



WHITEPAPER

## **Automated contract analysis & intelligence**

A joint project between DBS Bank Ltd and Pactly Private Limited

Jointly developed with

**Pactly**

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# EXECUTIVE SUMMARY

Automated contract review has generated significant amounts of interest in the last few years within the legal sector. Numerous publications including the New York Times<sup>1</sup>, Forbes<sup>2</sup> and Harvard Business Review<sup>3</sup> have, in part, contributed to the continued interest in the question whether artificial intelligence (“**A.I.**”) will eventually replace lawyers.

From DBS’ past experience experimenting with various A.I. technologies, there is still some way to go before realising the vision of a fully autonomous solution for the negotiation of contracts. Contract negotiations for many organisations remain a complex affair involving numerous stakeholders, competing interests and often, the subjective assessment of risk. Even so, with the right technology partners, there can be substantial improvements in the way that contracts are negotiated. Thoughtfully implemented, A.I. can and will play a significant role in contract negotiations whilst providing improvements in efficiency and risk governance in the near term.

This paper begins with a discussion of the pain points in the existing contract review process. The central objective of the Proof of Concept (“**POC**”) is to build an enterprise-ready contract review solution centred on the meaningful collection of data to support decision making, legal process optimisation, and to set in motion the preliminary steps towards a future of autonomous contract review. This paper will share how a data-centric view towards contract negotiations provides significant efficiency gains while still ensuring robust risk governance.

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1 Steve Lohr, “A.I. Is Doing Legal Work. But It Won’t Replace Lawyers, Yet.”, March 19, 2017, <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html> (accessed 25 May 2021)

2 Neil Sahota, “Will A.I. Put Lawyers Out of Business”, February 9, 2019, <https://www.forbes.com/sites/cognitiveworld/2019/02/09/will-a-i-put-lawyers-out-of-business/> (accessed 25 May 2021)

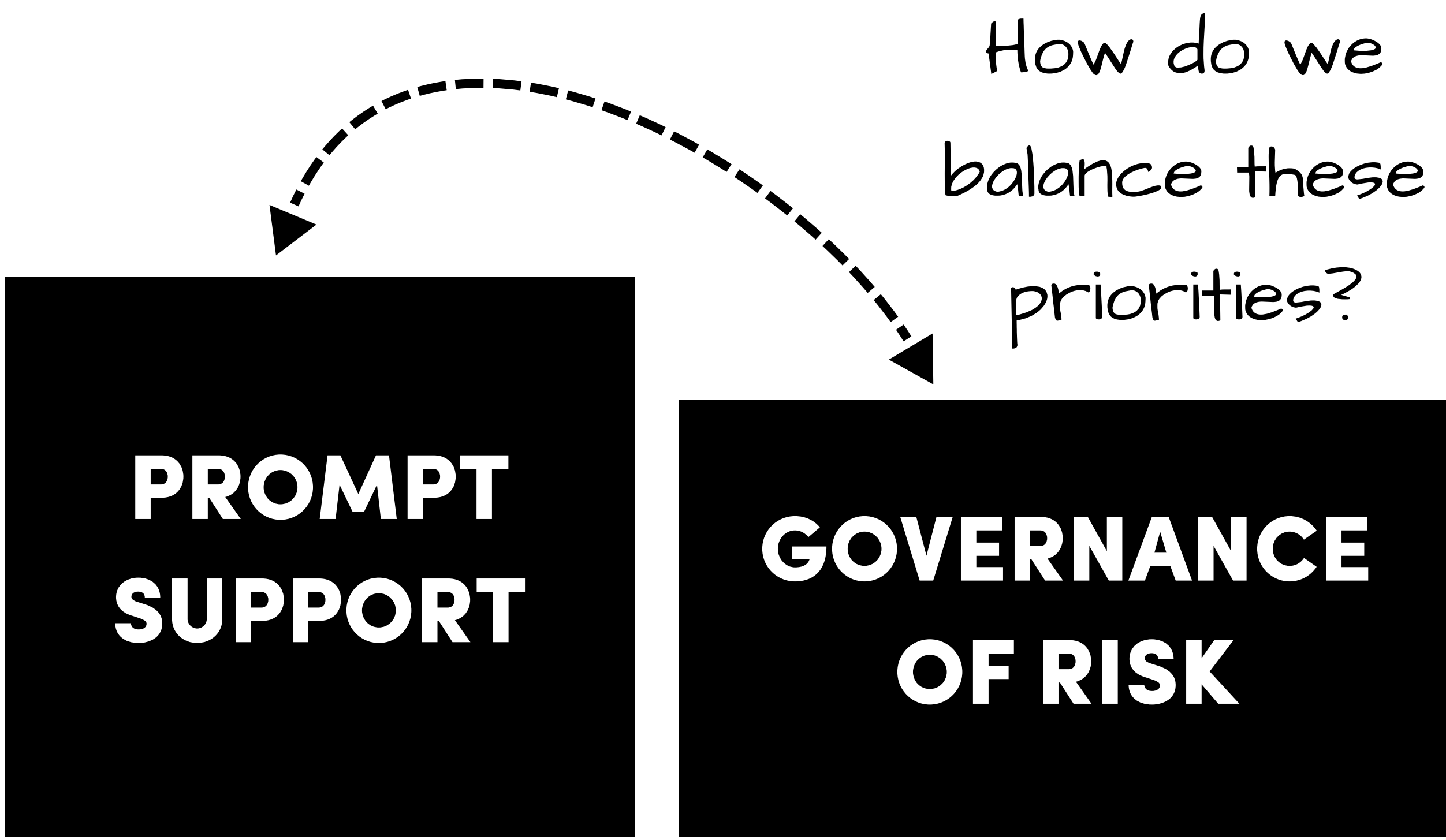
3 Richard Susskind and Daniel Susskind, “Technology Will Replace Many Doctors, Lawyers and Other Professionals”, October 11, 2016, <https://hbr.org/2016/10/robots-will-replace-doctors-lawyers-and-other-professionals> (accessed 25 May 2021)



# CHALLENGES OF CONTRACT REVIEW

Many large enterprises deal with a large volume of operational and business contracts. The review of these contracts is usually the in-house legal team’s responsibility.

The challenge is to provide prompt support for business units to execute contracts and conduct their business faster, while ensuring that the governance of legal, credit, business and operational risks, across the entire contracting workflow, is not compromised due to such speed and volume.



### Current Approaches

to managing the ongoing contract review workload is usually calibrated based on the contract's complexity and the type of risks presented by these contracts.

### For Low Complexity Contracts




Business units are usually required to contract on standardised non-negotiable templates as opposed to templates from third parties (e.g. clients, vendors and partners).

### For High Complexity Contracts

In recognition of the need for greater flexibility to accommodate a wider variety of commercial objectives and more complex risk allocation outcome between parties, business units are guided by negotiation playbooks and develop specific expertise to handle/process frequently negotiated provisions in such contracts.

