004). Typical examples of boundary objects are *repositories* – which represent common information, *standardized forms and methods* – which represent common patterns of actions to perform a task and/or solve a problem, and *objects, models and maps* – which represent a common tool to discover, negotiate, and transform convergent and divergent knowledge and practices (Carlile, 2002).

Effective boundary objects afford the knowledge dynamics needed for collaboration and coordination (transfer, translation, transformation) through a mix of robustness and flexibility: their language, meaning, and functionality is somewhat recognized and shared across communities, even though each community may also understand certain aspects of the objects in its own way and make use of it in its own specific professional practices (Star & Griesemer, 1989;). According to Trompette and Vinck (2009) “interpretive flexibility” is the aspect of Star’s original concept that has attracted more interest and found wider analytic application, while other aspects of the concept have remained almost forgotten – such as the ability of boundary objects to facilitate delegation of work and processes of categorization and standardization of information, norms, and practices. However, the nature of a boundary object, despite the intense negotiation and knowledge transformation processes that may surround it, is rather stable, if compared with the unfinished, “in flux” nature of epistemic objects (Ewenstein & Whyte, 2009).

In addition to boundary objects, other distinct types of secondary objects have been identified. The notion of *conscription device* (Henderson K., 1991) is complementary to that of boundary object, as the same artifact can play both roles in facilitating collaborative work. A conscription device enlists the participation of group members and gives it a focus, by providing a representation format for the participants to build and edit their knowledge (Hölttä, 2013). In this case, however, there is no cross-disciplinary boundary to be bridged: the challenge is rather one of supporting teams in reasoning, learning, solving problems, and creating together. A conscription device offers a way for a group to externalize cognition in a shared interactional space – the stage for the “production and resolution of design dilemmas” – and sustain communication when “speech begins to fail” (Henderson K., 1991, p.458). Collaboration and participation take place through the practice of working on and through the conscription device.

Conversely, the notion of *boundary negotiating artifacts* was developed to create a sharp distinction from the original concept of boundary objects. Lee (2007) argues that while boundary objects are supposed to satisfy the informational needs of various communities of practice, this does not apply to all artifacts used in collaboration: rather than helping to cross knowledge boundaries, often objects are used to negotiate and contest such boundaries – especially when the project at hand is highly complex, non-routine, and novel. In these cases, often roles, expertise domains, division of labor, and the very nature of the collaboration may be contested. The use of boundary negotiating artifacts is thus not effortless, and they may require additional explanation and negotiation to enable the uneasy collaboration (Lee, 2007). The concept of *intermediary object of design (IOD)* instead stresses the evolution of artifacts around and through which collaboration take place. An IOD materializes the output and the understanding of the project participants at different times during the evolution of a project – similarly to “snapshots” of a given moment and situation (Papadimitriou & Pellegrin, 2007). Objects act as intermediaries between the stages of a process and between people, enabling the progression of the collaborative work but also necessarily imposing specific interpretations on the solution being developed (Vinck & Jeantet, 1995). IODs almost seem the concrete counterpart of epistemic objects, as they well embody the characteristic of being continuously *unfolding* (Ewenstein & Whyte, 2009) and *cascading* (Whyte et al., 2016) into new forms as the collaborative activity proceeds towards its goal and the shared understanding of the participants evolves. In fact, IODs are the way in which goals are translated into concrete results for professional communities (Vinck & Jeantet, 1995): this is particularly visible in problem-solving and design-oriented professional communities such as engineers, architects, and designers.

The concept of *mediating artifact*, developed within the framework of activity theory, can instead be seen as a wider umbrella term that helps clarifying the very nature of the objects used throughout human activity. The relationships between the individual, the collective, and the goal of one’s activity are mediated by the artifacts, tools and symbols employed in human action (Kaptelinin &

Nardi, 2006). Everything that is used within a practice is a tool, which enables and constrains how humans can act upon reality (Virkkunen & Kuutti, 2000). The purposeful interaction with (or acting upon) reality is thus always mediated, and artifacts should never be ignored within the thorough analysis of a community at work. Tools are crucial because they embed and reflect the experience accumulated by other people who had engaged in solving the same problems, and who created ways to make it easier, more effective and efficient: tools and their use are a way to accumulate and share knowledge (Kaptelinin & Nardi, 2006). At the same time, human development can be seen as a process of “remediation”, where old tools are substituted with new ones that better serve the needs of the users engaged in an activity (Virkkunen & Kuutti, 2000).

Lastly, organizational life is constellated with *tertiary objects* – objects, artifacts, tools, and spaces that provide the invisible, yet ever-present, everyday material structure that enables and constrains joint action. According to Nicolini and colleagues (2012), the objects in this category are usually seen as unproblematic and consolidated tools which often exist in the background, and are not the focus of interaction unless called into play. At the same time, without this material infrastructure collaboration, or any other type of work, would be impossibly hard: think, for instance, about engaging a team in a brainstorming session without whiteboards, markers, a suitably large meeting room, and phones or email to invite participants to join. Orlikowski (2006) proposes the metaphor of *scaffolds* – temporary structures used to support and allow the construction and renovation of a physical structure, for instance a building – to illustrate how human agency is enabled and constrained by the material world. Similarly, the concept of *technical object* indicates tools that have been fully accepted into everyday practice so as to become taken for granted (Ewenstein & Whyte, 2009).

The existing conceptual labels to categorize objects in organizations are somewhat blurred in the empirical cases described by researchers. This is because the roles and functions of artifacts are not predefined in the moment they are created; rather they “*appear to be a consequence of the situational challenges and web of relationships in which they are embedded*” (Endrissat & Noppeney, 2013, p. 62) and their role(s) can change, evolve, and coexist (Nicolini et al., 2012). The distinction between the different conceptualizations applied to artifacts is not clear-cut, and in practice different roles often coexist. For example, Henderson K. (1991) shows how visual representations and sketches in design engineering projects can serve at the same time as boundary objects and conscription devices – or shift between these two statuses as their level of unfinishedness and editability changes. Similarly, Ewenstein and Whyte (2009), in their study of collaboration practices in architectural design projects, notice that an artifact can be at the same time a boundary object, an epistemic object, and a technical object. For instance, when architects and engineers sketch over construction blueprints – which are stable, not problematized technical objects – the nature of the resulting hybrid representation evolves: the act of sketching may have been performed to explain, integrate or transform knowledge in a discussion between engineers and architects

(boundary object), or, in face of new insights, it may have served the purpose to reframe the whole vision of what is being built, giving a new objective to the community (epistemic object).

The role of an artifact cannot be predefined by management. Levina and Vaast (2005) distinguish between designation and practice. This explains how solutions designed to support knowledge sharing, collaboration, and potentially support the emergence of new common knowledge across diverse communities of expertise ultimately fail if they are not locally useful, usable and embedded in the actual practice. Management can, for instance, get a designer to create a visualized contract guide to help bridge the knowledge boundary between the lawyers who drafted a contract and the project managers tasked with implementing a contract. At this point, this is just a *designated boundary object*, created with a specific purpose and in response to the issue of having legal and business see eye to eye. What would eventually make the contract guide a *boundary object-in-use* is whether both communities start using it meaningfully in their activities (e.g. project managers keep the guide on their desk, rather than locking it up in a cabinet along with the original contract document, and use it as a reference point to monitor if contract implementation is succeeding), while finally being able to have meaningful conversations (e.g. lawyers are now able to explain a certain legal risk to project managers in a way that the managers understand, as they are familiar with the guide and do not need to learn to speak “legalese”).

Levina and Vaast (2005) suggest that boundary objects-in-use emerge if they gain a local usefulness – which is dependent on the ability of local actors to make sense of and use the object (Carlile, 2002; Bechky, 2003) – as well as a common global identity – meaning that both camps recognize the value and role of the artifact in question. This hints that an artifact’s role is not determined by *what it is*: in the case above, it means that it is not enough to create an instance of the artifact called “contract guide” to achieve the intended boundary-spanning goals. By touching upon the concept of affordance again, I would suggest, rather, that an artifact role may be determined by *what it does*. These action possibilities – the activity of knowing – have much to do with good design – that is, design that is suited for the abilities and needs of a given user group, in a given context, to achieve a given purpose.

Let us try to ask questions about what the contract guide does: is the contract guide understandable? Does it touch upon the topics that the involved individuals feel are most relevant? Does it help people to find a solution to doubts and problems? Can it be easily searched? Can it be easily used in the actual contexts and situations when it is needed?

The answer, if given in general terms, can only be “*it depends*”. Are we talking about a 100-page completely textual contract guide, compiled by copy-pasting excerpts of the original contract? Or are we talking about a 20-page contract guide, in plain language, full of diagrams, checklists, and summary tables? Although their *designated* purpose is the same, they are *designed* in different ways. Since these objects are fundamentally different in terms of the

interactions they afford, fundamentally different practices (or lack of thereof) emerge from their use.

2.3.2.2 Knowledge Visualization

Despite a renewed interest in organizational artifacts and materiality, the “*visual manifestations of social knowledge and practice*” (Meyer, Höllerer, Jancsary, & van Leeuwen, 2013, p.491) remain insufficiently explored, an “absent present” stream in organization and management literature (p. 488). According to Meyer and colleagues (2013), the ‘visual mode’ represents

“a specific way of constructing and expressing meaning: it is created, transformed, transferred, and put into practice by either the use of primarily visual objects and artifacts, or by integrating the visual and the verbal in such a way that neither can be fully understood without the other” (p.491).

In the previous section, we saw how artifacts enable and constrain the possibilities and the practice of knowing. I also proposed that ensuring affordances and dynamic affordances, then, becomes a matter of deliberate, purposeful design. Deliberately redesigning documents in more visual formats, or creating new ones from scratch, is consequential to practice: in fact, an “*intervention to change the visual practices of a project team is a useful way to refocus its problem-solving activities*” (Whyte et al., 2008).

Visualizations have been studied as tools for enabling, facilitating, and focusing knowledge work – in particular, of the collaborative type. This specific use of visual representations has been labeled as *knowledge visualization (KV)*:

“... the use of visual representations to improve the transfer and creation of knowledge between at least two persons. Knowledge visualization thus designates all graphic means that can be used to construct and convey insight [and] experiences, attitudes, values, expectations, perspectives, opinions, and predictions, and in this way [...] enable someone else to re-construct, remember and apply these insights correctly” (Eppler & Burkhard, 2004, p.3).

In the introduction to their comprehensive edited volume on KV, Keller and Tergan (2005) offer a second meaning of the term, which focuses on how a representation of the content and structure of a body conceptual knowledge can be represented by visual means:

“the term ‘knowledge visualization’ is, however, also used if a knowledge structure of an expert is presented to students as a means for self-assessing knowledge and for aiding comprehension and navigation.” (p.7)

This said, I focus on the first definition of KV, where the use of visualization is dedicated to convey knowledge and to amplify cognition, communication and collaboration. The goal is to “*improve the creation of knowledge in groups*”, as well as “*augment[ing] knowledge-intensive processes (e.g., knowledge transfer, communication) among individuals*” (Burkhard, 2005, p. 243).

In regards as to what “visualization” is in KV, Bresciani (2011) clarifies that, in this context, it should be intended as the combined use of text and visual elements, integrated in compositions where meaning is conveyed jointly by the interplay of both elements. The positive effects of knowledge visualization have been studied in domains as varied as *strategy communication* (Platts & Tan, 2004; Kernbach, Eppler & Bresciani, 2015), *groupwork facilitation* (Mengis & Eppler, 2006; Bresciani & Eppler, 2009; Eppler & Pfister, 2010; 2011), *inter-organizational collaboration* (Comi & Eppler, 2010; 2011), and *project-based design* (Yakura, 2002; Whyte et al., 2008; Whyte et al., 2016). A key finding from this research stream is that knowledge visualizations are better conduits for knowledge creation and sharing than pure text, and that using facilitating visual tools in face-to-face contexts leads to superior results than no facilitation or textual facilitation.

Eppler and Burkhard (2007) categorize the main formats of knowledge visualizations in the following six families (Figure 2.3):

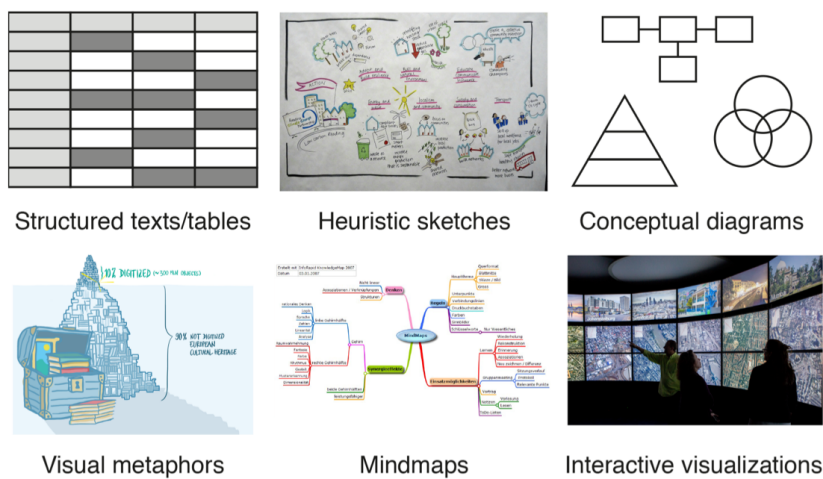


Figure 2.3. Categorization of knowledge visualization types (based on Eppler & Burkhard, 2007)

- *Structured texts and tables*, which organize textual knowledge visually through grids and layouts (e.g. a table).
- *Heuristic sketches*, which assist knowledge communication and discussion by providing rough representations of key ideas, which remain open to personal interpretation while providing a focus for the discussion (e.g. a sketchnote).
- *Conceptual diagrams*, which are used to elicit and give a shape to abstract or implicit knowledge, focusing on representing relationships between concepts (e.g. a flowchart).
- *Visual metaphors*, which foster understanding of a new domain by describing it through the elements of an already well-known domain (e.g. the picture of a mountaintop with various camps to illustrate various development goals)

- *Knowledge maps*, which facilitate mapping knowledge domains, their structure, and their mutual links (e.g. a mindmap).
- *Interactive visualizations and animations*, which allow users to explore complex information, find patterns, understand the relationships between variables, and generate insights (e.g. Hans Rosling's interactive visual statistics on social, economic, and environmental development in the world, collected at gapminder.org).

To plan and effectively implement knowledge visualization, Eppler and Burkhard (2007) also propose a framework that helps to assess what type of knowledge is shown to whom, in what way, when, and why. The options provided in each category of the framework (Table 2.5) constitute a checklist to describe the situation at hand and make a strategic communication choice. For example, a swimlane chart (*Conceptual Diagram*) can be used during contract negotiations (*Face-to-Face and Online*) to plan and assign responsibilities between the parties in a balanced way (*Creating, Identifying and Codifying Know-what, Know-who, and Values*), so that the negotiators (*Oneself and Another Person*) can conclude the deal and communicate it more clearly (*Transferring, on Paper and Face-to-Face*) to their colleagues tasked with contract implementation (*Team or Community of Practice, Applying/Learning*).

Table 2.5. Eppler & Burkhard's (2007) framework for the use of knowledge visualization (adapted).

Knowledge type WHAT?	Knowledge management function WHY?	Target group FOR WHOM?	Situation WHEN?	Visualization format HOW?
Know-what	Creating	Oneself	In a paper report	Structured text/tables
Know-how	Codifying	Another person	In a face-to-face dialogue	Mental images/stories
Know-why	Transferring	Team	In a speech	Heuristic sketches
Know-who	Identifying	Community of practice	In a workshop	Conceptual diagrams
Know-where	Applying/learning	All employees	In an expert system	Visual metaphors
Know-what-if	Measuring/assessing	Specific stakeholders	Online	Knowledge maps
Values	Signaling	The public	In a virtual environment	Interactive visualizations

According to Eppler (2011), for a visualization to work as a knowledge visualization, it has to fulfill the following basic criteria:

- It captures and depicts knowledge of informed people.
- It contains insights from more than one person, and facilitates others in relating to them.
- It has to support group dynamics of knowledge transfer and integration, synchronously or asynchronously.
- It has to be flexibly and easily editable over time.

- It needs to be communicable and understandable to others who did not participate in the creation process of the visualization.
- Ideally, it leads to new and useful insights.

In particular, according to Eppler (2011), an *effective* knowledge visualization displays the following five characteristics – or affordances (Eppler & Bresciani, 2013):

- *Visual variety* – the visualization uses a range of ways of expression, from simple to sophisticated, to appropriately capture and communicate knowledge.
- *Visual unfreezing* – the visualization can be easily switched between an “unfrozen” or editable mode, and a “frozen” or stable format.
- *Visual discovery* – the visualization provides assistance in cognitively challenging knowledge work, such as reasoning, reflecting, analyzing, and generating insights.
- *Visual playfulness* – the visualization encourages the participants to engage, contribute, reframe issues, and explore and play with insights, as well as collaborating with each other.
- *Visual guidance* – the visualization provides a format, process, logic, or guidance to capture and structure inputs in a useful sequence and manner, so that the participants are guided through the process.

Each visual format has its specific features, such as structure and notation, which form its specific “language”. When visualizations are used with the purpose of supporting collaboration, the chosen visual format can be evaluated against a set of criteria that determines its suitability for the collaborative task at hand. Bresciani, Blackwell and Eppler (2008) suggest the following criteria in their collaborative dimensions of visualization framework:

- *Visual impact* – the extent to which a visualization grabs attention
- *Clarity* – the extent to which a visualization can be understood with low cognitive effort.
- *Directed focus* – the extent to which a visualization frames and structures the issue at hand.
- *Inference support* – the extent to which a visualization supports insights.
- *Perceived finishedness* – the extent to which a visualization encourages or inhibits modifications.
- *Modifiability* – the extent to which a visualization can be altered in response to how a discussion and the resulting understanding evolves.
- *Discourse management* – the extent to which a visualization shapes group dynamics and the flow of the discussion.

The qualities described by Eppler (2011) and Bresciani et al. (2008) emerge from visual artifacts’ “*concreteness, referentiability and attention focusing properties*”, which makes them highly salient in addressing the cognitive and practical needs of people engaged in an activity: this lead to “*a more engaged,*

synchronized and focused interaction pattern among people cooperating" (Eppler, Öste, & Bresciani 2013, p.342). By looking at the criteria proposed in these two frameworks, and comparing them with concept and findings from other studies, it seems that the benefits afforded by visualizations in supporting knowledge work can be simplified into two opposite, yet complementary dimensions, which can be called *restrictiveness* and *elicitation*.

The *restrictive* dimension of visualization ensures that participants follow an effective process, which delivers the desired knowledge outcome (Alexander E., Bresciani & Eppler, 2015). The concept clearly emerges in Eppler's notion of 'visual guidance' (2011) and Bresciani and colleagues' criteria of "directed focus" and "discourse management" (2008). It also shares similarities with Orlikowski's (2007) concept of "scaffolding", since visual structures, representations, and notations guide and discipline human interactions between each other and with the information itself (Alexander E., Eppler, & Bresciani, 2013): the users can give themselves to the process afforded by the visualization, instead of devoting cognitive resources to self-manage their discussion and thinking. Effective visualizations offer a common, tangible, externalized referent for those involved, allowing them to focus productively on the issue at hand rather than on personal disagreements (Mengis & Eppler, 2006).

At the same time, highly salient visual artifacts help *elicit* knowledge and insights. Elements such as "visual variety", "playfulness", and "discovery" (Eppler, 2011) provide assistance in linking and translating knowledge, and generating insights and ideas (Eppler et al., 2013). The "*clear guidance and orientation*" afforded by visualizations (Eppler et al., 2013, p.344) do not only restrict the focus of activity, but positively affect knowledge creation: maybe this facilitative, fluency-increasing effect emerges *also because* visualizations help focusing, so that their users can devote more of their cognitive resources to generative and transformative thinking. Moreover, an explorative mindset is encouraged also by features such as "perceived finishedness" and "modifiability", which invite the participants to contribute and engage, without fear of "breaking" the visualization (Bresciani et al., 2008). As a result, research has found that the use of visual templates facilitate idea production in teams, leading to more ideas, categorized in a more coherent and fine-grained fashion (Bresciani & Eppler, 2009). Similar positive effects were observed in regards to the practice of collaborative sketching (Eppler & Pfister, 2011). Collaborative sketching is also beneficial in another "generative" activity – decision-making – as it "*visually elicit[s] and captur[es] interpretation processes, clarifies basic assumptions, stimulates different perspectives, and extrapolates trends into the future*" (Eppler & Pfister, 2010, p.369).

The dichotomy between a focused and efficient use of knowledge versus a divergent and explorative one appears also in Whyte et al. (2008), even though in different terms. The study observes how visual practices and artifacts support both knowledge *exploration* processes – where visualization is associated with *sense-making* of unknown and ill-structured problems – as well as knowledge *exploitation* processes – where visualization is a tool to manage

decision-making by articulating and making explicit possible alternatives and their consequences.

Comparing the recurring concepts of KV literature with work on formalization as an organizing process emerging from the need to tackle the “problems of understanding” in organizations (Vlaar, Van Den Bosch, & Volberda, 2006), we can readily see visualization as a tool for sensemaking. Just like formalization, in fact, visualization supports sensemaking by 1) focusing attention; 2) forcing articulation, deliberation and reflection; 3) instigating and maintaining interaction; and 4) reducing judgment errors and biases, by diminishing the incompleteness and inconsistency of cognitive representations (Vlaar et al., 2006, p. 1617).

At the same time, visualization can be a tool for decision-making, emphasized in strategy visualization literature (Platts & Tan, 2004; Eppler & Platts, 2009). Often managers are flooded with “piles of data”, required to make important decisions, and face information overload: the quality of decision making is positively correlated with information, but only up to a certain point, after which performance worsens because there is simply too much information to attend (Eppler & Mengis, 2004). Visualization is a way to process, compress, integrate, and display information in a useful and meaningful way (Eppler & Mengis, 2004), offloading some of the cognitive work outside our brains (Scaife & Rogers, 1996). For instance, visualizations aid cognition by revealing patterns, causality, and hierarchies of relevance in the information (Platts & Tan, 2004). These patterns, which may be crucial in articulating a good decision, are often implicit and can be revealed only if we are able to build a correct and sophisticated enough mental model of the situation at hand. The closer a visualization “mimics” the mental processes it tries to support or substitute for, the better it can work as a “prosthetic device for the human mind” which supports thinking (Chabris & Kosslyn, 2005, p. 54).

2.3.3 Section Summary and Research Gaps

In line with a pragmatic epistemology, theories should be seen as tools to guide and discipline a productive inquiry towards new knowledge and solutions (Cook & Brown J., 1999) – each theory being a different tool, each affording a diverse perspective more or less suited to investigate a certain aspect of a phenomenon.

Nahapiet and Ghoshal (1998, p.256) describe the arising of a knowledge-based view as a shift to “*develop a theory of the firm that is expressed in positive terms*”, a theory “*grounded in the concept of organizational advantage*” rather than in those of market failure and opportunism. The same theoretical diversification can be applied to the phenomena of contracts and contracting, which have been so far entrenched mostly within a TCE interpretation. A single theoretical tradition – despite its merits and explanatory successes – necessarily limits the research questions and the approaches that can inform one’s research. PPL scholarship constitutes an attempt to challenge the overly dominant “TCE-view of contracts”, which focuses on the safeguarding function of contracts, where contracts are mechanisms to economize on transaction costs and protect against opportunism. PPL proposes a re-conceptualization in posi-

tive terms of contracts, beyond their safeguarding function: from instruments of safeguard and enforcement, to managerial-legal tools to achieve collaboration and successful business (Haapio, 2006b; Haapio, 2013a). While proactive and preventive law does not explicitly mention an allegiance to a given theory of the firm, a knowledge-based view seems an appropriate match as both discourses are grounded in the necessity of the search for competitive advantage (cf. Siedel, 2002).

A shift from a “TCE-view of contracts” to a “*knowledge-based view of contracts*” helps find a theoretical home within organizational studies for emerging research interests such as contracts as artifacts (Suchman, 2003), the psychological effects of contract framing (Weber & Mayer K., 2011; Bertrandias et al., 2010; Lumineau, 2014), and contract visualization as a way to strengthen the collaborative and communicative functions of contracts (Berger-Walliser et al., 2011; Barton et al., 2013; Haapio, 2013a; Haapio & Barton, 2016). Under this paradigm switch, especially if a sociomaterial and practice-oriented stance is adopted, it is in fact possible and reasonable to explore what a contract *is* and *does* at a micro level of analysis, concentrating on individuals and their needs, abilities, and attitudes – enmeshed within a social context. This approach also opens the way to explore the role of language, document design, and visualization in contracts, and to what extent and for what purposes they can be strategically harnessed to obtain better exchanges, relationships, and management results.

In this research, in particular, I wish to explore the role of contracts (and contract visualization) as tools to support collaboration, sensemaking, and cognition in interactions based on the creation and use of complex knowledge. Previous research has conceptualized contracts as an example of boundary objects (e.g. Brown J. & Duguid, 1998; Koskinen & Mäkinen, 2009; Pohjonen & Koskelainen, 2012; Passera & Haapio, 2013b), but has not provided empirical evidence and accounts of which types of boundaries they bridge and how, under what conditions they are actual boundary objects in use rather than nominated boundary objects, and in what ways the existing “problems of understanding” (Vlaar et al., 2006) can be ameliorated.

3. Methodology

3.1 Mixed Methods Approach

This thesis follows a mixed methods approach, combining quantitative and qualitative methods of data collection and analysis across a series of studies (Creswell, 2008).

The primary goal of mixed methods research is to generate better understanding of the studied phenomenon (Greene, 2007; Creswell, 2008), in which “better” may mean increasing credibility and validity of findings, generating broader or deeper understanding of different perspectives, or engaging with multiple, discordant perspectives (Greene, 2007, 21). Single methods, each with their strengths and weaknesses, can only answer specific types of questions in a credible way. Mixed methods make it possible to ask different types of questions within the same research.

Mixed methods require to overcome the strongly-held paradigmatic positions of traditional monomethod research, in which ontology, epistemology and methodology research choices come as a full package (Teddle & Tashakkori, 2003). In opposition to this traditional “paradigmatically purist” stance, researchers have developed alternative research stances that allow and even encourage mixed methods (Teddle & Tashakkori, 2003; Greene, 2007):

- **The a-paradigmatic stance**, that sees methods and epistemology as independent of one another (e.g. Patton, 2008, pp. 465–467);
- **The “complementary strengths” stance**, according to which methods can be mixed over a series of studies, but must be kept separate within individual studies to capitalize on their strengths, and respect the assumptions within each paradigm (e.g. Morse, 2003);
- **The “alternative paradigm” stance**, which calls for either pragmatism (Maxcy, 2003; Teddle & Tashakkori, 2003; Johnson & Onwuegbuzie, 2004; Morgan, 2007) or a transformative-emancipatory paradigm (Mertens, 2003) as the suitable foundation of mixed methods research;
- **The dialectic stance**, which assumes that all paradigms are valuable and have something to offer, but all are irremediably partial worldviews (Greene & Caracelli, 1997; 2003); and
- **The “multiple paradigm” stance**, in which one suitable paradigm is chosen to inform different types of mixed methods design, which include different methods (Creswell et al., 2003). No paradigm is considered su-

perior, but considerations on the nature and overall “flavor” of the research reveal the paradigm to be chosen.

Mixed methods research is not an excuse for “anything goes”. In addition to require a reflection on one’s own stance in regards to paradigms, the reasons for mixing methods should be clearly and deliberately identified by the researcher. Greene (2007, 100-104) has identified five purposes that justify choosing mixed methods:

1. **Triangulation**, seeking convergence and corroboration of results, studying the *same phenomenon* through different measures;
2. **Complementarity**, seeking a broader or deeper understanding, by using methods that allow studying *different aspects or dimensions* of the *same phenomenon*;
3. **Development**, using the results from one method to inform the development of the other method, for instance *identifying the constructs* of a phenomenon with one method and *measuring them* with the other;
4. **Initiation**, seeking to explore the paradoxes, divergences and contradictions emerging from *different facets of the same complex phenomenon*, in addition to finding points of convergence;
5. **Expansion**, seeking to extend the range and breadth of inquiry, *covering more than one related phenomenon* in the same study.

I conducted experiments and a qualitative case study in a sequential fashion (Figure 3.1), with a purpose of *expansion*. First, I had to evaluate whether the method I proposed would work at all, what would be the extent of the potential benefits, and whether there would be some “contraindication” or undesirable effect. To assess whether and to what extent a visualized contract works better than a traditional, text-only one, I ran experiments and collected control variables through a questionnaire. This allowed me to measure comprehension in an objective way – accuracy and speed in answering a series of comprehension questions about the document. However, experiments do not tell us whether contract professionals would adopt contract visualization practices, and for what purposes. So, after having assessed that visualization in contracts *do* improve comprehension, I wanted to discover more about this practice “in real life”: would it be accepted by its intended users and beneficiaries? What problems would it help them to solve? What are its benefits and risks *in practice*, within a context where social actors create their own value systems and perceptions of usefulness? To answer these questions, I conducted qualitative research according to a single case study design.

