BFA

R²A

REGTECH FOR REGULATORS ACCELERATOR

The RegTech for Regulators Accelerator (R²A) Process

Giving Financial Authorities Superpowers

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The RegTech for Regulators Accelerator (R²A)

The RegTech for Regulators Accelerator (R²A) partners with leading financial sector authorities to pioneer the next generation of tools and techniques for regulation, market supervision, and policy analysis. Accessing new datasets and analyzing available data more effectively allows financial authorities to establish a body of knowledge and evidence to drive smart policy reforms that promote financial inclusion and ensure financial stability, integrity, and consumer protection. R²A accelerates these advances by helping authorities re-imagine how they collect and manage data, and by prototyping new solutions that strengthen their capabilities. Through R²A, partner financial authorities seek to harness technology to improve the speed, quality, and comprehensiveness of information in support of targeted, risk-based decision-making.

Launched in October 2016, R²A has already partnered with the Bangko Sentral ng Pilipinas (BSP) and the Mexican Comisión Nacional Bancaria y de Valores (CNBV) to develop and test next-generation prototypes that can serve as examples for other supervisors and regulators. R²A also engages closely with technology innovators to create structured opportunities for them to propose solutions and collaborate with financial authorities in the design and testing of promising ideas.

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R²A is sponsored by

Bill & Melinda Gates foundation

Omidyar Network

USAID FROM THE AMERICAN PEOPLE

And implemented by

BFA

Rockefeller Philanthropy Advisors

"Our RegTech projects will result in streamlined processes, enhanced ability for better data capture, and increased bandwidth for our human resources to perform higher quality analytics to support more responsive supervision and development of financial inclusion policies."

Nestor A. Espenilla Jr.
Governor, Bangko Sentral ng Pilipinas

COMISIÓN NACIONAL
BANCARIA Y DE VALORES

"As a result of the partnership with R^2A, CNBV has strengthened tech-oriented innovation for market supervision."

Bernardo González Rosas
President Comisión Nacional Bancaria y de Valores

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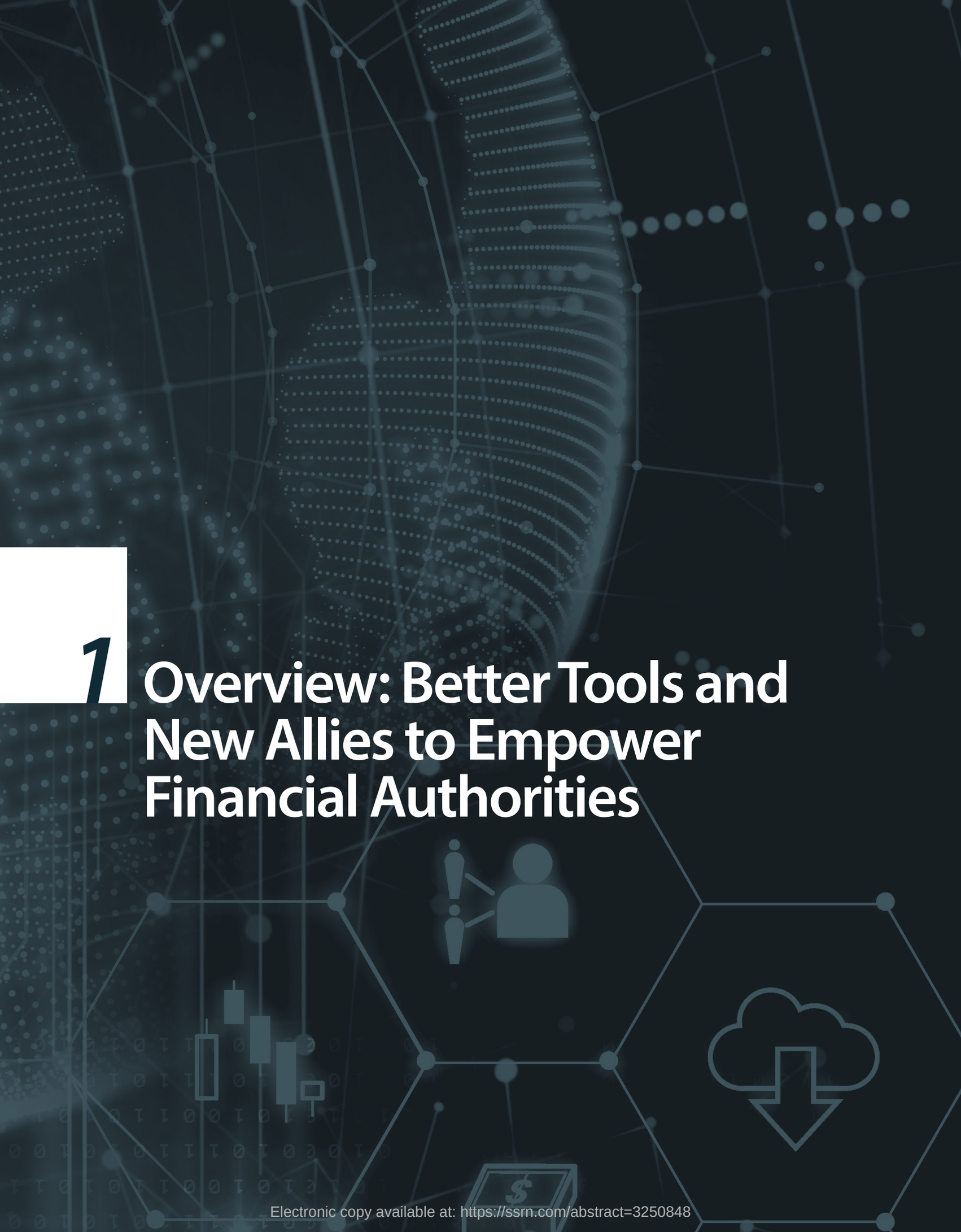
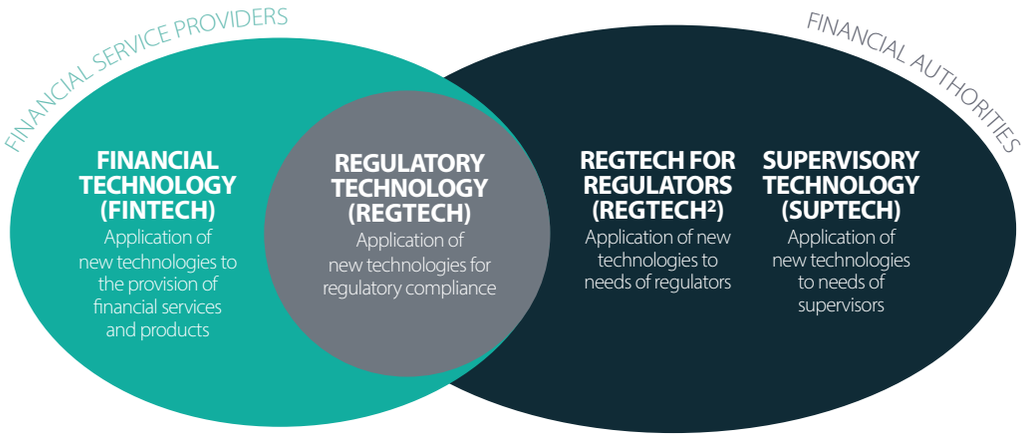


1 Overview: Better Tools and New Allies to Empower Financial Authorities

Since 2016, BFA has worked with supervisors, regulators, and tech vendors from around the world to reimagine the roles of technology and data in regulation and supervision. The RegTech for Regulators Accelerator (R^2A) initiative seeks to unlock the potential of emerging technologies to augment the capabilities of financial sector regulators and supervisors ($RegTech^2$ and SupTech respectively).[1] The $RegTech^2$/SupTech prototypes that result from R^2A engagements leverage the latest advances in artificial intelligence (AI) and Big Data and equip financial authorities with powerful new tools to implement risk-based supervision and proportionate regulation. R^2A was conceived to tap this opportunity and thereby create regulatory environments that foster financial inclusion and digital innovation.