Generally, the current approach isn't good enough because ...

These approaches tend to be feasible only for more well-resourced legal teams, and even then, there are substantial inefficiencies in the process (see specific examples below). Additionally, manual processes presently do not capture contractual metadata in a manner that facilitates improvements to the negotiations process or legal operations, hence presenting a huge missed opportunity for process optimisation.

Specific Examples	CONTRACT TYPES	 Non-disclosure Agreement	 Master Service Agreement	 Facility Letters
	CURRENT APPROACH	<ul style="list-style-type: none"><li>⊕ Building <b>standardised templates</b></li><li>⊕ Requiring business units to contract on DBS templates</li></ul>	<ul style="list-style-type: none"><li>⊕ Negotiable templates</li><li>⊕ Standardising fallback positions by developing <b>negotiation playbooks</b></li></ul>	<ul style="list-style-type: none"><li>⊕ Customisable and negotiable templates</li><li>⊕ Negotiation playbooks</li><li>⊕ Developing <b>task specialisations</b> (e.g. credit documentation team)</li></ul>
	CHALLENGES WITH EXISTING APPROACH	<ul style="list-style-type: none"><li>⊖ Time spent confirming that no unauthorised changes were made to the approved template</li><li>⊖ Reliance on self-reporting process where business users assess if changes are significant and require further legal review</li></ul>	<p>Challenges 1 and 2 equally applicable.</p> <ul style="list-style-type: none"><li>⊖ Developing negotiation playbooks is time-consuming and costly</li><li>⊖ Challenge in getting business users to adopt playbook and negotiate the contracts, independent of Legal</li></ul>	<p>Challenges 1, 2, 3 and 4 equally applicable.</p> <ul style="list-style-type: none"><li>⊖ Institutional and expert knowledge is restricted to such tasks specialists</li><li>⊖ Risk of inconsistent application of know-how across time and across different task specialists</li></ul>
	ADVANTAGES OF PROPOSED SOLUTION	<ul style="list-style-type: none"><li>⊕ Time spent on challenge 1 is removed once checks are automated</li><li>⊕ Improved risk control with legal review triggered by the solution, instead of the business user based on his/her subjective assessment</li></ul>	<p>Advantages 1 and 2 equally applicable.</p> <ul style="list-style-type: none"><li>⊕ Developing playbooks with insights from the analysis of legacy contractual data performed by the solution</li><li>⊕ Establishing pre-approved fallbacks gives business users greater confidence and control in contract negotiations</li></ul>	<p>Advantages 1, 2, 3 and 4 equally applicable.</p> <ul style="list-style-type: none"><li>⊕ Knowledge transferrable as variations from DBS standard positions are logged and available to train new users</li><li>⊕ Accessibility of legacy contractual data improves consistency in decision making</li></ul>



# A NEW APPROACH

By re-designing the entire contracting process, the challenges described in the section above may be addressed. In particular, along with DBS' technology partner, Pactly, a new approach was designed with three fundamental principles in mind:

1. automating low-risk and routine tasks,
2. democratising contract drafting, and
3. establishing data as a core pillar for decision making.

## 01

### Automating low-risk and routine tasks

In the case of a Master Service Agreement, DBS and Pactly jointly analysed each step of the contract creation and negotiation process, identifying routine tasks suitable for automation.

Previously, if contract owners require a contract, they would have to identify the right template to use and complete them correctly. The solution was to use an intake questionnaire to guide contract selection and the user's responses, ensuring that no field is accidentally left incomplete.

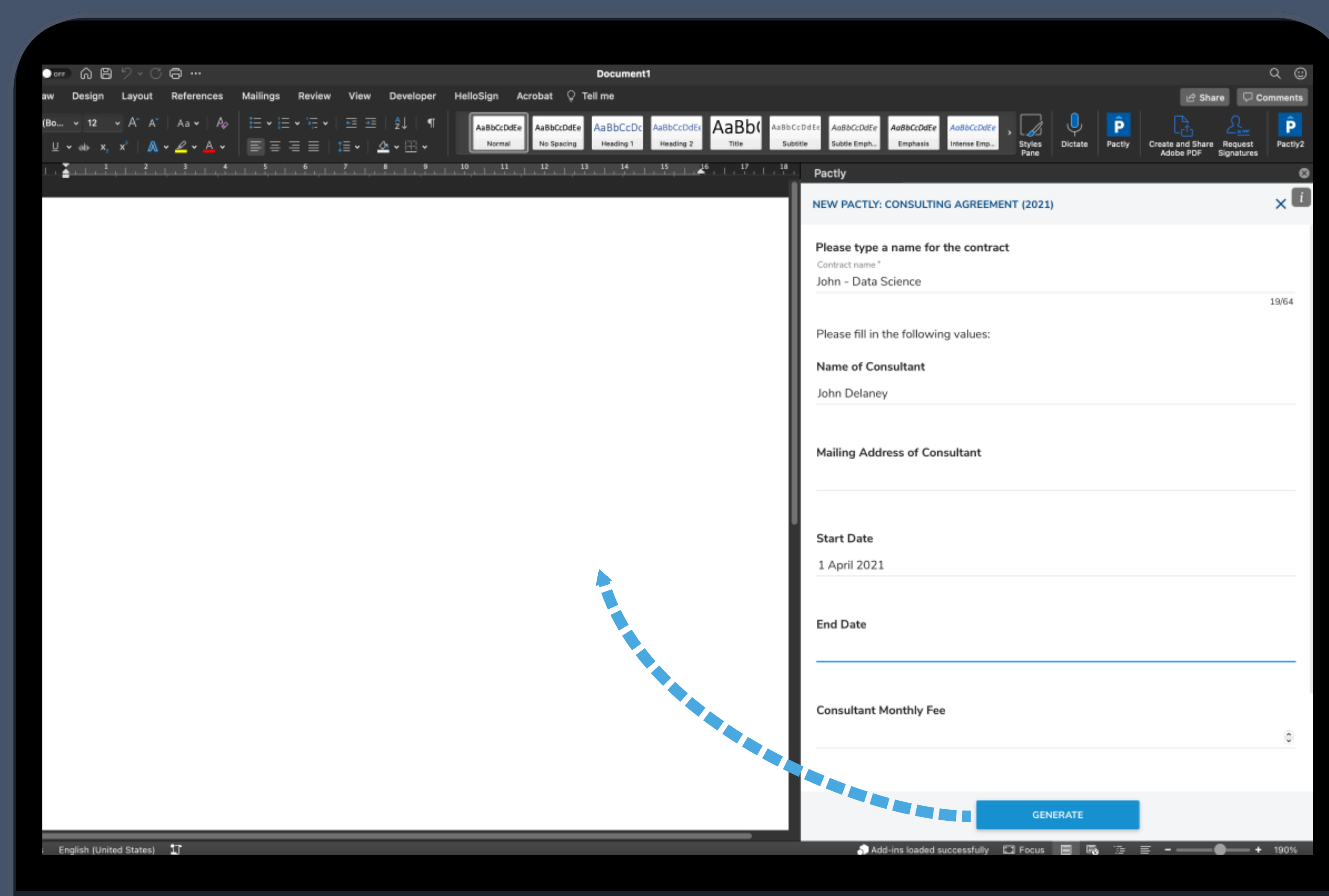


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Generate first drafts easily  
by completing a simple  
questionnaire right from  
Microsoft Word

During the negotiation phase, contract owners would have to check for compliance across a set of legal, commercial and payment issues (referred internally as the minimum standards). For example, a contract owner would have to confirm if the payment currency is in Singapore dollars, or that there are no clauses that trigger an auto-renewal of the contract term without the Bank's consent.