The quantitative component of the study is comparatively more substantial than the qualitative one – for three reasons. Firstly, as I previously explained, it would not have made sense to move to the qualitative part of the research if the quantitative part had yielded negative results. For this reason, it was important to dedicate substantial attention to the experimental part. Secondly, the qualitative component of the study has not been “superficially applied”

(Bergman, 2011). It has been implemented as a case study, where different sources of qualitative data were thoroughly analyzed and collected over a timespan of almost two years. Thirdly, since contract visualization is an emergent practice – and gaining access to organizations where the phenomenon can be observed is not straightforward – it would have been difficult, if not impossible, to carry out a mixed method, comparative case study instead.

Each component of the research was necessary to justify the value of the other – also from a practical perspective. On one hand, practitioners would only try to employ visualized contracts if they are actually easier to comprehend than traditional, text-only contracts. From an ethical standpoint, I also had to be sure that I could advise them on a beneficial practice. On the other hand, visualized contracts would only become an actual solution rather than a thought experiment when applied and welcomed outside academia. I am not conducting research just to prove a theory, but to put what I know into service of a larger community (in this case, contract experts), by transforming such knowledge into viable, workable solutions.

Table 3.1 provides a summary of the research context, the data, data collection and analysis. Before presenting the methodological choices taken in the empirical studies in detail (sections 3.2 and 3.3), I briefly introduce the pragmatist stance I adopted in my research, and how it informs mixed methods application.

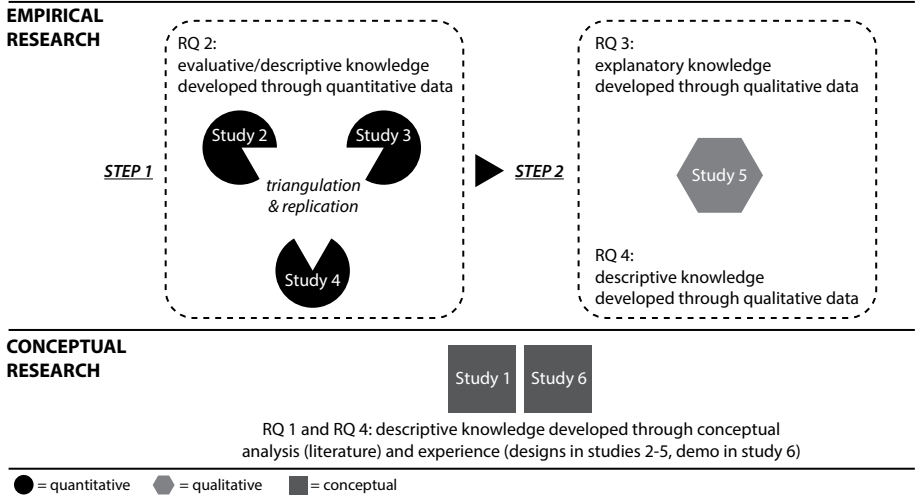


Figure 3.1. Design of the research, and its relation to the research questions. The empirical part of the research has been carried out in a sequential fashion (quantitative first, followed by qualitative)

Table 3.1. Summary of research methods and collected data

Publication	Method	Data	Research participants	Research context
1	Conceptual analysis	/	/	Mostly B2B
2	Data collection <ul style="list-style-type: none"> Experiment with independent samples Pre-test survey (to collect control variables) Post-test survey (psychometric scale to evaluate user experience) Data analysis <ul style="list-style-type: none"> Statistics 	Quantitative dataset (N=48)	International Master's students from six European universities	B2C, tenancy
3	Data collection <ul style="list-style-type: none"> Experiment with dependent samples (repeated measures) Pre-test survey (to collect control variables) Post-test survey (two psychometric scales to evaluate user experience) Post-test focus group discussions Data analysis <ul style="list-style-type: none"> Statistics (primary) Thematic, at the semantic level (secondary) 	Main data: quantitative dataset (N=72) Supporting data: qualitative insights from focus group discussions	Civil servants and other professionals working in the public procurement function of Finnish public organizations	Public procurement, Finland
4	Data collection <ul style="list-style-type: none"> Experiment with independent samples Pre-test survey (to collect control variables) Data analysis <ul style="list-style-type: none"> Statistics 	Quantitative dataset (N=122)	International members of the IACCM (International Association for Contract Management), e.g. sales/purchase managers, contract managers, supply chain managers, legal counsel, contract consultants, academics	B2B, global business
5	Data collection <ul style="list-style-type: none"> Single case study Data analysis <ul style="list-style-type: none"> Thematic analysis 	Qualitative data, collected during interviews before design process (6), interviews after design process (2), and observations during design process (4).	7 research participants: 6 belonging to the same sales team	B2B, Finnish company with global clients
6	Conceptual analysis and demo	/	/	B2B

3.1.1 A pragmatic stance

Influenced by my design background, I took a pragmatist stance in my research. This stance is a common one among advocates and practitioners of mixed methods research (Datta, 1997; Maxcy, 2003; Teddlie & Tashakkori, 2003; Johnson & Onwuegbuzie, 2004; Morgan, 2007). In this view, thought is intrinsically linked to action, and theory is seen as an instrument rather than a pure ideal (Maxcy, 2003). The generation of new theoretical knowledge is also not an exercise for its own sake, but an instrument to solve the question of what is the right course of action to take (Dewey, 1920/2008, p. 163–164).

Morgan (2007) outlines the key differences of the pragmatic approach in comparison to the monomethodologies imposed by “metaphysical paradigms”²² (see Table 3.2 for a summary). Firstly, in contrast to an unrealistic adhesion to purely deductive or inductive strategies, pragmatism accepts and encourages abductive reasoning, which “*moves back and forth between induction and deduction – first converting observations into theories and then assessing those theories through action*” (p. 71). Secondly, pragmatism overcomes the forced dichotomy between subjectivity and objectivity, emphasizing instead the intersubjective nature of the relationship between the researcher and the researched (pp. 71–72). A pragmatist sees knowledge as neither completely constructed nor completely independent of consciousness: rather, knowledge and “truth” exist in experience, between conscious minds interacting with each other and their environment (Biesta & Burbules, pp. 10–11). Therefore, there is no incommensurability between methods and types of knowledge. Lastly, pragmatism rejects choosing between knowledge that is only context-specific or a manifestation of general principles (Morgan, 2007, p. 72). This affects the inferences that can be drawn from research, as pragmatism suggests the principle of transferability: the focus should be on “*how much of our existing knowledge might be usable in a new set of circumstances, as well as what our warrant is for making any such claims*” rather than on “*on abstract arguments about the possibility or impossibility of generalizability*” (p. 72).

A focus on research questions and on warranted, workable means to answer them encourage the deliberate choice of mixing methods in the act of knowing. Greene’s thoughts (2007) well mirror the exigencies that I faced in my research: “*if it is important to gauge both the frequency and intensity of a phenomenon and its experiential meaningfulness, it simply makes good methodological sense to use both a survey and a case study design*” (2007, p. 28). A pragmatic stance, according to Datta (1997, p. 34), means making research design decisions that are practical, contextually responsive (respects the exi-

²² By “metaphysical paradigm” Morgan (2007) indicates a widespread way of approaching social science methodology, in which metaphysical issues related to the nature of reality and truth are emphasized and constrain the actual implementation of research. A metaphysical paradigm can be equated to an all-encompassing worldview, in which ontology, epistemology, and methodology are strongly coupled: assumptions about the nature of reality trickles down constraining epistemological assumptions and methodological repertoire. Both realism and constructivism are, for instance, examples of metaphysical paradigms. On the other hand, pragmatism sees ontology, epistemology and methodology as loosely coupled, and in particular rejects that research should be guided by ontological and epistemological stances in the first place. Pragmatism instead is primarily concerned with methodology, its actionability, workability and warrantedness.

gencies, opportunities, and hurdles arising in a given research context), and consequential (the results from research are usable, informative, and have the power to steer practice).

It is thus research questions, rather than assumptions about the essence of knowledge, that drive the choice of method of inquiry (Onwuegbuzie & Leech, 2005; Greene, 2007, p. 97; Morgan, 2007). This means “giving up on the assumption that there is some external system that will explain our beliefs to us” (Morgan, 2007, p. 66). Instead of relying on a top-down approach that privileges ontological issues above all, pragmatism rather concentrates on methodology in its own right, seen as “an area that connects issues at the abstract level of epistemology and the mechanical level of actual methods” (Morgan, 2007, p. 68). In my work, a pragmatic stance illuminates my relationship to theory: I did not choose a suitable phenomenon in order to test, confirm or extend a theory in which I was invested. Vice versa, I became interested in different theoretical concepts, frameworks, and methods – from different disciplines – that could allow making “warranted assertions”²³ about a concrete problem I was interested in solving.

Table 3.2: The key differences between the pragmatic approach and the main research paradigms in social sciences (adapted from Morgan, 2007)

	Qualitative approach	Quantitative approach	Pragmatic approach
Connection of theory and data	Induction	Deduction	Abduction
Relationship between researcher and research process	Subjectivity	Objectivity	Intersubjectivity
Inference from data	Context	Generality	Transferability

²³ “Warranted assertibility” is a concept found in Dewey’s *Logic: The theory of inquiry* (1938), when he addresses the nature of truth, knowledge and beliefs. Dewey sees human inquiry as arising from practical matters, when humans find themselves in indeterminate situations when interacting with their environment. By framing this halting state of indetermination into a “problematic situation”, humans can then start to come up with possible solutions – hypotheses to act upon the problematic situation – which are evaluated to estimate their relative merit. When a possible solution, theory, or *assertion* is finally put into action, the question of its truth enters the picture and depends on whether the solution is suitable to solve the problem. An assertion is warranted when it produces, in practice, the desired effect and resolves the indeterminate, problematic situation between humans and the world. Truth is not absolute and objective, as no assertion is definitive, but is destined to be replaced by better, more warranted assertions in time. Truth is not entirely subjective either, as it is not constructed in the mind, but in the very interaction between the human and the world. Thus, assertions are tools for inquiry (and problem-solving) that can be more or less warranted – that is, can offer a solution in a more or less fitting manner. The “truth” and “value” of an assertion depend on the effects it plays out at the end of the inquiry process.

3.2 Quantitative Component of the Study

3.2.1 Publication II: Beyond the wall of text: how information design can make contracts user-friendly (Passera, 2015)

This study was published as a conference paper. Given the strict page limit/word limit (5000 words including references), the original method section of the paper skips some details about the data and their analysis that I nonetheless took into consideration. To make the results more comparable with those of the other studies included in this dissertation, I take the opportunity to add some methodological clarification and descriptive statistics in this section. While these additions do not change the substance of the results published in the conference paper, they may answer some doubts that readers may have in regards to the rigor of the methodology adopted.

Study goal and questions

The study sought to assess the relative roles of content structuring and visual information display in supporting information comprehension in contracts. In short: is it enough to provide a more logical thematic structure to contracts to make them more understandable for its users, or are visual elements and layout improvements a key factor in significantly improving comprehension?

While my interest is mostly on inter-organizational commercial contracts, for thoroughness' sake I wanted to run a smaller experimental evaluation involving a more general audience. This was done for two reasons: firstly, working in a university I am surrounded every day by Master's students, individuals about to start their careers. They represent the professionals of the future, and capturing their perspective may help support the information needs of a workforce that will communicate in very different ways from its predecessors. Secondly, organizations might in the future become interested in visualizing consumer contracts in addition to B2B contracts, as transparency may provide them with a competitive advantage within an information economy. It thus felt appropriate to build initial knowledge also in this domain.

However, to run an experiment with Master's students, I had to use a contract document that would be meaningful to them: B2B or B2G agreements are created for a different intended audience, and thus would be unsuitable. For this reason, I chose a tenancy agreement for student apartments. This choice also allowed me to test whether visualizations could work in simpler, shorter contracts. In this way, it is possible to explore whether there is a minimum threshold below which the effort and resources needed to create contract visualizations exceeds the possible benefits for the end-users.

Hypotheses

H1. Intellectual performance (comprehension and ease of comprehension) using a traditional text-only contract is worse than performance using a text-only contract where information has been better re-ordered and structured.

H2. Intellectual performance (comprehension and ease of comprehension) using either a text-only traditional contract or a restructured contract is worse than performance using a restructured contract where visual solutions are also employed.

H3. The experience of using a visually improved and logically restructured contract is more positive than the experiences elicited by using either a traditional text-only contract or a logically restructured contract.

Method and sample

The study was carried out as an experiment, in which participants had to answer seven comprehension questions about a tenancy agreement (see Appendix 2), using one of three versions of the same agreement.

Before the experiment, the participants filled out a survey, through which control variables were collected. At this phase, for instance, they were administered the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ) (Blazhenkova & Kozhevnikov, 2009), a scale used to assess visual and verbal cognitive *learning styles* (the preferred way an individual perceives, processes, and remembers information). The OSIVQ includes 45 items – 15 for each of its three separate dimensions – in a five-point Likert-type scale format, and yields three scores:

1. An assessment of object-imagery skills (O), the ability to build and process vivid, colorful, detailed images of individual objects, in a holistic way;
2. An assessment of spatial-imagery skills (S), the ability to represent and process schematic images, spatial relationship between objects, movement and spatial transformations; and
3. An assessment of verbal skills (V), the ability to reason in a verbal, logical, sequential, and analytical manner.

The instrument was chosen because is easy to administer, and showed a relatively good internal reliability²⁴. Moreover, its components are based on modern neuroscientific research that suggests that visual information is processed through two imagery sub-systems in the brain, the object imagery system and the spatial imagery system (Kozhevnikov et al., 2005; Blazhenkova and Kozhevnikov, 2010).

After the experiment, the participants evaluated the experience of reading and using the tenancy agreement to answer comprehension questions. For this purpose, I used the HED/UT (Hedonic/Utilitarian) scale (Spangenberg et al., 1997;

²⁴ Internal reliability coefficients were $\alpha = .74$ for the verbal scale, $\alpha = .83$ for the object scale, and $\alpha = .79$ for the spatial scale in the original study (Blazhenkova & Kozhevnikov, 2009), $\alpha = .79$ for the verbal scale, $\alpha = .83$ for the object scale, and $\alpha = .80$ for the spatial scale in this study.

Voss et al., 2003), which is a validated and reliable²⁵ tool to assess user experience in terms of how useful/functional (utilitarian dimension) and gratifying/pleasurable (hedonic dimension) a product or service is perceived by users.

The participants completed the questionnaires and comprehension tasks using a proprietary web-form developed for the scope of this research. The documents were printed, and provided in an envelope to be opened at the appropriate moment during the test. The web-form had the capability of recording the time taken for each task, and the participants were instructed how to use it. After reading a comprehension question, the participant would press the button “start” to start the timer and make the answer field appear. After pressing “start”, the participant started to search for the answer in the document, and wrote down their answer. By pressing the button “submit” the participant confirmed their answer and stopped the timer, and would then proceed to the next question. The participants were given a maximum of 6.5 minutes to answer each comprehension question. This restriction was imposed for two reasons: first, to keep the length of the experiment under one hour; second, because a usable contract should allow potential users to find answers quickly and clearly to practical and straightforward questions. Not being able to do so in a relatively short time indicates a document design failure.

To test the documents with their intended audience, I recruited 48 research participants, 24 female and 24 male Master’s students, from at least six different European universities (the most represented institutions were Aalto University, with 18 participants, and ESADE Business School, with 12 participants). The sample was widely diverse, since the participants:

- came from 21 different countries (the most represented group was Finland, with 15 participants) and only three participants were English mother tongue speakers
- their English language proficiency spanned between 2 and 11 on a self-assessed 12-point scale, with a mean value of 8.63 (0 = no proficiency; 11 = mothertongue)
- had at least six different educational backgrounds (law, arts and design, business, engineering, sciences, social sciences, other).

The participants participated voluntarily, and received a free lunch as incentive.

The chosen agreement for the experiment was the English version of the tenancy agreement for student apartments in the Helsinki capital area, kindly provided by HOAS (Foundation for Student Housing in the Helsinki Region). The participants were randomly assigned to three comparison groups as follows:

- ‘Textual/original’ group (n = 16): the first group, acting as control, used the original version of the tenancy agreement. The document

²⁵ Voss and colleagues (2003) report internal reliability coefficients of $\alpha = .88$ for the hedonic subscale and $\alpha = .87$ for the utilitarian subscale. In this study, the coefficients were $\alpha = .91$ for the hedonic subscale and $\alpha = .78$ for the utilitarian subscale

was set in font size 6 pt Arial, in a two-column layout, in A4 size. The document was completely textual.

- ‘Textual/restructured’ group (n = 17): the second group used a modified version of the original tenancy agreement. The document was still completely textual and presented in the same layout and font size as the original. However, the order of the clauses was modified so as to improve its logic, sorting similar topics together. More descriptive, plain language headings were added to aid navigation. The original text was also chunked down in bulleted lists, so as to simplify its structure.
- ‘Visual/restructured’ group (n = 15): the third group used a second modified version of the agreement. In addition to all the structural and logical improvements of the second version, further design improvements were made in terms of layout (one column, wider margins, headings larger than copy text, dividing lines between clauses), typography (typeface Helvetica, font size 8 pt), and navigation aids (more visible bulleted lists, addition of companion icons placed next to the clause headings, boldface to highlight key information such as deadlines or monetary amounts). The content and the wording remained, again, unchanged.

The documents were provided to the participants in a printed format, and they were contained in white, indistinguishable envelopes. The web-form notified the participant to open the envelope just before starting the comprehension tasks.

Measures

The measures used in the study are defined and summarized in Table 3.3. The measures marked with (*) were not explicitly presented in the analysis of the original published paper, but are provided and further elaborated in this dissertation for transparency’s sake.

Analysis

As mentioned earlier, I performed (but not reported in the Publication) some preliminary analyses on the data to assess whether there would be statistical differences among groups in relation to control variables. First, I checked that the distributions of the educational background in the groups, and they seemed reasonably balanced (Figure 3.2). Then I performed a Kruskal-Wallis H test on the control variables. The only statistical significant difference was in the mean age of the participants, which was higher in the Visual/Restructured group (Table 3.4). I thus investigated whether age might have been a factor in the better results of the Visual/Restructured group. However, there was no statistically significant correlation between age and any of the dependent variables (assessed through Pearson correlation).

Table 3.3. Variables in Publication II

Variable	Description	Role
Answering speed	Continuous variable. The sum of the time taken to answer each question. Since the participants were allowed at most 6,5 minutes for each question, the measure ranges between 0 and 2520 seconds. A higher time value indicates that the given version of the document is more difficult to understand for the research participants, and does not support task completion.	Dependent variable
Answering accuracy	Continuous variable. The sum of the scores accrued on each answer. The measure ranges between 0 (all answers wrong) and 7 (all answers right). For more information on how the individual answers were graded see Appendix 1. A low score indicates that the given version of the document is more difficult to understand for the research participants, and does not support task completion.	Dependent variable
Skipped answers	Continuous variable, value ranging between 0 and 7. The research participants were given the option to skip the comprehension tasks. They were instructed that skipping would mean <i>'I give up. This document is too badly designed, I think it is impossible to find the answer in the given time.'</i> More skipped answers indicate that the given version of the document is more difficult to understand for the research participants, and does not support task completion.	Dependent variable
User experience measure: HED/UT scale scores	Discrete variable, value ranging between 1 and 7. Measured through the HED/UT scale (Spangenberg et al., 1997; Voss et al., 2003), which is a 7-points ordinal scale (anchor points determined by pairs of adjectives; see Appendix 5). The user experience elicited by document use is evaluated in terms of usefulness/functionality on one hand (5 items), and gratification/pleasantness on the other (5 items).	Dependent variable
Age (*)	Continuous variable.	Control variable
Gender (*)	Categorical variable: female (1); male (0).	Control variable
Level of English language proficiency (*)	Ordinal variable: value ranging between 0 and 11, indicating the levels recommended by the Interagency Language Roundtable (n.d.): No proficiency (0); Memorized proficiency (1); Elementary proficiency (2); Elementary proficiency + (3); Limited working proficiency (4); Limited working proficiency + (5); Professional working proficiency (6); Professional working proficiency + (7); Full professional proficiency (8); (9); Full professional proficiency + (10); Native or bilingual proficiency (11).	Control variable
Number of tenancy agreements signed (*)	Continuous variable.	Control variable
Object visualizer cognitive style (*)	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "O" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Spatial visualizer cognitive style (*)	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "S" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Verbalizer cognitive style (*)	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "V" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Educational background (*)	Categorical variable: Engineering; Law; Business; Sciences; Arts and Design; Other.	Background information
Nationality (*)	Categorical Variable: Finnish; German; Spanish; Belgian; Italian; Chinese; Nigerian; South Sudanese; Filipino; American; Singaporean; Lebanese; Ukrainian; Brazilian; Indian; Iranian; Russian; French; Argentinian; Slovenian; Greek	Background information

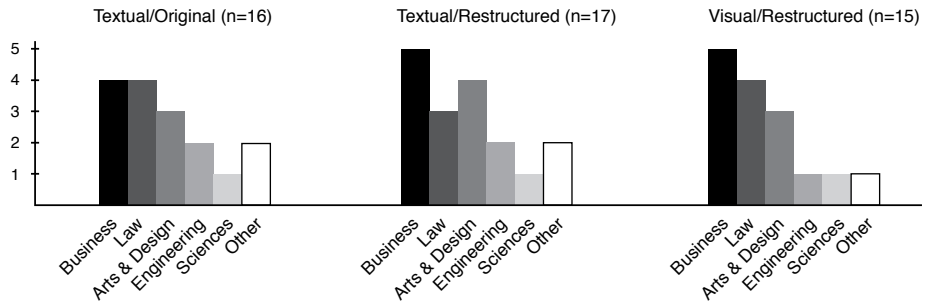


Figure 3.2. Educational background of research participants, distribution

Table 3.4. Control variable means within each group, and statistical significance/effect size of mean differences between groups

Variable	Textual/original group	Textual/restructured group	Visual/restructured group	Significance
Age	M= 23,81 SD = 2,42	M = 25,43 SD = 2,70	M = 30,13 SD = 7,94	$\chi^2 = 10.43$ $p = 0.005$
Gender	M = 0,56 SD = 0,51	M = 0,43 SD = 0,53	M = 0,33 SD = 0,48	n.s.
English proficiency	M = 9 SD = 1,15	M = 8,29 SD = 1,38	M = 8,60 SD = 2,44	n.s.
Number of tenancy agreements signed in your life	M = 3,44 SD = 3,10	M = 4,86 SD = 5,08	M = 4,54 SD = 3,72	n.s.
Object visualizer cognitive style	M = 3.31 SD = 0.59	M = 3.46 SD = 0.66	M = 3.43 SD = 0.68	n.s.
Space visualizer cognitive style	M = 2.96 SD = 0.77	M = 2.94 SD = 0.54	M = 2.95 SD = 0.61	n.s.
Verbalizer cognitive style	M = 2.84 SD = 0.75	M = 2.80 SD = 0.46	M = 2.87 SD = 0.61	n.s.

Then I analyzed differences in the mean values of the dependent variables among the three experimental groups. One-way ANOVA (analysis of variance) methods were suitable for this purpose. However, looking at the characteristics of the data I had to choose particular versions of ANOVA, as the data violated certain assumptions needed to run a reliable ANOVA (Table 3.5). These decisions were taken following the guidance and assessment tests provided by the Laerd Statistics online guide (Laerd Statistics, n.d.). I did not use a two-way ANOVA because there were no significant differences in the distributions of the control variables, and I did not expect the presence of significant interaction effects.

In general, I first performed an ANOVA (or a robust alternative test) on the overall differences between groups. These omnibus tests were followed by post hoc pairwise tests (Dunn's test for multiple pairwise comparisons with Bonfer-

roni adjustment, and Games-Howell post hoc test) to assess between which groups significant mean differences existed.

Table 3.5. Rationale for choosing robust alternatives to traditional one-way ANOVA

Variable	Data features that prevented the use of traditional one-way ANOVA	Chosen robust alternative
Answering speed	<ul style="list-style-type: none"> • Unequal sample sizes • Three groups • Assumption on homogeneity of variance was violated 	<ul style="list-style-type: none"> • Welch ANOVA for overall effect • Games-Howell post-hoc test for pairwise comparison
Answering accuracy	<ul style="list-style-type: none"> • Unequal sample sizes • Three groups • Discrete variable, data can vary only in increments of 0,25 points • Assumption on normality of data distribution was violated • Presence of outliers, which however appeared to be genuine data points since individual performance can vary greatly 	<ul style="list-style-type: none"> • Kruskal-Wallis H test (non-parametric one way ANOVA) • Dunn's test for multiple pairwise comparisons with Bonferroni adjustment
HED/UT scores	<ul style="list-style-type: none"> • Three groups • Discrete variable, data can vary only in increments of 1 point • Different distributions in each group 	<ul style="list-style-type: none"> • Mood's test of medians (nonparametric)

3.2.2 Publication III: Flowcharts, swimlanes, and timelines – Alternatives to prose in communicating legal-bureaucratic instructions to civil servants. (Passera, in press)

Study goal and questions

The purpose of this study was to gather quantitative data on the effectiveness – in terms of comprehension and user experience – of visualizations in B2G contracts. Moreover, from a practical standpoint, it served as a thorough evaluation of the *JYSEn käyttämisopas* [JYSE Visual Guide in English] (Aalto University & Kuntaliitto ry, 2013), a guide to the Finnish terms of public procurement of services targeted primarily at civil servants and secondarily at small-medium enterprises that wished to participate in public procurement.

The Visual Guide had to be evaluated against the original version of the Finnish terms and conditions for the public procurement of services JYSE 2009 SERVICES (Ministry of Finance, 2009). The original document provided the performance benchmark, because the goal was to develop a Visual Guide that 1) could support civil servants in understanding the terms and conditions more accurately and rapidly, and 2) would look and feel more user-friendly and pleasant to use, so as to motivate civil servants to read it.

The JYSE Visual Guide is a highly visual document, which employs in particular swimlane tables, flowcharts, and timelines as ways to explain the logic behind different contractual topics, the roles and responsibilities of the parties, and how certain clauses should be considered together when implementing the contract or facing unexpected contingencies. The three visualization types proved quite adaptable to explain and represent all the contracting topics covered by JYSE. The final result thus is concise and coherent, and

requires the readers to only “learn to read” three common types of diagrammatic representations.

Hypotheses

H1: A highly diagrammatic format of legal-bureaucratic instructions (in this case, JYSE Visual Guide) allows for faster comprehension of their content, in comparison to the text-only version of the same document (in this case, JYSE 2009 SERVICES).

H2: A highly diagrammatic format of legal-bureaucratic instructions (in this case, JYSE Visual Guide) allows for more accurate comprehension of their content, in comparison to the text-only version of the same document (in this case, JYSE 2009 SERVICES).

H3: A highly diagrammatic format of legal-bureaucratic instructions (in this case, JYSE Visual Guide) elicits a more positive overall user experience, in comparison to the text-only version of the same document (in this case, JYSE 2009 SERVICES).

Method and sample

The study was also carried out as an experiment, in which research participants had to complete ten comprehension tasks – five using the original JYSE 2009 SERVICES terms, and five using the JYSE Visual Guide (see Appendix 3). The participants recorded all their answers using the same web-form system previously described. Before the experiment, the participants filled out a survey, through which control variables were collected (see Table 3.6). At this phase, for instance, they were administered the Finnish translation of the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ) (Blazhenkova & Kozhevnikov, 2009). Similarly to the original English version, the Finnish version possesses a relatively good internal reliability²⁶.

During the experiment, the order of the tasks, and which tasks had to be completed in a given condition, were randomized so as to avoid any “order effect” (Cozby, 2009) – the systematic bias that may affect the score of later tasks, because repeating similar tasks leads to incidental learning (and systematically better results) or fatigue (and systematically worse results). The participants received both documents in separate envelopes, one marked with the number 1 and one marked with the number 2: the first batch of comprehension tasks was answered using the document in envelope 1, and the second using the document in envelope 2.

The differences between the two documents can be summarized as follows:

²⁶ The item translations were provided by fellow doctoral student Satu Lehto, as she developed and validated the Finnish version of OSIVQ as part of her currently unpublished research. The internal reliability coefficients in her study were $\alpha = .80$ for the verbal scale, $\alpha = .84$ for the object scale, and $\alpha = .81$ for the spatial scale. In my study, the coefficients were $\alpha = .70$ for the verbal scale, $\alpha = .89$ for the object scale, and $\alpha = .78$ for the spatial scale.

- JYSE 2009 SERVICES: the document is completely textual, apart from a picture on its cover. The text set in a single-column layout, in 11 pt font size Minion. Clause headings are set in 14 pt Myriad Pro Semibold Condensed, and are blue. In terms of navigation aids, the document employs a table of content, page numbers, and clause numbers.
- JYSE Visual Guide: the document is a collection of explanatory diagrams. Each page tackles a contractual issue, and features a large diagram to explain such issues. Diagrams can be swimlane tables, flowcharts or timelines. The diagrams are complemented with companion icons, illustrating recurrent concepts throughout the Guide (e.g. “Customer”, “Service Provider”, “Termination”, etc.). The text in the diagrams is essentially the same from the original JYSE 2009 SERVICES, but chunked down in sentences and blocks of text that could be accommodated in the diagrams. In terms of navigation aids, the document employs a table of content, thematic headings, page numbers and cross-references to the clauses of the original JYSE.