R^2A was also born out of a growing awareness amongst financial authorities, donors, and the financial inclusion community that the rapid expansion and digitization of financial services poses unique challenges for regulation and supervision. The additional workload of overseeing growing numbers of digital financial providers, products and customers is aggravating pain points in established regulatory and supervisory approaches. The manual processes and outdated technologies that pervade many data architectures struggle to process the surfeit of data generated by digital financial services, let alone mine them for new insights. Manual processes and legacy IT systems can embed inefficiencies, supervisory blind spots, and minefields of operational risks that render regulation and supervision more retrospective, reactive, and error prone. By exacerbating regulatory bottlenecks and backlogs, they also threaten to slow the growth of budding financial technology (Fintech) industries.

Figure 1: Overlapping worlds of tech



Source: R^2A

R^2A was also created with a view to closing the gap in the market for "off-the-shelf" $RegTech^2$/SupTech solutions by bridging the divide between financial authorities and technology vendors. Limited contact and mutual misperceptions have complicated engagements between financial authorities and providers of $RegTech^2$/SupTech solutions (see Figure 2). Innovators may have been discouraged from pursuing opportunities in $RegTech^2$/SupTech due to a lack of information or clarity about the demands and needs of the financial authorities, limited exposure to public-sector projects, or cumbersome procurement processes. Regulators and supervisors, for their part, have been apprehensive or even averse to partnering with technology vendors that are pioneering $RegTech^2$/SupTech innovations because they lack the necessary credentials in the regulatory/supervisory space. R^2A seeks to correct this mismatch in the demand and supply of $RegTech^2$/SupTech solutions.

Figure 2: Causes of the mismatch in demand and supply of RegTech²/SupTech

R²A bridges the divide by "de-risking" the engagement for both parties—that is, by mediating the relationship and providing guidance to each side on how to navigate the other's world. Specifically, R²A operates as a facilitator by "translating" the asks of financial authorities into detailed specs that vendors can understand. It also stands in as the intermediary counterparty to both the financial authority and the vendor in the procurement contract.

The purpose of this working paper is to share the R²A approach, process, and tools with financial authorities and other experts who aim to undertake and facilitate a similar journey. The R²A approach draws on best practices from management and entrepreneurial consulting as well as from lessons learned by BFA during past engagements with both the public sector and the Fintech community.[2] The R²A process employs lean design and innovative procurement methods to develop cutting-edge prototypes aimed at relieving specific pain points in financial regulation and supervision. That entails crafting new solutions around the idiosyncratic needs and circumstances of partner financial authorities, which can then be adapted to other jurisdictions in order to reach scale and create an off-the-shelf product.

BFA and its partners agreed that designing and testing such an approach was as important as the desired outputs of the initiative. The first three projects under R²A worked on specific use cases in Mexico and the Philippines covering anti-money laundering (AML) supervision, prudential compliance reporting, and consumer complaints handling. A subsequent "data stack" project in Nigeria[3] and a gender-disaggregated data project in Egypt[4] allowed for further refinements to the workflow.

These case studies produced tangible results and validated R²A's value proposition. Interactions with financial authorities and technologists in the context of R²A revealed that there is considerable interest for RegTech²/SupTech applications to other use cases, as well as plentiful supply of innovative ideas from technologists who do not typically engage with the public sector.

The first section of this paper describes the R²A approach. The second lays out the process of its seven phases, and describes some of the tools available to crowdsource ideas and engage with tech vendors. The appendix provides detailed information on case studies and concepts and methods.

2 The R²A's Approach to Co-creation

The R^2A approach is a unique accelerator model employed by BFA to guide the co-creation of $RegTech^2$ and SupTech prototypes in collaboration with partner financial authorities. Like the startup accelerators on which it is loosely modeled, R^2A is a rapid, intense, streamlined process for developing innovative solutions to specific problems as well as to explore novel applications of emerging technologies for regulation and supervision. The resulting prototypes are designed to be readily scaled up and deployed once an engagement is concluded. Whereas traditional methods for researching and developing (R&D) technological tools for financial authorities can entail significant time and resources – as well as lengthy and cumbersome public procurement procedures – R^2A seeks to compress the R&D cycle into just a few months. For this to succeed, the approach follows a number of guiding principles:

1. **User-centered design.** Borrowing insights from human-centered design (HCD), the R^2A approach holds that the end users—in this case the regulators and supervisors—know their needs best. They are intimately familiar with the pain points that hamper their workflow and detract from their core duties. R^2A helps them articulate a vision for how to solve those problems and develop the tools to realize that vision. It does not prescribe remedies or issue directives. Rather, prototypes are designed in accordance with the idiosyncratic needs and circumstances of the financial authority and its jurisdiction. By contrast, off-the-shelf solutions tend to require little to no additional design work but often entail significant investment in installation, onboarding, and customization.

2. **User-driven development.** Beyond design, R^2A also ensures that the user is an integral part of the development process, with staff at the financial authority actively involved in building the prototype together with the technology vendor. User-driven development involves frequent interactions between the end-users and the development team in order to ensure that the end-product aligns with the vision. Furthermore, knowledge of the prototype's inner workings provides the authority the technical know-how to service the prototype and further develop it post-engagement.

3. **Lean production.** Because IT departments at financial authorities often operate under tight budgets and since many $RegTech^2$/SupTech solutions are untried and untested, R^2A projects resemble technology startups in several respects. Hence, the lean design methodologies widely used by the "tech" community also lend themselves to R^2A engagements. These emphasize fast iteration and frequent user testing, which keeps the production process fluid and flexible. Also, R^2A tends to be relatively lean in cost since it draws on a deep pool of technology vendors and relatively cost-effective technologies (e.g., open-source software without licensing fees). By contrast, enterprise IT solutions might tie users to particular software packages or lock them into costly service agreements.

4. **Open collaboration.** R^2A is premised on the notion that openness breeds cooperation, stimulates ideation, and fosters innovation. Accordingly, R^2A seeks to establish close partnerships between the users of technology and its developers. This not only facilitates project management and technical troubleshooting, but it also builds the necessary trust between teams and departments to elicit honest and creative feedback. Likewise, R^2A is expanding its global network of financial authorities, technologists, and growing the financial inclusion community where it can showcase its prototypes and share learnings. Such fora help to cross-pollinate ideas from or to similar $RegTech^2$/SupTech applications, as well as contribute to a global marketplace for solutions.

5. **Security by design.** The flipside of openness is trust. The often highly sensitive nature of the data collected and managed by regulators and supervisors makes security paramount. Confidentiality and access controls are maintained throughout the process, and a premium is put on safeguarding databases and transmission channels from possible attacks or theft.

3 The R²A Process: Seven Steps to Building a Prototype

The R²A process describes a particular *modus operandi* for co-creating RegTech²/SupTech prototypes using a "lean" design and development approach. It can be broken down into seven steps summarized in Figure 3.

Figure 3: R²A's process schema

Step 1 Inception: Building trust and securing commitment

The starting point for an R²A engagement is typically a formal request from a financial authority to undertake a RegTech²/SupTech project in collaboration with BFA. The request may be for an open-ended exploration of several RegTech²/SupTech use cases, or it may seek a solution to a specific problem. Either way, the R²A team first needs to ascertain whether the prospective partner has the willingness and ability to see the project through to the end. Here considerations extend beyond institutional capacity and financing to questions of commitment to the program. Crucially, BFA needs to see alignment in vision and effort between the project owners and those bodies tasked with implementing it. For R²A, it is important to verify that commitment and to ensure that the all participating supervisors and regulators have the delegated authority to undertake the journey.

A formal agreement between financial authorities and R²A is approved by the head of the financial authority (e.g., the governor) in the form of a memorandum of understanding (MoU), letters of commitment to request the engagement, or a contract of service. This document outlines the project's governance framework in broad terms, including specifying who in the financial authority (e.g., a deputy governor) will be responsible for making crucial decisions such as the precise definition of the scope of the engagement. Moreover, because it is critical for the financial authorities to entrust their counterparts with access to data and technical architectures, a non-disclosure agreement (NDA) is typically required (whether separately or incorporated into the previous document).