These are checks carried out consistently, which can now be fully or partially checked for by the solution. Additionally, common drafting errors, such as incomplete fields, incorrect references and internal comments not meant for external circulation, will be automatically identified and flagged for the user's attention.

An example of  
a minimum  
standard check

- (5) the Agreement;
  - (6) the remainder of the Order; and
  - (7) any documents incorporated by reference in any of the above.
- 4 Duration**
- 4.1** This Agreement shall commence on the Effective Date and endure for a period of 5-ten years. The Customer and Supplier may renew or extend this Agreement by agreement in writing.
- 4.14.2** Unless either party gives written notice of termination of this Agreement at least 60 days prior to the end of the Initial Term, or any successive three-year term, this Agreement shall automatically renew for successive additional three-year terms.
- 4.24.3** Each Contract entered into pursuant to this Agreement, commences on the date, and endures for the period, stated in the applicable Order.
- 4.34.4** If any Contract remains in force on expiry of this Agreement, the General Terms and the applicable Modules will remain in force for the purposes of that Contract only until its expiry or termination.
- 4.44.5** Customer and Supplier may not conclude new Contracts after expiry or termination of this Agreement.
- 5 Relationship management**
- 5.1** Customer and Supplier must designate:
- (1) a Relationship Manager with the authority necessary to make prompt decisions with respect to Contracts; and

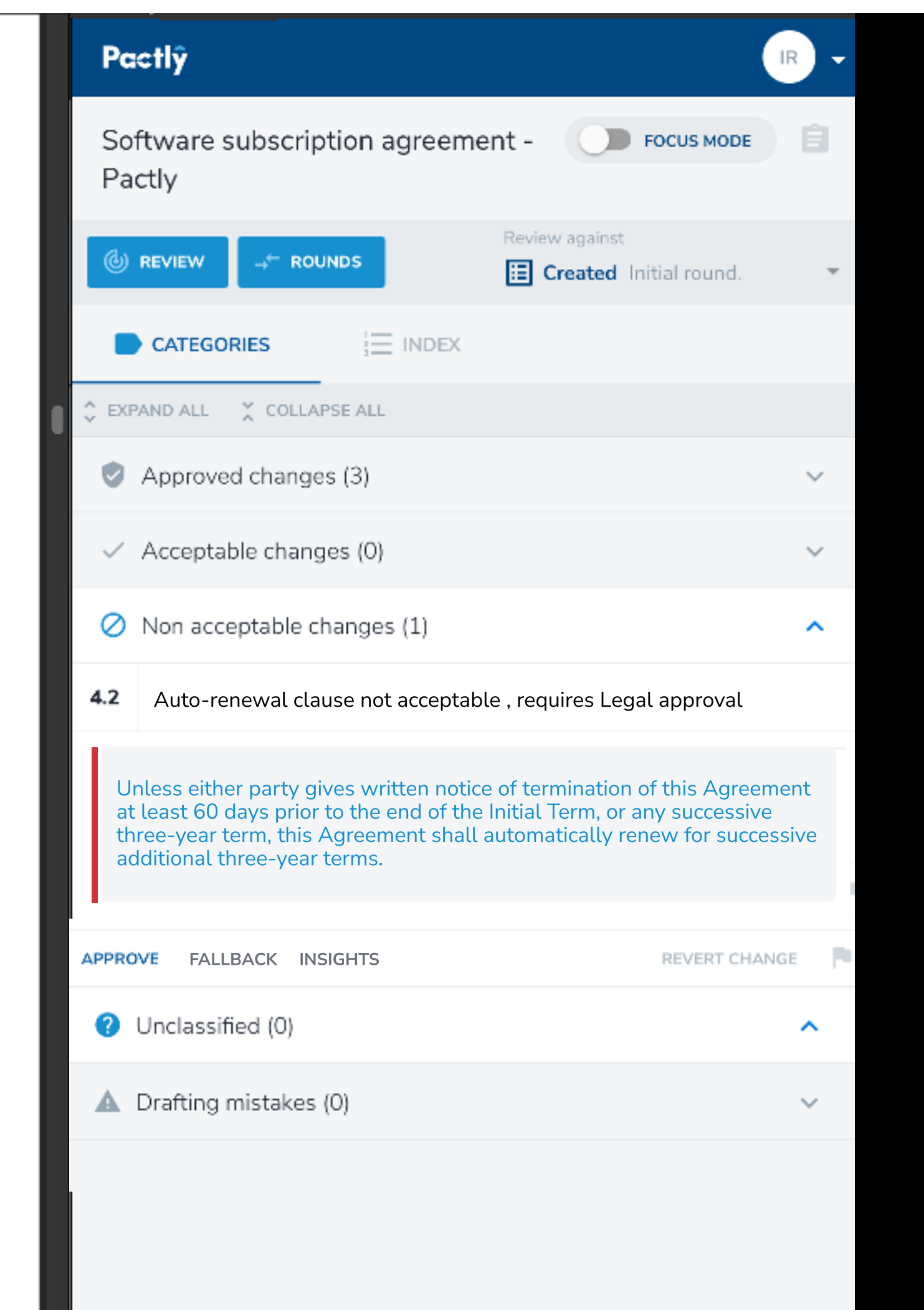


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Post-negotiation and in finalising the document, any precedent terms, deal-specific knowledge or information required for monitoring would have to be manually curated or extracted, especially if there is a need for such information to be shared with other business or support units. In future, the solution will extract the contractual data in a structured manner and may be integrated with other business/support units' systems to facilitate data exchange between this new contracting platform and the other information systems.