The two documents were provided to the participants in a printed format, each in a separate envelope marked with either A or B. The web-form notified when to open each envelope and use the document it contained.

After each batch of tasks, the participants evaluated the experience of reading and using the given document to answer comprehension questions. Two validated scales were used for this purpose: the previously introduced HED/UT scale (Spangenberg et al., 1997; Voss et al., 2003), and the I-PANAS-SF scale (International Positive and Negative Affect Schedule Short Form; Thompson, 2007), which instead provides a measure of the positive and negative affect experienced by the user in interacting with the document. The I-PANAS-SF is the short form of the popular PANAS questionnaire (Watson & Clarke, 1994), and it has been worded so that it is suitable for use with international audiences (Thompson, 2007). The internal reliability coefficients are $\alpha = .80$ for the positive affect subscale and $\alpha = .74$ for the negative affect subscale (Thompson, 2007).

The items of the HED/UT and I-PANAS-SF were translated into Finnish, and validated through a procedure of translation-and-back-translation: firstly, I obtained Finnish translations from a professional academic translator; then, I sent the Finnish translations to ten Finnish colleagues not involved with the study, and asked them to back-translate them to English. The majority of the back-translations coincided with the original English version, so they were accepted. To obtain reliable Finnish versions of the four items that did not successfully back-translated, I provided them in English to the colleagues, and asked them to suggest the most appropriate Finnish translation. I accepted the terms on which at least 99% of the respondent agreed. The internal reliability coefficients of the translated scales, as calculated on the dataset collected in this study, were for the I-PANAS-SF $\alpha = .84$ (positive affect subscale) and $\alpha = .82$ (negative affect subscale), and for the HED/UT $\alpha = .92$ (hedonic subscale) and $\alpha = .94$ (utilitarian subscale).

The participants completed the comprehension tasks and filled in pre- and post-test questionnaire using the same web-form system previously described. A time limitation of 6.5 minutes per comprehension question was also imposed in this experiment, for the same reasons previously described in section 3.1.1. Additionally, the research participants were asked to participate in a focus group discussion, so as to provide feedback on the guide as well as supporting qualitative data to better interpret the experimental data.

I recruited 76 civil servants from different Finnish public organizations (municipalities, hospital districts, regional procurement centers, universities, etc.), and all participated on a voluntary basis. Four responses had missing variables, and were excluded from the analysis.

The sample can be considered well-educated and well-informed, thus eliminating possible confounding causes of poor comprehension performance, since:

- most of the participants had obtained at least a Bachelor's (34.7%) or Master's degree (47.2%);
- all were working in the procurement function of their organization, and have been in this field for an average of 6.9 years;
- their self-assessed knowledge of the JYSE terms was acceptable (their average score was 5.3 on a 9-point scale, where 1 means "very poor knowledge" and 9 means "excellent knowledge").

Measures

The measures used in the study are defined and summarized in Table 3.6.

Analysis

Firstly, I conducted a preliminary analysis to verify that the randomization procedure worked, and there was no systematic bias in different batches of results. The results of a one-way ANOVA with pairwise comparisons indicates that randomization was successful.

In light of these results, I pooled all the results obtained in the control condition (when the participants completed tasks with the original, text-only JYSE) and the experimental condition (when the participants completed tasks with the JYSE Visual Guide). I performed paired-samples t-tests to assess statistically significant differences in answering accuracy and speed scores in the two conditions. I used a Wilcoxon signed rank test (a non-parametric alternative to paired samples t-test) to assess differences in the two convergent measures for user experience, HED/UT and I-PANAS-SF scores, because the data were not normally distributed.

I then ran regression analysis to assess whether control variables, in addition to the experimental effect, affected the performance scores (answering accuracy and speed). I was particularly interested in detecting any "expertise reversal effect" (Kalyuga, 2007) – that is an aptitude-by-treatment interaction in which information presentation techniques reverse their effectiveness when used by novices or experts.

Table 3.4. Variables in Publication III

Variable	Description	Role
Answering speed	Continuous variable. The sum of the time taken to answer each question. Since the participants were allowed at most 6,5 minutes for each question, the measure ranges between 0 and 1950 seconds. A higher time value indicates that the given version of the document is more difficult to understand for the research participants, and does not support task completion. Each participant had two answering speed scores: one for the control condition, and one for the experimental condition.	Dependent variable
Answering accuracy	Continuous variable. The sum of the scores accrued on each answer. The measure ranges between 0 (all answers wrong) and 5 (all answers right). For more information on how the individual answers were graded see Appendix 1. A low score indicates that the given version of the document is more difficult to understand for the research participants, and does not support task completion. Each participant had two answering accuracy scores: one for the control condition, and one for the experimental condition.	Dependent variable
Skipped answers	Continuous variable, value ranging between 0 and 7. The research participants were given the option to skip the comprehension tasks. They were instructed that skipping would mean <i>'I give up. This document is too badly designed, I think it is impossible to find the answer in the given time.'</i> More skipped answers indicate that the given version of the document is more difficult to understand for the research participants, and does not support task completion.	Dependent variable
User experience measure 1: HED/UT scale scores	Discrete variable, value ranging between 1 and 7. Measured through the HED/UT scale (Spangenberg et al., 1997; Voss et al., 2003), which is a 7-points ordinal scale (anchor points determined by pairs of adjectives; see Appendix 5). The user experience elicited by document use is evaluated in terms of usefulness/functionality on one hand (5 items), and gratification/pleasantness on the other (5 items).	Dependent variable
User experience measure 2: I-PANAS-SF scale scores	Discrete variable, value ranging between 5 and 25. Measured through the I-PANAS-SF scale (Thompson, 2007), which is a 5-points ordinal scale. The user experience elicited by document use is evaluated in terms of the positive and the negative affective response of the user (5 items for positive affect; 5 items for negative affect); see Appendix 6. Each participant had two I-PANAS-SF scores: one for the control condition, and one for the experimental condition.	Dependent variable
Age	Continuous variable.	Control variable
Gender	Categorical variable: female (1); male (0).	Control variable
Years of experience in procurement	Continuous variable.	Control variable
Self-assessed level of knowledge of the JYSE 2009 SERVICE document	Ordinal variable, ranging between 1 (Anchor point: "very poor knowledge") and 9 (Anchor point: "extremely good knowledge").	Control variable
Object visualizer cognitive style	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "O" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Spatial visualizer cognitive style	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "S" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Verbalizer cognitive style	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "V" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable

I verified whether different levels of expertise affected comprehension in the experimental and control conditions, by including two interaction terms in the regression analysis (Treatment \times Years of experience; Treatment \times Knowledge of JYSE). I also verified whether different cognitive styles affected comprehension in the experimental and control condition, by including three more interaction terms in the regression analysis (Treatment \times Verbal skill score; Treatment \times Object-imagery skill score; Treatment \times Spatial-imagery skill score). All variables included in the interaction terms were first centered to avoid multicollinearity (high correlations that undermine the statistical significance of the involved independent variables) between these terms and their individual components, as recommended by Aiken and West (1991, pp. 37-38).

The qualitative data collected during the focus group discussions was not fully analyzed, even though it was transcribed verbatim. Its role was to corroborate and clarify the quantitative results, and selected quotes from these discussions were included in the Analysis and Discussion sections of Publication III so as to provide a better account of what the quantitative data already revealed.

3.2.3 Publication IV: Diagrams in contracts: fostering understanding in global business communication (Passera, Kankaanranta & Louhiala-Salminen, 2017)

Study goal and questions

The study sought to replicate the results obtained in Publications II and III, by investigating a new user group: international contract experts. Two considerations led this choice. Firstly, usually, managers working in private organizations are considered more skilled and business-savvy than civil servants: would visualized contracts also work well for them, or would we observe an expertise reversal effect (Kalyuga, 2007)? Secondly, these contract users are not all native English speakers, but still use English as a business lingua franca. Contract “legalese” may be particularly challenging for non-native English speakers. Do non-native speakers benefit more from visualized contracts, in terms of comprehension, than native speakers? Lastly, I wanted to assess whether there are systematic interactions between individual characteristics and the format in which the contract is presented that affect comprehension. For instance, is the comprehension of lawyers affected at all, positively or negatively, by visualizations? And is it so, as suggested by the results of my previous experiments, that different cognitive styles do not affect the communicative superiority of visual contracts (that is, they are equally easier to understand for both “verbalizers” and “visualizers”)?

Hypotheses

H1. Contracts including diagrams allow for faster information finding than traditional, text-only contracts.

H2. Contracts including diagrams allow for more accurate comprehension than traditional, text-only contracts.

H3. The mental efficiency of the version of the contract including diagrams is higher than that of the text-only version, meaning that participants require less mental effort to obtain an equal level of performance.

H4a. Cognitive styles interact with experimental treatment, and with each other: verbalizers are equally fast with either contract, and are fastest with the textual contract; spatial visualizers are the fastest with contracts including diagrams; object visualizers become faster with contracts including diagrams than textual ones, but remain the slowest performing group.

H4b. Cognitive styles interact with experimental treatment, and with each other: verbalizers are equally accurate with either contract, and are most accurate with the textual contract; spatial visualizers are the most accurate with contracts including diagrams; object visualizers become more accurate with contracts including diagrams than textual ones, but remain the least accurate group.

H5a. Language interacts with experimental treatment: native speakers of English are faster and more accurate than non-native speakers with the traditional version of the contract (text-only), while non-native speakers perform faster and more accurately with the version of the contract including diagrams.

H5b. Profession-specific knowledge interacts with experimental treatment: subjects with a legal background are faster and more accurate with the traditional version of the contract (text-only), while subjects without legal background perform faster and more accurately with the version of the contracts including diagrams.

H5c. Language interacts with profession-specific knowledge and experimental treatment: native speakers of English with a legal background are the fastest and most accurate with the traditional version of the contract (text-only), while non-native speakers without a legal background are fastest and most accurate with the version of the contract including diagrams.

Method and sample

The study was also carried out as an experiment, in which research participants had to complete six comprehension tasks about an agreement on the purchase of industrial equipment, using either the original, text-only version of the agreement or its visually enhanced version (in which the text was not, however, modified). Before the experiment, the participants filled out a survey, through which control variables were collected (see Table 3.7). At this phase they were administered the OSIVQ²⁷ (Blazhenkova & Kozhevnikov, 2009. A time limita-

²⁷ In this study, the internal reliability coefficients were $\alpha = .70$ for the verbal scale, $\alpha = .83$ for the object scale, and $\alpha = .83$ for the spatial scale.

tion of seven minutes per comprehension question was also imposed in this experiment, for the same reasons previously described in section 3.1.1.

122 participants were recruited among the members of the IACCM (International Association for Contract and Commercial Management). The goal was to run the experiment with a sample as heterogeneous as possible in terms of nationality, industry, professional role, and educational background (see details in Table 3.7), to reflect the diversity of people operating in global businesses. As an incentive, all participants received a summary of their results in the comprehension tasks, and an assessment of their cognitive style according to the OSIVQ scale.

The experiment was organized as two online sessions, at two different times, so as to allow contract professionals from as many countries and time zones as possible to participate. The session was organized through IACCM's webinar platform (Citrix GoToWebinar). Before the experiment, I held a brief introductory presentation to give instructions on the procedure and how to use the web-form to record answers. During the experiment I remained online, so that all participants could contact me in real time in case they had technical problems or questions about the procedure. The participants recorded all their answers using the same web-form system described in section 3.1.1. The test documents were provided in digital format (PDF). One of the two versions of the agreement, selected randomly, was sent via email to the participants just after the introductory presentation.

The differences between the two versions of the agreement used in the experiment can be summarized as follows:

- The document given to the control group is the anonymized version of a real, past agreement on the purchase of industrial equipment, kindly provided by Ruukki (now SSAB). The agreement is fully textual, set in a one-column layout in pt 11 Arial. No color is used throughout the document and the clause headings are not particularly prominent, even though they are set in all-capitals. In terms of navigation aids, the document employs a table of contents, page numbers, and clause numbers.
- The document given to the experimental group is the visually enhanced version of the same agreement. In this agreement, diagrams are presented below the relevant clause they seek to clarify. The diagrams can be categorized mostly as timelines or charts representing a process. The document is set in a one-column layout, with red clause headings on the left-hand side to facilitate search, and wider white margins. The text is set in 10.8 pt Utopia, and the headings are set in 11 pt Helvetica. Key information (e.g. deadlines, prices) is highlighted in boldface throughout the text of the agreement.

Measures

The measures used in the study are defined and summarized in Table 3.7.

Table 3.5. Variables in Publication IV

Variable	Description	Role
Answering speed	Continuous variable. The sum of the time taken to answer each question. Since the participants were allowed at most 7 minutes for each question, the measure ranges between 0 and 2520 seconds. A higher time value indicates that the given version of the document is more difficult to understand for the research participants, and does not support task completion.	Dependent variable
Answering accuracy	Continuous variable. The sum of the scores accrued on each answer. The measure ranges between 0 (all answers wrong) and 6 (all answers right). For more information on how the individual answers were graded see Appendix 1. A low score indicates that the given version of the document is more difficult to understand for the research participants, and does not support task completion.	Dependent variable
Age	Continuous variable.	Control variable
Gender	Categorical variable: female (1); male (0).	Control variable
Years of experience in working with contracts	Continuous variable.	Control variable
Mental effort	Categorical ordinal variable ranging between: very, very low mental effort (1) and very, very high mental effort (9)	Control variable
Legal background	Categorical variable: yes (1); no (0) (variable obtained from "Educational background").	Control variable
Native language	Categorical variable: English (1); Other (0).	Control variable
Object visualizer cognitive style	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "O" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Spatial visualizer cognitive style	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "S" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Verbalizer cognitive style	Continuous variable: value ranging from 0 to 5; obtained as average of the 15 "V" items in the OSIVQ questionnaire (Blazhenkova & Kozhevnikov, 2009).	Control variable
Educational background	Categorical variable: Engineering, manufacturing, construction; Law; Business and administration; Life sciences, physics, math, computer science; Education; Arts; Humanities; Social sciences; Other.	Background information
Nationality	Categorical variable: US; UK; Canada; Australia; Germany; Italy; Spain; Finland; Norway; Ireland; Czech Republic; Denmark; Poland; France; Hungary; Netherlands; Ukraine; Croatia; China; India; Pakistan; Senegal; South Africa; Nigeria.	Background information
Level of English language proficiency	Ordinal variable: value ranging between 0 and 11, indicating the levels recommended by the Interagency Language Roundtable (n.d.): No proficiency (0); Memorized proficiency (1); Elementary proficiency (2); Elementary proficiency + (3); Limited working proficiency (4); Limited working proficiency + (5); Professional working proficiency (6); Professional working proficiency + (7); Full professional proficiency (8); (9); Full professional proficiency + (10); Native or bilingual proficiency (11).	Background information
Current professional role	Categorical variable: Contract management; Legal; Sales/Commercial; Procurement/Strategic sourcing; Combination sales/sourcing; IT; HR/Recruitment/Placement; Finance; Operations; Academic; Other.	Background information
Industry	Categorical variable: IT/Telecoms; Oil/Gas/Minerals/Utilities; Banking/Insurance/Finance; Aerospace/Defense; Technology; Services/Outsourcing/Consulting; Transportation/Logistics; Automotive; Engineering/Constructions; Electronics; Healthcare/Pharma/Chemicals; Public sector; Manufacturing/Processing; Retail; Other.	Background information

Analysis

Firstly, I analyzed the differences in answering speed and accuracy between the two groups. The difference in mean answering speed in the two experimental groups was analyzed with a Welch t-test, an adaptation of the classical t-test to be alternatively used when the two samples have unequal variances, as in this case. The difference in answering accuracy, instead, had to be analyzed through the non-parametric Mann-Whitney U-test, because the scores of the experimental group were non-normally distributed, thus violating one of the assumptions required for a t-test. The Mann-Whitney U-test could be interpreted as a test of medians, because its two main assumptions were respected: the two samples had equal variance, as assessed through a Levene's test, and their distributions were similar in shape (as assessed through visual inspection of the plotted data-points).

Secondly, I wished to justify the comprehension performance improvements enabled by the visualized contract in terms of cognitive load theory (Sweller, 1994; Sweller et al., 1998). Since the intrinsic difficulty of the document did not change (both documents had the same text), according to CLT the improvements should be caused by a decrease in extrinsic cognitive load – meaning that the more visual display of information is more efficient than the text-only version and requires a lower mental effort from its users. I followed Paas and Merriënboer's procedure (1993) to calculate the efficiency of each document (see Appendix 7), which puts individual performance in the context of related subjectively experienced cognitive load. Perceiving low mental effort or achieving good comprehension performance, by themselves, are not very informative: one's performance, for instance, can improve or worsen depending on the effort that one puts in solving the task. Thus the two measures need to be considered together: mentally efficient documents will support good performance requiring only a relatively small mental effort, while mentally inefficient documents will yield a poor performance despite the high mental effort put in by the user.

Then I proceeded to run regression analysis to assess the possible effect of control variables and interaction terms. Since the study sample ($N = 122$) was too small to generate sufficient predictive power if all variables and interaction terms had been included at once, I chose a stepwise method based on probability of the F-value. This means that variables were included in the regression model one at a time, starting with those with the lowest p-values. Variables already in the equation would be eliminated if their p-value became not significant (higher than 0.05) because of the inclusion of a new variable.

The regression analyses included a number of interaction terms (see Tables 4.6 and 4.7 in the next chapter), as I wanted to test whether cognitive styles (verbalizer, object visualizer, and spatial visualizer, as assessed through OSIVQ) and being a native speaker of "English 'legalese'" (measured through the self-assessed variables "legal background" and "native language") interacted with the effect of treatment (text-only vs. visualized contract) on comprehension (answering speed and accuracy). All variables included in the interaction terms were first centered to avoid multicollinearity between these terms and their individual components, as recommended by Aiken and West (1991, pp. 37-38).

Lastly, I followed up the investigation of the significant interaction term (treatment \times native language) with a two-way ANOVA, to better assess the main effect of each independent variable and how they interacted, followed by univariate post hoc tests (to whether there are simple effects and provide an effect size) and Bonferroni-adjusted pairwise comparisons (to assess whether there are significant mean differences within groups).

3.3 Qualitative Component of the Study

3.3.1 Publication V: Exploring contract visualization: Clarification and framing strategies to shape collaborative business relationships (Passera, Smedlund & Liinasuo, 2016)

Study goal and questions

After having experimentally assessed the effectiveness of contract visualization in supporting comprehension and improving user experience, it was time to observe it *in practice*, in a realistic setting.

The opportunity to build a case study arose when CartaFirm (a pseudonym), a company operating globally in the paper industry, decided to try adopting contract visualization in their service business. A team of six people, tasked with the sales of operation and maintenance (O&M) outsourced services, expressed their interest in being the pilot case. We gained access to the research field by offering my graphic design skills to the team, and by promising to share summaries of our findings as well as of any contracting best practice and trends we encountered at conferences.

The study sought to explore how and why organizational actors would use contract visualization in practice, as well as their strategies for choosing, adopting, and communicating through visualizations.

Method

The study was carried out as a single case study, a method suitable to explore undertheorized practices (Lumineau et al., 2011) and unique, uncommon, or novel phenomena, where it is difficult to distinguish between the phenomenon itself and contextual peculiarities (Flyvbjerg, 2006; Yin, 2014).

The goal was to gain knowledge from within an O&M services sales team as they went through the process of ideating and designing visualizations to be used in their service contract, and during its negotiations. The research was carried out in three steps: interviews before the design phase, observations and analysis of email messages and visualization drafts during the design phase, and follow-up interviews with two key informants about one year after initial adoption of the visualizations.

Before the design phase started, all six members of the O&M services sales team were interviewed. The interviews were semi-structured: I asked pre-determined questions (Table 3.8) that entailed open-ended answers and would act as the start of a conversation with the interviewees (Ayres, 2012). The interview always started by asking interviewees to recall in detail one example of successful, “ideal” contract negotiations, and one unsuccessful, problematic

example. Interesting or unclear episodes and statements were followed up with additional questions, in an unstructured way. After that, the interviewees were asked to name and draw the key phases of the sales and negotiation process, and on its basis the duration of each phase as well as typical bottlenecks were discussed. Lastly, I asked the interviewees to go through their current agreement, and discuss which contractual topics and issues are most contentious in negotiation; what is crucial to close a deal successfully; and what parts of the agreement they thought would benefit from visualization and clarification. All interviews lasted about two hours, were conducted face-to-face, and were transcribed verbatim.

In between interviews, with my co-authors we digitalized and remodeled the contracting process sketches made by the participants into service blueprints (Shostack, 1984; Bitner et al, 2008), and we sent them back to the participants for further comments and amendments. The service blueprints mapped the contract negotiation phases in a chronological order, up to contract signature. In particular, we mapped 1) the sales and contracting documents exchanged by the parties (e.g. sales slides, proposal letter, contract draft, etc.), 2) the customer's actions, 3) the "front-stage" actions of the salesperson in contact with the customer, 4) the "backstage" actions of the same salesperson when not interacting with the customer 5) the actions required from "backstage" support team-members and colleagues (e.g. HR, legal, financial and cost accounting issues, etc.) (Figure 3.3).

During the design phase, I acted as the designer and took charge of creating the desired visualizations for the team, as they did not have time or felt they did not have sufficient skill. The visualizations were created in Word and PowerPoint, so that the team would be able to edit and adjust them on a case-by-case basis in the future.

During this phase, we had face-to-face four design review meetings, each of two hours. The meetings were audio-recorded and transcribed, and I additionally kept notes of the feedback received, in order to modify the design accordingly. We also collected the email exchanges between the team and me where they commented, made suggestions, and asked for changes on the preliminary designs. For each design, we kept all versions, from initial sketch to final version.

When the designs were ready, the team started to use them in their contracting negotiations and documents. Follow-up phone interviews were organized with two key informants one year after initial adoption, so as to reflect on the experience and evaluate how the solutions worked in practice. Each interview lasted about two hours.

Analysis

Braun and Clarke (2008) point out the flexibility of thematic analysis, defining it as a qualitative method that is independent of theory and epistemology, but can adapt to different types of research. This seemed to fit well with the a-paradigmatic, pragmatic overall approach chosen for my research, and thus thematic analysis.

Table 3.8. Semi-structured interview guide

Research goal	Interview topics and questions
Understanding CartaFirm's sales and contracting process, and its possible communication and coordination bottlenecks	Recall in detail one successful sales and contract negotiation case you have been involved with.
	Recall in detail one unsuccessful sales and contract negotiation case you have been involved with.
	On the basis of the examples you provided and your experience, can you name and sketch for me the key phases of a typical sales and negotiation process? Who is involved at each stage? How long does each stage take? Can you point out typical bottlenecks?
	(The results from each interview were re-modeled by the authors as service blueprints and sent back to the participants for further comments and detailing)
Understanding the relative importance of different topics during the negotiations, sources of tough bargaining, and what is important for CartaFirm's negotiators	Which topics and contractual matters are the most crucial in successfully closing a negotiation?
	Which topics contractual matters are the most contentious in negotiations?
	Which of the clauses of the current contract model you would like to be clarified and visualized? Why?

Process phases in chronological order →	
Touchpoints: Documents	
Customer's actions	
"Front-stage" salesperson's actions	
"Backstage" salesperson's actions	
"Backstage"actions of salesperson's colleagues and support team	

Figure 3.3. Service blueprint structure template

The analysis was carried out in an iterative way during and after data collection, following Braun and Clarke's six key phases of analysis (2008, p. 87):

1. Familiarizing yourself with data, through reading and re-reading
2. Generating initial codes, according to interesting features of the data (patterns), mostly at semantic, explicit level (Boyatzis, 1998, pp.3-4); collating data excerpts around codes
3. Searching for themes, by collating similar or somehow related codes into clusters; sketching and refining tentative thematic mind-maps in order to explore the relationships between data excerpts, codes, emerging themes; assigning tentative names to themes
4. Reviewing themes, checking that the related data excerpts are sufficiently homogeneous *within* the theme, and sufficiently heterogeneous *across* different themes (cf. Patton, 1990/2002, p.465). Iteration between themes and codes, and sometimes re-coding, may be necessary
5. Defining themes and assigning a name that well reflects the "essence" of what they are about; naming also sub-themes so as to provide a more fine grained description; finalizing the descriptions of the themes and the thematic map/structure
6. Writing up the study – which is seen as a further occasion for analysis and refinement, rather than pedestrian reporting. Selecting the most vivid and compelling examples, and creating a narrative that provides a logical, interesting account of the study; the result should go beyond description, and be a well-evidenced argument that helps answer the research questions.

The first round of analysis took place after all pre-design interviews were carried out. We analyzed the interviews to identify what topics needed to be visualized, for what goal, and in what contracting phase and document it would be appropriate to use the visualizations.

A second, partial round of analysis was performed after completing the design phase (analysis phases 1 to 3), and then iterated on, deepened and completed during a third round, after the follow-up interviews, on the complete dataset. Fine-tuning and improvements of the analysis were done in the write-up phase (the article went through two rounds of revisions during the peer review process).

4. Summary of the Results

This section offers a summary of the results reported in the Publications included in this study, focusing on their main arguments and results.

4.1 Publication I – *Contracts as interfaces: Exploring visual representation patterns in contract design*

The purpose of this study was to identify the key types of visualizations to be used to enhance the understandability and functionality of contracts. We analyzed existing literature, as well as contract documents publicly or commercially available, seeking for a meaningful way to define what “visualization” means in the context of contracts, what it is used for, and how. The literature on contract visualization is not particularly vast, but a systematic literature review based on database query is of limited use because only a handful of relevant studies appear in Scopus and Web of Science (for instance, a number of studies appear in conference proceedings which are not indexed). For this reason, we relied on the “personal database” of resources that both co-authors have collected over the years on the basis, for instance, of 1) “snowball sampling” of references featured in publications about contract visualization, 2) informal contact and suggestions among scholars interested in contract visualization (e.g. mailing lists, personal communication). An example of the body of literature considered can be found in Table 2.1, in the Literature Review section of this study.

The conceptual contribution of this study is threefold, since we established first a wider conceptual framework to look at visualization in contracts, before restricting our analytic focus to a particular category of visualizations (Figure 4.1). After having establishing *visualizing* as part of the communicative dimension of the contract design process, and *visualizations* as a distinct family of patterns to solve recurrent contract design problems, we possess a robust enough conceptual base to contextualize and warrant a more fine-grained analysis of part of the phenomenon.

Firstly, we introduce a revised concept of contract design. The concept is not new in contracting literature (Mayer K. & Argyres, 2004; Argyres & Mayer K., 2007; Ryall & Sampson, 2009; Schepker et al., 2014; Duplat & Lumineau, 2015), in which it mostly indicates the deliberate choice of the right governance, safeguard and incentive mechanisms in relation to the nature of the transaction at hand (e.g. transaction complexity, level of risk, level of vertical

integration, past knowledge of the other party). Conversely, we aimed at complementing these strategic considerations with a communicative dimension, looking at the document design choices needed to make contracts understandable, usable, and useful for those organizational actors tasked with implementing the contracts. As my co-author Haapio often pointed out in her work “*Contracts do not make things happen – people do*” (2013a, p. 68). For this reason, we propose that contract design is a multidisciplinary endeavor that encompasses

“strategic choices about the drivers and goals of collaboration, merge(d) with business and legal knowledge about how to maximize the chances of success and minimize risks and disputes, all wrapped up in people-centered communications to ensure that the contract can actually be implemented within the allotted time, with the resources that have been allocated, and within budget.” (Haapio & Passera, in press)

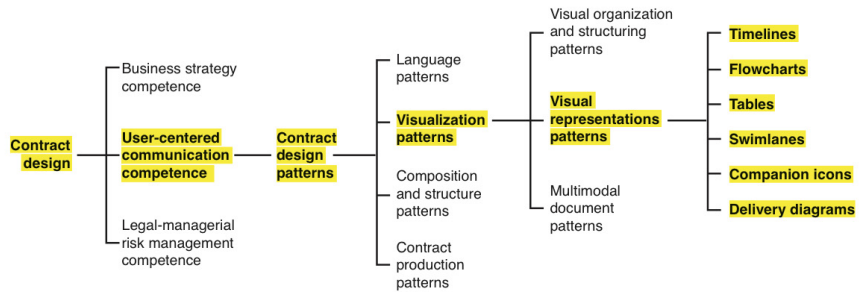


Figure 4.1. Conceptual structure, scope, and focus of Publication I

Secondly, we argue that a *pattern approach* is a viable way for contracting scholars and practitioners alike to build shared knowledge about effective solutions in contract design. We define *patterns* as reusable, distinctive model solutions applied contextually to tackle frequently occurring problems in a given domain. We borrow the concepts of patterns, pattern language, and pattern library from design fields where this approach is common, such as architecture (e.g. Alexander C. et al., 1977), interaction design (e.g. Tidwell, 2014), information design (e.g. Waller & Delin, 2011) and software development (e.g. Gamma, Helm, Johnson & Vlissides, 1994).

