

# CASE STUDY

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Adopting Morphir:  
A study of Capital  
One's successful  
implementation and  
collaboration



**FINOS**

Fintech  
Open Source  
Foundation

## ABOUT MORPHIR

**Date Open Sourced  
in FINOS:**

October 2020

**Initially contributed by:**  
Morgan Stanley**Link:**  
[morphir.finos.org](https://morphir.finos.org)**GitHub:**  
[github.com/finos/morphir](https://github.com/finos/morphir)**Summary:**

Morphir is a library of tools that works to capture business logic as data. These tools facilitate the digitization of business logic into multiple different languages and platforms. Digitized business logic provides numerous advantages, including sharing that logic across teams, departments, applications, and even technologies, providing improved maintainability, reusability, traceability, and auditability.

## Introduction

The Fintech Open Source Foundation (FINOS) was created to provide an efficient and transparent way for financial institutions to collaborate on open-source solutions. A major benefit of FINOS membership is the ability to use and collaborate on projects that provide benefit to the industry as whole. This case study explores a successful realization of this FINOS goal via Capital One's adoption and collaboration on the Morphir project, which was originally contributed by Morgan Stanley in 2020.

## The Story

### The Challenge

Like most financial institutions, Capital One has vast amounts of data across the organization. This creates a significant challenge for firm-wide management. To alleviate the burden, Capital One developed a proprietary Domain Specific Language (DSL) to enable users across the organization to apply specific business logic and rules for processing and managing large amounts of data. While the DSL was initially successful, broader adoption across the firm put strain on its capabilities and on the team maintaining it. Eventually, the team looked for other solutions that could better meet their growing demand.

### More about DSLs for Finance:

Financial operations regularly require organizations to follow intricate business rules and calculations. A DSL can provide a structured, customized, and concise way to express these complex business rules, such as accounting, interest calculations, payments, product lifecycle events, or regulatory reporting, in the language of the business. This has the advantage of keeping the communication between developers and subject matter experts aligned, thereby increasing quality and efficiency. DSLs also provide a buffer from the technical platform, which allows development teams to update the technology without concern for rewriting the vital business logic. A successful DSL can also provide full transparency into exactly how the application is behaving in real world situations.

An analysis of vendor and open-source solutions concluded that the Morphir project strongly aligned with Capital One's requirements. Some specific reasons included:

1. Morphir's technically scalable architecture, which is essential to being a cornerstone system in Capital One's enterprise architecture.
2. Morphir's pure functional model ensures consistent and predictable outputs, which is critical for data operations.
3. Morphir is an established open-source project with active maintainers, a defined roadmap, and a growing community.
4. Capital One engineers would be able to develop new features and components for their users.
5. The open-source project sits within FINOS and the Linux Foundation, providing essential assurances regarding community support, security, and project viability.

## The Implementation

Capital One is an open-source first organization with a robust process for onboarding open-source projects so the entire Morphir ecosystem was up-and-running in no time. From the project's inception, Capital One has had a dedicated team of engineers focused on the Morphir implementation, which resulted in the contribution of a new project, Morphir Scala, to FINOS. Within a year, two

## Capital One's Approach to Open Source

For many years, Capital One has recognized the value that open-source brings to its organization and the industry. The organization consumes large amounts of open-source software and actively gives back by open-sourcing their projects, contributing to third-party open-source projects, and participating in open standards initiatives. Capital One has invested significantly over the years to build appropriate tools and processes to consume and contribute to open source software projects safely. They oversee open-source policies, standards, controls, and tooling through their Open Source Program Office, which engages with stakeholders across the firm, including legal, compliance, risk, and security professionals.

developers became Morphir maintainers, which is no small feat. Since then, the team has consistently added functionality to the project, addressing Capital One's needs while providing additional features for the entire Morphir community. Capital One is now using Morphir to enable its users to turn complex business rules and calculations into code which implements that business logic. They continue to expand its use and have identified Morphir as a foundational component of Capital One's enterprise platforms as they seek to deliver modern technology solutions.

This data management implementation has captured the interest of other teams within the organization. Capital One regularly runs internal open-source days to promote awareness among its developers. Morphir was featured as a highlighted project and generated a surge of interest and inquiries from internal teams assessing the applicability of Morphir for their own use cases. This growing interest has prompted the team to conduct numerous internal presentations and demos, showcasing their use of Morphir and the benefits it provides.