## Democratising contract drafting

02

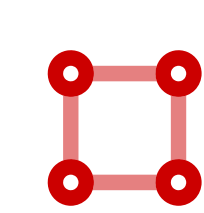
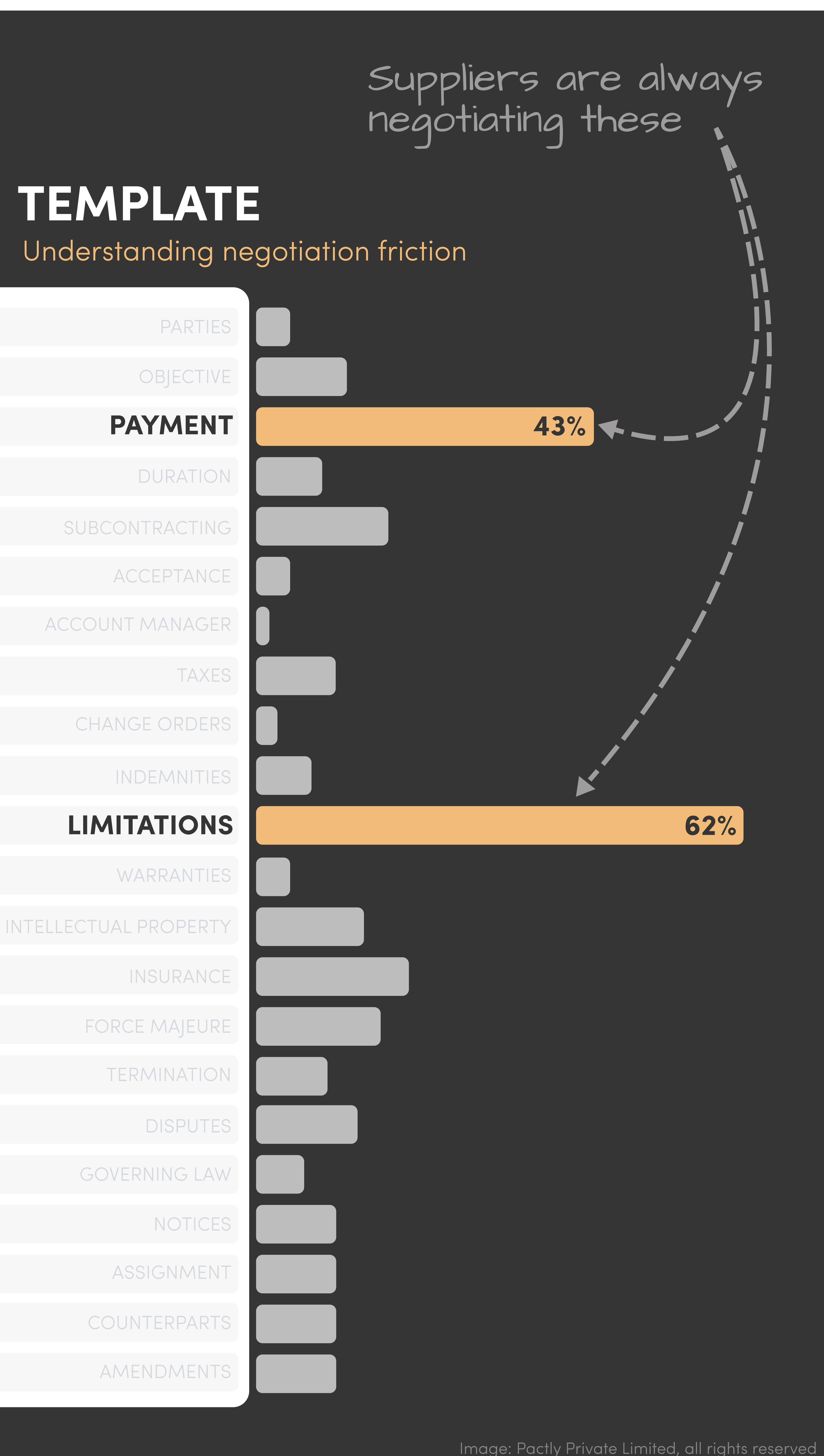
After generating the contract based on an approved template, the solution will assist contract owners in making suitable amendments throughout the negotiation process. For example, where the counterparty makes a change to the template contract, the solution will propose alternatives that have been pre-approved by the legal team or other stakeholders as acceptable fallbacks. This automation allows contract owners to be more self-reliant while providing confidence that the relevant legal, operational or business risks are appropriately managed.



## 03

## Establishing data as the core pillar for decision making

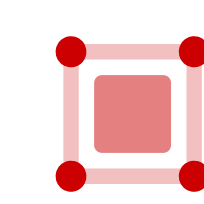
The solution keeps track of every amendment made by a counterparty to the template clause, and every deviation that DBS Legal or the relevant stakeholder eventually approves. A substantial amount of data is collected and mapped back to the specific contract template. This deliberate collection of data sits at the heart of DBS' new approach of facilitating data-driven decision making at every level of legal operations, continuous refinement of analytics solution, and future innovation of data-driven products.



### Operational decision making

contract owners, counsels reviewing the document

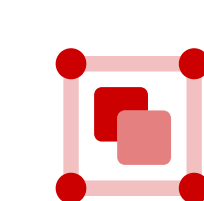
Contract owners and legal counsels can now review past variations of the same clause to determine negotiation and deviation frequency. In certain instances, they can establish alternative fallback language based on insights from these past deviations. This allows legal counsels to work with contract owners to pre-emptively address commonly negotiated terms, thereby shortening the negotiation process and quickly advance the DBS' interest.



### Management decision making

template owners, legal counsels

Template owners or counsels managing that particular contract can identify areas in the template that generate the most friction in the negotiation process. They can then address these friction points by (i) increasing education amongst the contract owners about these specific points of negotiation, (ii) introducing more fallback positions, or even (iii) adjusting the default template positions. In each case, such recommendations are guided by real data of how the template is performing with DBS' counterparties.