In regards to contracts, several model solutions have been identified in regards to language and content of clauses, document structure and functional components, visualizations, and processes for the production and negotiation of contracts. Haapio and Hagan (2016) propose an initial categorization of different patterns applicable in contract design, with the intent to bring clarity to different approaches, and highlight some of the different dimensions of contract design. In this paper, my co-author and I extend this line of inquiry, proposing a more rigorous categorization for the “visualization shelf” of the emerging contract design pattern library. Our categorization organizes the various solutions reported in scholarly literature and practical applications alike as follows:

1) Visual organization and structuring patterns: *“the least obviously visual. Their function is to organize and structure texts visually by means of layout, page design, and typography in order to increase readability and legibility and support strategic reading activities such as searching, skimming, and selecting relevant content.”* (Haapio & Passera, in press)

2) Multimodal document patterns: *“solutions [to transform] contracts into more visual documents where text and images are fully integrated. In fact the first impression of the document is something visual, rather than textual: not a typical contract. This opens up the possibility of visualizations not only in contracts but also beyond: as contracts and about contracts. Take, for example, comic-based contracts”* (Haapio & Passera, in press)

3) Visual representation patterns: *“[solutions to represent] the logic, content, or prerequisites of contracts through a diagrammatic or pictorial representation. The goal is to explain the text, with visual communication used to make visible the abstract relationships within information, e.g., sequences, transitions, interactions, or hierarchies. Visual representations do not usually substitute for text, but complement and disambiguate it. In fact, textual elements are a key element within diagrams: they provide conceptual labels and meaning to its components.”* (Haapio & Passera, in press)

Rather than proposing new solutions that could solve specific contract design issues, we focus on categorizing visualizations that have already emerged, and have been documented: in fact, their pattern-like nature is signaled by such repetitions and adaptations, instances of the same prototypical pattern.

Thirdly, we focus specifically on visual representation patterns, and introduce what we conclude to be the six most distinctive, recurrent, and widely applicable patterns for contracts (Figures 4.2 – 4.7):

- **Timelines** – a representation of time or duration, or a sequence of events taking place within a certain timeframe
- **Flowcharts** – step-by-step representation of a workflow, a process, or sequence of events
- **Tables** – a systematic way to arrange facts and figures in rows and columns, so that information can be searched and skimmed more easily.
- **Swimlanes** – a representation which shows the parties’ areas of responsibility as columns, where roles, tasks, obligations etc. are assigned
- **Companion icons** – synthetic, minimal graphic symbols that accompany texts to represent their meaning, function, or theme in an immediate way
- **Delivery diagrams** – a representation of the place, time and modality in which a delivery takes place, and when risk and cost are transferred from supplier to buyer.

Each pattern is described in detail, explaining the communication problem they solve and how they help solving it. Real-life examples of the patterns and their variations are also introduced.

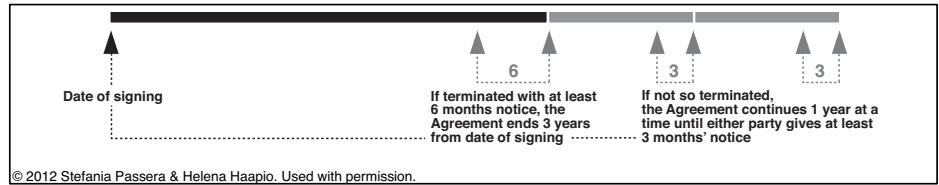


Figure 4.2. Example of timeline pattern

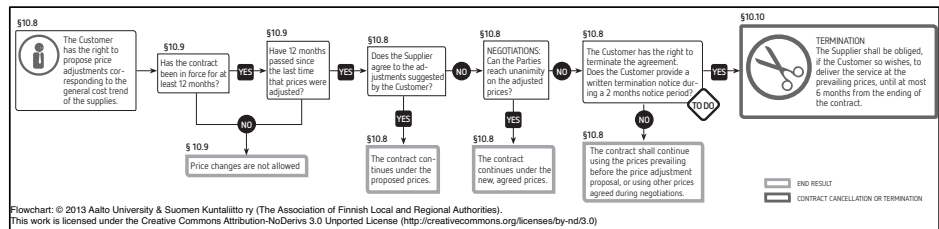





Figure 4.3. Example of flowchart

WHO	RIGHT TO FOREGROUND INFORMATION (FI)	RIGHT TO TRANSFER OWNERSHIP	RIGHT TO LICENCE	RIGHT TO SUBLICENCE	DURATION OF THE RIGHTS
 INVENTING PARTY & THEIR GROUP ENTITIES	Ownership (10.1)	Yes, as long as (10.3): - Rights and obligations arising from this Agreement are transferred as well; - Other Parties have priority over third parties: they have the right to be offered Ownership on the same terms agreed with third parties until 24 months from the end of Programme.	Yes, but (10.4): - Not exclusively; - There is an obligation to inform the other Parties during the Programme within 30 days from the execution of license.	N/A	No time limit, unless Ownership is transferred
 OTHER PARTIES & THEIR GROUP ENTITIES	Royalty-free Access Right (non-exclusive, irrevocable and perpetual licence and right to use FI in R&D work and business operations) (10.4)	No	No	Only in these cases (10.7): - To subcontractors for Party's own research or development work or business operations - To users of a Party's end product or service, if elements of FI are included in a Party's product or distributed appended to it	No time limit. Note however that a license to Background Information may be needed.
 SUBCONTRACTORS	Royalty-free Limited Access Right (non-exclusive right to use FI to the extent it is necessary for carrying out work within the Programme) (10.6)	No	No	No	For as long as Access Right to FI is necessary for carrying out work within Programme.

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Figure 4.4. Example of table

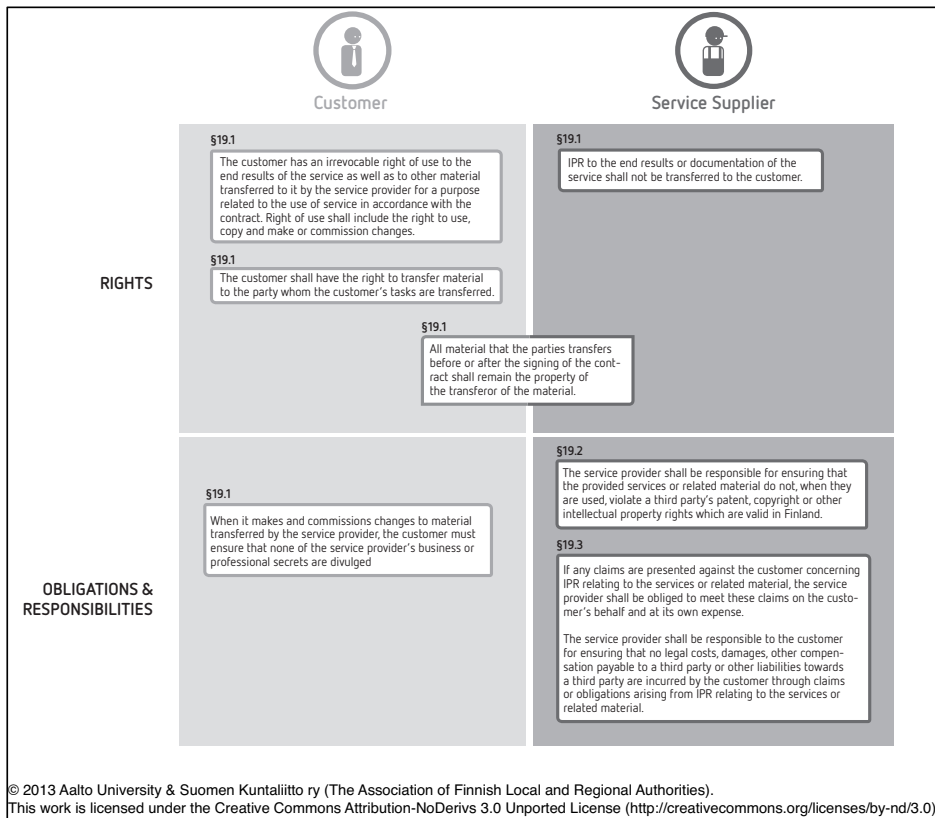



Figure 4.5. Example of swimlanes



7. Pets



- Outside of your apartment you must keep pets **on the leash** and they **should not disturb** other tenants
- It is strictly forbidden to take cats and dogs out at the **yard, children's playground** or its immediate **vicinity**
- Pets must not make **dirty** the building or outdoor areas of the housing company
- It is forbidden to **keep or wash** pets in **common facilities**


8. Safety and prevention

1. Use of dishwashers and washing machines

- The Tenant is responsible for the **use, supervision and possible problems** that occur with any equipment/machines that **they or the previous tenant** has installed
- Washing machines and dishwashers should always be **installed by a professional**
- The **water supply tap** must always be **turned off** after using the machine and a safety bin should be installed under the dish washer
- If a washing machine/dishwasher tap cannot be found in the apartment, it means that using one **is not allowed**
- In order to use washing machines and dishwashers the Tenant must have a **home insurance**

2. Fire



- When using doors which are to be kept locked, including fire doors, be sure that they **remain locked** after you for safety reasons
- It is forbidden to **barbecue, light up torches** or practise any other kind of activity on the balconies/terraces that may increase the **risk of a fire**
- Mopeds** and similar items must not be stored in the basement/other indoor facilities **unless fuel is completely drained**

Figure 4.6. Example of companion icons

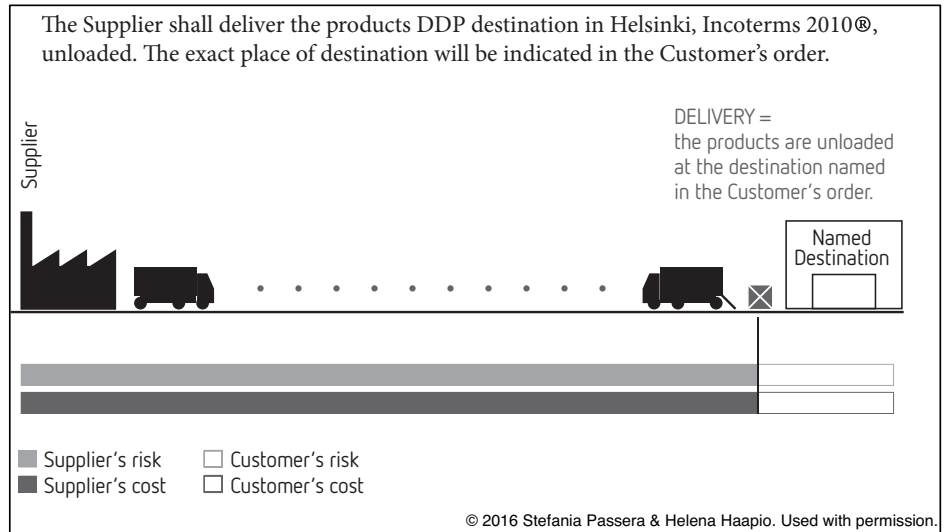


Figure 4.7. Example of delivery diagram

4.2 Publication II – *Beyond the wall of text: How information design can make contracts user-friendly*

The purpose of this study was to gather quantitative data on the effectiveness – in terms of comprehension and user experience – of visualizations in B2C contracts. The contract used in the experiment was a tenancy agreement for student apartments.

The experiment compared the performance of three groups, one using the original, text-only version of the tenancy agreement; a second one in which the text was re-ordered more logically, divided into bulleted lists, and given more informative headings; and a third one where the better structured document was also complemented with thematic companion icons, each positioned next to a section of the agreement

The overall difference in comprehension scores among groups was statistically significant (Welch ANOVA for answering speed, $F(2, 25.806) = 6.734$, $p = 0.004$; Kruskal-Wallis H test for answering accuracy, $\chi^2(2) = 7.535$, $p = 0.023$). However, the only statistically significant pairwise differences in answering accuracy and speed were found between the group using the *text-only version* and the group using the *visual/restructured version*. The mean difference, for answering speed, was -309.37 seconds (Games-Howell post hoc test: $p = 0.008$, 95% CI [-540.972, -77.760]). The mean difference for answering accuracy was 1.38 points (Dunn's post hoc test with Bonferroni adjustment: mean rank difference -13.102, $p = 0.022$). The trends in the data (Table 4.1, Figure 4.8) indicate that giving a better structure to the document helps comprehension, but not enough: the improvement becomes significant enough only when this better structure is also made more visible and searchable for the end users. The results indicate that contract readers may display low an-

swering accuracy (by making several comprehension mistakes) and invest considerable reading time even when the contract is short and comparatively simple. Displaying information in a more visually structured and salient manner can also bring significant improvements in comprehension in this scenario. Looking at the standard deviations in the answering accuracy and speed scores (Table 4.1) of all three groups, as well as their boxplots (Figure 4.8), it is possible to see that the results obtained in the visual/restructured group are more narrowly distributed around its central values: all research participants in this group performed rather well. Conversely, in the other two groups the performance levels were much less homogeneous: while some individuals may have not encountered much difficulty, others struggled, and on average performance was poorer.

Table 4.1. Mean values, standard deviations, and main effects between groups

Variable	Textual/ original group	Textual/ restructured group	Visual/ restructured group	Main effect across groups
Answering accuracy	M= 4.62 SD = 1.54	M = 5.09 SD = 1.29	M = 6.00 SD = 0.87	F = 6.73 p = 0.004
Answering speed	M = 896 SD = 333.65	M = 827.11 SD = 464.15	M = 586.64 SD = 149.48	$\chi^2 = 7.53$ p = 0.023

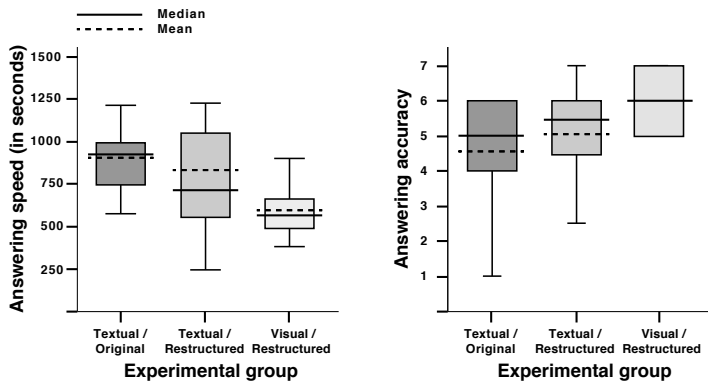


Figure 4.8. Boxplot graphs displaying the central tendency (as mean and median) and the distributions of mean answering accuracy and answering speed for each experimental group. The top whisker represents the maximum value of the dataset, and the bottom whisker represents the minimum. The central rectangles span between the first to third quartiles of the data distribution.

In terms of user experience, measured by the HED/UT scale (Figure 4.9), the visual/restructured document was perceived as significantly more functional and pleasant to use than the other two versions of the document original document and the textual/restructured document were both evaluated poorly, and shared similar median scores. A Mood’s median test shows that the differences for both HED dimension ($\chi^2(2) = 18.23, p < 0.001$) and UT dimension ($\chi^2(2) =$

9.39 $p = 0.009$) are statistically significant. The results suggest that it is not enough to restructure a document in a more logical way to increase its perceived utility and pleasantness. Even though the research participants using the latter document performed somewhat better in terms of answering accuracy and speed, the experience as a whole was not perceived as any different: dense textual layouts are indeed a great put-off for readers (Waller, 2011; Albers, 2012; Schriver, 2015). Structural changes also need to be signaled visually in order to change the negative attitudes of readers to the contract. The visual/restructured contract was in fact evaluated as much more pleasant to use, as well as more useful and functional.

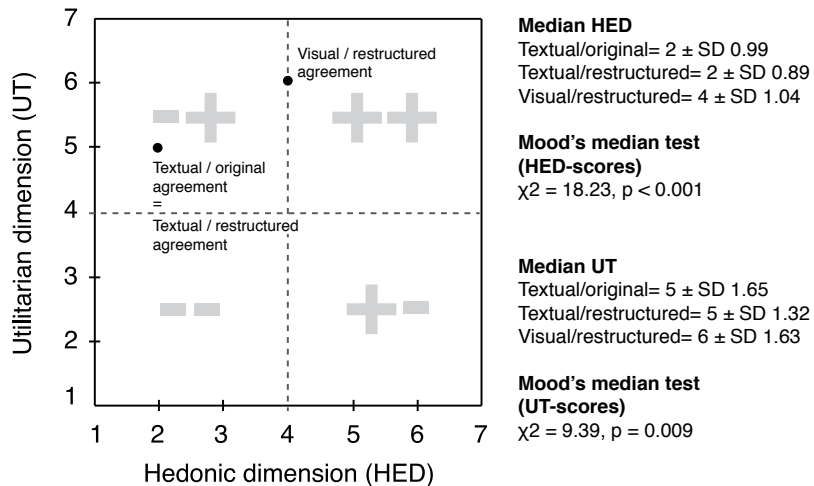


Figure 4.9. HED/UT scores. Statistical significance of the difference of medians assessed through a Mood's test

4.3 Publication III – *Flowcharts, swimlanes, and timelines – Alternatives to prose in communicating legal-bureaucratic instructions to civil servants*

The study focused on B2G contracts, and compared the JYSE Visual Guide to the original version of the terms of public procurement of services, the JYSE 2009 SERVICES (Ministry of Finance, 2009). The study was conducted as an experimental evaluation, complemented with pre-test questionnaires (to gather control variables) and post-test questionnaires (to assess user experience), and qualitative focus group discussions.

The experimental results show that civil servants could answer the comprehension tasks more accurately when using the JYSE Visual Guide (4.170 ± 0.734 points) compared to when using the original version of the JYSE terms (3.629 ± 0.888 points). At the same time, the civil servants could answer the comprehension tasks more quickly when using the JYSE Visual Guide (818.979 ± 222.791 seconds) compared to when using the original version of

the JYSE terms (990.612 ± 219.216 seconds). The results of the paired-samples t-tests show that the differences in accuracy ($t(71) = 4.238, p < .001$) and speed ($t(71) = -6.206, p < .001$) are both statistically significant. A summary of the results can be found in Table 4.2.

The results of the regression analysis suggest that these changes in accuracy and speed can be explained mostly in terms of experimental treatment, which shows a statistically significant coefficient in both models (Answering speed model: $\beta=-0.364, p < .001$; answering accuracy model: $\beta=.358, p < .001$) (Tables 4.3 and 4.4.). Both linear regression models are statistically significant (Answering speed model: $F(13, 130) = 2.762, R^2 = .212, p = .002$; Answering accuracy model: $F(13, 130) = 3.211, R^2 = .242, p < .001$).

Additionally, one of the models shows that a high imagery-skill score (measured through the OSIVQ questionnaire), has a negative effect on comprehension accuracy ($\beta=-0.206, p < .005$) (Table 4.4). As the analysis does not reveal any statistically significant interaction term between cognitive styles and treatment (Table 4.4), we can conclude that object visualizers were *in general* less accurate in both experimental conditions than verbalizers and spatial visualizers. A possible explanation is that object visualizers tend to process information holistically (Kozhevnikov et al., 2005), while reading and understanding a contract may be better achieved through a sequential-analytic processing style – which is more characteristic of spatial visualizers and verbalizers.

All in all, no interaction effect – either involving cognitive styles or expertise levels, such as knowledge of JYSE or years of experience in procurement – was found in either of the models (the interaction effects in Tables 4.3 and 4.4 are all non-significant). This suggests that the JYSE Visual Guide is an equally helpful tool for individuals with different thinking styles and levels of expertise.

The civil servants also attributed higher utility and pleasantness, as assessed through the HED/UT scale (Figure 4.10), to the JYSE Visual Guide (HED = 4.9 ± 1.185 ; UT = 3.8 ± 2.005) in comparison to the original (HED = 3.8 ± 1.209 ; UT = 3.6 ± 1.695). These differences, as assessed through a Wilcoxon signed rank test, a non-parametric equivalent of a paired sample t-test, were statistically significant for the HED-scores ($z = 6.391, p < .001$) and trending towards significance for the UT-scores ($z = 1.685, p = .0092$). These results display a pattern similar to those already observed in Publication II, where the visual contract was also evaluated more favorably on both HED and UT dimensions.

Table 4.2. Mean answering speed and accuracy, assessed through a paired-samples t-test

	JYSE Visual Guide		Original Textual JYSE		Difference of means	Test statistic and significance (two-tailed, $p < .001$)
	Mean	SD	Mean	SD		
Answering speed (seconds)	818.979	222.791	990.612	219.216	- 171.633	- 6.206
Answering accuracy (points)	4.170	.734	3.629	.888	.541	4.238

Table 4.3. Results of the regression analysis (answering speed as the dependent variable)

Variables	Coefficients
Experimental treatment (0 = textual; 1 = visual)	-.364**
Age	.034
Gender	-.155
Years of experience in procurement	.155
Knowledge of JYSE	-.160
Spatial-imagery skill score	-.103
Object-imagery skill score	.006
Verbal skill score	.027
Treatment x Years of experience	-.022
Treatment x Knowledge of JYSE	.136
Treatment x Object-imagery score	-.021
Treatment x Spatial-imagery score	.026
Treatment x Verbal skill score	.019
Adjusted R ²	.138
R ²	.212
F (13, 130)	2.762
Significance of the model, p	.002
n = 144 ** p < .001	

Table 4.4. Results of the regression analysis (answering accuracy as the dependent variable)

Variables	Coefficients
Experimental treatment (0 = textual; 1 = visual)	.358**
Age	.016
Gender	.125
Years of experience in procurement	.110
Knowledge of JYSE	.062
Spatial-imagery skill score	.042
Object-imagery skill score	-.206*
Verbal skill score	.016
Treatment x Years of experience	-.134
Treatment x Knowledge of JYSE	-.036
Treatment x Object-imagery score	.069
Treatment x Spatial-imagery score	-.129
Treatment x Verbal skill score	-.101
Adjusted R ²	.167
R ²	.242
F (13, 130)	3.211
Significance of the model, p	< .001
n = 144 * p < .05 ** p < .001	

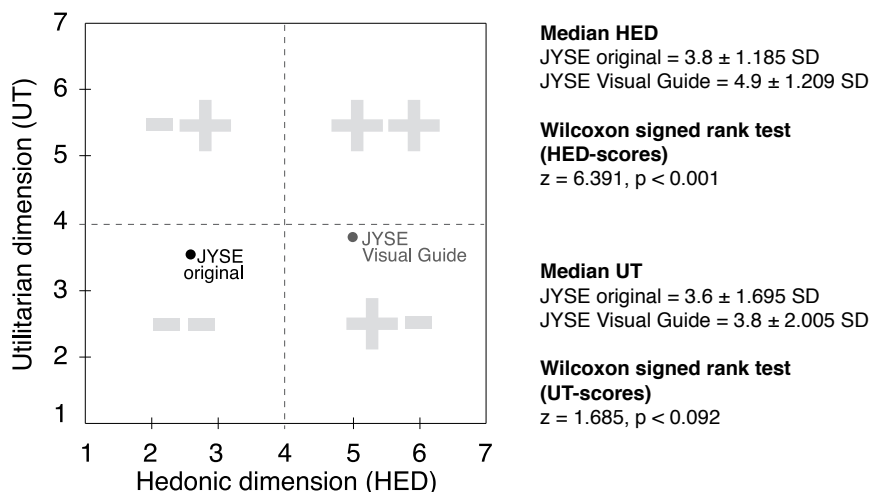


Figure 4.10. HED/UT scores. Statistical significance of the difference of medians

Table 4.5. I-PANAS-SF scores: mean positive and negative affect. Statistical significance of the difference of means assessed through a Wilcoxon signed rank test

	Visual condition		Textual condition		Difference of means	Test statistic and significance (two-tailed, $p < .001$)
	Mean	SD	Mean	SD		
Positive Affect (PA)	17.986	3.81	15.583	3.340	2.403	5.283
Negative Affect (NA)	7.069	2.795	9.305	3.231	- 2.236	- 4.759

The HED/UT scores hint at an improvement in user experience, which is also corroborated by the results of the SF-PANAS-I scale (Table 4.5). These results indicate that the civil servants experienced a higher level of positive affect ($PA = 17.986 \pm 3.81$) and a lower level of negative affect ($NA = 7.069 \pm 2.795$) when using the JYSE Visual Guide, as compared to using the original JYSE document ($PA = 15.583 \pm 3.340$; $NA = 9.305 \pm 3.231$). The differences in both positive affect and negative affect were statistically significant, as assessed through a Wilcoxon signed rank test ($PA: z = 5.283, p < .001$; $NA: z = -4.759, p < .001$).

Lastly, these measures of improved user experience (HED/UT and I-PANAS-SF) were confirmed qualitatively during the focus group discussions, which were held after the experimental evaluation. The participants confirmed that they preferred using the JYSE Visual Guide, and liked the visual approach so much that they would have liked it to be applied in other public procurement contract documents. The focus group discussions also shed light on why the UT-scores for both the original JYSE and Visual Guide were below the sufficiency threshold of 4. On one hand, the participants revealed their misgivings about the JYSE terms as such, as they felt that the *content* and the *logic* of the

document needed to be improved, and that the document was of limited use without clearer guidelines on how to use it more strategically in procurement. On the other hand, the participants would have preferred that diagrams would be included in the official JYSE document, rather than in a separate guide – although unfortunately this was not possible for political reasons.

4.4 Publication IV – Diagrams in contracts: Fostering understanding in global business communication

The purpose of this study was to gather quantitative data on the effectiveness – in terms of comprehension – of visualizations in B2B contracts.

In particular, we sought to estimate what would be the effect of visualized contracts in global business, a scenario in which English is used as a *lingua franca* among non-native speakers (NNS), or between NNS and native speakers (NS). Contracts are undoubtedly hard to understand for NNS who use English “to get the job done”, as the type of English they employ is based on a specialized and native language register, that of NS lawyers.

The results of the comprehension experiment converge with the results of the previous two publications: the group of participants using the visually enhanced version of the test document could complete the assigned comprehension tasks more accurately (as assessed through Mann-Whitney U-test, $U = 2835$, $p < .001$) and quickly (as assessed through Welch’s t-test, $t(119.931) = -2.943$, $p = .004$). The bar charts in Figures 4.11 and 4.12 report the mean speed and accuracy mean, for each comprehension task (numbers 1 to 6) and as an overall mean score calculated on all tasks (thicker bar charts on the right). The results of the statistical tests, for each task and overall, are reported in the tables under the bar charts (Figures 4.11. and 4.12).

Answering speed scores on tasks 3, 4 and 5, however, are not statistically significant. Similarly, answering accuracy scores on tasks 3 and 5 are not statistically significant, and on task 6 it only trends towards significance. These variations are to be expected, as different tasks and the information required to complete them may show differences in intrinsic difficulty. For instance, the high answering accuracy and speed showed in task 5 (Appendix 4) can be explained by the “easy” subject matter of the question. We had asked which party carried the risk for the equipment during its testing, without knowing that it is customary for the supplier to be responsible. Most respondents probably already knew the answer from previous experience, and simply checked the document very quickly for confirmation. Prose or visualization did not thus play a big role in acquiring the knowledge needed to answer the question. In regards to task 3, we hypothesize that the diagrams used did not provide a sufficiently helpful and readily applicable problem representation. For instance, in order to correctly answer task 3 (Appendix 4), participants were required to calculate the correct duration of the warranty period. The diagram in the visual version suggested more clearly how to perform the correct calculation, but it did not provide a ready-made answer (Figure 4.13). Thus, the participants still had to spend equally the same amount of time to perform the calculation, and were open to mistakes while performing it.