Phase 2 Use Case: Value proposition analysis

To articulate the value proposition of the project, the R²A team and the partnering financial authority team take three steps:

i. Understand the challenges and desires
ii. Define objectives
iii. Craft solutions

In keeping with R²A's open and collaborative approach, this phase is intended to take place in a workshop setting where regulators and supervisors can freely discuss practical challenges and explore potential solutions based on their lived experiences. To assist them with this exercise, R²A provides an outsider's perspective, technical expertise, and an analytical framework. The following is a rough guide for completing such a workshop by way of prompts and exploratory questions.

i. **Understanding the challenge:** The first engagement consists of a series of meetings between the R²A team (at least one policy expert and one entrepreneurial technologist) and key departments involved in regulatory and supervisory activities, research, statistics, and IT. The aim is to have frank conversations and elicit honest feedback from functionaries about technological bottlenecks or inefficiencies that detract from their ability to perform core tasks, as well as to unleash their imaginations with regard to possible solutions.

Common complaints that surface during these conversations include the limitations of Excel spreadsheets as a tool for collecting regulatory reporting data, the delays in their validation, and the quality of data available to supervisors to undertake risk-based oversight activities.[5]

The practitioners who have wrestled with these problems on a daily basis are best placed to elucidate them. However, getting them to open up often requires some cajoling. Playful questions that have helped to spark conversation among workshop participants might include:

- *"What tasks make you dread coming to your job in the morning?"*
- *"What activities would you love to be doing in your current role, and what's getting in your way of doing that?"*
- *"What routine tasks do you wish you could outsource?"*
- *"If you could snap your fingers and have one professional superpower, what would it be?"*
- *"What's your idea for a killer app to improve your workflow?"*

The question and answer sessions may shed light on concrete problems and solutions, or they may give clues to ideas that can be fleshed out later. As important as investigating the pain points is establishing trust and rapport, as this may produce better responses and deeper levels of engagement during subsequent consultations.

ii. **Setting objectives:** Once the main pain points are diagnosed, identifying the corresponding pain relievers is relatively straightforward. These become the objectives of the project. Generally, they relate to the overarching mandates of the personas in question, such as safeguarding the stability and integrity of financial markets (banking, insurance, and capital markets supervision), guaranteeing the smooth functioning of payments systems (central banks), or optimizing the administration of public resources (ministries of finance). For example, to overcome the aforementioned operational inefficiencies and risks of Excel- and email-based regulatory reporting, one objective could be to upgrade regulatory systems in order to increase the speed, volume, and granularity of data submissions. The ability to collect, validate, and interpret data more quickly and completely should, in turn, make for more evidence-based and targeted regulation and supervisory interventions.

In setting objectives, the potential impact of th pursuit should also be taken into account. This extends beyond the goal of achieving efficiency gains to the wider knock-on effects on financial inclusion and innovation, economic development, market efficiency, governance, and the like. Such considerations are often crucial to secure philanthropic backing for a project.

Some questions to frame the objective-setting discussion include:

- *Would the possible solution address the challenge/pain point? How well will this use case address the expressed need of the department that came up with it?*
- *How well will this benefit the financial authority across all departments? E.g., freeing up resources that could be dedicated to address other pain points, or allowing to test and deploy technologies that would then ease the development of solutions to address the other pain points.*
- *What is the potential impact on the relevant stakeholders in the ecosystem?*
- *How much will implementing this benefit supervised entities and new providers?*

- *What benefit will this solution provide to the existing and potential end users of financial services? What level of impact will this solution have for those currently excluded from the formal financial system?*

iii. **Identifying possible solutions:** The final step in this phase seeks to identify technological solutions (in low fidelity) that can address the challenges and meet the objectives defined in the prior step.

R²A incorporates existing technologies and providers (even those beyond the RegTech²/SupTech world) into proposed RegTech² and SupTech applications, since these are deemed to be the most effective tools for managing the risks in an increasingly digital and data-intensive regulatory environment. The appropriate technology will depend on the nature of problem.

Two key considerations in selecting from among these technologies are feasibility and value. These pertain to the institutional and technological readiness of the authority, including budgetary capacity to take on such a project.

- *What data are currently available?*
- *How can this information be securely collected, validated, and stored?*
- *How many stakeholders/institutions must be involved in order for the prototype to be developed?*
- *Are the goals and visions of these organizations/individuals aligned, or will they need to be negotiated and reconciled?*
- *Can the use cases be accommodated within the availble time/cost budget for this product? Is it possible to split it into smaller use cases?*
- *What risks could jeopardize the project and how can they be mitigated?*

Questions regarding the value of R²A aim to give due consideration to alternative solutions and intangible benefits. For example:

- *Does development of the solution require the R²A process?*
- *Could the problem be resolved with a solution that is already available off-the-shelf (e.g., an enterprise IT solution)?*
- *Does this position the financial authority and potential vendor(s) as leaders in the field?*

This final assessment provides the top management of the financial authority with information to inform their decisions of which use cases to prioritize. There is no strict method for picking these, as each financial authority may perceive the risk-return trade-off differently. A key is that all decisions are documented and defensible when a short-list of proposals is presented to leadership (e.g., governor, president, deputy governor, board of governors) for final selection and approval. This is critical to ensuring buy-in, continued

engagement, advocacy, and dissemination at the highest level, and starting the engagement at an institutional-level rather than as department choice, and also to make sure that everyone is aligned on timing, risk, value, goals, and so forth.

Box 1: Completing the Challenge-Objective-Solution Worksheet

The Mexican National Banking and Securities Commission (CNBV), is the authority charged with supervising Mexico's financial system, and in particular AML. Its AML duties include conducting on-site inspections, auditing AML systems, contributing to suspicious activity reports (SARs), and providing input into know-your-customer (KYC).

In 2017, CNBV engaged R^2A hoping to reengineer its data infrastructure in order to strengthen its AML supervisory capacity and to accommodate a growing Fintech sector.

Challenge: The CNBV lacked an efficient means to extract insights from existing data since supervisors often had to load appropriate data from compact discs and paper files. Based on conversations with R^2A staff, several pain points were identified:

- Too much time was spent acquiring relevant data and information from providers
- The AML department faced staff shortages and budgetary constraints
- On-site inspections were inefficient because of limited data granularity, and analytics
- Large datasets exceeded the limits of Excel-based processes

Objective: The CNBV aimed to:

- Allow financial institutions to submit information for AML compliance digitally and automatically
- Increase the volume, granularity, and frequency – and improve the quality – of AML-related data
- Enable CNBV staff to retrieve historical records from a central data storage platform
- Enable CNBV staff to improve AML-related data validation and analysis, and generate customized reports for supervision and policy development

Solution: At the core of the new data infrastructure is a central, access-controlled data storage platform that can house transactional data submitted by supervised financial entities via Application Programming Interfaces (APIs). Once securely stored, the platform renders the data in risk dashboards, alerts, statistical reports, and machine learning (ML) models using advanced data analytics and visualization tools (e.g., algorithms, notifications, dashboards). It identifies outliers (suspicious transactions, clients, or reports) as well as informs and targets on-site visits.[6]

Phase 3 Governance: Defining project parameters

Defining the parameters means defining, together with the principal stakeholders in the project, the project's high-level rationale, overarching objectives, and broad scope of work. A project charter is drawn up, which is a non-binding framework charting out the implementation of the project in general terms. It typically contains the following elements:

- **Project overview:** The focal area of the project is stated, and the key contributing parties are listed. Typically, they include the partner financial authority project sponsor (e.g., ministry of finance, central bank, regulatory body, etc.).

- **Rationale:** The rationale makes the business or philanthropic case for the project. It presents the problem that the stakeholders wish to solve, or the opportunities that the project seeks to exploit. The expected impact and intended benefits of the project are also outlined.