### Strategic decision making

general counsels, head of departments

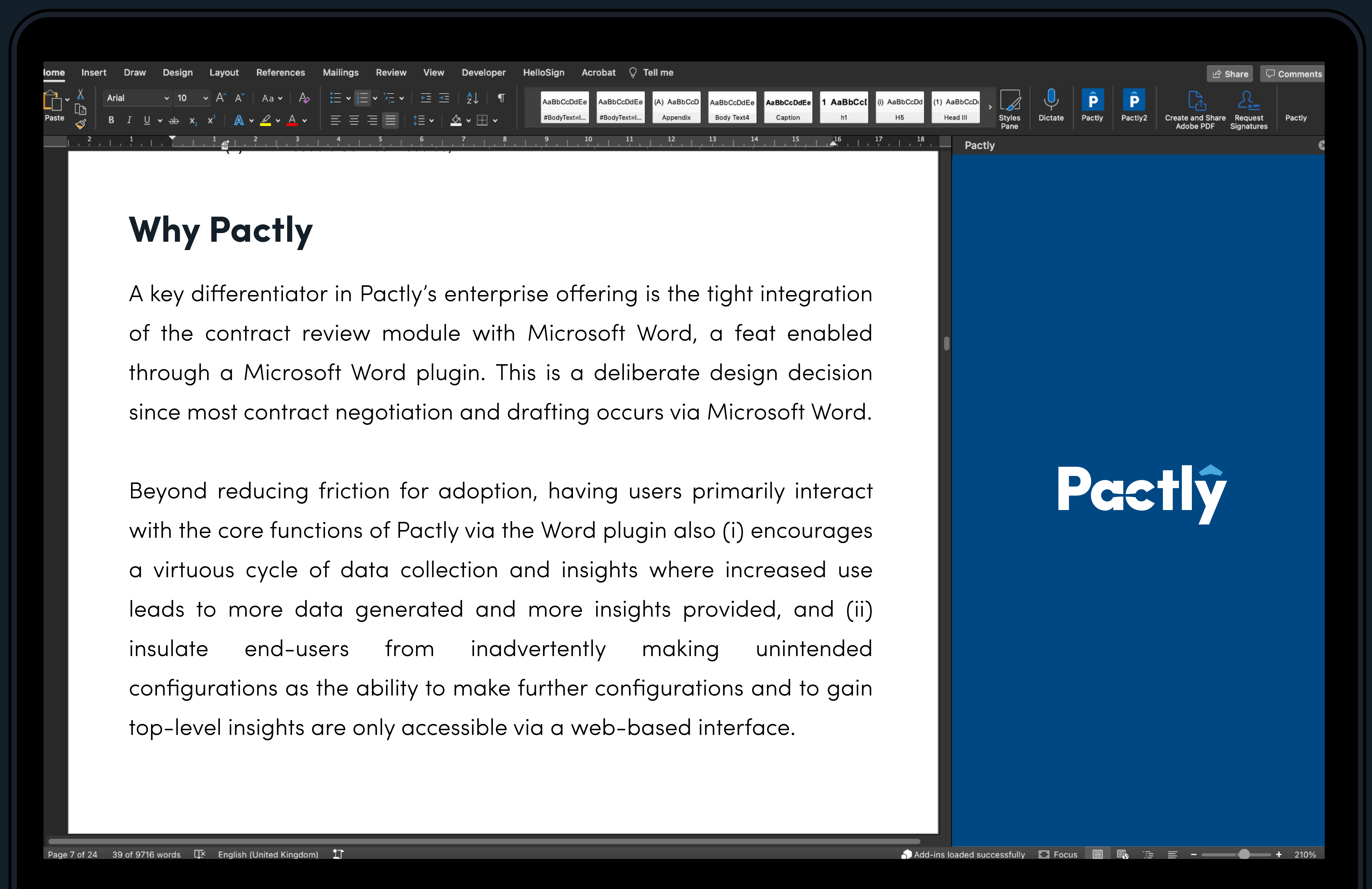
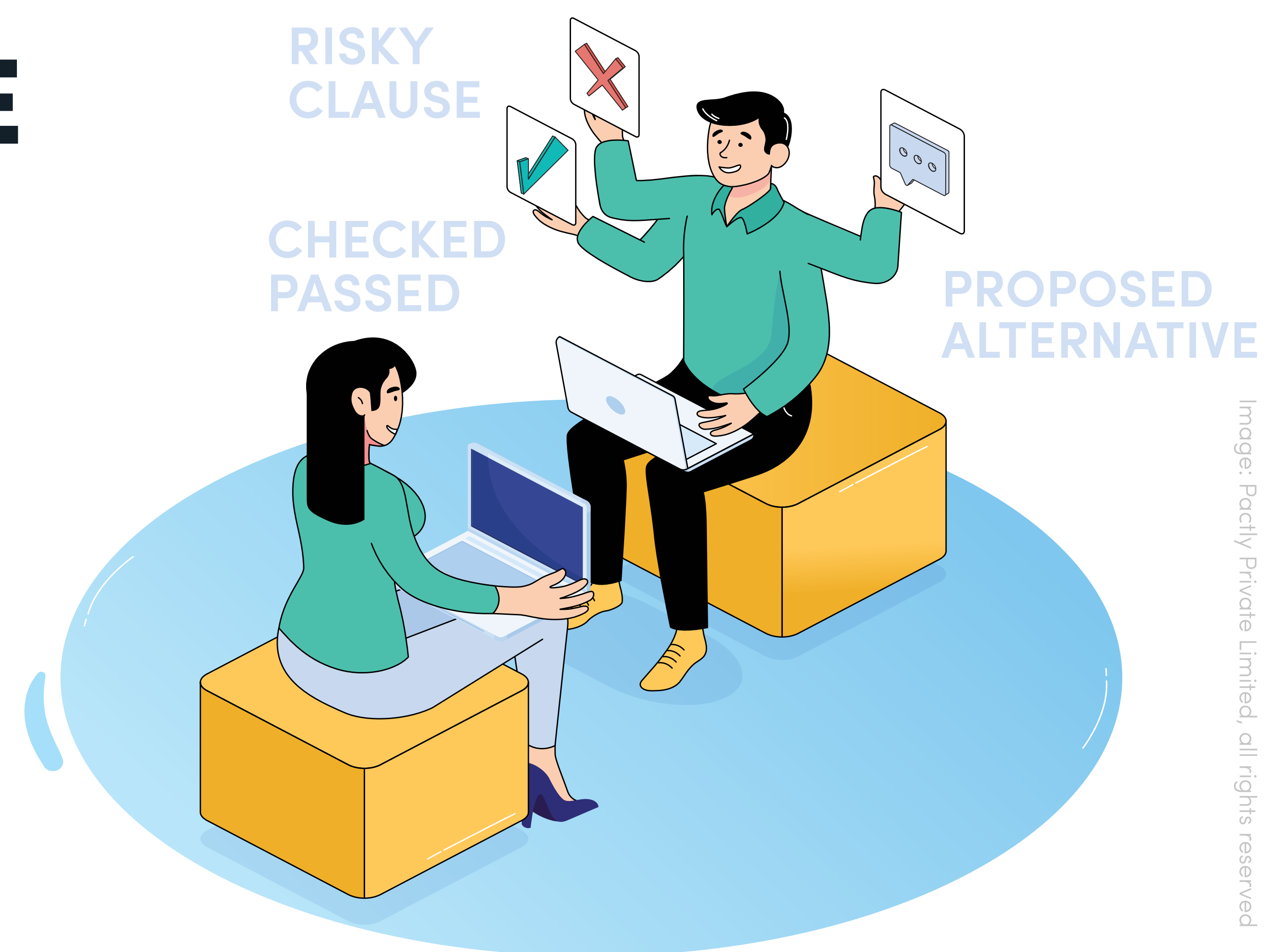
DBS and Pactly periodically review the analytics captured to identify areas which would have the highest impact on negotiation efficiency if built into automated checks.