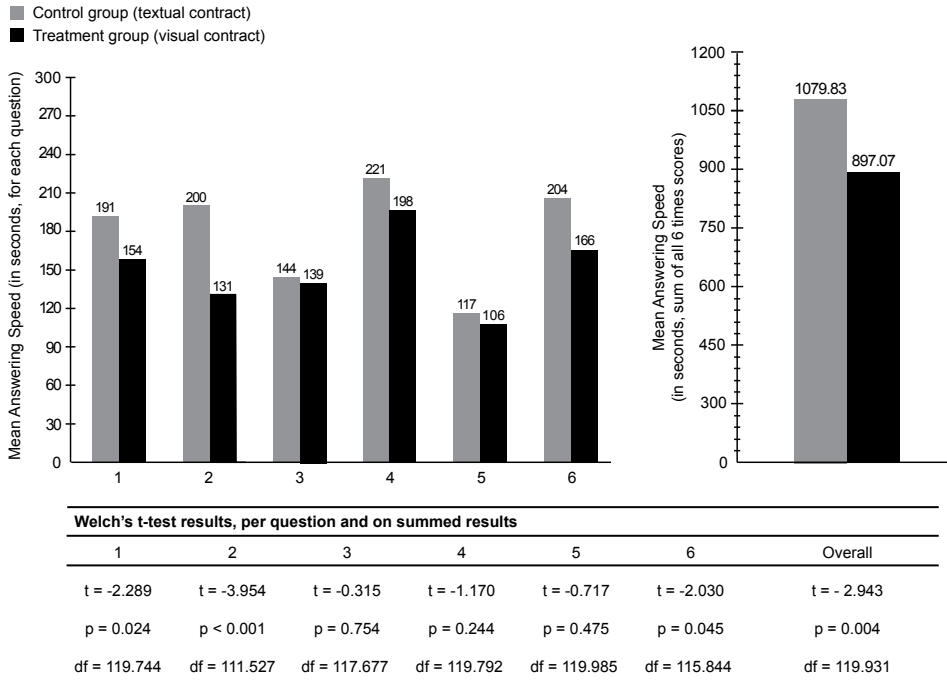


Figure 4.11. Mean answering speed for each comprehension question (left, numbers 1 to 6), and total mean answering speed (right). Results of Welch's t-test (table at the bottom)

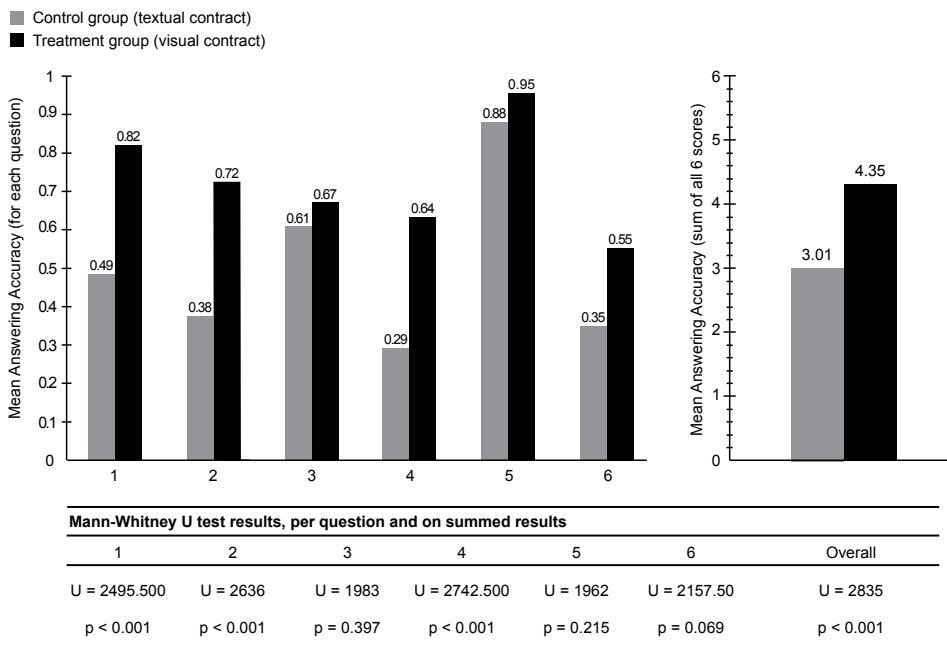


Figure 4.12. Mean answering accuracy for each comprehension question (left). Total mean answering accuracy (right). Results of Mann-Whitney U-test (table at the bottom).

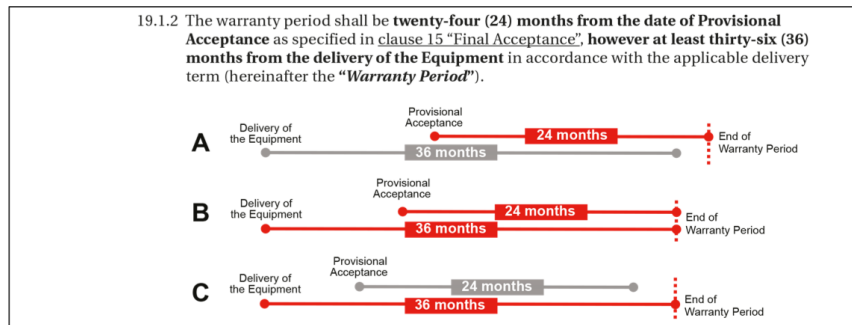


Figure 4.13. Clause and diagram needed to complete task 3

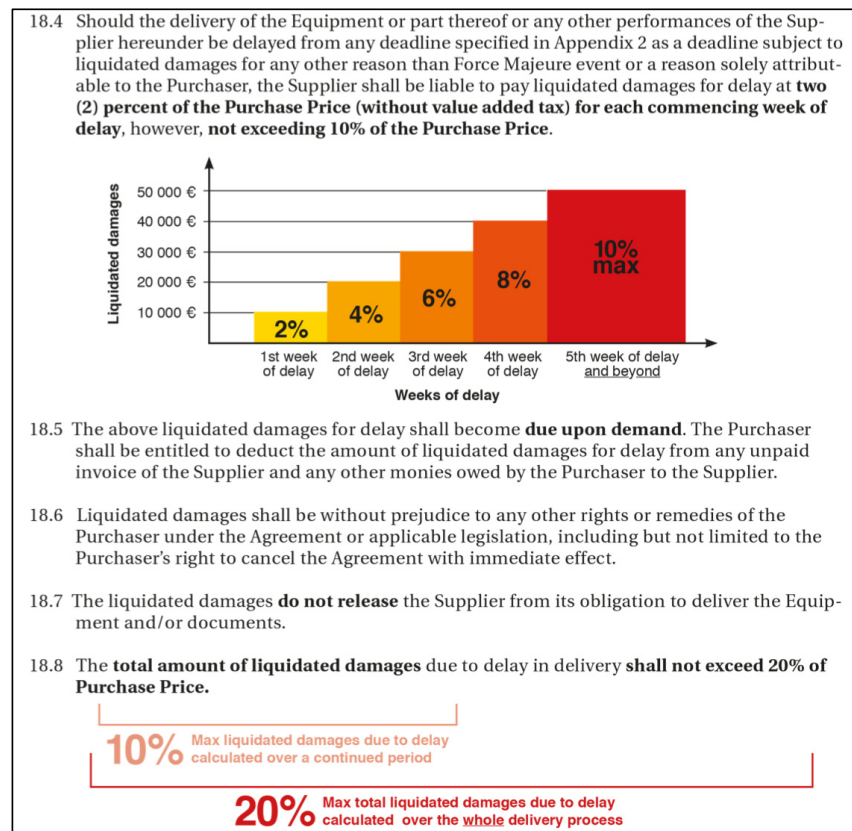


Figure 4.14. Clause and diagram needed to complete task 4

In task 4 (Appendix 4), participants did not significantly differ in answering speed, but were much more accurate when using the visual version of the contract. This may be explained by the fact that the participants still had to calculate the total weeks of delay caused by the supplier (and that took time in each condition). However, when they had done the calculation, the diagrams in clauses 18.4 and 18.8 (see Figure 4.14) helped them in assessing more accurately the total amount of liquidated damages the customer was entitled to.

These results suggest that diagrams, in general, can aid comprehension as long as they provide the right problem representation in relation to the task at hand, and, when possible, provide a more ready-to-use answer. However, when the subject matter is intrinsically difficult or requires further mental operations, diagrams may offer no comprehension benefit.

Given that results may strongly vary across tasks, the efficiency (the degree of mental effort exerted to yield a certain level of comprehension performance) was calculated on the overall test scores. The measure takes into consideration both answering accuracy and speed, and the procedure to calculate it is reported in Appendix 7. Figure 4.15 shows that the visually enhanced version of the contract displays higher efficiency than the text-only version (0.282 versus - 0.232). This difference, assessed through a t-test, is statistically significant ($t(120) = 3.399$, $p = 0.001$). These results establish that the significant differences in comprehension accuracy and speed are attributable to a decrease in cognitive load associated with the use of visually enhanced contracts. The visually enhanced contract not only requires a lower mental effort, but it also yields a superior comprehension performance. This means that the visually enhanced contract is a more *mentally efficient* method for presenting the same information as compared to traditional text-only contracts.

The stepwise linear regression analysis provided two statistical significant models (Answering speed model: $F(1, 119) = 9.404$, $R^2 = .073$, $p = .003$; Answering accuracy model: $F(3, 117) = 14.438$, $R^2 = .270$, $p < .001$). In the answering speed model, the only statistically significant coefficient is experimental treatment ($\beta = -.271$, $p = .003$) (Table 4.6). In the answering accuracy model, three statistically significant coefficients were found: experimental treatment ($\beta = .468$, $p < .001$), mother tongue ($\beta = .167$, $p = .026$), and the interaction term experimental treatment \times mother tongue ($\beta = -.179$, $p = .037$) (Table 4.7). As in the previous studies, age, gender, educational background, and cognitive style had no influence on the results, which can be attributed mostly to the version of the document assigned to the participants (see non-significant coefficients in Tables 4.6 and 4.7).

The statistically significant coefficients in the answering accuracy model indicate that treatment may differ, in terms of effect size and directionality, for native (NS) and non-native speakers (NNS) of English. The study of this interaction effect was followed up with a two-way ANOVA (Table 4.8), univariate post hoc tests (Tables 4.9 and 4.10), and Bonferroni-adjusted pairwise comparisons (Tables 4.11 and 4.12).

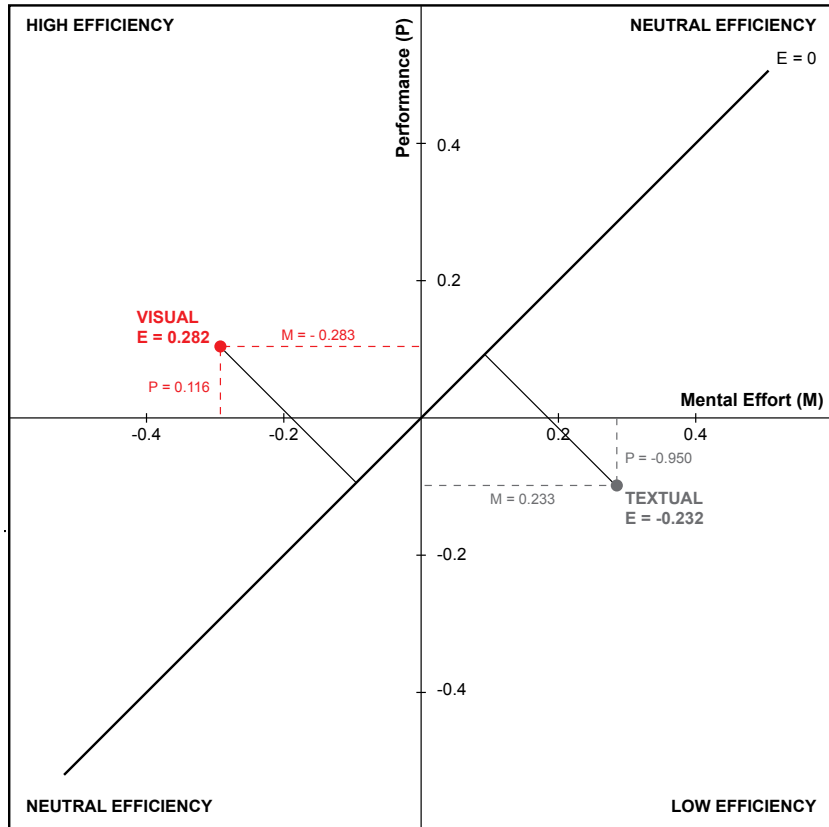


Figure 4.15. Graph of efficiency (E) for visual and textual conditions

NS provided, in average, more accurate answers (3.394 points) than NNS (2.435 points) (Figure 4.16) using the textual version ($F(1, 118)$, $p = .002$, partial $\eta^2 = 0.076$). However, when using the visually enhanced version, both groups performed essentially at the same level of accuracy (NS = 4.289 points; NNS = 4.385 points), and the small difference in performance was non-significant ($F(1, 118) = 0.067$, $p = .796$, partial $\eta^2 = 0.001$).

Although both groups were significantly more accurate when using the visual version of the contract, the effect of the experimental treatment was stronger for NNS ($F(1, 118) = 31.771$, $p < .001$, partial $\eta^2 = 0.212$) than for NS ($F(1, 118) = 9.397$, $p = .003$, partial $\eta^2 = 0.074$). Tables 4.11 and 4.12 report the pairwise mean differences, and their statistical significance.

Table 4.6. Results of the stepwise regression analysis (answering speed as the dependent variable)

Variables	Coefficients
<i>Variables included in the model</i>	
Experimental treatment	-0.271*
<i>Variables excluded from the model, $p > 0.05$</i>	
Age	0.021
Gender	-0.021
Legal background	0.012
Years of experience in working with contracts	-0.008
Mother tongue	0.136
Spatial- imagery skill score	-0.025
Object-imagery skill score	-0.089
Verbal skill score	-0.011
Mental effort	0.175
Spatial-imagery skill score × Experimental treatment	0.004
Object-imagery skill score × Experimental treatment	-0.002
Verbal skill score × Experimental treatment	0.114
Spatial-imagery skill score × Verbal skill score	0.018
Object-imagery skill score × Verbal skill score	-0.087
Object-imagery skill score × Spatial-imagery skill score	-0.065
Legal background × Mother tongue	0.086
Legal background × Experimental treatment	0.086
Mother tongue × Experimental treatment	0.084
Object-imagery skill score × Spatial-imagery skill score × Experimental treatment	-0.129
Object-imagery skill score × Verbal skill score × Experimental treatment	-0.066
Spatial-imagery skill score × Verbal skill score × Experimental treatment	-0.089
Object-imagery skill score × Spatial-imagery skill score × Verbal skill score	-0.137
Legal background × Mother tongue × Experimental treatment	-0.029
Object-imagery skill score × Spatial-imagery skill score × Verbal skill score × Experimental treatment	0.051
Adjusted R ²	0.065
R ²	0.073
F (1, 119)	9.404
Significance of the model, p	0.003
n = 121 * p = 0.003	

Table 4.7. Results of the stepwise regression analysis (answering accuracy as the dependent variable)

Variables	Coefficients
<i>Variables included in the model</i>	
Experimental treatment	0.468**
Mother tongue	0.167***
Mother tongue × Experimental treatment	-0.179***
<i>Variables excluded from the model, $p > 0.05$</i>	
Age	-0.083
Gender	-0.055
Legal background	-0.095
Years of experience in working with contracts	-0.012
Spatial-imagery skill score	0.139
Object-imagery skill score	-0.085
Verbal skill score	-0.023
Mental effort	-0.075
Spatial-imagery skill score × Experimental treatment	0.029
Object-imagery skill score × Experimental treatment	0.070
Verbal skill score × Experimental treatment	0.025
Spatial-imagery skill score × Verbal skill score	-0.005
Object-imagery skill score × Verbal skill score	-0.046
Object-imagery skill score × Spatial-imagery skill score	-0.015
Legal background × Mother tongue	0.016
Legal background × Experimental treatment	-0.092
Object-imagery skill score × Spatial-imagery skill score × Experimental treatment	-0.076
Object-imagery skill score × Verbal skill score × Experimental treatment	0.130
Spatial-imagery skill score × Verbal skill score × Experimental treatment	-0.155
Object-imagery skill score × Spatial-imagery skill score × Verbal skill score	0.074
Legal background × Mother tongue × Experimental treatment	0.052
Object-imagery skill score × Spatial-imagery skill score × Verbal skill score × Experimental treatment	-0.038
Adjusted R^2	0.251
R^2	0.270
F (3, 117)	14.438
Significance of the model, p	< 0.001
n = 121 ** $p < 0.01$ *** $p < 0.05$	

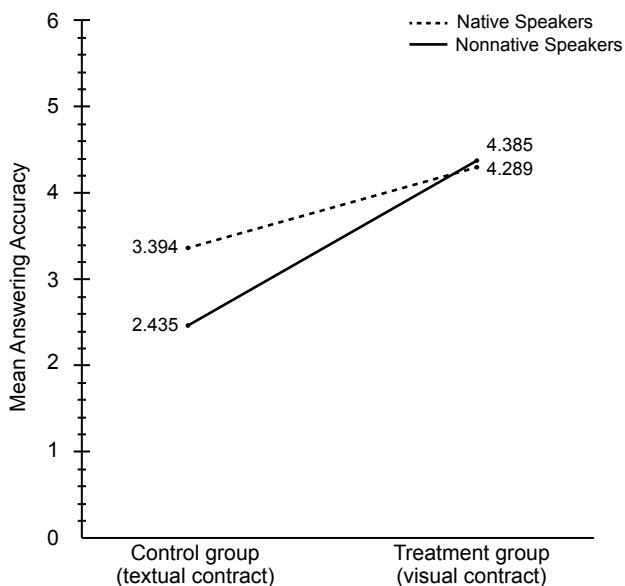


Figure 4.16. Mean answering accuracy for native and nonnative speakers in the control group and in the treatment group

Table 4.8. 2-way ANOVA – Test of between-groups effects on answering accuracy

Source of variance	Sum of squares	df	Mean squares	F	p-value	Partial eta squared
Treatment	59.945	1	59.945	39.410	< 0.001	0.250
Mother Tongue	5.587	1	5.587	3.673	0.058	0.030
Treatment x Mother Tongue	8.041	1	8.041	5.286	0.023	0.043
Error	179.485	118	1.521			
Total	247.740	121				

Table 4.9. Post hoc univariate tests on simple main effect of 'Mother Tongue' within 'Treatment' groups

Source of variance	Sum of squares	df	Mean squares	F	p-value	Partial eta squared
Treatment group (visual)	0.102	1	0.102	0.067	0.796	0.001
Error	179.485	118	1.521			
Control group (textual)	14.811	1	14.811	9.737	0.002	0.076
Error	179.485	118	1.521			

Table 4.10. Post hoc univariate tests on simple main effect of 'Treatment' within 'Mother tongue' groups

Source of variance	Sum of squares	df	Mean squares	F	p-value	Partial eta Squared
Native speakers	14.293	1	14.293	9.397	0.003	0.074
Error	179.485	118	1.521			
Nonnative speakers	48.326	1	48.326	31.771	< 0.001	0.212
Error	179.485	118	1.521			

Table 4.11. Pairwise comparisons: mean difference of 'Mother tongue' within 'Treatment' groups

Treatment groups	Mean score NS	Mean score NNS	Mean difference (NS - NNS)	p-value	95% confidence interval for difference	
					Lower bound	Upper bound
Treatment group (visual)	4.298	4.385	- 0.087	0.769	- 0.757	0.577
Control group (textual)	3.394	2.435	0.959	0.002	0.350	1.567

Table 4.12. Pairwise comparisons: mean difference of 'Treatment' within 'Mother tongue' groups

Mother tongue groups	Mean score treatment group (visual)	Mean score control group (textual)	Mean difference (visual-textual)	p-value	95% confidence interval for difference	
					Lower bound	Upper bound
Native speakers	4.298	3.394	0.905	0.003	0.320	1.489
Non-native speakers	4.385	2.435	1.950	< 0.001	1.265	2.635

4.5 Publication V – Exploring contract visualization: Clarification and framing strategies to shape collaborative business relationships

The purpose of this explorative single study was to gather qualitative data on the use of visualization in contracts in a real-life context. In particular, we sought to understand 1) the motivations, purposes, and expectations behind the choice of organizational actors to employ visualization in their contracts, and 2) the organizational actors' approaches to choosing, adopting, and communicating through visualization.

Firstly, we discovered three key knowledge gaps that challenge coordination and relationship-building during the contracting process: a gap between firms, a gap between professions, and a gap between phases of the contracting process (the three last themes in Table 4.13). Our research participants used visualization as a way to minimize these knowledge gaps, which can be categorized as pragmatic knowledge boundaries (Carlile, 2002; 2004): situations that disrupt coordination and understanding because the parties – in addition to initially lacking a shared lexicon to communicate – also need to negotiate interests and make trade-offs in a regime of limited common knowledge. This use of contract visualization characterizes them as boundary objects (Star & Griesemer, 1989) that can provide concrete, robust-yet-adaptable means to represent and negotiate knowledge and interests, and coordinate across functional or professional domains (Carlile, 2004; Scarbrough et al., 2015). Additionally, the visualizations were planned as *conscription devices* (Henderson, 1991) to enlist more fully the perspectives and knowledge of different players in the contracting process, since the contract can be adapted to their needs, in addition to those of lawyers. Sub-themes such as “*different professional perspectives in contracting*”, “*tensions between legal and business*”, and “*challenges in project handover*” (Table 4.13) indicate the challenges of cross-professional collaboration (which contribute to creating a knowledge gap). The participants felt that visualization could present contractual issues in a less “lawyerly” way, so that, for instance, different contract stakeholders (HR, financial controllers, operation managers) would be more engaged in commenting and giving input on the issues in their competence area. Another goal was to make contracts look more like managerial tools, so that implementation managers would be more willing to read them accurately during handover.

Secondly, the data suggests *how* visualizations are employed to bridge knowledge gaps and ensure better communication and coordination in contracting – that is, *how* they function as boundary objects. The first strategy – illustrated by the theme *visualization as a tool for clarification* (Table 4.13) – sought to present information in a format that decreases ambiguity, as the research participants (who mostly had an engineering or business background) considered visualizations as clearer, more enticing and practical than long, dense texts. The second strategy – illustrated by the theme *visualization as a tool for framing* (Table 4.13) – was to use visualizations to induce a promotive contract framing (Weber & Mayer K., 2011), a mindset stressing gains and opportunities rather than losses, risks and problems. Visualizations and

contract documents are not by-products, “material traces” generated under a collaborative relationship. Instead, they are tools used to deliberately shape the nature of the relationship, since collaboration and communication provide a basis of trust and goodwill, which are better conducive to success in this line of business. Previous research indicated that framing clauses in different ways affects the nature and transaction of relationships (Lumineau, 2014; Weber & Mayer K., 2011; Weber et al., 2011).

Thirdly, we discovered a number of clauses and contractual issues that the research participants perceived as crucial in closing a successful deal (details in Table 4.14). Identifying these topics not only gave a direction on what to visualize and why, but also started to reveal more about the contracting context. We realized that contracts do not exist as stand alone documents, but are linked in a “temporal chain” to other artifacts (presentations, drafts): for instance, a topic such as service scope is first presented, discussed, and commented upon through presentation slides, and in a second instance as a textual draft, which will evolve into the “service scope appendix” of the contract. For this reason, we designed the visualizations in an editable format so that they could be included in the actual contract as an explanation tool, *but also* used and modified during negotiations as a tool to facilitate and structure discussions.

The participants welcomed the idea of visualizations that could be used in contracts as well as for contracting, and in time gave a name to these editable files: *visual templates*.

Our fourth contribution is the concept of visual templates, which we defined as “*visualizations in a modifiable format, [which] can be used flexibly in slides and contract drafts during negotiations, until crystallized in the signed contract document as a ‘snapshot of the reached meeting-of-the-minds’*” (Passera, Smedlund & Liinasuo, 2016, p.18) (Figure 4.17). Visual templates are at the basis of the approach to contract visualization that CartaFirm adopted:

1. *An approach that allows creating visualizations in easy and fast ways.* As described in the context of the study, the sales team we followed experienced a hectic workload. For this reason, they needed a way to implement visualization that would not require extra work of them. The ready-made, editable visualizations can be easily modified in PowerPoint to reflect the contracting situation at hand – with just a few clicks and the addition of bespoke text. In this way, visualization is not a skill to be effortfully acquired and applied from scratch: it is productized into a simple tool that is ready to use²⁸.
2. *An approach that allows continuity and consistency in communication during the various phases of the contracting process.* The data indicates the difficulty of gaining a shared understanding across complex and lengthy contract negotiations (the three knowledge gaps) and the need

²⁸ This conceptualization of visualization as a tool is also reflected in the name of two of the themes: “*Role of visualization as a tool for clarification*” and “*Role of visualization as a tool for framing*” (cf. Table 4.13)

for informational and relational cues to increase goal alignment during negotiations and collaboration during implementation (e.g. “ideal relationship”, “clarification”, and “framing” themes). Visual templates help to communicate in a coherent, consistent manner during the various contracting phases and in various documents (presentations, contract, briefs...) (Figure 4.17), increasing the opportunities for the many stakeholders involved to gain a better common understanding.

Table 4.13. Thematic structure emerging from data analysis

THEMES	SUB-THEMES
CartaFirms’s “ideal relationship” to coordinate a successful O&M outsourcing deal	Need for trust to succeed
	Need for shared understanding
	Long-term orientation
	Need for personalization and continuity
Role of visualization as a tool for clarification	Addressing traditional contract problems: - length - complexity - inconsistency - possibility of omissions and mistakes
	Make the document look easier to read
	Increase information salience
Role of visualization as a framing device	Stressing gains and value
	Stressing trustworthiness
	Stressing common ground
Inter-firm knowledge gaps in contracting	Understanding service possibilities
	Understanding customer needs
	Understanding the other party’s intentions
Cross-professional knowledge gaps in contracting	Different professional perspectives in contracting
	Tensions between legal and business
	Challenges in project handover
Temporal knowledge gaps in contracting	Cognitive load caused by efforts in remembering, attending to information, coordinating, and stress

Table 4.14. Contracting topics and negotiation goals, supporting visualizations, and their usage scenarios

Contracting topic	Goal of negotiation	Type of visualization	When/where the visualization is to be used
Scope of service	Agree with the customer what is included in the service-to-be; what the supplier should provide	Service Scope Map, created case by case from a bespoke icon library	<ul style="list-style-type: none"> • Presentations to the customer • “Scope of delivery” contract appendix
Who does what	Univocally clarify roles and responsibilities of the parties	Swimlane chart	<ul style="list-style-type: none"> • Planning meetings with the customer • Presentations to the customer • The swimlane does not appear in the contract, but its content feeds the following sections: “Scope of delivery” contract appendix; “Tools and machinery provided by the Supplier” contract appendix; “Tools and machinery provided by the Customer” contract appendix; other case-specific appendices and clauses
Nature of the services; uniqueness of the offering	Show the “flavor” of the services, and how they differ from typical competitors	Photographs	<ul style="list-style-type: none"> • Presentations to the customer • “Scope of delivery” contract appendix • “Tools and machinery provided by the Supplier” contract appendix
Pricing model, fees	Justify costs; show why the suggested pricing model is convenient and fair	X/Y axis diagram; table	<ul style="list-style-type: none"> • Presentations to the customer • “Pricing” contract appendix
Key performance indicators	Reassure the customer that the supplier is able to provide the service according to key metrics and service levels; agree how to reward exceptional performance; agree how to penalize poor performance	Table	<ul style="list-style-type: none"> • Presentations to the customer • “Pricing” contract appendix
Costs, types of payments, invoicing	Specify payment schedules; establish invoicing rules	Timeline; table	<ul style="list-style-type: none"> • Presentations to the customer • “Payment terms” contract appendix
Termination of the contract	Provide reasonable ways out of the contract in case one of the parties is severely breaching the contract	Flowchart	<ul style="list-style-type: none"> • Planning meetings with the customer • Termination clause in the Agreement
Accounting rules (inventories costs; property, plants, and equipment costs; write-down rules; depreciation rules)	Provide shared rules for accounting and book-keeping, so as to allocate the outsourcing costs correctly	Tables	<ul style="list-style-type: none"> • Documentation sent to the customer • Financial contract appendix • CartaFirm internal service planning process • Accounting processes at the customer’s plant after the beginning of O&M outsourcing

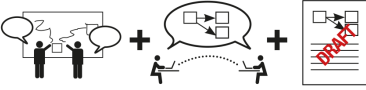

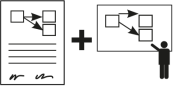
CONTRACTING PHASES	SALES NEGOTIATIONS: SERVICE CUSTOMIZATION	CONTRACT NEGOTIATIONS	CONTRACT SIGNATURE	IMPLEMENTATION
DOCUMENTS WHERE VISUALIZATIONS ARE USED	<ul style="list-style-type: none"> - Presentations - Contract appendices' drafts 	<ul style="list-style-type: none"> - Presentations - Contract appendices' drafts - Contract draft 	<ul style="list-style-type: none"> - Contract 	<ul style="list-style-type: none"> - Signed Contract - Contract briefs - Brief presentations
USE OF VISUALIZATIONS	 <ul style="list-style-type: none"> - Diagrams are editable - Give form to discussions - Edited together face-to-face by the parties, as well as asynchronously edited and exchanged via email 		 <ul style="list-style-type: none"> - No more edits: "snapshot of the meeting of the minds" - The final versions of the diagrams are included in the contract, as a complement to clarify further the existing clauses 	 <ul style="list-style-type: none"> - No more edits: "snapshot of the meeting of the minds" - Spreading the reached understanding through the organizations

Figure 4.17. Evolution and use of “visual templates” during the different phases of contracting

4.6 Publication VI – Making the meaning of contracts visible – Automating contract visualization

The purpose of this conceptual study was to explore how the creation of contract visualizations could be made as simple as possible for managers and lawyers, and whether automation could offer a viable solution. Automation, in this context, means a software solution that can automatically generate contracts or clauses based on input provided by the user, who fills out a questionnaire-like data gathering form (Lauritsen, 2007). Based on user choices, the software chooses the right type of clause from a clause library, so avoiding manual writing or copy-pasting. Moreover, it adds to the text case-specific input variables (e.g. price, name of parties, dates) where needed, and automatically calculates values based on these variables (e.g. it may calculate payment installments or liquidated damages for delay based on the total sales price provided). Contract assembly software has become more common²⁹ in commercial legal practice and in corporations, where a high volume of document production requires more efficient and consistent methods for document production. However, existing solutions generate only contract text and clauses. In our study, we aimed at testing if the same approach adopted for automatically generated text could also be used to create explanatory diagrams for the related clause.