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We regularly review our policies, standards, and procedures, bringing together all of our stakeholders to assess how things are working and where we can make improvements. This also includes discussions around how to best educate our developers through training, speaker series, and participation in internal and external open source focused events.”

**- DUANE O'BRIEN, DIRECTOR, SOFTWARE ENGINEERING, CAPITAL ONE**

## Foundations bring value to financial services organizations

Open-source foundations like FINOS and the Linux Foundation provide essential support for open source projects and their communities. Projects undergo rigorous security and vulnerability checks during initial contribution and with subsequent commits. The FINOS team also helps project teams develop and maintain open-source best practices, including building roadmaps, holding structured project meetings, enforcing contributor license agreements, and following appropriate voting and release procedures. And, importantly, FINOS provides a neutral and collaborative environment where industry experts come together to share insights and address common challenges in a manner compliant with the regulations of a highly regulated industry.

## Community and Collaboration

Collaboration with a community of developers is a valuable benefit of adopting open-source projects. FINOS provides member firms with a streamlined path to collaboration. This has helped Capital One with their Morphir adoption and enabled them to have highly technical discussions with peers outside their organization. Since their adoption, they have worked closely with Morgan Stanley to coordinate on features and roadmaps. Access to the FINOS community of experts from Morgan Stanley, Codethink, and Turntabl has provided a high-level discourse and different perspectives on a variety of technical topics.

Morphir community members attend bi-weekly project meetings to discuss issues, new requests, releases, roadmaps, and more. With attendees from Morgan Stanley, Databricks, Snowflake, Confluent, RBC, Turntabl, Cognizant, and more, they provide an opportunity to leverage knowledge and experience from across the financial and technology industries. These discussions provide a unique opportunity to incorporate diverse insights into solutions, leading to smarter contributions that meet the requirements of multiple parties, reducing the resources required by any single organization.



“One of the greatest things about having this community is that you don’t get tunnel vision from being focused on one single element. Community input can help us realize that we can tweak one small thing and suddenly have a much bigger impact. We all benefit from the kind of ‘checks and balances’ that are in place because of the diverse community.”

**- DAMIAN REEVES, DISTINGUISHED ENGINEER,  
CAPITAL ONE**

Contributions from the Morphir community have expanded since Morgan Stanley contributed the project in 2020. In addition to Capital One joining Morgan Stanley as co-maintainers, the project has received contributions from Royal Bank of Canada, Microsoft, Databricks, Snowflake, Confluent, Codethink, and Turntabl. The project even gets unsolicited contributions from programming language enthusiasts.

# Results

Throughout this case study, we've highlighted how Capital One has benefitted from adopting the open source project, Morphir. Here, we summarize and highlight several of those benefits.

- **Feature Alignment:** Morphir's features and capabilities strongly aligned with Capital One's requirements, offering a solution that catered to their current and future needs.
- **Faster Time to Market:** Customizing Morphir and adding new features required by Capital One achieved faster delivery than adding the equivalent to their proprietary DSL or another market solution.
- **Direct Development:** Capital One engineers can directly develop new features and components their users require, offering flexibility and control.
- **Cost Savings:**
  - Identifying enhancements or new features that the Morphir community can develop collaboratively means Capital One doesn't have to bear the entire development burden.
  - The successful implementation of Morphir at Capital One piqued the interest of other internal teams, leading to further exploration of Morphir's applicability for their use cases. Increased use across the organization can keep development and support costs down.
- **Collaboration:** Working closely with Morgan Stanley on shared features and roadmaps.
- **Diverse Insights:** Community discussions bring subject matter experts from different organizations together, leading to better, more widely applicable solutions and smarter contributions.

## Future Directions

The success of Morphir at powerhouse finance firms like Capital One and Morgan Stanley demonstrates the project's value in its ability to provide complete transparency and lineage for a range of data management, calculations, and complex logic. In conjunction with the FINOS Open Reg Tech initiatives, near term features will expand these capabilities. The Morphir maintainers recognize that the path to further growth lies in enabling a wider range of contributors, so will also focus on accessibility and documentation.

The collaboration between Morgan Stanley and Capital One on the Morphir project really highlights the value of open-source in Finance. A major motivation for open-sourcing the project was to create an ecosystem beyond what any individual firm could provide. This collaboration has done exactly that. The two firms have been able to coordinate across a variety of use cases and innovative ideas to provide combined value for all Morphir users."

**- STEPHEN GOLDBAUM,  
EXECUTIVE DIRECTOR AND  
DISTINGUISHED ENGINEER,  
MORGAN STANLEY**

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