# THE PACTLY DIFFERENCE

## Our technology partner of choice

Pactly is a Singapore company that builds contract review software for businesses and legal teams. Since 2018, DBS has worked with Pactly to develop and implement the new approach to automating and augmenting contract review as described in the previous section and the specific workflows required thereunder.





# PROCESS FLOW

Throughout the POC, the project team has had numerous discussions with various stakeholders across DBS. From these discussions, the business pain points, legal requirements and technology drivers identified have shaped the business process flow set out below.

## 1 Generation of draft

The contract owner generates a contract based on DBS' template by completing a questionnaire. The contract owner then sends this contract to the counterparty for review.

## 2 Contract analysis

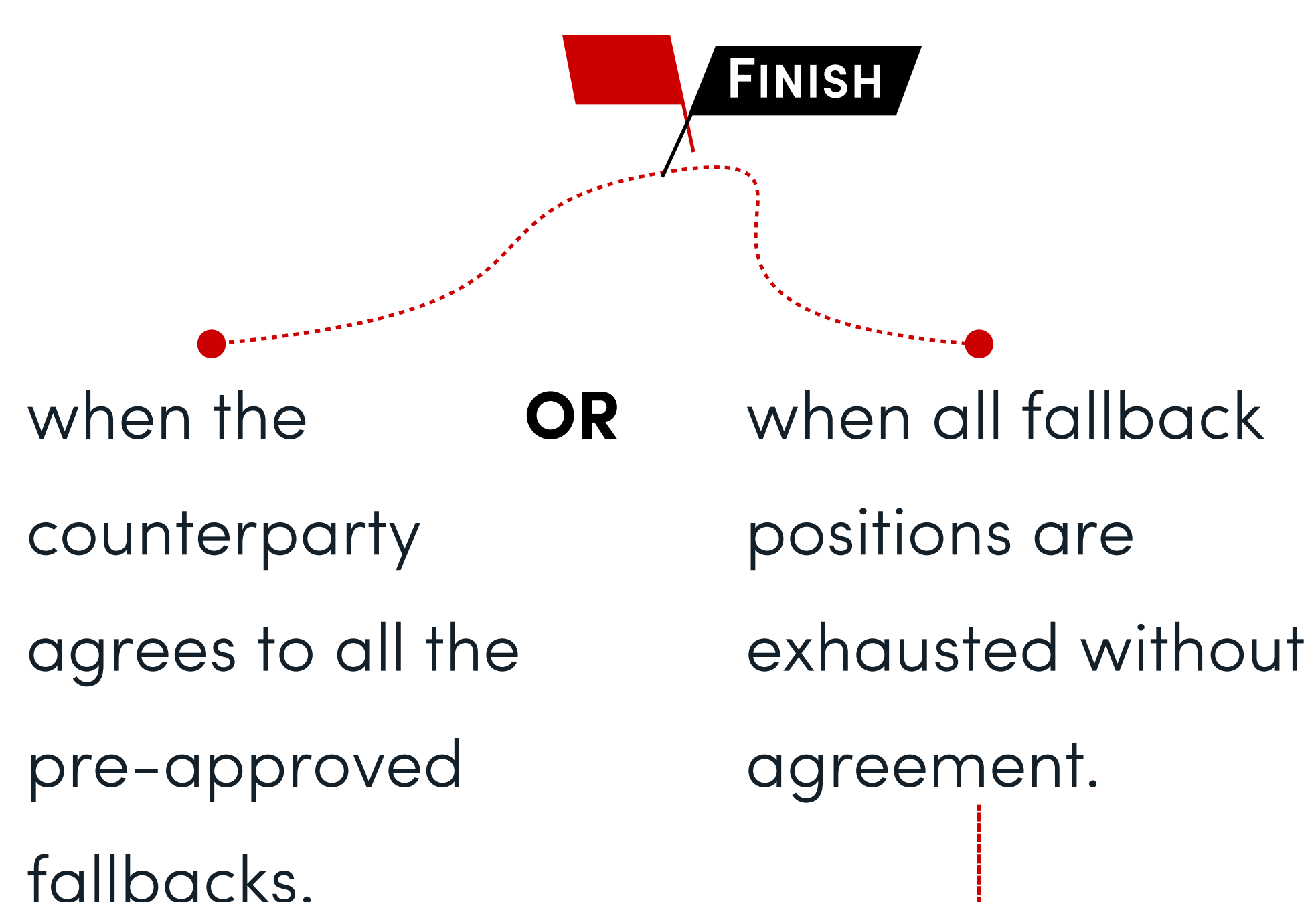
If there are no substantial changes to the DBS template or the changes are consistent with the review rules pre-configured by DBS, the document is approved, and no further action is required.

## 3 Self-service review

However, if changes fall outside what DBS would typically accept, the contract owner is provided with alternative provisions to replace the problematic clauses. These alternative provisions, known as fallback positions, are pre-configured by DBS and represent a concession to the initial templates' default positions.

## 4 Negotiations

The contract owner sends the amended contract (in step 3) to the counterparty and repeats steps 1 through 3 if further amendments are received. The negotiation process ends either:



In this case, the system triggers DBS Legal team to review the document.

## 5 Legal review

If there are:

- » substantial edits by the counterparty,
  - » a negotiation impasse described in step 4, or
  - » changes that the review system cannot classify
- the system triggers a review by the DBS Legal team.

The DBS Legal user can view the negotiation history between the contract owner and the counterparty to understand the parties' positions. Additionally, the DBS Legal user can review historical data specific to the negotiated clause to examine if DBS had granted concessions in the past, the frequency of such concessions and commonalities in the concessions granted.



# BUSINESS AND TECHNICAL CHALLENGES

Through the course of the POC, several business and technical challenges were encountered. These challenges, and how DBS and Pactly have worked together to address them are shared below with the hope that these learnings may serve as lessons for anyone considering implementing similar solutions in future.

## 01 Deployment of solution on-premise

Given the confidential nature of the information flowing through the solution and the strict regulatory requirements on banks for technology outsourcing, an early decision was made to deploy the system on-premise. A key consideration favouring on-premise deployment is the degree of control that DBS has over the environment and with it the corresponding ability to better fulfil regulatory requirements and mitigate security risks.

However, the choice of on-premise deployment is not without trade-offs as in addition to higher deployment costs, having a garden-walled system also means that the DBS' deployment of the Pactly solution would have to face challenges that standard cloud-based deployments do not face. In particular, during the deployment preparation phase, unexpectedly, several rounds of modifications and enhancements were needed before the DBS' deployment of the Pactly solution met the necessary deployment specifications and security requirements.