We took a design science approach (Hevner et al. 2004; van Aken, 2005; Holmström et al. 2009), which is a characteristic way of conducting research on information systems: in this approach, knowledge is generated by identifying a relevant organizational problem and creating innovative and suitable solutions for it. The output of a design science study can be *design artifacts*

²⁹ A 2013 survey of 494 firms (representing 88000 lawyers), conducted by the International Legal Technology Association (ILTA, 2013) found that 38% of surveyed firms used contract assembly software, and 76% of firms used at least some simple form of automation, such as macros in Microsoft software. Another survey conducted by ILTA revealed that, as of 2011, 54% of in-house legal departments, sampled from a wide array of industries, used Microsoft Word as their contract assembly tool of choice. A quick Google search for the term “contract assembly software” returns, as of April 2017, several commercially available solutions (ActiveDocs, ContractExpress, Exari, HotDocs, WeAgree, RocketLawyer). Moreover, large law firms and corporations are likely to develop in-house solutions, rather than relying on off-the-shelf software (Lauritsen, 2007).

(e.g. tested vocabulary, symbols, representations, algorithms, implemented and prototype systems), *design foundations* (creative development of novel artifacts, theories, and frameworks), or *methodologies* (evaluation methods to validate the foundations and test/evaluate artifacts) (Hevner et al., 2004). In our case, we aimed at developing foundational knowledge, testing whether the current questionnaire-based approach to contract assembly could be extended to also generate visualizations – by building a rough proof-of-concept prototype of the system.

Design science studies always start from a relevant practical problem, and ours can be framed as such: contract professionals would be eager to engage in contract visualization, but only if it would not require a major investment in acquiring visual skills, and it would not make contract creation process even more time-consuming. These insights emerged during the case study conducted at CartaFirm, and were often echoed in discussions with contract professionals I encountered during the development of this doctoral study (e.g. spontaneous feedback from IACCM members who participated in study IV, comments from civil servants in study III, feedback from the audience at scholarly and professional conferences). There were two main concerns: contract professionals often felt that their visual skills were not up to task, and complained that software available on their work computers was not easy enough to use to create appealing visualizations (the most “visual” content creation tool most of them have installed on their work computers is Microsoft PowerPoint). These two factors would make the process of creating contract visualization inefficient – and without any guarantee on the quality of the resulting visualization.

We decided to develop a simple but functional prototype that could generate visual content for three typical contract clauses taken from a B2B contract. The software would collect user input through a simple questionnaire-like interface (as in current contract assembly software), and create explanatory diagrams as an output. We worked as a multidisciplinary team. Haapio brought the business lawyer perspective, selecting a number of clauses from B2B commercial contracts that would not be too industry-specific. I acted as the interaction designer of the team, charged with figuring out the right questions to include in the questionnaire-like input form, how to ask those questions, and designing the output visualizations. The output of the design process was a series of digital static storyboards, which showed vis-à-vis the input form and how the user choices and inputted data resulted in the visual output (an example is provided in Appendix 8). Curtotti was in charge of the technical implementation, transforming the static storyboards I produced into a functioning prototype.

Three clauses were chosen for the prototype, because they can be commonly found in many types of sales contracts: term and termination of the agreement, price and payment, and liquidated damages for delay in delivery. We then envisioned which type of design pattern to use to communicate each clause. At this phase, Haapio and I had not yet developed the design pattern classification presented in Publication I, so we relied on the existing designs at hand (which had been previously created and used within the scope of Publications III and IV):

- timelines to represent the term and termination of an agreement (Figure 4.18);
- a 2D line plot on Cartesian axes for performance-based prices (Figure 4.19), and a hybrid combination of a table and a timeline for installment-based prices (Figure 4.20);
- a bar-chart combined with a timeline to represent accruing liquidated damages (Figure 4.21).

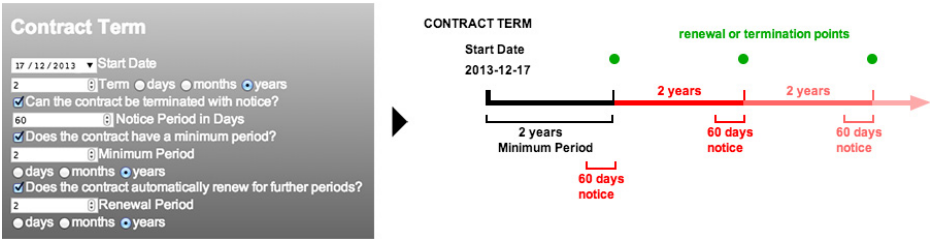


Figure 4.18. Input interface and visualization generated for the term and termination clause



Figure 4.19. Input interface and visualization generated for the price and payment clause (fixed price to be paid in installments)

Payment Clause

☐ Payment By Instalment
 ☒ Payment By Production

Frequency of Billing:

Price per unit of production \$

☐ Is there a periodic minimum payment?
☒ Is there a penalty for failing minimum production?

Minimum no of units:

Production penalty \$

☒ Is there a bonus production level?

Production Bonus in units:

Production Bonus \$

weekly payment based on production

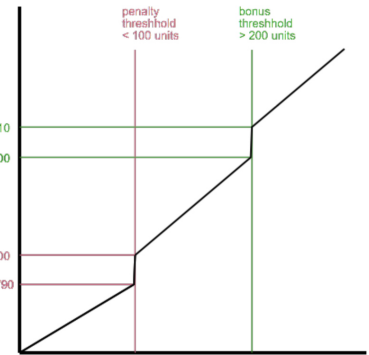


Figure 4.20. Input interface and visualization generated for the price and payment clause (performance-based pricing)

Liquidated Damages Clause

☒ NL 01 E
 ☐ custom

Euros Currency

Delivery required by:

Price (VAT exclusive)

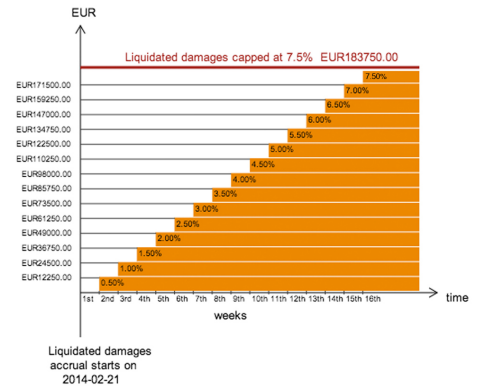


Figure 4.21. Input interface and visualization generated for the liquidated damages for delay clause

To model the right questions to include in the input interface, we had to first identify the variables at play in each clause, which are listed in Table 4.15. The variables were identified by reading through several examples of contracts (e.g. publicly or commercially available standard terms from various industries, contracts from previously studied organizations, contracts from past customers) where the clauses we wanted to model were present, and noting the differences among various instances of the same clause. Let us take the term and termination clause as an example of variation within the same clause. A contract can be fixed term or rolling term. If the contract is on rolling term, there may be a minimum period during which the contract cannot be terminated. If the contract is fixed term, the parties can decide to have it automatically renewing for a further period, unless terminated. Whenever a termination notification is requested, the parties can decide on how much in advance such notification should be sent before the date of effective termination.

Table 4.15. Variables used to model the questionnaire-like input interface for each clause. Indentations mean that the question used to collect user input for the given variable appears only if the user chooses a certain option

Clause	Variables
1) Contract term and termination	Commencement date of the agreement
	Type of agreement (fixed or rolling term)
	If fixed term: duration of the term
	If fixed term: the agreement renews for a further period (yes/no)
	If contract renews for further periods: length of notice period to opt out of automatic renewal periods at the end of the end of the fixed term
	If contract renews for further periods: duration of renewal period
	If contract renews for further periods: possible limit on the amount of automatic renewal periods
	If contract renews for further periods: length of notice period to terminate the agreement during a renewal period
	If rolling term: length of notice period for termination
	If rolling term: the agreement has a minimum period during which it cannot be terminated (yes/no)
2a) Price and payment (fixed price to be paid in installments)	Total price of the agreement
	Currency
	Payment term
	Number of installments
	For each installment: select precondition for payment
	For each installment: select percentage of total price to be paid
2b) Price and payment (performance-based pricing)	Frequency of invoicing (weekly, monthly, quarterly, yearly)
	Price per unit of production
	Currency
	Unit of production (e.g. units, ton, cubic ton...)
	Periodic fixed minimum payment (yes/no)
	If fixed minimum payment: Amount of fixed minimum payment
	Penalty for not reaching minimum production level (yes/no)
	If penalty: Minimum production level, in units
	If penalty: Production penalty
	Bonus for exceeding a threshold production level (yes/no)
	If bonus: Production threshold for bonus, in units
	If bonus: Production bonus
3) Liquidated damages for delayed delivery	Total price
	Currency
	Liquidated damages rules (standard rules, e.g. NL01 or custom rules)
	If standard rules are chosen, the user does not need to make any further choice
	If custom rules: amount of weekly liquidated damages (as % of total price)
	If custom rules: maximum total amount of payable liquidated damages

To avoid overwhelming the user, we decided to only show the minimum possible amount of relevant questions at a time. Further optional questions would be shown only after the user had made a choice. For instance, to continue with the previous example, at the beginning the user would only be asked to provide the commencement date of the agreement, and choose whether it is a fixed or rolling term agreement. On the basis of the fixed/rolling term choice, the user is shown the next context-appropriate questions (e.g. in the fixed term scenario: what is the duration of the term, and choosing whether the agreement can automatically renew for further periods).

During the design and implementation process, my co-authors and I kept notes about our design choices and observations, and had regular Skype calls to discuss our thoughts. Lastly, we used the write-up and publication phase of the research as a further occasion to crystallize our learning. As a result from building a minimum functional prototype and reflecting on the process, we developed two main insights, both in regards to how such software could be built and what benefits it might bring to the contract design process:

- ***To design an automation tool for contract visualization, one first needs to identify what clauses can be modeled:*** that is, which clauses remain more or less similar across a variety of contracts, and the differences and variations of which can also be identified in advance. For instance, automating the creation of a service scope representation may be impossible, because every company offers different services underpinned by different logics, and there is great diversity not only across industries but also across individual market niches and individual providers. A general “archetype” might not exist, and the creation of a functional, pertinent and useful automation tool may be a possibility just at individual firm level. On the other hand, a topic such as contract duration and termination can be modeled more easily, as there are just a handful of different ways to agree on such matters, and few variables are at play: whether the agreement is fixed term or rolling term; when it can be terminated and how long is the notification period; whether option or renewal terms are included; when option terms should be triggered. Price and payment models may vary across industries, but also in this case the variables at play are recognizable (e.g. fixed “lump-sum” price or based on performance or hours; whether there are predetermined installments; whether there are key performance indicators affecting the price and how; etc.). The need for quantitative or at least categorical data as the input of the automatically generated visualization also implies that such tools might not be suitable for creating more depictive visualizations, such as icons (in which the meaning or the “essence” of the information, rather than its logic, is conveyed).
- ***The introduction of automation tools for contract visualizations may change some aspects of the process of contract design.*** For instance, it could support more cooperative negotiations:

the parties can generate different visualizations by inputting different values, and by discussing these different alternatives, settle on mutually beneficial solutions. Comparison of different scenarios is facilitated because the style of the visualizations remains similar, and attention can be devoted to compare how they differ. Figure 4.22 provides an example: since the two representations share the same visual pattern (bar chart/timeline hybrid), it is easy to comparing them. For instance, one may notice that the alternative on the left represents a supplier-friendly choice (the total cap for liquidated damages is lower, and can weekly increments in the liquidated damages are smaller), while the one on the right is more buyer-friendly (the supplier is penalized more severely for delay, and the maximum amount of payable liquidated damages is higher). If the parties were seeking to agree on balanced terms, the visual comparison could provide support to modify the variables at play and find a solution that is equitable for both supplier and buyer. Visual comparison may also allow contract creators to test whether the intended meaning of the clauses is conveyed: by showing texts paired with their automatically generated visualization to colleagues or clients, contract creators can “user test” that the clause is interpreted in the same way as the picture and vice versa. Improvements to the text of the clause can thus be made during negotiations, before it causes costly misunderstandings to the parties.

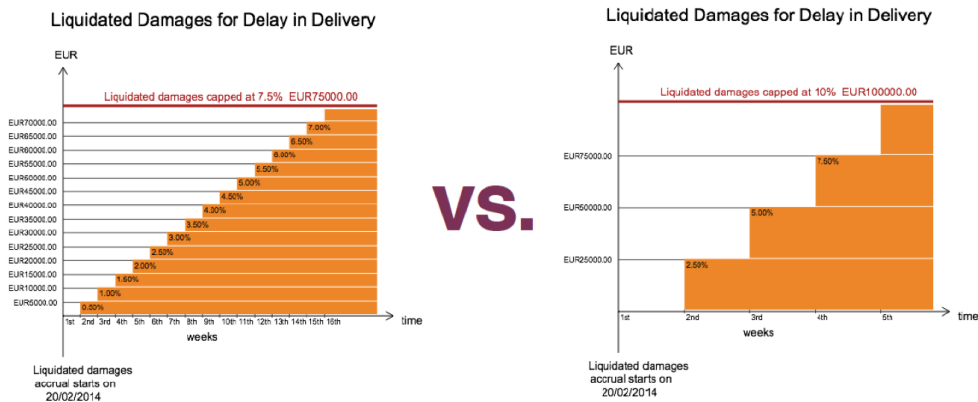


Figure 4.22. Example of two automatically generated visualizations, showing two alternatives to agree on liquidated damages for delay in delivery

5. Discussion and Conclusions

The goal of this study was to explore the emerging topic of contract visualization, test its potential benefits quantitatively, and in general expand understanding of the phenomenon from both a practical and a theoretical perspective. The dominant finding is that contract visualization has indeed a number of positive cognitive and emotional effects: it increases document comprehension, it improves user experience of contract use, and it contributes to building shared understanding and more collaborative relationships across professional domains and between organizations.

In the following section, I summarize and discuss the research results in relation to the four research questions driving this study (Figure 5.1). I then proceed to discuss the theoretical and practical contributions of the findings. This section is followed by an evaluation of the scientific quality and limitations of this study. Lastly, I suggest possible future avenues of research.

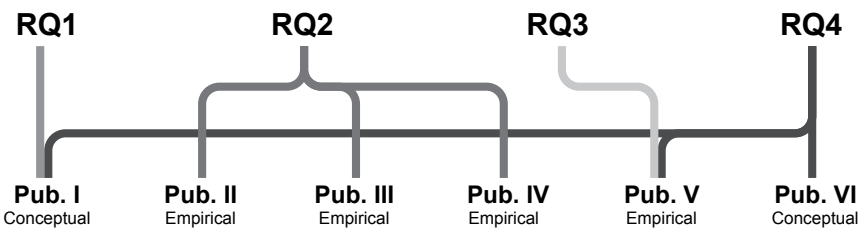


Figure 5.1. How the findings of this dissertation provide answers to the research questions

5.1 Discussion of the Findings

RQ 1 *What types of visualization are suitable for representing the types of information encoded in contracts?*

Publication I reviews extant literature and examples of contract visualization, and offers a number of visual representation patterns which have been consistently found to be used in contract documents, contract guides and manuals, and even in supporting materials and sketches used in planning and negotiating contracts: timelines, flowcharts, tables, swimlanes, companion icons, and delivery diagrams. These visualizations allow encoding and visually repre-

senting some typical types of information recurrently found in contracts, such as:

- Sequences of events and timeframe duration – information contained, for instance, in terms and termination clauses – can be represented by timelines.
- Processes with alternative decision points or outcomes, and exceptional scenarios – information signaled by typical words found in contracts such as “unless”, “if ...then”, and “notwithstanding” – can be represented by flowcharts.
- The transfer of risk and cost from supplier to buyer upon delivery, and where and how delivery can be considered successfully completed – information contained, for instance, in delivery term clauses – can be represented by delivery diagrams.

The last three visualization patterns, companion icons, tables, and swimlanes, can be used in various situations and are not methods specifically for encoding a particular type of information (e.g. bespoke icons can be created to represent various concepts). Rather, these patterns are suitable for supporting typical tasks performed when reading contracts:

- Since contracts are typically long, set in an undifferentiated layout, and contain lots of information, visual searches for relevant information can take time. Companion icons create visual cues to localize salient information more easily.
- Contracts may contain descriptive information about a range of related items, categorized according to a number of characteristics. For example, a multilateral agreement can describe the rights and obligations of different parties in regards to a certain contractual issue (say, intellectual property). Tables help to structure this type of descriptive information by categories, aiding search and comparison of information.
- Contracts encode the responsibilities, rights, obligations, and prohibitions of each party. Swimlanes organize the information which is relevant for each party (including shared responsibilities) more clearly, so that the reader can filter out information that is not relevant more easily, and decrease cognitive overload.

Haapio and I argue against a normative and expert-driven categorization of visualizations, as we consider that a *pattern language* approach (Alexander C. et al., 1977; Alexander C., 1979; Waller & Delin, 2011; Tidwell, 2014) – typically used by design and technical professionals, such as interaction designers and programmers – offers a more robust and expandable solution. Patterns are model solutions to recurrent problems. They emerge from practice, are tested through it, and eventually spread as best practices if they are effective in solving their users’ problems. However, they do not dictate exactly how they should be implemented: they are based on heuristics and imitation-with-variation rather than on formal rules. Haapio and I focused only on the six

patterns for which we found evidence of wider application. While all these patterns have appeared in the visualized contracts featured in the other publications included in this study (Table 5.1), they have also been used by other authors and practitioners. Even though we have experience of other viable visualizations, we argue these are the most fundamentally applicable to contract information.

A pattern-based conceptualization also offers another important advantage: it stresses the indispensable fit between problem and solution. Visualizations are not categorized as different techniques/patterns because they look different and are based on a different visual syntax, but because they solve different problems.

It is tempting to try to identify the most effective form of visualization. However, this is an ill-framed question: each visualization is a solution used for a different purpose, and in most cases they are not interchangeable. It is thus misleading to think about a “best type of visualization” in absolute terms. As I argue in Publication IV, the comprehension levels eventually afforded by various visualizations (and other presentation methods, such as prose) need to be always considered as relative to the task at hand. This line of thought is aligned with current cognitive psychology principles and hypotheses, for instance the representational correspondence principle (*“effective diagrams depict information the same way that our internal mental representations do”*, Chabris & Kosslyn, 2005 p.40) and the impact of external representation on mental model formation³⁰.

Table 5.1. Summary of visual representation patterns appearing in the contracts examined in the empirical studies of this dissertation

Pattern	Appears in
<i>Timelines</i>	Publications III, IV, V, VI
<i>Flowcharts</i>	Publications III, V
<i>Delivery diagrams</i>	Publication IV
<i>Companion icons</i>	Publications II, III, V
<i>Tables</i>	Publications III, V
<i>Swimlanes</i>	Publications III, V

³⁰ Mental models are formed on the basis of internal problem representations, mental representations which possess a quasi visuo-spatial nature. External representations encode conceptual information spatially, and thus influence how internal problem representations are formed, which in turn affect mental model formation (cf. Schnotz & Bannert, 2003).

RQ 2 *To what extent do visualizations enhance the comprehension of contract documents among their intended users operating in an everyday, non-adversarial organizational scenario?*

RQ 2.1 *What individual characteristics of contract users (e.g. expertise, educational background, cognitive style...) may affect the possible comprehension benefits of visualizations in contracts, and to what extent?*

RQ 2.2 *Do contextual characteristics, such as contract type and contracting situation, affect the possible comprehension benefits of visualizations in contracts, and to what extent?*

RQ 2.3 *To what extent do those same visualizations improve the perception and experience of interacting with contracts among their intended users?*

The findings of my quantitative studies (Publications II, III, and IV), confirm that the presence of visualizations in contracts and contract guides significantly improves comprehension accuracy in speed, as assessed through controlled comprehension tasks. These results are in line with early empirical studies on the subject (Passera, 2012; Passera & Haapio, 2013a; Passera, Pohjonen, et al., 2013; Mamula & Hagel, 2015). The effect was consistently found across different user types (contract professionals in the private sector, civil servants, and university Master's students) and contract types (B2B, B2G, B2C), even though the effect size differed.

These differences in effect sizes do not provide a clear explanation on the basis of the evidence at hand. However, I suggest a number of factors (document length, intrinsic difficulty of the document, and familiarity with the document – which I did not control for in my studies) that could explain these differences, and should thus be included in future studies. In Publication IV, even though the participants were all contract experts, their results are comparatively worse than those of the general public (Publication II) and civil servants (Publication III). It is to be noted that this group of research participants had to complete the comprehension test using a much longer document (7890 words, versus 3160 words in the JYSE terms and 4189 words in the tenancy agreement) which they had never seen before, and the subject of which may have not been in line with their typical competencies (e.g. some participants may have been very familiar with, say, IT contracts, but had never seen or negotiated an equipment purchase contract). The civil servants, in comparison, had the advantage of being at least familiar (if not well-acquainted) with the JYSE terms – as they revealed in the qualitative group discussions carried out after the comprehension test. The Master's students, instead, had the advantage of using a rather short agreement, which was not at all intrinsically complex in terms of subject matter (civilized living in a shared building) and concepts (mundane housing-related words, rather than technical terms of art).

The effects of familiarity, intrinsic difficulty of the content, and contract length, however, may emerge only by comparing and contrasting the results of different studies, and including them in a quantitative analysis of effects at both within- and between-cases levels. However, some difficulties may arise in reliably operationalizing concepts, such as intrinsic difficulty and familiarity.

In regards to individual characteristics (e.g. age, educational background, years of experience, cognitive style), no interaction effect was found, confirming that contract visualizations are effective and valuable for a variety of potential users. These results suggest, in particular, that cognitive styles may not play a fundamental role in affecting comprehension within realistic, complex scenarios, as the tasks and information at hand may require the use of various cognitive resources at the same time. This adds to the current evidence against the so-called “meshing hypothesis” – according to which best instruction is given in a format that matches the individual’s cognitive style (Pashler et al., 2008).

However, a single interesting interaction effect was found in Publication IV: an interaction between native language and experimental treatment. Native speakers of English tended to be significantly more accurate (but not faster) than non-native speakers in answering comprehension questions using the text-only version of the contract. However, both groups performed equally well using the visualized version of the contract. Both groups were significantly more accurate than their respective control groups, but the effect was significantly stronger for non-native speakers of English. This suggests the suitability of contract visualizations in a global business setting using English as its lingua franca, as it allows non-native speakers of English to understand better and be more effective in their work.

Lastly, Publications II and III address the issue of user experience, and whether the faster and more accurate comprehension translates into an overall better experience of use. As any empirical researcher would know, what people say and what people do is often sharply at odds: it is not unheard of for individuals involved in usability testing to fail their tasks and yet reporting, post-test, satisfaction with the tested product³¹. The results suggest that the experiential gratification (hedonic qualities) derived from using the visualized contract is significantly higher than using a traditional, text-only contract. At the same time, the results show a moderate increase (significant in Publication II, and trending towards significance in Publication III) in the perceived usefulness, utility and functionality of contracts (utilitarian quality) when they contain visualizations. Publication III also indicates that research participants experienced a higher positive affect (the subjective experience of positive emotions) and a lower negative affect (the subjective experience of negative emotions) when using visualized contracts, as compared to using text-only contracts.

The qualitative interviews conducted in Publication III confirm the quantitative results obtained in that study – civil servants did enjoy and preferred a more visual approach in contracts – and helped explain the reason of the com-

³¹ For instance, studies show that only a modest correlation of circa $r = 0.16$ exists between user effectiveness in performing tasks (e.g. measured as error rates) and post-test evaluations of user satisfaction (Hornbæk & Law, 2007; Sauro & Lewis, 2009).

paratively small increase in perceived utility (as measured through the UT subscale) between the text-only and visual versions of the JYSE document. In fact, most civil servants were of the opinion that the JYSE Terms & Conditions were not very functional and usable, because there was a lack of strategic guidance and training – at the institutional level – on how to apply them or eventually modify them to obtain better procurement deals.

RQ 3 *How and why do contract creators use contract visualizations in contract documents (or as a support for the contracting process, and in explanatory guides and materials about contract documents)?*

RQ 3.1 *What knowledge-related problems are contract creators trying to solve by employing visualizations in contracts?*

The findings of the qualitative study (Publication V) illustrate how contracts do not only play the role of a legal safeguard in the eye of their creators. Contract creators can take a strategic look at contract design, and use it as a way to further clarity, aid sensemaking, and frame burgeoning business relationships in terms of collaboration.

From a knowledge perspective, the contracting lifecycle presents some of the challenges typical of highly cross-professional settings, which Carlile (2002; 2004) has recognized as pragmatic boundaries: differences in common language, meanings, and practical priorities make it difficult for different parties to align interests and negotiate trade-offs. The specific knowledge embedded in the practices and communities of different professional domains can be a barrier to collaboration, but it can also become a source of innovative thinking if properly managed (Carlile, 2002). As an example, the sales team at CartaFirm felt that the quality of the service solution they would deliver was directly affected by the level of their understanding of the needs and overall business vision of their clients. For this reason, it became their goal to develop effective ways to elicit that knowledge and translate it into desirable service offerings – for instance, by using visual service maps to discuss the scope of the service, and by using swim-lane charts to negotiate a desirable division of responsibilities between their outsourcing organization and the customer.

In this sense, the visualizations acted as *boundary objects* (Star & Griesemer, 1989), pragmatic tools with the ability to aid knowledge elicitation, representation, and transformation in the presence of pragmatic knowledge boundaries (Carlile, 2002; 2004). At the same time, the visualizations could be seen as *con-scription devices* (Henderson K., 1991), which made it easier for business managers, engineers, and other communities of “non-lawyers” to contribute to and engage with contract documents.

As to *how* these visualizations (or visual templates) worked as knowledge artifacts, two mechanisms emerged: clarification and framing. Information clarification acts as a collaboration-supporting strategy, addressing the need of overcoming knowledge gaps between different professional groups and across organizations, along a complex process often disrupted by time gaps. The use of arti-

facts as tools to transform knowledge and create common ground, allowing collaboration in cross-professional and knowledge-intensive processes, is consistent with previous research (Carlile, 2002; 2004; Bechky, 2003). The overall aim of negotiating and contracting is to decrease ambiguity through a progressive process of formalization and sensemaking (Vlaar et al., 2006), so that the parties can understand each other, the context, and their common goal, and thus create a basis for concerted action. As to how visualization contributes to decreasing ambiguity, previous literature suggests two ways: on one hand, it helps to elicit and generate knowledge (e.g. Bresciani & Eppler, 2009; Eppler et al., 2013;), which helps to fill existing gaps in the parties' understanding. On the other hand, it provides focus and helps to manage interactions (e.g. Alexander E. et al., 2013; 2015), so that the discussions are kept as effective and efficient as possible, and can be memorialized straight away. All in all, the rationale for contracting parties to use contract visualization dovetails with what is hypothesized in knowledge visualization literature: the perceptual affordances of visualizations can be employed to support cognition, communication, collaboration, and other knowledge-intensive processes in groups (Burkhard, 2005; Bresciani, 2011) and across professional boundaries (Eppler, 2007; Eppler & Bresciani, 2013).

The findings on framing effects are consistent with previous findings in recent contracting literature, but also extend these ideas to the material and visual aspects of contract documents – which are “sources” of framing as much as language and specific contract clauses are. The sales team in charge of the contract sought to induce a proactive contract framing (cf. Weber & Mayer K., 2011) from the very beginning of the negotiations, as they expected, from experience, that flexibility and cooperation were indispensable relational features needed for a successful outsourcing deal and its implementation. The framing effect of visualization played at both a global document level and a local clause level. At a global document level, the very use of visualizations was used to signal CartaFirm's willingness to invest extra resources in coordination and communication efforts. At the local clause level, visualizations were used to increase the salience of customers' benefits and gains as compared to costs (for instance, this was a crucial issue in conceptualizing and communicating CartaFirm's pricing model). These framing efforts can be interpreted as an attempt to deliberately project trustworthiness (cf. Bertrandias et al., 2010), by affecting the customer's judgments both at an emotional level (better look and feel of contracts, impression of openness and commitment) and a rational level (using the visualization to drive better, more focused discussions, as well as demonstrating CartaFirm's expertise) (cf. Lumineau, 2014).

RQ 4 *What approaches can facilitate contract creators in selecting, creating, modifying, and deploying visualizations in contracts?*

The answer to this research question can be found in Publications I, V and VI, as each provides an alternative approach to support contract visualization adoption.

The first approach is that offered by *design pattern libraries*. In Publication I, Haapio and I argue that a normative and rigid categorization of visualization techniques is counter-productive because it would limit scholars and professionals in discovering and proposing best practices to real, recurrent communication problems in contracting. For this reason, we stress the need to adopt a *pattern language approach*, where model solutions to recurring problems emerge from use, and are reused over and over again because of their effectiveness, even though this repetition is never a mere copy-paste, but an adaptation (Alexander C. et al., 1977; Alexander C., 1979). Patterns evolve as robust, tested practices in use, and can eventually be collected in pattern libraries, collections of solutions which allow easy aggregation and sharing of effective solutions created by and for a community of practice (e.g., Pan & Stolterman, 2013; Tidwell, 2014; Waller & Delin, 2011). The pattern library approach facilitates a gradual, robust, and common accumulation of knowledge, so that practitioners can find inspiration and solutions to readily apply. Moreover, pattern libraries can be further tailored to the needs of a specific organization, which can develop its own coherent in-house elements of document design style.