- **Project scope:** Here the overarching objective(s) are defined, such as, "improve regulatory compliance of mobile money operators." Certain high-level requirements are identified in order to achieve those objectives; for example, "develop and test a prototype that automates regulatory reporting." In addition, major deliverables are spelled out, again, in broad terms. The mode of engagement with developers is tentatively decided on, and the main elements of a proof of concept and prototype are sketched out. Furthermore, the boundaries of the work program may be delineated, in particular the activities that fall within and outside of the scope of the project.

- **Legal terms of use:** This refers mainly to the use and sharing of confidential information, whether and under what conditions such information may be presented or used in knowledge products without triggering a breach of confidentiality. It also specifies the laws and regulations (if applicable) that govern the project and the outcome.

- **Timeline:** The estimated completion timeframe is indicated, and the high-level executive milestones are planned out.

- **Specifies roles and duties:** The main contributions and expectations of each party involved in the project are specified, in terms of who performs which role and with what responsibility. For instance, the project director leads the effort and is responsible for project delivery; the project manager supports project onboarding, vendor selection, and overall project implementation; the project advisor provides technical assistance as needed; and subject matter experts support the design and development of the product.

The project charter is a living document that can be easily amended to reflect the evolution of the project. Annexes are often added to define additional technical and juridical aspects that were not clear or required at the beginning.

Phase 4 Design: Proof of Concept

At R²A, the design phase of product development typically begins with a "design sprint" – a short (typically three to five days) but intense workshop aimed at digging into value proposition analysis (see figure 4), and answering critical questions through rapid prototyping and user testing. Google, which pioneered the process, argues that this process, "helps spark innovation, encourage user-centered thinking, align your team under a shared vision, and get you to product launch faster."[7] Its four-step problem-solving framework is as follows: (i) deepen understanding of users' needs; (ii) diverge and ideate alternate solutions; (iii) review all ideas and vote for the best option; (iv) prototype without investing a lot time, money, or resources.[8] This sequence does not need to be followed strictly, and R²A has developed its own adaptations to suit the particular needs of the RegTech²/SupTech community (see Box 2).

Box 2: Mock Design Sprint Agenda

Persona development

1. *Purpose:* to identify an archetype for a specific team or department that we are creating this solution for, and then for specific roles within that team.
2. *Deliverable:* two or three personas that will inform the remainder of the workshop.

Value proposition design ("Jobs, Pains, Gains")

3. *Purpose:* to identify the jobs (responsibilities), pains (challenges in accomplishing those responsibilities), and gains (ideal practical "superpowers") for each persona.
4. *Deliverable:* a completed "right half" of the value proposition design canvas (see figure 4).

Divergence

5. *Purpose:* to provide an opportunity for each of the workshop attendees to individually sketch what a solution might look like that relieves pains and effects gains in the jobs that each persona needs to get done.
6. *Deliverable:* three "frames" (e.g. portions of a website/app, steps in a process, etc.) per workshop attendee, presented to the rest of the group.

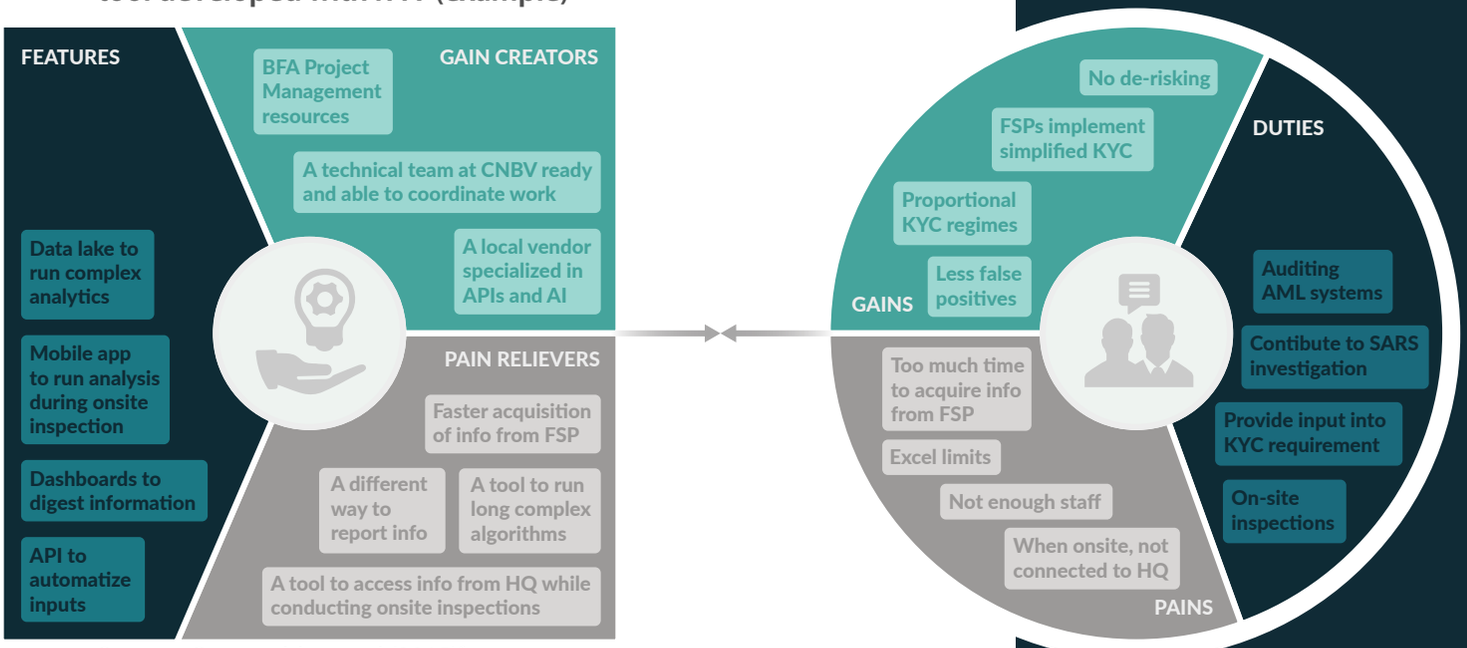
Convergence

7. *Purpose:* after continuing presentation of the sketches as needed, the attendees discuss the features/metrics/elements and give each other feedback. Then each attendee votes on their favorite ones.
8. *Deliverable:* a prioritized list of features/metrics/elements, based on the group's consensus.

Lay out action points for next steps

9. *Purpose:* to assess the prioritized list of features against the real jobs/pains/gains of the personas from the persona development exercise, to understand whether/how they produce value.
10. *Deliverable:* a completed "left half" of the value proposition design canvas.

Figure 4: R²A's simplified version of the CNBV value proposition analysis for the AML data storage and analytics tool developed with R²A (example)



Source: Osterwalder et. al (2015)[9]

Questions of product feasibility and viability are also addressed with the design sprint. R²A enlists the expertise of resident technologists, user-experience (UX) and user interface (UI) designers, and subject matter experts to translate the challenges and desires of the financial authority into concrete functional requirements and technical specifications. Based on these "specs", a "proof of concept" (POC) is built using dummy data, bare-bones architecture, and mock-up dashboards and visualizations. The POC serves to (i) establish consensus on the features that a final product would possess in an ideal world, (ii) draft specs that are intelligible to the technologists who will develop the eventual product; (iii) resolve ambiguities before decisions become hard to reverse; (iv) and determine the feasibility of the solution.

Phase 5 Resourcing: Pairing financial authorities with tech providers

Once the proof of concept is validated, R²A seeks a tech vendor to partner in developing the solution. From the regulators'/supervisors' standpoint, R²A can assist with various procurement mechanisms to identify and select RegTech²/ SupTech solution developers. For competitive processes where several vendors bid to deliver the best-value solution, several modes of engagement are possible, including requests for proposals (RFPs) and applications (RFAs), and more.

Financial authorities can adopt different models to engage experts like data scientists and technologists in the development of their RegTech²/SupTech solutions. Different models correspond to different needs, and they vary in the size of the expert pool, the scope of work, and the time and cost commitment. Trade-offs between these and other factors (e.g., location, cybersecurity, etc.) need to be weighed before making a decision on the appropriate model.