### SOLUTION

#### Project resourcing

Once the decision was made to deploy on-premise, DBS and Pactly designated the required resources to support the deployment. The deployment involved many technical teams with varied responsibilities, including Office 365 administration and backend infrastructure. For example, an experienced project manager from DBS was critical in coordinating all the internal resources required, making sure to involve the right resources at the right time.

### SOLUTION

#### Production deployment preparation

A properly planned deployment is an important risk management practice for smooth post-go-live operations. To mitigate deployment delays, there should be early identification of the stakeholders involved as well as clear visibility of the deployment activities and their interdependencies. A regular communication channel was put in place to update on deployment progress and allow for roadblocks to be quickly escalated for resolution.

## 02 Introduction of a new template document

Before developing the solution that was deployed on-premise, DBS and Pactly had jointly reviewed almost three years' worth of DBS-specific historical contracts. The intent was to use this data to train various machine learning models to support contract review. However, the implementation of Pactly coincided with a significant change in DBS' templates, which meant that there were some limitations on the degree of reliance that could be placed on the historical data that was previously analysed.

### SOLUTION

#### Data mapping exercise

While Pactly could not rely on all the historical data, this constraint was ameliorated partly by mapping similar clauses and concepts from DBS' old templates to those in the new templates. This mapping exercise provided a useful starting point for developing the solution that was deployed on DBS' premise.

### SOLUTION

#### Planning forward and capturing data well

Significantly, the decision was made to onboard most of the new contract templates sooner rather than later as it meant that the system once deployed could start capturing all the variation data to the templates thenceforth. Such data capture puts the DBS in a better position to leverage on much more structured and organised data, to revise the templates and build further automation into the review system in future. On that front, DBS has agreed with Pactly for a long-term support model that is centred on collaborative improvements to the system so that DBS and Pactly may collectively review and further improve the degree of automation over time.



## 03 Governance of probabilistic models

Given the key role that the review system plays in the future state of contract negotiations, it is important to consider how the probabilistic models underpinning the review system ought to be reviewed from a risk governance perspective.

As part of any automated contract review solution, there would inevitably be predictive models assessing whether a clause (or variation to a clause) was acceptable or otherwise. In many cases, these models tended to return the probability of a clause being an issue is triggered by the crossing of a predefined threshold optimised through backtesting. Given the statistical nature of such models, there could be cases where the analytical solution flags a clause as an issue, when this may not be the case when considered by a human reviewer, and vice versa. Any A.I. solution will hence need to manage this tension between faithfulness towards either the judgment of a model or human reviewer, and it remains more an art rather than a science when it comes down to striking this balance that maximises the ultimate business goal while taking in the relevant risk control requirements.

In addition, an analytics-driven solution is largely based on the data that it learns from. Consequently, the quality of past data, data drift caused by behavioural changes, introduction of new types of legal contracts can lead to fluctuations in model performance. The active usage of the model output can potentially change the underlying data such that future model retraining/refreshing will lead to significantly different models.

### SOLUTION

#### Design and architecture of review logic

Pactly built the solution with the starting assumption that every unknown change was an unacceptable change; any specific model introduced, relied on this assumption, which resulted in a more cautious and calibrated approach.

Due to this simplifying assumption, the models built could lean heavily towards high precision, at the expense of model recall. For example, DBS and Pactly could optimise the model, which detects whether the term of the contract auto-renews, for precision. The model has a high level of confidence in identifying counterparty amendments that included auto-renewal of the contract term as part of the draft and facilitated remediation of the issue by the contract owner. Conversely, due to the low recall, the model would in some instances miss out on identifying an edit introducing auto-renewal. However, this did not pose a legal risk to DBS, as the failure of the model to identify it as an auto-renewal clause meant that it would have been flagged as an unclassified clause, requiring human review.

On an ongoing basis, model performance and data used by the models are closely monitored to ensure they are working within acceptable performance benchmarks and have fall-back safety mechanisms in the event of significant performance variation.

Over time as the review system collects more data, there is confidence (both in the qualitative and quantitative sense) that these models would be further optimised to improve recall without compromising precision. At that point, improvements to recall would allow for more issues to be automatically identified by the review system, translating to more efficiency gains.

### SOLUTION

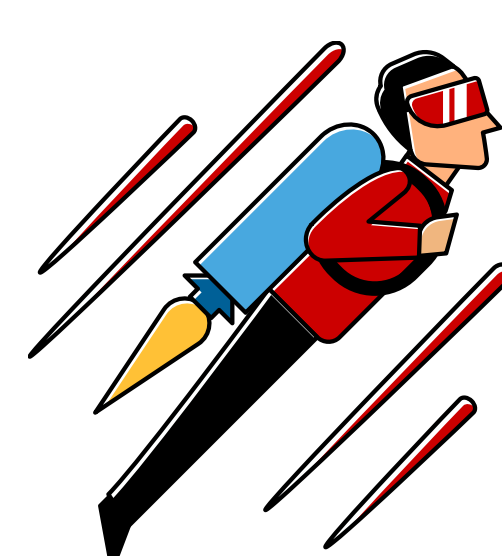
#### Legal developer tools

Additionally, the solution provides a user interface for legal users to test the review logic of specific clauses with either model-based or natural language processing-based techniques implemented. DBS Legal users can select and amend any of these template clauses, introducing variations to test if the analysis outcome is correct. If the user obtains an unexpected result, this is immediately shared via the solution with Pactly so that Pactly can work on further model improvements.



# EXPECTED BENEFITS AND IMPROVEMENTS

## Improved productivity



The deployed solution is expected to increase productivity across DBS Legal team and the relevant business units as:

- ⊕ tedious and low-value checks are now programmatic,
- ⊕ involvement of DBS Legal team is reduced and only required in more complex negotiations, and
- ⊕ the turnaround time to conclude negotiations is expected to decrease.

## Better risk governance



Besides improved productivity, one of the key benefits expected is a more consistent and principled approach to contracting and managing legal risks. By analysing the historical data, DBS Legal team can define and pre-approve acceptable deviations more efficiently, promoting consistency across the organisation. On an ongoing basis, making such historical data accessible to DBS Legal users reviewing the variations also promotes a more consistent application of when deviations should be accepted.

## Data-driven legal framework



The solution will provide DBS Legal team with access to new data insights at a deeper level, such as identifying clauses that are heavily negotiated by counterparties, the frequency of such negotiations, and DBS' response. This analytics data can inform playbook development, template preparations, internal training, benchmarking of a template's effectiveness, and establish well-informed business relationships with its counterparties.

## Benefits to negotiation counterparties



Beyond DBS, the new contract review approach is also expected to positively affect DBS' trading counterparties, vendors, and customers. An immediate result is that contracts can be negotiated and concluded faster, resulting in faster time to deal execution and/or market. A less obvious implication is that a more consistent application of contract terms across various parties within the same industry, backed by data, promotes fairness and reduces the time spent by all parties on contract risk assessment, negotiation and ultimately legal costs.