The second approach, which is complementary to that of pattern libraries, is that of *visual templates*. The concept, discussed in Publication V, was developed by the research participants themselves, and it indicates visualizations created in a modifiable and editable format, so that they can be flexibly used in slides and contract drafts during negotiations, and then crystallized as un-modifiable images to be included in the contract document. While a pattern library may as well be composed of ready-to-use visualizations stored as editable code or file formats, the concept of visual templates underlines the continuous and consistent use, throughout the contracting cycle, of a given visualization. In this sense, the visualization becomes a tool to discuss and represent a certain topic. Its benefit is not only that it is reusable across several contract negotiations, but also that it offers a scaffold to frame complex discussions around key topics within every single negotiation. Moreover, in comparison to patterns, visualizations used as visual templates may be highly idiosyncratic and organization-specific, as they may be developed to represent the specific contract scope, business model, KPIs or pricing model of a given offering. However, visual templates and patterns are highly complementary, and may exist in a nested fashion. For example, a visual representation pattern may be used as part of the visual template, as in the service scope map presented in Publication IV, which is an application of the companion icon pattern. Over time, if the idea of a service scope map is found to be a useful tool to solve the recurrent problem of communicating complex modular services to new customers, it may become a *composition pattern* (Haapio & Hagan, 2016) – a functional document element which plays a specific role in structuring it (other examples of patterns belonging to this category include tables of contents, executive summaries, terms sheets, and checklists). The concept of visual templates is also consistent with previous research by Whyte and colleagues on the role of visual representation in knowledge-intensive, cross-professional, team-based project-work. Those studies show how the continued interaction with an evolving “cascade” of visual rep-

representation during a project helps participants to develop and foster understanding (Whyte et al. 2016). The meaning and identity of the “epistemic object” (what the community is working on) unfolds over time with the help of visual representations, which at the same time elicits and captures this conceptual evolution (Ewenstein & Whyte, 2009). In the same way, visual templates are designed to evolve over time, as they help the contracting party envision their deal.

The third approach is that of *automation*. As contract assembly software has become more and more common in legal departments and law firms dealing with a high volume of contracts (ILTA, 2011; 2013), my co-authors and I sought to explore, in Publication VI, if the same approach could be used not only for text clauses, but also for their visual representation. We discovered that the current questionnaire-like input interfaces of contract assembly software (Lauritsen, 2007) can be used to gather the relevant information at the same time to model not only text, but also the accompanying explanatory visualizations. By extending the functionality of current contract assembly software from text only to text and visualizations, the hurdle to adopting contract visualization practices in organizations would be reduced: creating visualizations would not require extra time and effort, and the users could be sure that the clause text and visualization created at the same time were accurate and consistent with each other. The idea of design patterns is relevant also in automation, as the shape of the outcome generated by the software needs to be modeled in advance for consistent results. The chosen pattern needs to be flexible enough to visually vary in response to different data input, but should also be robust enough to always maintain a recognizable format.

5.2 Theoretical Contributions

Through its approach and contributions, this study answers the call for a broadening of the research questions asked in either legal or organizational studies of contracts (Smith & King, 2009), and an increase in research on social and psycho-cognitive “microdynamics of contracting” (Lumineau, Fréchet and Puthod, 2011).

Firstly, this study contributes to the emerging *contract visualization research stream*, situated within the *PPL literature on contracts*. Previous literature theorized several benefits of contract visualizations, such as improving contract comprehension (Berger-Walliser et al., 2011; Haapio, 2011; Mahler, 2013; Haapio & Barton, 2016), improving perceptions, experiences and relationships between the parties (Rekola & Boucht, 2011; Barton et al., 2013), and supporting cross-professional and inter-firm collaboration, communication, and knowledge sharing (Barton et al., 2013; Berger-Walliser et al., 2011; Plewe & de Rooy, 2016; Pohjonen & Koskelainen, 2012). These topics have been empirically studied only in a handful of studies, which, however, present methodological limitations that affect their validity. For instance, one study found that the presence of visual elements increased the time spent reading end-user license agreements, so that any improvement in comprehension levels might

have been a direct function of increased reading time (Kay & Terry, 2010). Another study claimed improvements in comprehension, but it tested only a very small part of the agreement (Mamula & Hagel, 2015). Lastly, other studies employed small participant samples and insufficiently thorough statistical analysis (Passera, 2012; Mamula & Hagel, 2015). In addition to these quantitative studies, a handful of qualitative studies exist (e.g. Jones & Oswald, 2001; Rekola & Boucht, 2011; Keating & Andersen, 2016), but the evidence they offer is borderline anecdotal: this is because of a lack of rigor and transparency in describing their data collection and analysis, and in how their conclusions were obtained.

This study employs a mixed method approach aimed at overcoming these methodological issues, as well as ensuring a rich enough conceptual elaboration of the phenomenon. On one hand, the experimental design (Publications II, III, IV) allows for rigorous control and testing of variables, providing reliable evidence for the positive effects of contract visualization in improving comprehension and user experience. On the other hand, the exploratory single case study design (Publication V) furthers the current understanding of contract visualization in practice: how it is used and adopted, and for what purposes. In particular, the case study helps to identify and conceptualize two key effects of contract visualization. Firstly, it confirms that the *clarification* effect of contract visualization – the ability to increase comprehension and reduce ambiguity in contract interpretation, already observed and quantified in the experiments – is actually desirable and sought after in an organizational setting. In fact, contract creators, users, and stakeholders strongly feel the need to manage information overload and increase cross-professional understanding and collaboration around contracts. Secondly, the study reveals the *framing* effect of contract visualization: visual representations of contract contents can be used to elicit desirable impressions, signal commitment, influence sense-making, and ultimately induce collaborative relationships and behaviors.

These findings on the effects and roles of contract visualization also contribute to an emerging research stream of *contracting research within organizational studies*, which focuses on *psychological effects* (Weber K. & Mayer, 2011) or *psychocognitive dimensions* (Lumineau et al., 2011) of contracts. This stream of research demonstrates how different types of clauses or simply different ways of framing contract content and wording affect the emerging type of relationship between the parties (Weber & Mayer K., 2011), levels of trust (Bertrandias et al., 2010), negotiation outcomes (Ariño et al., 2014), and levels of conflict (Schilke & Lumineau, 2016). This study contributes to the research stream in two ways. On one hand, it provides empirical evidence that framing effects exist “outside the laboratory”: negotiators and contract creators deliberately seek to frame information in ways that are more likely to foster collaborative, open, and value-maximizing relationships (Publication V). On the other hand, since framing effects are also found to be induced through visual (re)presentations of contract content, it implicates the necessity to expand the definition of *contract design*. Traditionally, contract design has been intended mostly as the choice and matching of safeguard, incentive, and en-

forcement mechanisms in relation to transactional attributes (cf. Schepker et al., 2014). Research on the psychological effects of contracts necessarily enlarges this definition: contract design is *also* the choice of specific contract provisions to be included in contract documents, and how they are framed and actually written (Weber & Mayer K., 2011; Weber et al., 2011; Bertrandias et al., 2010). The results of this study open the definition of contract design even further, since *actual document design choices* (e.g. layout, inclusion of visualizations, document structure) have an impact on how contracts are understood, perceived and used. Contract design, then, is *also* the deliberate and strategic design of contract documents, with the purpose of enhancing comprehension, knowledge interactions, and collaboration within the contracting lifecycle (Publication I).

Lastly, the results lend themselves to being interpreted from a *knowledge-based and practice-based perspective*. Contract visualization helps create perceptible affordances (Gaver, 1991) of what functions a contract and its provisions have, and decrease the cognitive load (Sweller, 1994) associated with understanding them: in so doing, visualization helps its users in making use of the information and transforming prescriptions into actions. In this scenario, visualization enables and constrains contract users' understanding and what they are going to do with it. "What people do with contract documents" during the contracting lifecycle, from an analytical point of view, can be conceptualized in terms of knowledge practices. At every step of the contracting lifecycle, the involved actors try to create, access, share, validate, and apply knowledge. Knowledge is necessary to decrease the unavoidable ambiguity marking the beginning of new business relationships (cf. Vlaar et al., 2007), as well as to coordinate various actors – belonging to different professional communities – during contract creation and implementation. Publication V illustrates many of these knowledge-intensive complex interactions in contracting, and their typical challenges. For instance, sales managers need to elicit and understand the customer's values, needs, culture, and expectations (different types of tacit knowledge) to tailor a suitable service scope and pricing model: if the offering does not match the need, there will either be no deal, or dissatisfied customers down the line. Legal and business professionals need to contribute their disciplinary knowledge during contract creation, collaborating across cross-professional boundaries, as each community has developed better capabilities to deal with different contractual issues and functions (cf. Argyres & Mayer K., 2007; Mayer K. & Argyres, 2007). If either "repository of knowledge" is not involved early enough, there is the risk of creating contracts which are "misaligned" with business and transactional goals. Negotiators need to memorialize the deal in contract documents, appendices, and supporting materials in ways that are understandable and actionable for the implementation teams and project managers tasked to deliver on the promises made to the customer: if these materials feel like irrelevant and unusable "legalese" they will simply be ignored, and valuable insights potentially lost.

Visualizations play a role in mediating and supporting intensive and complex knowledge interactions (e.g. eliciting, creating, sharing, integrating, trans-

forming, and applying knowledge), and overcoming the gaps in understanding and collaboration existing across disciplinary and organizational boundaries. Visualizations act as tools to elicit missing relevant knowledge and articulating the deal around key factors and decisions to be considered (e.g. the visual templates used during negotiations in Publication V). At the same time, they clarify ambiguous information and constrain possible interpretations across different individuals and professional communities (Publications II, III, IV). This dichotomy between the *restrictiveness* and *elicitation* afforded by visualizations emerged also in my review of extant knowledge visualization literature (e.g. Alexander E. et al., 2013; 2015; Bresciani & Eppler, 2009; Eppler et al., 2013), and helps to clarify the indispensable role played by visual artifacts in facilitating knowledge-intensive interactions (e.g. communication, knowledge elicitation and creation, knowledge transfer and transformation) within processes requiring cross-professional collaboration.

The implication of interpreting contract visualizing as a knowledge practice and contract visualizations as knowledge artifacts within organizations is an expansion in the theoretical vantage points from which we study contracts and contracting. The predominant “TCE-view of contracts” offers limited understanding on contracts-as-artifacts: mostly, it concentrates on transactional features as *antecedents* affecting the frequency of certain clause types (Ryall & Sampson, 2009) or contract complexity³² (Poppo & Zenger, 2002; Reuer & Ariño, 2007). As Schilke and Lumineau point out, little insight is offered about the *consequences* of contract design (2015).

The point of departure for finding alternative theoretical lenses to understand contracting can be initially identified in the work of Mayer K. and Argyres, who recognized contract design capabilities as a potential source of competitive advantage (Mayer K. & Argyres, 2004; Argyres & Mayer K., 2007). Later research on the psychological research of contracts (Weber & Mayer K., 2011; Weber et al., 2011; Bertrandias et al., 2010) seems to confirm this view, as the ability to frame contracts and create the right type of relational bonds with the counterparty can ultimately affect the success of the transaction. My research continues in this “resource-based” vein, but in a significantly different manner: past research implies that contract design and framing capabilities provide a competitive advantage in terms of better *governance of transaction costs* (cf. Argyres & Mayer K., 2007). Conversely, my research focuses on different issues: what “problems of understanding” (cf. Vlaar et al., 2007) exist in the contracting process, with negative consequences in terms of non-compliance, non-delivery, customer dissatisfaction, and possible legal conflict? What is the role of contract visualization in preventing and ameliorating these problems by supporting the knowledge-intensive interactions of contracting?

³² Contract complexity is often just superficially operationalized as contract length and subjective evaluation of the level of customization and amount of legal work that it required (Poppo & Zenger, 2002), or as composite measures based on the presence and amount of safeguard clauses (Reuer & Ariño, 2007). Hagedoorn and Hesen (2007) correctly point out that these objective/structural measures are insufficient, and must be integrated with user-based measures reflecting the cognitive load experienced by contract users, as well as their actual level of comprehension.

I suggest that a *knowledge-based view of contracts* is a more suitable theoretical lens for investigating *contracts-as-artifacts* (Suchman, 2003) and the cognitive, psychological, and social effects of their design at a micro-level of analysis. This theoretical stance also allows a closer interfacing between organizational contracting literature and PPL, because the knowledge-based view calls for an interpretation of organizational phenomena “grounded in the concept of organizational advantage” rather than in market failure and opportunism (Nahapiet & Ghoshal, 1998, p.256). Under this view of the firm, contracts, contracting, and contract design capabilities would be recast in positive terms – as already seen in the PPL paradigm: from mechanisms of governance and safeguards envisioned to limit opportunism and penalize transgressors, to managerial-legal tools to secure success and prevent conflict (Siedel, 2002; Siedel & Haapio, 2010; 2011; Haapio 2006a; Haapio, 2013a).

5.3 Practical Implications

This study targets a problem – that of contract comprehension and effective contract design practices – which is fundamentally practical, and aims at providing insights and recommendations, based on scientific knowledge, to help organizations innovate their contracting practice. This work offers a number of readily usable visualization patterns and the rationale for their application (Publication I), as well as examples of contract visualization in real documents (Publications III, IV, V), so that practitioners can get inspiration and tools to start their own experimentations (and eventually scale them up through pattern libraries and automated assembly tools). Moreover, evidence of contract visualization benefits (increased information comprehension, improved user experience, and positive influence on relationship development) offers organizations a solid basis for deciding to adopt contract visualization practices.

These readily usable results have, however, further implications. Firstly, they show that contracts do not need to fulfill the negative expectations contract professionals currently hold (IACCM, 2015a; 2015b): contracts can be more understandable and useful, and less alienating, if their content and presentation are designed around the needs and tasks of organizational users. Contract visualization helps to decrease the cognitive effort needed to make sense of these documents, while signaling at the same time that these are *not* traditional contracts created by lawyers for lawyers. By using visual representations familiar to business audiences such as timelines, tables, and flowcharts, visualized contracts present themselves as business documents, rather than legal ones, encouraging managers to engage early in their creation as well as making use of them during implementation. From a “within the organization” perspective, it is in the interests of legal departments and business units to develop tools to communicate and collaborate more effectively, so that the organization becomes better capable to satisfy its customers and drive the performance of its suppliers.

From an “across organizations” perspective, simpler and more appealing contracts contribute to improving the customer experience. Contracts are currently underdeveloped customer touchpoints. Most contracts share the same bureaucratic style, impersonal tone of voice, and undifferentiated layouts even though they may be created by very different organizations. An opportunity is lost to reinforce the organization’s brand promise and influence the customers’ perceptions of value and levels of trust. In the current trend, where customization around customers’ needs is crucial, and experiential and relational factors play an important role in differentiating firms and allowing them to compete, all organizational functions – including the legal department – should ask what customer-centeredness may mean for their operations.

Secondly, contract visualization practices should be of particular interest for global businesses, where negotiations and internal cooperation are further complicated by cultural and language barriers. Currently, global organizations operate in English, the *de facto* lingua franca of business. Quite often, English is used even though nobody around the negotiating table is a native speaker. Contract visualization can help organizations conduct global transactions more effectively and efficiently, minimizing the risk of misunderstandings. As we suggest in Publication IV, visual skills should be part of the pragmatic communicative toolbox of the skillful global business communicator, who is required to make use of whichever media, modality, and communication resource “gets the job done”.

Thirdly, this study suggests three approaches for organizations to start implementing contract visualization practices: design patterns, visual templates and automation. Each of these approaches has merits, and each may be more suitable in different organizational situations. A large company dealing with the creation of a high volume of contract documents may have the resources, the knowledge, and the interest to develop a bespoke automation tool for its purposes. An organization facing a considerably lower volume of contract documents may not wish to invest in an automated solution, but may resort to visual templates and pattern libraries at a fraction of the cost, and distributing the development efforts over time – since solutions could be developed one step at a time, as responses to specific problems encountered.

Fourthly, emerging technological advances such as blockchain, artificial intelligence, and automation are bound to profoundly change what contracts are in the coming years, and how they are created, managed, monitored, and even executed. As contracts evolve to become machine-readable, there will be a greater need to ensure that they remain also human-readable. Currently, contracts are hard to understand because their language is overly technical, and their “ownership” belongs to the legal department. Substituting “legalese” with code, and shifting the ownership to software engineers will not solve the current problems of understanding: negotiators still need to envision and agree upon the “variables” and “parameters” that will populate a smart contract, and human agents may still play a role in understanding what was promised and implement the contract (or monitor smart contracts’ self-implementation). These profound changes – if anything – will require even better multimodal interfaces to envi-

sion, create, interact with, and manage contractual information, especially if the main medium will be mobile- or tablet-sized screens instead of paper.

A further implication of the rising impact of technology and user/customer-centric thinking is a growing need for multidisciplinary in contracting practice and research:

“A focus on a computational context leads us to look at law from the viewpoint of software developers and to see laws as data. A business context, in turn, expands our view from data to information and knowledge and how these are designed and communicated. Visualization calls on a design paradigm, and on understanding the skills, needs, and experiences of users in order to craft information into usable visual artefacts. This contextual exploration also allows us to re-examine the nature of legal rules.” (Curtotti, Haapio & Passera, 2015, p. 455)

This change is already underway: for instance, large law firms have begun to create internal technology and design teams, which in some cases are evolving into actual legal design functions – as in the case of Houtoff Buruma in The Netherlands (Houtoff Buruma Magazine, 2017). Changes have been visible also in academia: for instance Stanford University’s Legal Design Lab is spearheading industry-university innovation projects that merge design, legal, and technological expertise to create better legal systems and services (Legal Design Lab, n.d.). Another example is Legal Design Assas, a student-driven association in Paris, France, which runs clinics, runs a magazine, and organizes conferences to help students and professionals develop design thinking and visualization skills (Legal Design Assas, n.d.). My own research collaborations, and those of some of my co-authors, also testify the need for a multitude of perspectives to grasp the problems and future developments of contracting: for instance, I am an information designer and organizational researcher; Helena Haapio is a business law scholar, arbitrator, and entrepreneur; Michael Curtotti is a lawyer and computer scientist. In particular, Haapio’s collaborations have been broad (*service designers*, Rekola & Haapio, 2009; 2011; *information designers*, Waller et al., 2016; *coders and entrepreneurs*, Wong et al., 2015; Hazard & Haapio, 2017; *educational researchers*, Haapio & Haavisto, 2005), and well illustrate the “paradigmatic shift” in mindset, practices and tools required to improve and innovate the future of contracts (cf. Haapio, 2013a).

In a scenario where contract creation, fruition, and management will progressively be mediated through digital tools:

“... expertise is not required solely to create legally binding commitments or to respond to legal challenges one contract at a time, but rather to orchestrate in advance what to put in the end user’s ‘toolbox’, and how these tools should behave, look, and feel when used in real-life situations. It takes great knowledge to create a tool that can adapt to different situations without ‘breaking’.” (Curtotti et al., 2015, p. 460).

5.4 Research Evaluation and Limitations

Given that this study followed a mixed method approach, the evaluation of its quality is based on three sets of standards (Creswell & Plano Clark, 2007): those for quantitative research and for qualitative research – each appropriately applied to the correspondent component of this research – and those for mixed method studies on their own grounds.

The quantitative and qualitative standards applying to the empirical studies included in this dissertation are discussed in detail in each publication (Publications II–V), along with limitations. Tables 5.2 and 5.3 summarize on a general level the precautions I took to ensure that I fulfilled these scientific quality criteria. Moreover, all publications have passed peer-review evaluation and have been published or accepted for publication. This offers, at least in terms of face validity, a further guarantee of the methodological appropriateness of the studies.

In regards to evaluating this study as a mixed method study, the research as a whole was designed in a rather straightforward manner, choosing a sequential design where an initial quantitative phase was then followed and expanded by a qualitative phase. Since this was not an *advanced* mixed methods research design – where the two types of data would be nested, triangulated, embedded, or transformed during analysis (cf. Creswell & Plano Clark, 2007) – the methodological rigor in each component of the study is a first guarantee of quality.

Secondly, quantitative and qualitative methods were not applied superficially or simply to cancel out their mutual weaknesses (Bergman, 2011), but each contributes to answering specific research questions that have been driving the whole research. For instance, a key result of this study (the identification of clarification and framing as the main psychological effects of contract visualization) relies on both sources of evidence: framing could only emerge and be observed through a qualitative analysis, and clarification would have remained a vague concept of undefined magnitude without a quantitative test. Similarly, the inferences I was able to draw as the final outcome of this research (e.g. suggesting that a knowledge-based view of contracts is possible and desirable) could not have been drawn nor well argued without reflecting on the results as a whole (cf. Teddlie & Tashakkori, 2006, pp. 15-16 and p. 35).

However, no study is without limitations. Let us start from the quantitative component of the research. Firstly, the research participants' samples in all three experiments could have been *even* larger to ensure more reliable and generalizable results.

Secondly, Publications II and III could have offered a task-by-task analysis in the same way that Publication IV did: in this way, I would have been able to add a more fine-grained analytical layer, and better identify the factors affecting comprehension (e.g. intrinsic difficulty of the information or the task itself) and in which cases visualizations have particular strong effects in supporting comprehension.

Thirdly, there are issue of generalizability in regards to Publication II: on one hand, it shows that contract visualization also has positive effects on the gen-

eral public, and not only on contract professionals, suggesting that contract visualization may be useful in many different contracting situations; at the same time, it is difficult to argue how the results exactly transfer to business contracts, and what important differences there might be between professional and non-professional contract users. The tenancy agreement used companion icons, but did not present any explanatory diagram, as its content was so mundane that there was little to be explained through process or time-based diagrams. On the contrary, B2B and B2G extensively used explanatory diagrams. The question of whether and when these techniques are appropriate for both audiences and for the level of information complexity they encounter remains open.

This leads to the fourth limitation: each study compares visualizations versus texts, but it does not compare *different* visualizations. In some cases (even though not always), some visualization patterns may be better at conveying the information and supporting the formation of a correct mental model (cf. discussion in Publication IV). Moreover, a pattern is just a pattern, and its actual implementation and perceptual characteristics matter: a timeline can be designed in a clear, cognitively and perceptually ergonomic way – and is thus easy to understand – but it can also be designed in a confusing, cluttered, inconsistent way – and utterly confuse the viewer (cf. Bresciani & Eppler, 2015; Bresciani, 2011). A more nuanced experimental design could help illustrating the do's and don'ts of contract visualization, and help to manage the risk of misunderstanding arising from poor design implementation.

Lastly, the replication of the experimental design in the three quantitative studies could have been carried out in a more rigorous manner. A more thorough replication would have allowed for a nested data analysis between and within experiments, and possibly offered more fine-grained and generalizable insights. While the result of the three studies are convergent and allow for triangulation, each study had to be implemented in a slightly different way from the others because of some practical factors – such as:

- In Publication III, we had to offer all civil servants a chance to try the new JYSE Visual Guide, so we were not able to simply divide them in control and experimental groups, as in Publication II and IV.
- Publications II and III could have reported efficiency measures (as the relevant data to calculate it was actually collected), similarly to Publication IV, but some practical and rhetorical factors in the publication history of the two studies made it impossible. Publication II was a conference paper and had quite stringent length limits, while in Publication III's case the reviewers encouraged me to devote more of the allotted space to reflect on the design process in public organization settings.

Table 5.2. Meeting the quality criteria for quantitative research

Reliability	<ul style="list-style-type: none"> • I used previously validated scales and tested procedures whenever possible. • When Finnish translations of scale items were needed, I used a translation/back-translation protocol to ensure that the correct meaning of the items would be preserved. • In grading the accuracy in comprehension tasks, I used an established grading rationale (Appendix 4), and when more than one rater was involved, I checked inter-rater reliability (at least a 98% level) and asked the raters to reassess together the answers they had rated differently. • Research participants were assigned randomly to experimental conditions, and raters were blind to their condition when grading the accuracy of their answers. • Whenever datasets did not meet the assumptions (e.g. normal distributions, equal variances, unequal sample sizes, etc.) required to warrant the statistical robustness of a test, I chose a robust alternative test.
Internal validity	<ul style="list-style-type: none"> • The chosen experimental research design, if rigorously conducted (use of randomization, sufficiently large samples, control groups, replication), has a better chance of establishing a causal explanation of the results compared to other methods (e.g. descriptive methods, such as cross-sectional designs or quantitative case studies, and quasi-experimental designs). • The language of the contracts used in the experiments was the same in each version of the contracts, to avoid the introduction of language as a confounding variable. • A wide number of control variables were introduced in the analysis to confidently exclude the presence of confounding variables. • The experimental and control groups in the three experiments did not significantly differ, on average, in regards to any measured variable. In Publication II a significant difference in average age between groups was found, but further analysis showed that the variable did not confound the results. • In Publication IV, tasks and type of contract used to complete them were further randomized to avoid any learning or fatigue effect caused by the completion of the tasks.
External validity	<ul style="list-style-type: none"> • Population validity was ensured by 1) recruiting as diverse as possible individuals within each target group (contract professionals in the private sector; civil servants involved in public procurement; Master's students); 2) ensuring wide participation by organizing more than one data collection session; 3) randomizing the assignment of participants to experimental groups. • Ecological validity was ensured by 1) using authentic agreements (even though sometimes anonymized, as in Publication III); 2) realistically "matching" research participants with tested agreements (e.g. Master's students were involved in testing a tenancy agreement for student apartments); 3) by designing comprehension tasks that would be as practical as possible and reflect legitimate doubts that a user might have in context; 4) by verifying with experts in each context that the comprehension tasks were plausible in content and understandable in form.
Generalizability	<ul style="list-style-type: none"> • Three experiments in three different contexts were conducted, and although there are differences in effect sizes across contexts, the results seem to converge.

Table 5.3. Meeting the quality criteria for qualitative research (based on criteria by Lincoln & Guba, 1985)

Credibility	<ul style="list-style-type: none"> • I engaged with the research setting and participants for over two years. • I carried out “member checks” with research participants: I asked them in person, email, or on the phone to verify that their thoughts were correctly represented in my notes and analysis, and that they found the emerging interpretations plausible. • Co-authors (since they were not directly involved in the bulk of data analysis, after the interview phase) were involved in discussing the emerging interpretations. • When possible (e.g. interviews, feedback meetings), data was audio recorded and transcribed, and complemented with written notes taken during the occasion or immediately after. • Various data sources were employed (individual interviews, participant observation in feedback meetings, written comments on service blueprints, various versions of contract visualizations being developed).
Transferability	<ul style="list-style-type: none"> • The context of the research was described as thoroughly as possible, within the given limitations of a journal article. • The research process was described as thoroughly as possible.
Dependability	<ul style="list-style-type: none"> • The analysis was materialized in a visible thematic structure, which links themes, sub-themes, and verbatim data excerpts. • Preliminary interpretations of the data were also materialized through visible representations that allowed better discussion and more effective member checks (e.g. service blueprints, prototypes of visualizations).
Confirmability	<ul style="list-style-type: none"> • “Member checks” with research participants were carried out to verify that their thoughts were correctly represented, and that they found the emerging interpretations plausible. They read and approved Publication V’s manuscript before we submitted it to a journal. • The plausibility of the emerging themes and analysis was verified with the co-authors. Since they were not directly involved in data analysis after the analysis of the pre-design interviews, they were able to provide a detached (yet scholarly informed) perspective.

The qualitative study also presents a number of issues. Firstly, the initial intent of the research – follow a sales team while they develop contract visualizations and start using them “in the real world” – had to settle for a more modest objective – follow a sales team while they develop contract visualizations. The adoption and deployment of contract visualizations was much slower than initially expected, and at follow-up the team did not have enough relevant data on how contract visualization was working with customers – even though the initial impressions were good. Doing field research on contracts is always challenging, as they are sensitive and confidential materials for organizations. Moreover, getting research participants to agree to observations (and possible recordings) of actual negotiations is very hard: their priority is to manage customers’ impressions and confidentiality, as well as to minimize any disturbance that may negatively affect the negotiation. Additionally, most of these

negotiations happened around the world, and, even if I had obtained permission to shadow the negotiators, there would have been no budget to actually carry out such an ambitious travel plan.

Secondly, it would have been ideal to collect more data, in more occasions, during the research process. This would have increased the trustworthiness of the results, and helped to paint a richer, more fine-grained picture of the contracting challenges and developmental ambitions at CartaFirm. However, there were severe practical hurdles to carrying out what Lincoln and Guba call “prolonged engagement” and “persistent observation” (1985, pp. 301-305). All team members were always incredibly busy, as their relatively small team was in charge of the sales of O&M outsourcing services *globally*. While they all showed a genuine interest in the topic, and were eager to co-develop new tools to make their work more effective, research participation was a low-priority item in their hectic schedules.