The scope of work in a competition depends on whether it is open-ended or results-oriented. In some cases, for instance data competitions, the outcomes are difficult to predict in advance. Such models may be suitable for novel challenges that require innovative solutions, yet they also bear the risk of deviating too far from the requirements of the project. For projects that are more routine or have precise parameters, RFPs are more appropriate since solutions or products can be tailored to the request. However, a drawback of RFPs is that they tend to attract mostly "traditional" vendors offering "off-the-shelf" solutions.

Time and cost are other considerations in selecting the right competition model. Hackathons, bootcamps, data dives, and datapaloozas are intended to be fast and fruitful engagements. However, their results will typically be preliminary designs, proofs of concept, or early prototypes. Without incentives for continued effort after the competitions end, there are no assurances that the winning teams will carry the projects forward.

Accelerators such as R²A keep the momentum going by sequencing and pacing different modes of engagement, ushering the product or solution along from conceptualization to finalization. For example, a data dive may be used to define the nature of the problem and the scope of the project, which is then followed up by a data competition to develop a prototype. R²A selects the engagement model based on the best fit for purpose.

For the first three R²A projects, a combination of RFAs and challenge prizes were used. RFAs were appropriate for the prudential reporting solution in the Philippines and the AML solution in Mexico because the underlying technology—application programming interfaces (APIs)—is relatively mature and their functional and technical requirements have been largely standardized. In other words, many design questions had already been settled. By contrast, the consumer complaints chatbot developed for the central bank of the Philippines (BSP) had few precedents in financial supervision, and therefore was suitable for selection models that crowdsource ideas from innovators - in this case, a challenge prize. For all three projects a panel of judges participated in the evaluation of vendors that had been shortlisted by the R²A team and made recommendations for R²A and the partner financial authority on the winner to pick from.

The proposals were evaluated according to six key criteria:

1. Relevant experience, as demonstrated by a list of representative past projects, including examples of prior experience specifically related to the project requirements

2. Technical and managerial expertise, as demonstrated by information on the qualifications of key staff to be involved in the project

3. Adequate resourcing, as demonstrated by the ability to devote sufficient resources to complete the work within the established timeframe

4. Topic responsiveness: How well does the proposal address the key needs stated in the RFA?

5. Execution plan: Is the workplan feasible within the budget and time allocated for the project?

6. Innovative approach: Does the idea offer a creative approach to the problem?

Models for financial authorities to engage with data scientists, technologists and other innovators

Model	Pros	Cons	Examples & Tools
Hackathon: A multi-disciplinary event in which technology-oriented participants engage in collaborative problem-solving and prototyping over a short but intensive (usually up to 48 hours) period of time.	✓ Gather diverse sets of preliminary solutions from a broader cross section of experts and across a range of organizations ✓ Short duration, potentially faster results ✓ Raise awareness of an issue area and build foundation of a community around articulated project	× Solutions are preliminary, with few incentives for follow-up efforts × Need linkages with technology community and networks; success depends on the expertise and energy of participants × Can't be too prescriptive of desired end solution	● In November 2016, the UK's Financial Conduct Authority (FCA) held a two-day "Tech Sprint"[10] focused on "unlocking regulatory reporting,"[11] and in 2018 one on AML[12] ● DevPost Hackathon Platform provides tools to advertise and register hackathon[13]
Bootcamp: A structured workshop-style event focused on bringing together technology players (and the broader community) and demo-ing solutions that usually lasts between three to five days.	✓ Raise awareness of project efforts and build foundational community ✓ Provide opportunities for engagement with multiple types of stakeholder ✓ Gather input and and buy-in from participants for next steps grounded in sector best practices and collaborative goals	× Need to sustain activities and sessions over multiple days, and arrange logistics for week-long events × No guarantee that participants will remain engaged without incentives and roadmap × Difficult to balance open and highly collaborative agenda with closed-door strategy sessions	● In 2016, the Monetary Authority of Singapore organized a "fintech festival" with a bootcamp around RegTech, Fintech and Tech Risk[14] ● The 100% Open Innovation Toolkit provides tools to help organize bootcamps[15]
Sprint: A methodological, goal-driven engagement with a team or solution focused on driving a particular element of development forward (i.e. design sprint, data sprint, or code sprint) usually in under a week (numerous sprints can be repeated in a single engagement over a longer period of time)	✓ Quick development framework, focused on prioritizing user value and deconstructing assumptions ✓ Familiarize the project team with agile-development methodologies ✓ Deep dive into team's capacity, and examination of "product market fit"	× Limited to and by pre-identified team(s) or solutions; need due diligence to ensure fit × Requires an engaged and capable sprint leader to keep team(s) on track × Need to prioritize stakeholders involved; sprints can become unwieldy as they grow in size and scope	● In 2015, 18F, a specialized team within the U.S. federal government focused on building digital solutions and streamlining technology projects with government agencies, created a sprint with the Department of Labor[16] ● Google Ventures and 18F provide guides on how to run a design sprint[17]
Data Competition: A data competition provides a financial reward to analyze or build a service utilizing a shared or publicly open dataset in a defined timeframe	✓ Generates a diversity of solutions that are not biased by the approach ✓ Attracts wide range of innovators ✓ Raise awareness of effort, garner media attention (esp. when announcing winners)	× Outcomes are hard to anticipate × Requires capacity to fully anonymize and desensitize data to guarantee privacy and protection standards × Requires linkages with networks of data practitioners, innovators	● In 2016, the Australian Government held its 7th annual GovHack open data competition using more than 170 datasets[18] ● Open Knowledge International provides an Open Data Handbook[19]

Model	Pros	Cons	Examples & Tools
Data dive/jam: When a selected organization works alongside teams of data scientists, developers, and designers to analyze, visualize, and mashup data to gain initial insights into their programs and build preliminary prototypes to enhance their services	✓ Leverages multiple approaches (e.g., analytics, visualizations, etc.) ✓ Rapid development of data prototypes and initial insights ✓ Raise awareness of a dataset or problem and build foundation of a community around issue area(s)	× Need to anonymize and desensitize data if internal dataset(s) are being shared × Requires linkages with networks of data scientists × No assurance that teams will carry forward projects beyond prototypes and initial phases; need incentives/commitment for continued effort	● Datakind, a community of data scientists, held a weekend-long data dive to help four civic groups in India better utilize, build on, and analyze public-sector datasets[20] ● UNDP and Global Pulse provide a Guide to Data Innovation for Development[21]
Datapalooza: Convenes public and private sector partners in workshop-based event to showcase data solutions, and sets the stage for plans to mobilize efforts around a specific data project or database(s)	✓ Sharing best practices and data solutions from a range of innovators ✓ Raise awareness and build a community around a dataset or data project ✓ Provides opportunities for engagement with various stakeholders	× Requires capacity to fully anonymize and desensitize data to guarantee privacy and protection standards × Requires linkages with networks of data practitioners × No guarantee that teams will take forward projects after datapalooza	● In 2010, the U.S. Department of Health & Human Services (HHS) hosted its first datapalooza, and annual datapaloozas thereafter[22] ● Socrata provides a Datapalooza How-To Guide[23]
Request for proposals (RFP) or applications (RFA): Calls to solicit proposed solutions, often made through an open bidding process, for the procurement of vendors. RFPs are used for contracts, while RFAs are for grants	✓ Determines upfront timelines, costs and requirements of project ✓ Allows ample room for vendors to detail relevant experience and solutions ✓ Provides the ability for a targeted engagement with clear guidelines	× Often limits pool of applicants to traditional players × Run the risk of procuring rigid "off-the-shelf" solutions × Traditional RFPs are often more expensive, bureaucratic, and time consuming	● White House's Office of Science Technology Policy issued guidance based on agencies experimentation for a staged contract method for procurement[24] ● The U.S. Digital Services provides a Digital Services Playbook[25]
Challenge prize: Invites participants to contribute a solution to a specific problem statement incentivized by offering a financial reward (and sometimes in-kind) to be executed in a defined timeframe	✓ Attracts a wide ranging groups of innovators ✓ Pay only when results or preset goals are met ✓ Generates a diversity of solutions that are not biased by the approach ✓ Raise awareness of effort, garner media attention (esp. when announcing winners)	× Requires linkages with networks of data practitioners, innovators × Needs to strike the right balance between openness to participants and narrowness of scope × Need to clarify intellectual property issues at the outset to agree on rights to and ownership of the end solution	● In 2017, Citi launched the "Tech for Integrity" challenge to build solutions that promote integrity, accountability, and transparency in the public sector[26] ● Younoodle is a platform to manage competitions[27]
Accelerator model: A fixed-term, cohort-based program where the sponsoring organization selects aligning participants (usually early-stage startups) to accelerate their development through mentorship, educational components, and often capital which culminates in a demo day or pilot project	✓ Provides adaptable model in which sponsors and organizers can customize focus areas, participants, and goals ✓ Brings together multiple layers of the entrepreneur ecosystem (e.g., startups, investors, etc.) ✓ Contributes to the development of the broader technology community	× Crucial to closely vet the participants, as they largely determine the direction of product development × Can be resource intensive (the estimate for a traditional accelerator is around $1 million a year for two cohorts, but costs are wide ranging based on focus, participants, and duration of accelerator)	● In 2016, the Bank of England (BoE) launched its accelerator to harness fintech innovations for central banking[28] ● F6S offers a platform to apply for startup programs, including accelerators[29]