# FINDINGS

## Targeted application of solution to address contracting friction more effectively

A key finding is that instead of building one generic solution that can review all kinds of potential changes to a contract, it is more effective for a targeted implementation that addresses friction points for the specific templates in question. From a technical development perspective, the POC has demonstrated that this approach effectively increases the likelihood of achieving meaningful results at reasonable costs. From an operational perspective, the belief is that this approach will have a more direct impact in terms of time saved in contract negotiations.

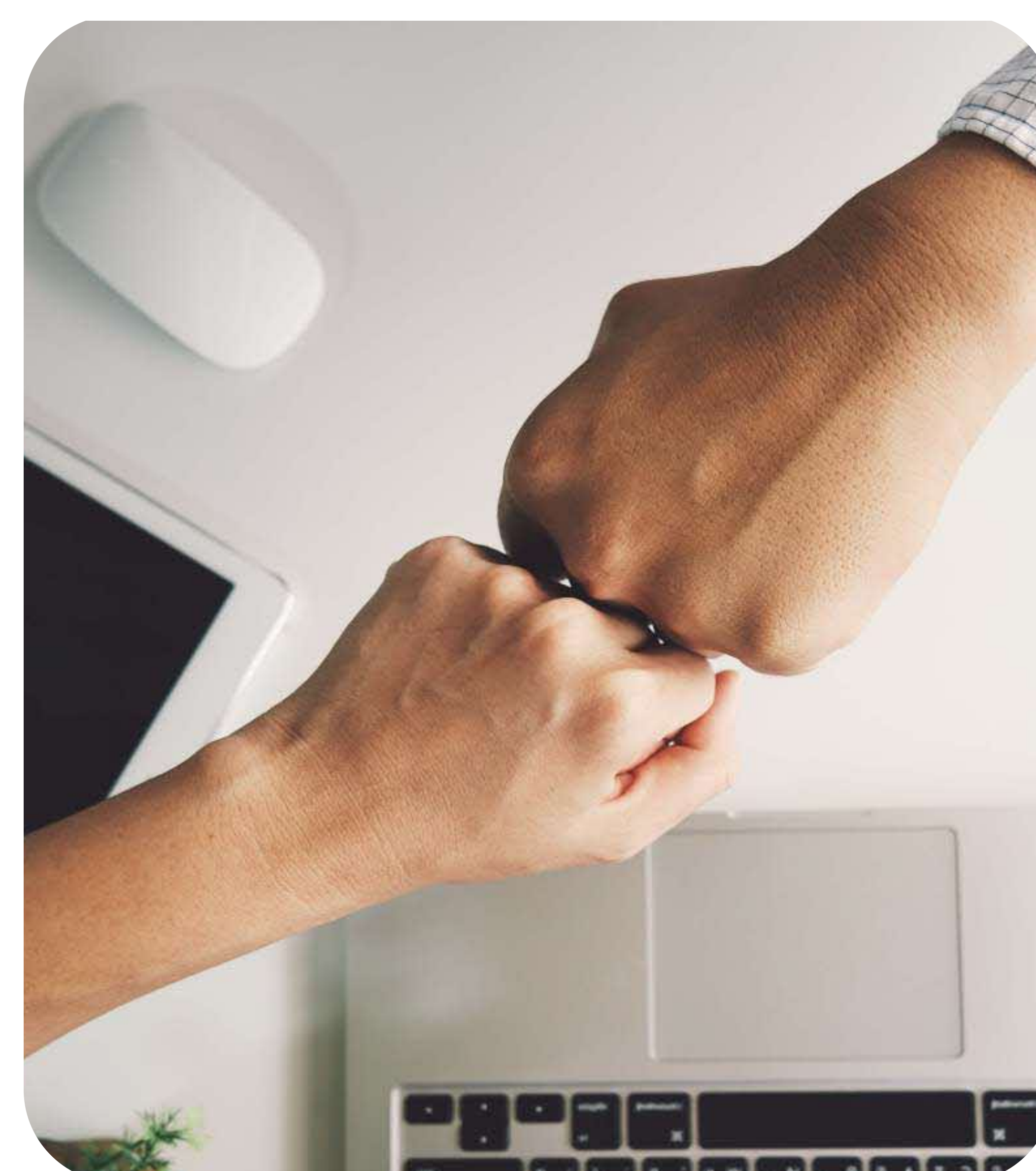


## Bootstrapping with high-precision models and defaulting to human-in-the-loop

The decision to keep the human-in-the-loop<sup>4</sup> is an important simplifying assumption. In the absence of large labelled datasets, using high-precision models with human-in-the-loop is an effective way to kick-start the building of an automated contract review solution. High-precision models provide a high degree of confidence that an issue has been correctly flagged even though such models are usually less than comprehensive in terms of their range of issue identification. Hence, the importance of human supervision. As more data is collected over time, human supervision will likely reduce as the model will be able to identify a greater range of issues.

## Co-development model with start-ups mutually beneficial

It is apparent that a co-development model with start-ups is a mutually beneficial way to develop novel solutions to complex problems. From DBS' perspective, working with start-ups allows innovation to occur much closer to the customer's/end-users' needs as they can adapt and customise more easily. This adaptability is crucial when dealing with complex problems since the solution may not always be immediately evident from the start. For the start-up, working with a mature institution like DBS enabled access to (i) data otherwise unavailable, and (ii) the customer/end-users' knowledge and experience. This co-development model has a synergistic effect and yielded significant advantages for both parties where the tighter feedback loop increases the likelihood of developing a solution that meaningfully solves the users' problem.



<sup>4</sup> Human-in-the-loop suggests that human oversight is active and involved, with the human retaining full control and the A.I. only providing recommendations or input. Decisions cannot be exercised without affirmative actions by the human, such as a human command to proceed with a given decision. This concept is explained in the Infocomm Media Development Authority's ("IMDA") Model A.I. Governance Framework on p. 30, accessible at: <http://go.gov.sg/AI-gov-MF-2> (last accessed 27 May 2021)



# BEYOND THE CURRENT PHASE

Going beyond the POC, DBS will continue to invest in developing a better understanding of the template performance via the analytics collected. To this end, DBS is working on a framework to assess how the data collected can be used to improve the way that an organisation thinks about templates and negotiation strategies, and encourage greater consistency in negotiating with counterparties across various contract types.

These are positive developments but there is room for further innovation and improvement in respect of contract review automation. DBS will continue to work with its technology partners (including Pactly and internal technology teams) on the technical front to develop new ways to improve and expand on the core review capabilities. This continued capability expansion would be relevant not just for the contract types that was worked on for the POC, but also for all the other contract types that DBS hopes to eventually onboard to this new approach.

There is no doubt that contract review automation will be a growth area and priority for many legal departments in the years to come.







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