Thirdly, a multiple case study would have been a more ideal design to discover contract visualization dynamics in practice, compare similarities and differences, and provide an account of these possible variations. However, this design could not be implemented, as there is still only a small number of firms engaging in contract visualization, and willing to give access to researchers – for the same issues of confidentiality mentioned above. While a single case study might not answer all questions, it is already an important first step to further our understanding of contract visualization in practice.

Lastly, I could have taken more procedural precautions to ensure confirmability, such as using computer-based tools to assist in more transparent data management and analysis. Due to my inexperience with qualitative research, most of the work was done in a manual way, and not in a clearly auditable way.

5.5 Suggestions for Future Research

This study has focused on contract visualization and its benefits in terms of supporting comprehension and collaboration. It offers empirical evidence of the extent to which visualization aids comprehension, as well as exploring contract visualization as an organizational practice. In this respect, it shows the role of visualization in facilitating the complex knowledge interactions (e.g. eliciting, creating, sharing, integrating, transforming, and applying knowledge) taking place during the contracting lifecycle, and discovered that visualizations are not only used to clarify information, but also to influence sensemaking and the emergence of collaborative business relationships. Lastly, the conceptual component of the study offers an initial categorization of suitable visual representation patterns that can be used to visualize contractual information, and suggests three approaches (design pattern libraries, visual templates, and automation) to more easily implement contract visualization practices in organizations.

A first avenue for future research would be to study in a controlled manner the clarification and framing effects of all contract document design dimensions in concert – visualization, typography, language, content and infor-

mation structure. For instance, how do readers understand and perceive fair contract terms written in “legalese” and presented in a dense layout? Conversely, how would they react to exploitative terms presented in a friendly manner? These questions may help to identify more precisely (and avoid) dysfunctional contract design practices that dilute the message to be conveyed. At the same time, since contract visualization can be deliberately used to achieve framing effects, it is important to understand the possible risks arising from its misuse (for instance, intentional manipulation of the other party). This research agenda would require a multidisciplinary approach, and would help to bring closer the fields of plain language, information design, and social and cognitive psychology. The insights from this line of inquiry would not only be useful for businesses, but also for consumers. A deeper understanding of how to present information clearly and fairly could inform policymaking and help to build precise and actionable evidence-based formats for businesses to present consumer contracts, terms of use, license agreements, privacy and personal data policies, and notifications.

A second, complementary avenue for future research would take forward the qualitative approach I have illustrated in this study, exploring contract design, its dynamics, and its effects in the field. Longitudinal case studies, participants’ observations, and action research may expand our understanding of the needs and priorities of the actors involved in the contracting lifecycle, and better reveal the hurdles to and opportunities for more effective contract design practices. As contracts have more functions than merely safeguarding (cf. Schepker et al., 2014; Liinamaa et al., 2016), it would be crucial to observe how organizational actors seek to put in place these functions, and how tools and practices contribute. Additionally, this research would seek to observe and quantify the outcomes of contract design on organizational performance – not only in terms of transaction cost reduction, but also in terms of increased competitive advantage (e.g. higher quality in delivery, higher customer satisfaction and retention, reputational advantages, etc.).

A third avenue for future research would also seek to adopt a cross-cultural perspective. Even though visualization might support understanding among non-native speakers of a language (cf. Publication IV), a more fine-grained understanding of how visual representations are interpreted – cognitively and socially – within different business cultures is needed (cf. Bresciani, 2011). For instance, different cultures perceive the importance and stringency of formal contract documents differently: consequently, contract visualization might also have a smaller impact within contexts where interpersonal relationships and continuous negotiations matter more than any written commitment and plan. Also, visual signs are culture dependent, and global businesses should always strive to communicate in a respectful and context-aware manner. For example, an icon depicting a thumbs-up may be interpreted in Europe and the US as a symbol for “yes”, “approval”, or “compliance”. However, the same icon may be very offensive in the Middle East, as it would be equivalent to a raised middle finger.

A fourth avenue for future research would be at the interface between technology, contracts, and design. Digital technologies will increasingly transform and disrupt what contracts are and how they are used: a glimpse into what the future holds is already offered by trends such as contract assembly automation; contract analytics based on AI and natural language processing; online environments for collaborative drafting, negotiation and revision; self-enforcing smart contracts modeled as parameters and enabled by blockchain. While technologies promise to save time and decrease transaction costs, their sophistication may also increase contract complexity. How to design human-centric and deceptively simple interfaces, services, products, and experiences on top of the technical complexity? How to ensure that future contracts will work well for humans and machines alike? What will be the impact of technology on contracting practices within organizations, and how to manage this change? Interaction design and user research are necessary to make future contracts usable and useful. At the same time a sociotechnical investigation of contract technologies would better help organizations to manage the opportunities and challenges that come with digital transformation.

All in all, multidisciplinary collaboration in contracting research and practice will be needed to face the current (and future) challenges of contracts, further our understanding of the role and effects of contract design, and transform them into practical tools that really work for businesses and consumers.

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Appendices

Appendix 1

Rationale for grading the accuracy of participants' responses in the quantitative component of this research (Publications II, III, IV)

0.25 points = The participant only mentions the clause number where the correct answer can be found, or copy-pastes the relevant excerpt. However, s/he does not provide a correct, precise, and clear response in his/her own words (e.g., if answering correctly would require to provide a precise date, the date is not given).

0.50 points = The participant wrote down the relevant clause or rule in his/her own words. However, s/he does not provide a correct, precise, and clear response in his/her own words (e.g., if answering correctly would require to provide a precise date, the date is not given).

0.75 points = The participant provided a correct, precise, and clear response in his/her own words, eventually referencing the clause or rule s/he applied. However, there is a minor imprecision (e.g., if answering correctly would require to provide a precise date such as 4th March 2016, the participant wrote 5th March 2016).

1 point = The answer is fully correct. The participant provided a correct, precise, and clear response in his/her own words, eventually referencing the clause or rule s/he applied (e.g., if answering correctly would require to provide a precise date, the date is given).

Appendix 2
Comprehension questions used in the experimental evaluation
reported in Publication II

Question 1 – Who is allowed to install a washing machine or a dishwasher?

Question 2 – Which is the right way to notify a damage that needs to be taken care of immediately (e.g. a broken window, or a plumbing leak)?

Question 3 – During which night hours should you avoid loud noises during weekends and holidays?

Question 4 – Can you use your deposit to pay the last month of your rent?

Question 5 – You just moved into a student apartment. When you moved in, you noticed that the handle of a door was broken, and you want it repaired. How much time do you have to notify Hoas and have it fixed at their cost?

Question 6 – List all the documents and regulations that tenants are subject to follow, in addition to the general terms of tenancy, when renting a student apartment.

Appendix 3

Comprehension questions used in the experimental evaluation reported in Publication III

First batch of questions

Question 1 – Voiko palveluntuottaja halutessaan siirtää sopimuksen jollekin yhteistyökumppanilleen?

[Does the service provider have the right to transfer the contract to a third party?]

Question 2 – Voiko ostaja kieltää palveluntuottajaa käyttämästä tiettyä alihankkijaa?

[Can the purchaser prohibit the service provider from employing a certain subcontractor for the service provision?]

Question 3 – Osapuolilla on sopimus, jossa ei ole määritelty hintaa kiinteäksi. Sopimuskausi on alkanut 1.1.2012. Palveluntuottaja ottaa yhteyttä ostajaan 29.5.2013 ja ehdottaa ensimmäisen kerran hinnanmuutosta. Onko hänellä tähän ajallisesti oikeus ja mitkä ovat muut hyväksyttävät perusteet muutoksele?

[The parties have agreed on a contract with non-fixed prices. The contract term started on 1.1.2012. The service provider contacts the purchaser on 29.5.2013, suggesting for the first time a price adjustment. Does the service provider have the right to suggest a price adjustment, and if yes, what are the legitimate grounds for a price change?]

Question 4 – Palvelussa on olennainen virhe, jota ei voi korjata. Mikä on vastaus seuraaviin kysymyksiin?

- Virheestä aiheutuu ostajalle vahinkoa, voiko ostaja saada vahingonkorvausta?
- Voiko ostaja velvoittaa palveluntuottajaa maksamaan viivästyssakkoa korvauksena vahingosta?
- Onko ostajalla oikeus irtisanoa sopimus päättymään kahden (2) kuukauden kuluttua?
- Voiko ostaja saada hinnanalennusta?

[The service presents a defect that cannot be repaired. Which of these are possible consequences?]

- *If the defect caused a loss to the purchaser, is the purchaser entitled to ask for damages?*
- *Can the purchaser request the payment of the delay penalty, as a compensation?*

- *Has the purchaser the right to terminate the contract in written form, within 2 months?*
- *Can the purchaser get a price reduction?]*

Question 5 – Osapuolilla on sopimus, jossa hintaa ei ole määritelty kiinteäksi. Palveluntuottaja ehdottaa hinnanmuutosta 20.1.2013. Ostaja ei hyväksy ehdotettua hinnanmuutosta. Osapuolet eivät pääse yhteisymmärrykseen uudesta hinnasta neuvottelemallakaan. Ostaja päättää irtisanoa sopimuksen ja ilmoittaa irtisanomisesta palveluntuottajalle 20.2.2013. Sopimuksen ilmoitetaan päättyvän 20.3.2013. Onko sopimuksen päättymisajankohta JYSEn mukainen? Perustele.

[The parties have agreed on a contract with non-fixed prices. The service provider suggests price adjustments on 20.1.2013. The buyer does not accept the suggested price adjustments, and the parties do not manage, after negotiations, to agree on new prices. The buyer decides to terminate the agreement, and notifies the service provider on 20.2.2013. The notification specifies that effective contract termination date is 20.3.2013. Does this contract termination date conform to JYSE terms? Explain why.]

Second batch of questions

Question 1 – Siirtyvätkö immateriaalioikeudet palvelun lopputuloksiin ostajalle sopimuksen päättyessä?

[Does the purchaser have the right to obtain the IP regarding the results and the documentation of the service provision, when the contract ends?]

Question 2 – Kuka toimii henkilökisteripitäjänä?

[Which party acts as personal data controller?]

Question 3 – Osapuolilla on sopimus, jossa ei ole määritelty hintaa kiinteäksi. Sopimuskausi on alkanut 1.1.2012. Ostaja ehdottaa 29.5.2013 palveluntuottajalle hinnanmuutosta, jolla on JYSEn mukaiset perusteet. Palveluntuottaja ei hyväksy ehdotettua hintaa, eivätkä osapuolet neuvoteltuaan pääse sopimukseen uusista hinnoista. Mitä vaihtoehtoisia lopputuloksia on olemassa?

[The parties have agreed on a contract with non-fixed prices. The contract term started on 1.1.2012. The purchaser contacts the service provider on 29.5.2013, suggesting a price adjustment, according to the legitimate grounds described in JYSE. The service provider does not accept the suggested price adjustments, and the parties do not manage, after negotiations, to agree on new prices. What are the possible outcomes of this situation, according to JYSE?]

Question 4 – Palvelussa on olennainen virhe, jota ei voi korjata. Mikä on vastaus seuraaviin kysymyksiin?

- Kun sopimuksessa on sovittu sopimussakosta, voiko ostaja velvoittaa palveluntuottajan tässä tilanteessa maksamaan sopimussakkoa?
- Voiko ostaja pidättäytyä maksamasta hinnasta määrän, joka on kaksi kertaa niin suuri kuin virheestä aiheutunut vahinko?
- Voiko ostaja purkaa sopimuksen kokonaan tai osittain?
- Voiko ostaja hankkia korvaavan palvelun toiselta yritykseltä ja pidättää tästä korvaavasta palvelusta aiheutuneet kustannukset palveluntuottajan seuraavista maksueristä?

[The service presents a defect that cannot be repaired. Which of these are possible consequences?

- *Has the purchaser the right to request a contract penalty, if such penalty was agreed beforehand?*
- *Has the purchaser the right to avoid payments up to a sum equal to twice the amount of damages caused by the defect?*
- *Can the purchaser cancel the agreement fully or partially?*
- *Can the purchaser get a replacement service from another source, and withhold the cost of the replacement service from the payments due to the service provider?]*

Question 5 – Osapuolilla on sopimus, jossa hintaa ei ole määritelty kiinteäksi. Ostaja ehdottaa hinnanmuutosta 20.1.2013. Palveluntuottaja ei hyväksy ehdotettua hinnanmuutosta. Osapuolet eivät pääse yhteisymmärrykseen uudesta hinnasta neuvottelemallakaan. Ostaja päättää irtisanoa sopimuksen ja ilmoittaa irtisanomisesta palveluntuottajalle 20.2.2013. Sopimuksen ilmoitetaan päättyvän 20.3.2013. Onko sopimuksen päättymisajankohta JYSEn mukainen? Perustele.

[The parties have agreed on a contract with non-fixed prices. The buyer suggests price adjustments on 20.1.2013. The service provider does not accept the suggested price adjustments, and the parties do not manage, after negotiations, to agree on new prices. The buyer decides to terminate the agreement, and notifies the service provider on 20.2.2013. The notification specifies that effective contract termination date is 20.3.2013. Does this contract termination date conform to JYSE terms? Explain why.]

Appendix 4

Comprehension questions used in the experimental evaluation reported in Publication IV

Question 1 – What are the consequences if the Test Run of the Equipment fails for the second time?

Question 2 – Given that the date of provisional acceptance is 6th March 2012, which date marks the end of the availability measurement period?

Question 3 – Given that the date of the delivery of the Equipment is 15th July 2011, and the date of provisional acceptance is 6th March 2012, on what date does the Warranty Period expire?

Question 4 – The first batch of the Equipment delivery was delayed 6 weeks. The second batch of the Equipment delivery was delayed 3 weeks. The third batch of the Equipment delivery was again delayed 3 weeks. What is the total amount of liquidated damages that the Supplier is liable to pay to the Purchaser?

Question 5 – Which of the Parties shall bear the risk for deterioration and damage to the Equipment during the Test Runs?

Question 6 – A spare part, included in the original scope of supply, is taken into service and brought back to the Purchaser on 20th May 2015. Given that the date of provisional acceptance is 6th March 2012, on what date does the Warranty Period for such reconditioned part expire?

Appendix 5

HED/UT Scale items and questionnaire (Voss et al., 2003).

The items are reported in the randomized order used in the experiments.

English version

Evaluate the document along these dimensions:

Effective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ineffective
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Helpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Unhelpful
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Functional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Not functional
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Necessary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Unnecessary
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Practical	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Impractical
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Not fun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Fun
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Dull	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Exciting
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Not delightful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Delightful
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Not thrilling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Thrilling
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	
Enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Unenjoyable
	Extremely	Quite	Slightly	Neutral	Slightly	Quite	Extremely	

Finnish version

Arvio dokumenttia seuraavilla määreillä

Tehokas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Tehoton
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Hyödyllinen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Hyödytön
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Toimiva	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Toimimaton
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Tarpeellinen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Tarpeeton
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Käytännöllinen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Epä- käytännöllinen
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Ei hauska	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Hauska
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Tylsä	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Kiinnostava
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Ei ihastuttava	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ihastuttava
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Ei jännittävä	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Jännittävä
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	
Nautittava	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ei nautittava
	Erittäin	Melko	Hieman	Ei kumpi- kaan	Hieman	Melko	Erittäin	

Appendix 6

I-PANAS-SF Scale items and questionnaire (Thompson, 2007).

The items are reported in the randomized order used in the experiments.

English version

Think about your experience of completing the tasks utilizing the document.

To what extent did it make you feel... (1= Not at all; 5= Extremely)

- ... Upset
- ... Hostile
- ... Alert
- ... Ashamed
- ... Inspired
- ... Nervous
- ... Determined
- ... Attentive
- ... Afraid
- ... Active

Finnish version

Millaiseksi koit tehtävien suorittamisen käyttäen dokumenttia. Missä määrin tunteitasi kuvaa... (1= Ei lainkaan; 5= Erittäin hyvin)

- ... suuttunut
- ... vihamielinen
- ... valpas
- ... häpeissäsi
- ... inspiroitunut
- ... hermostunut
- ... päättäväinen
- ... tarkkaavainen
- ... peloissasi
- ... aktiivinen

Appendix 7

Paas and Merriënboer's procedure (1993) to calculate the efficiency of a document.

1) The first step of the procedure is to standardize each research participant's answering speed, answering accuracy, and mental effort scores into z-scores – that is, they are standardized with a mean of 0 and a standard deviation of 1:

$$z = \frac{(\text{individual score} - M)}{SD}$$

where M indicates the grand mean of the group to which the individual score belongs (e.g. control/textual group vs. experimental/visual group)

2) The second step is to calculate performance as the mean of $z_{\text{Answering Speed}}$ and $z_{\text{Answering Accuracy}}$.

$$z_{\text{Performance}} = \frac{z_{\text{Answering Speed}} + z_{\text{Answering Accuracy}}}{2}$$

3) The third step is to calculate individual efficiency (e) as follows:

$$e = \frac{z_{\text{Performance}} - z_{\text{Mental Effort}}}{\sqrt{2}}$$

4) The fourth step is to calculate mean Efficiency (E), mean $z_{\text{Mental Effort}}$ and $z_{\text{Performance}}$ for each experimental condition.

5) The fifth step is to assess statistical differences between mean Efficiency scores in each experimental condition. These differences can be simply tested through e.g. t-test, or ANOVA.

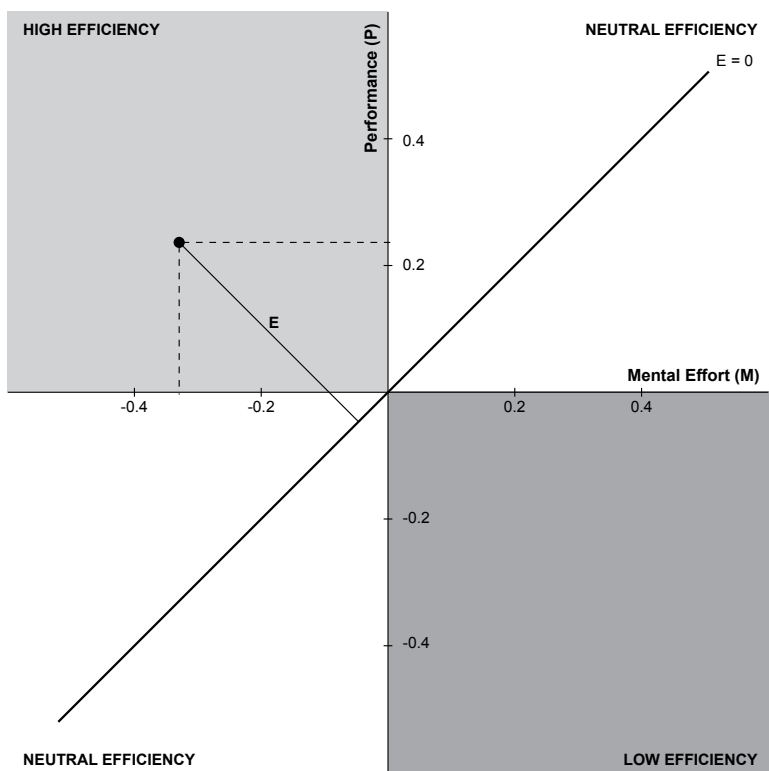
6) Lastly, in order to plot the mean Efficiencies for each experimental condition in a graph, build a Cartesian plane where the x axis represents the z-scores of performance, and the y axis represents the z-scores of mental effort.

For each experimental group, plot a point identified by the coordinates:

$$x = z_{\text{Mental Effort}}$$

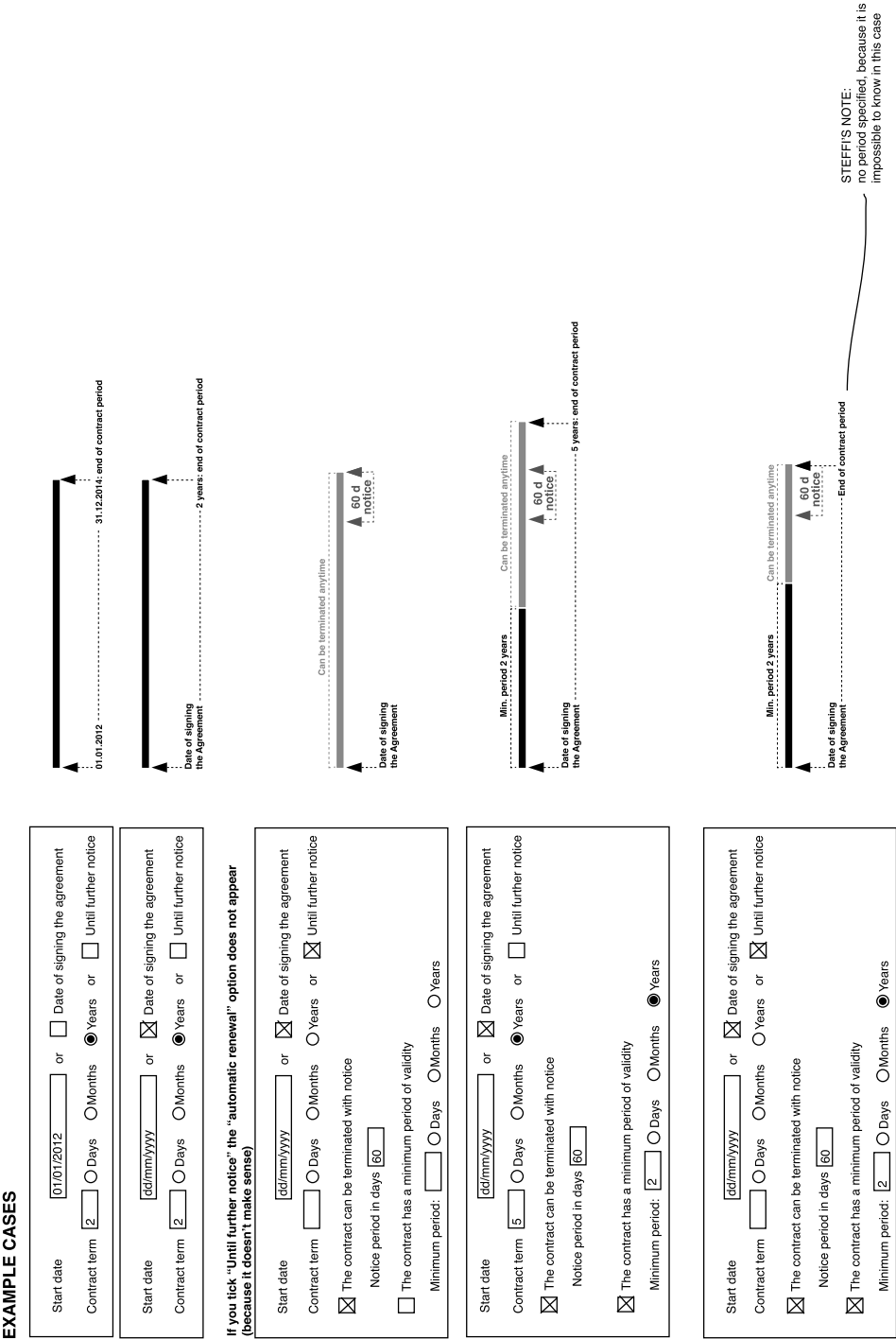
$$y = z_{\text{Performance}}$$

Efficiency of each condition is then represented as the distance of the plotted points from the bisecting diagonal of the I and III quadrant (which represents an efficiency of 0). For example:



Appendix 8

Example of storyboard produced to envision the user interface and output of the prototype contract visualization software described in Publication VI



Start date or ☒ Date of signing the agreement

Contract term ☐ Days ☒ Months ☐ Years or ☐ Until further notice

☒ The contract can be terminated with notice

Notice period in days

☒ The contract has a minimum period of validity

Minimum period: ☐ Days ☐ Months ☒ Years

☒ The contract automatically renews for further periods, if not terminated with notice

Renewed contract term: ☐ Days ☐ Month ☐ Years or ☒ Until further notice

Notice period in days

Start date or ☒ Date of signing the agreement

Contract term ☐ Days ☒ Months ☐ Years or ☐ Until further notice

☒ The contract can be terminated with notice

Notice period in days

☒ The contract has a minimum period of validity

Minimum period: ☐ Days ☒ Months ☐ Years

☒ The contract automatically renews for further periods, if not terminated with notice

Renewed contract term: ☐ Days ☐ Month ☐ Years or ☒ Until further notice

Notice period in days

Start date or ☒ Date of signing the agreement

Contract term ☐ Days ☒ Months ☐ Years or ☐ Until further notice

☒ The contract can be terminated with notice

Notice period in days

☐ The contract has a minimum period of validity

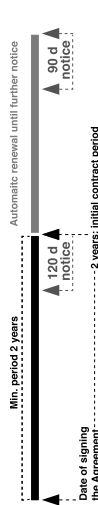
Minimum period: ☐ Days ☐ Months ☒ Years

☒ The contract automatically renews for further periods, if not terminated with notice

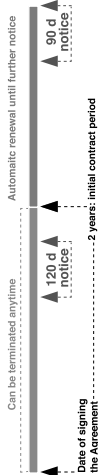
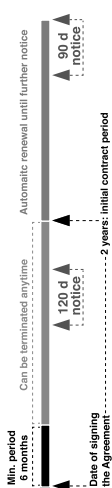
Renewed contract term: ☐ Days ☐ Month ☐ Years or ☒ Until further notice

Notice period in days

STEFFI'S NOTE:
when the renewal option is selected, the initial term is marked as 'initial contract period' and not as in the previous examples ('end of contract period')



STEFFI'S NOTE:
when a period is under 1 year, the text breaks in 2 lines, because the space is small



Start date

dd/mm/yyyy

or

☒ Date of signing the agreement

Contract term

2

Days

☒ Months

☐ Years

or

☐ Until further notice

☒ The contract can be terminated with notice

Notice period in days

120

☒ The contract has a minimum period of validity

Minimum period:

Days

☐ Months

☐ Years

☒ The contract automatically renews for further periods, if not terminated with notice

Renewed contract term:

1

Days

☐ Months

☒ Years

or

☐ Until further notice

☒ Contract renews only once, and terminates without notice

☐ Contract renews forever if not terminated with notice

Start date

dd/mm/yyyy

or

☒ Date of signing the agreement

Contract term

2

Days

☐ Months

☒ Years

or

☐ Until further notice

☒ The contract can be terminated with notice

Notice period in days

120

☒ The contract has a minimum period of validity

Minimum period:

Days

☐ Months

☐ Years

☒ The contract automatically renews for further periods, if not terminated with notice

Renewed contract term:

1

Days

☐ Months

☒ Years

or

☐ Until further notice

☐ Contract renews only once, and terminates without notice

☒ Contract renews forever if not terminated with notice

Notice period in days (for renewed agreements)

90

Start date

dd/mm/yyyy

or

☒ Date of signing the agreement

Contract term

2

Days

☐ Months

☒ Years

or

☐ Until further notice

☒ The contract can be terminated with notice

Notice period in days

120

☒ The contract has a minimum period of validity

Minimum period:

6

Months

☐ Days

☐ Years

☒ The contract automatically renews for further periods, if not terminated with notice

Renewed contract term:

1

Days

☐ Months

☒ Years

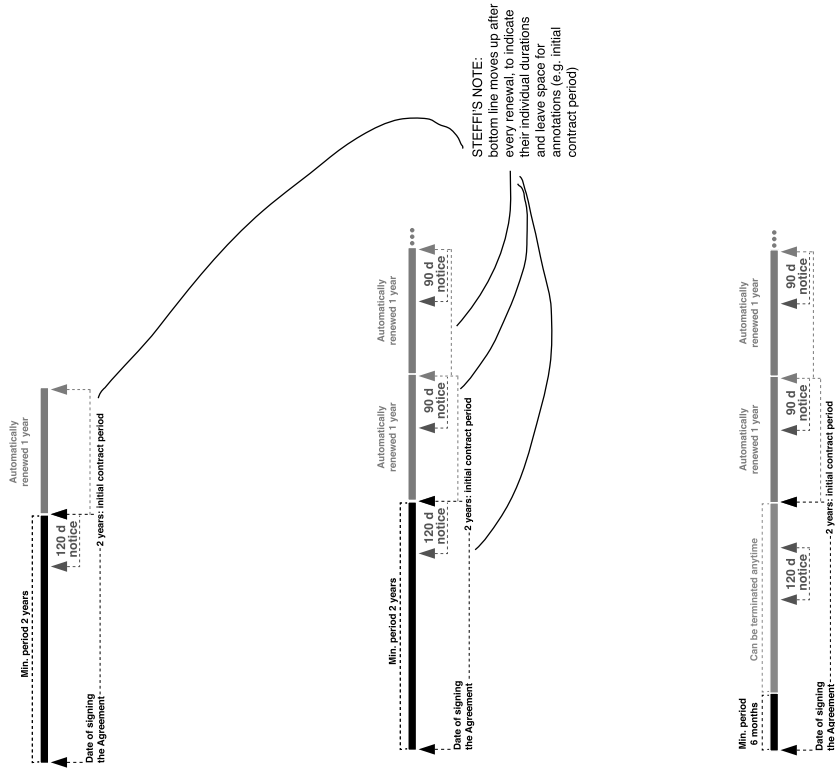
or

☐ Until further notice

☐ Contract renews only once, and then terminates without☒ Contract renews forever if not terminated with notice

Notice period in days (for renewed agreements)

90





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