Box 3: Finding a Tech Provider for the Central Bank of the Philippines

In 2017, the Central Bank of the Philippines (Bangko Sentral ng Pilipinas, BSP) engaged R²A to develop an Application Programming Interface (API) and back office reporting and visualization solution.

Challenge: The challenge was to improve BSP's mostly manual, relatively resource-intensive regulatory reporting process. At the time, many of the compliance reports submitted by supervised entities were incomplete, late, and/or inconsistent. Data cleaning and validation consumed significant resources, and e-mailing compliance reports was inherently insecure.

Objectives: Based on an analysis of the pain points, the following objectives were set:

1. Allow financial institutions to submit data digitally and automatically to the financial authority
2. Increase the volume, granularity, and frequency – and improve the quality – of data submitted to the central bank
3. Enable BSP staff to improve data validation and analysis, and generate customized reports for supervisory and policy development purposes

Competition model: A request for applications (RPA) was issued in October 2017, offering an award of US$100,000 to the winner.

Deliverable: The project deliverable was a prototype rather than a fully-fledged, production-ready product. It would be tested with two financial institutions, and it would use data from only a small subset of the required reports.

Proposal review: First, applicants were shortlisted by R²A's technical project team based on three criteria: (1) relevant experience (50%), technical and managerial expertise (30%), and adequate resourcing (20%). Next, the shortlist was reviewed by a panel of judges comprised of leading subject-matter experts and innovators from around the world, including a regulator, a banker, an entrepreneur, and a technologist. The criteria they considered during this second stage were: (1) innovative approach, (2) topic responsiveness, and (3) execution plan.

Nominating the winner: Based on the feedback from all reviewers during the evaluation stage, Compliant Risk Technologies (CRT) was selected and contracted, and the prototype design and development process was launched.

Outcome: The prototype developed by BSP in collaboration with R²A has demonstrated the feasibility of a market-level API-based solution for prudential reporting, and validated many of its promised benefits. As testing has shown, rationalization of the prudential data architecture and automation of reporting processes can relieve many pain points of the existing system and unlock significant efficiency gains for BSP and supervised entities. The API prototype could deliver a greater volume of data, at faster intervals (hourly even), and with fewer duplications, errors, and omissions.

Once the vendor has been selected and approved by the partner financial authority, R²A conducts the due diligence and settles legal issues with regard to (1) data sharing and storage, (2) licensing (of intellectual property), and (3) public procurement. The first may be covered by a non-disclosure agreement (NDA) with the vendors. Data sharing and storage may be subject to notice or confidentiality requirements stipulated in general data protection regulation or financial sector-specific regulation. Similarly, data localization regulation may stipulate that data be stored in-country or on local servers, potentially raising costs and curtailing access to cloud-based solutions. Some questions for the authorities to consider include:

- *What rules govern data sharing with outside parties, such as the R²A team and the vendor?*
- *What type of agreement would need to be in place to facilitate data sharing between the project sponsor (and in some cases, the partner financial institution(s) as well) and the vendor to develop the prototype solution?*
- *What measures would need to be taken to ensure that the sharing of this information complies with applicable data protection requirements (e.g., anonymization of personal data, data security requirements, etc.)?*
- *Do data localization requirements require data to be stored in-country on local servers?*

For licensing, R²A's approach is aimed at both (i) incentivizing vendors to apply and putting them in the position to scale their business, and (ii) avoiding vendor lock-in and ensuring that the outputs are available to project funders and their partners around the world. To strike this delicate balance, licensing agreements are established along the following lines:

- **Partner financial authority:** Each project sponsor receives a perpetual license to use the prototype solution developed under the R²A project. In addition, steps are taken to ensure that the project sponsor can work with a different vendor in the future to further develop the prototype solution, if desired. Depending upon the project, this is achieved either by (i) providing a copy of the deliverables in both source code and object code format; or (ii) providing the deliverables in object code format along with a detailed engineering design document.
- **Project funders:** To ensure that lessons learned from prototype development can be applied in other markets, project funders are granted a similar license to project sponsors.
- **Partner financial institutions:** In two of the prototypes that R²A has developed, banks participated in the project and were granted a limited license to use a working demonstration of the prototype for internal purposes only.
- **Vendors:** In all cases, vendors retain ownership over the deliverables developed through the R²A project. This affords each vendor the opportunity to scale business in other markets, consistent with R²A's efforts to develop a global marketplace for RegTech²/SupTech solutions.

A key question when considering the legal dimensions of licensing is:

- *How should the rights to the intellectual property developed through the R²A project be shared among the project sponsor, project funders, partner financial institutions (if applicable), and vendor?*

Finally, rules governing public procurement can have a significant bearing on the vendor engagement. For this reason, some key questions to answer on this question include:

- *What rules govern procurement of services by the project sponsor?*
- *How would the procurement rules impact the ability of the sponsor to purchase and roll out the prototype RegTech² solution in a timely fashion following the testing phase (if desired)? For example, would a small, foreign vendor -- either the vendor that delivers the prototype solution or another vendor -- be able to comply with the relevant requirements?*
- *Could the sponsor conclude a sole source agreement, or would an RFP or similar arrangement be required?*

Phase 6 Prototyping: Iterative testing and development

With a proof of concept in hand, a development team at the ready, and a contract in place, the vendor can begin the actual work of building a prototype.

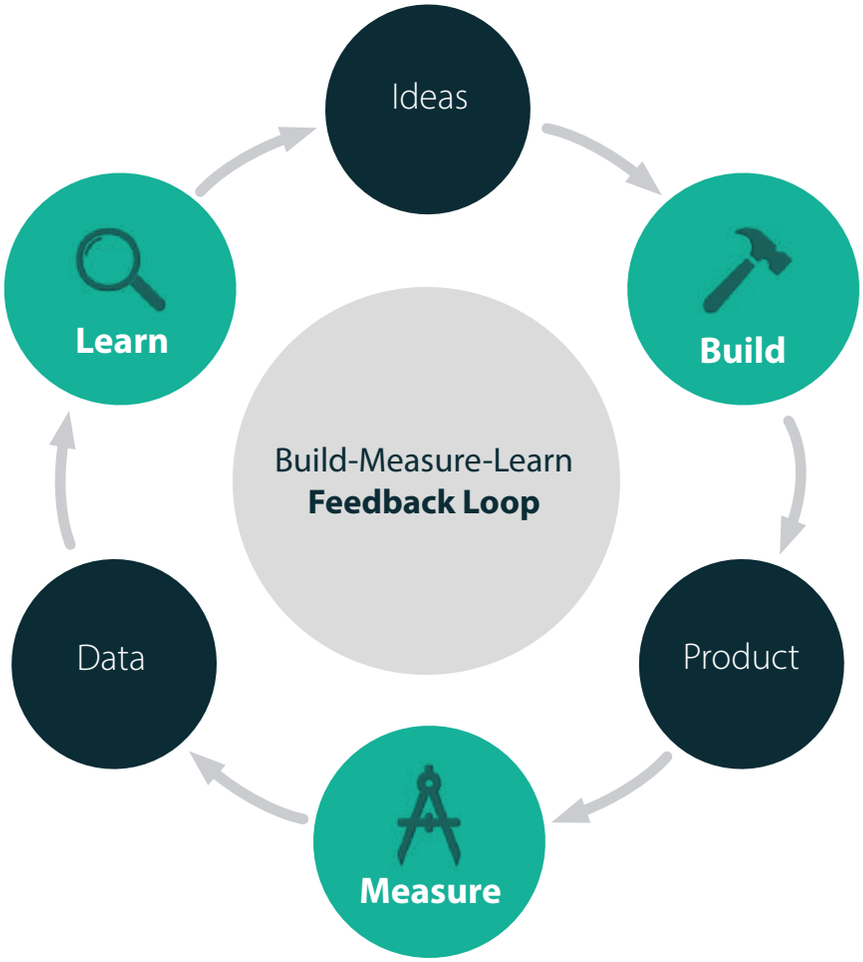
R²A leverages best practices employed by start-up accelerators and entrepreneurial management consultants, adopting a "lean" approach to design and development. That is, working models of the final product (i.e., prototypes) are developed and tested frequently and quickly in a build-measure-learn feedback loop until the desired outcome is achieved.[30] The design and development process is broken down into smaller steps that are punctuated by decision points, with insights or "rapid learnings" from each iteration feeding into the next such that the product is progressively refined. This helps to identify issues early so that course corrections can be taken before problems escalate or the project is already well underway. Meticulously planned projects tend to lack this flexibility to "pivot." This does not imply that the process is aimless; throughout, the steering committee ensures that it does not drift far from the overarching vision or objectives.

A lean approach is appropriate for R²A because of the highly uncertain conditions under which projects are being developed. The RegTech²/SupTech field is relatively nascent; there are few off-the-shelf products for authorities to adapt to their jurisdictions. The complex and variegated nature of regulatory regimes also renders one-size-fits-all solutions impractical for most projects, while the budgetary and capacity constraints under which many regulators operate give lean solutions additional appeal.

Phase 7 Production: Taking the product to market

Once the prototype has been developed to the satisfaction of the partner financial authority, a decision is made on whether to launch the product, i.e., to integrate the solution into formal regulatory/supervisory processes, or to shelve it for the time being. Perhaps the dearth of complementary supply-side data or lack of compatible reporting systems would make its immediate adoption premature; supervised entities for their part might still need to upgrade their data infrastructure before the RegTech²/SupTech solution becomes viable.

Figure 5: Lean design & development

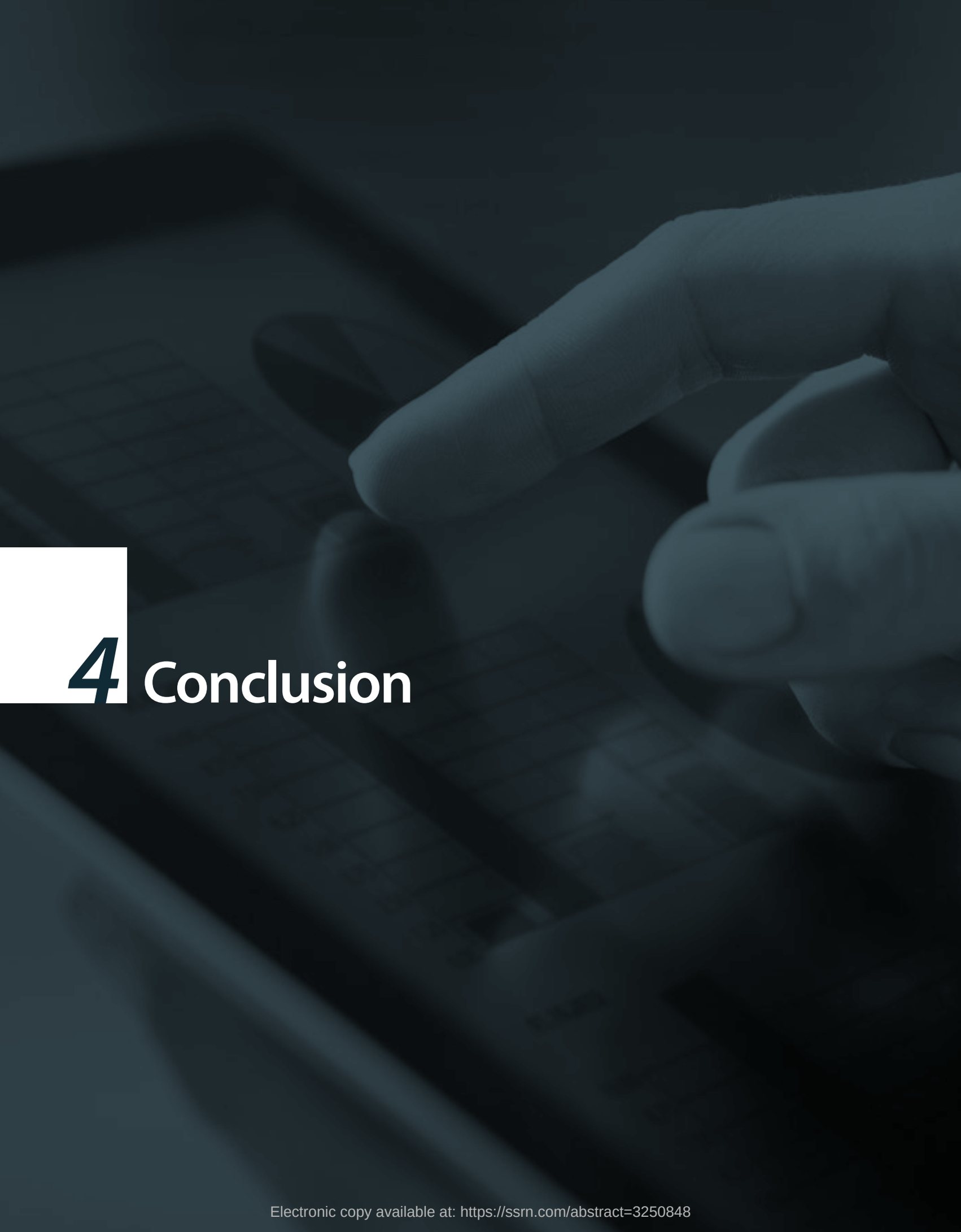


Source: Eric Ries (2011)[31]

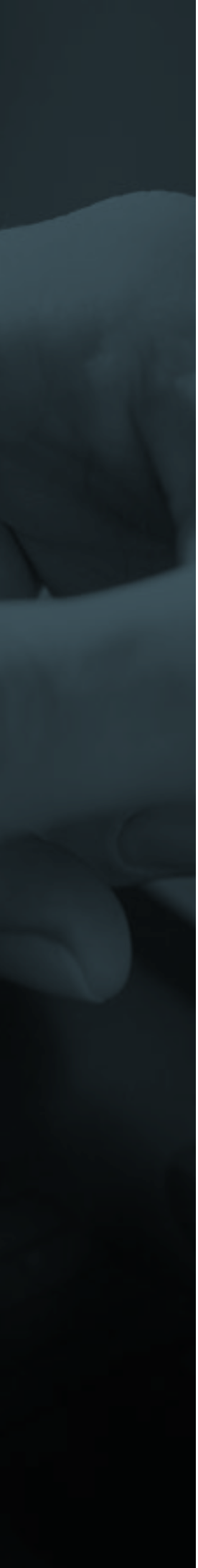
If the choice is to "go live," then BFA can assist with the implementation plan and handover to the dedicated product team. Whatever the decision or rationale, this stage typically marks the end of the R²A process.

After the development process is wrapped up, the learnings and lessons are documented and publicized (provided all parties consent). Dissemination can take many forms, including a case study, blog, or video. While each project is unique, every iteration helps to refine the R²A process and adds to the RegTech²/SupTech knowledge base. R²A's repository of tried and tested solutions can also serve as general blueprints for other projects, even if the particular architecture, features, and functionality differ from case to case.

R²A also periodically organizes peer learning conferences, workshops, working groups, webinars for members of the RegTech²/SupTech community (financial authorities, donors, technical experts, etc.). Such fora serve to build capacity and apprise attendees about latest developments and international best practices and standards in the RegTech²/SupTech space. Such fora also facilitate knowledge creation. Convening thought leaders and practitioners from different countries, subject areas, and departments in a creative and collaborative setting helps to cross-pollinate ideas, which in turn can lead to new solutions and applications.



4 Conclusion



The RegTech for Regulators Accelerator (R^2A) was conceived in 2016 with the aim of helping regulators and supervisors build their technological capacity and adapt their data architectures to the era of Big Data and fintech. It leverages best practices from technology and management consulting to develop data-driven, technology-enabled solutions to the challenge of implementing risk-based supervision and proportional regulation across the financial sector. The prototypes that emerge from R^2A engagements are at the forefront of the $RegTech^2$ and SupTech revolution. They promise to significantly increase the volume, velocity, granularity, and value of data that can be captured, stored, and analyzed by financial authorities. The partners who have participated in the Accelerator to date are pioneering solutions in anti-money laundering supervision, financial consumer complaints handling, and prudential regulatory reporting. These projects have validated the efficacy of R^2A's approach, and illustrated the transformational power of $RegTech^2$ and SupTech.[32]

The R^2A approach rests on five guiding principles that aim to make the engagements as fast, fluid, and cost effective as possible. First, *user-centered design* means that the prototypes are tailored to the idiosyncratic needs and preferences of the financial authorities, rather than the other way around. This is complemented by *user-driven development*, which ensures that financial authorities are actively involved in crafting the prototype together with the technology vendor. Adapting the design and development process to the unique circumstances of $RegTech^2$ and SupTech projects typically entails working under tight budgets constraints and conditions of high uncertainty (in the sense that many solutions are still untried and untested). To overcome these challenges, R^2A relies on *lean production* methods popularized by the tech community. These emphasize fast iteration and frequent user-testing, which help to contain costs and ensure product-market fit.

The fourth guiding principle of the R^2A approach is the notion that *open collaboration* is instrumental co-creation. Accordingly, R^2A seeks to build bridges between financial authorities, policy experts, and innovators using a variety of convenings: tech sprints, data competitions, challenge prizes, etc., as well as working groups, webinars, and conferences. These serve to cross-pollinate ideas, which can help to answer design questions or discover new use cases. The flipside of this openness is trust. The final guiding principle of *security by design* implies that best practices in privacy and data protection are built directly into the prototypes.

To operationalize the R^2A approach, this paper has outlined a seven-step process to co-creating $RegTech^2$/SupTech prototypes. It begins with establishing trust and securing the commitment of key project stakeholders (step 1). In order to identify an appropriate use case for the prospective project, R^2A staff help to identify specific pain points in existing regulatory and supervisory processes that can be alleviated using $RegTech^2$ or SupTech (step 2). Once the project parameters have been defined (step 3), R^2A staff conduct a design sprint to develop a proof of concept (step 4). This serves to define the technical and functional requirements that are subsequently used to select a technology vendor who can develop the solution (step 5). Iterative rounds of testing and development result in a viable, scalable, and economical prototype (step 6), at which point a decision is made on whether to deploy the solution after the R^2A project is concluded (step 7).

The benefits for financial authorities of undertaking the R^2A journey are numerous. They have the opportunity to experiment with cutting-edge technologies in a secure setting and with the support of R^2A technologists and policy experts. Through "lean" design and development, they can test and validate concrete solutions to specific pain points relatively quickly and economically. R^2A's experienced staff helps to accelerate the process by performing critical project management tasks, advising on technical and legal issues, cross-pollinating ideas through its vast peer learning network, and tapping into the global "tech" community for innovations and talent. The emphasis on capacity building ensures that the financial authorities are empowered to operate and service the solution post-production. Most importantly, regulators and supervisors are left with advanced Big Data and AI tools to fulfill their mandates in an increasingly data-intensive and technology complex world.

Endnotes

[1] See: http://bfaglobal.com/ for examples.

[2] See: https://www.R2Accelerator.org and Simone di Castri, Matt Grasser, and Arend Kulemkanpff, "Financial Authorities in the Era of Data Abundance. RegTech for Regulators and SupTech Solutions," RegTech for Regulators Accelerator (R^2A) white paper, August 2018.

[3] See: http://bfaglobal.com/projects/payments-and-transactions-data-stack-in-nigeria/

[4] See: http://bfaglobal.com/projects/gender-disaggregated-data-and-womens-financial-inclusion-study/

[5] In addition to being heavily time – and resource – intensive, the process is often duplicative as the same information is presented in various reports, while the transmission of data via mail, email, and data portals introduces security and speed of processing problems. This insecurity limits what data can be submitted and how frequently, which in turn affects the granularity and timeliness of the data the authorities ultimately have to work with.

[6] See: https://www.r2accelerator.org/publications/

[7] See: https://designsprintkit.withgoogle.com/

[8] See: https://medium.com/project-management-learnings/design-sprints-at-google-85ff62fed5f8

[9] Alexander Osterwalder, Yves Pigneur, Gregory Bernarda, and Alan Smith, "Value Proposition Design: How to Create Products and Services Customer Want," John Wiley & Sons, January 26, 2015.

[10] The FCA referred to the event as a tech sprint rather than a hackathon to refrain from promoting the notion of hacking.

[11] See: https://www.fca.org.uk/firms/regtech

[12] See: https://www.fca.org.uk/events/techsprints/aml-financial-crime-international-techsprint

[13] See: https://devpost.com/hackathons

[14] See: http://fintechfestival.sg/

[15] See: http://www.100open.com/toolkit/

[16] See: https://18f.gsa.gov/2015/09/09/how-a-two-day-sprint-moved-an-agency-twenty-years-forward/

[17] See: http://www.gv.com/sprint/. And: https://18f.gsa.gov/2014/10/21/how-to-run-your-own-3-sprint-agile-workshop/

[18] See: https://www.govhack.org/

[19] See: http://opendatahandbook.org/

[20] See: http://www.datakind.org/blog/datakind-bangalores-second-datadive

[21] See: http://unglobalpulse.org/sites/default/files/UNGP_BigDataGuide2016_%20Web.pdf

[22] See: https://www.mckinsey.com/industries/public-sector/our-insights/unleashing-governments-innovation-mojo-an- interview-with-the-us-chief-technology-officer

[23] See: https://21bqi49zoy82acfw93qlpqm1-wpengine.netdna-ssl.com/wp-content/uploads/Socrata-Datapalooza- How-To-Guide.pdf

[24] See: https://www.usds.gov/

[25] See: https://playbook.cio.gov/

[26] See: https://widgets.weforum.org/tech4integrity/

[27] See: https://www.younoodle.com/

[28] See: https://www.bankofengland.co.uk/research/fintech

[29] See: https://www.f6s.com/f6s

[30] Eric Ries, "The Lean Startup," Crown Business, 2011.

[31] Ibid.

[32] See Simone di Castri, Matt Grasser, and Arend Kulemkanpff, "Financial Authorities in the Era of Data Abundance. RegTech for Regulators and SupTech Solutions," RegTech for Regulators Accelerator (R^2A) white paper, August 2018.

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