WYOHACKATON 2020

Blockchain for Social Good - Supporting the United Nations Sustainable Development Goals [Les Objectifs de Développement Durable]

Proposed <FundTrack> Solution

2020 - Len Delunas and Christophe Bosquillon

3 Minute Video Link: https://youtu.be/wD7-vugXqew

Presentation (on Prezi): https://prezi.com/view/zdNcA67lhm0cCjGJhL3q

FundTrack Submittal

Premise - A Data Driven Transformation

The challenge of accomplishing the 17 UN Sustainable Development Goals (SDG) may have been formulated by and will be funded by permissioned, centralized organizations operating in and around the world's developed center.

> *"The 17 Sustainable Development Goals (SDGs) demand nothing short of a transformation of the financial, economic and political systems that govern our societies today to guarantee the human rights of all."*
>
> *"... leadership and support are needed to ensure statistical organizations have the tools and resources to facilitate timely and smart decision-making. To guide and support these actions, the United Nations system has mobilized at all levels, leveraging the recent reforms of the United Nations development system."*[1]

But the UN Sustainable Development Goals will be achieved only through the efforts of on-the-ground stakeholders - mostly living in the developing world. People and organizations working away from the edges of the developed world.

> *As structural UN reforms settle, we focus on building the data, digital, technology and innovation capabilities the UN needs to succeed in the 21st century.*
>
> *The Secretary-General's "Data Strategy for Action by Everyone, Everywhere" is our agenda for data-driven transformation. Data now permeates all aspects of our work, and its power – harnessed responsibly – is critical to global agendas we serve.*[2]

On-the-ground stakeholders - implementing partners doing the work, making the goals happen - must be equipped with data-driven tools to make the UN Secretary General's agenda for a data-driven transformation possible. Until FundTrack, they have had none.

The Cardano platform, and all of its components, properly harnessed and configured, offer opportunities for large and small organizations operating on the edge to simplify data collection and facilitate timely Project Accounting & Reporting. Creating a new, dynamic, data-driven dimension of *Monitoring and Evaluation,* the tool used by almost every UN agency, donors and sponsoring agencies. This "tip-of-the-spear" use of Cardano aimed at improving the Project Environment - will lead to many other applications across the spectrum of UN 17 SDG goals, in countries throughout the developing world.

FundTrack

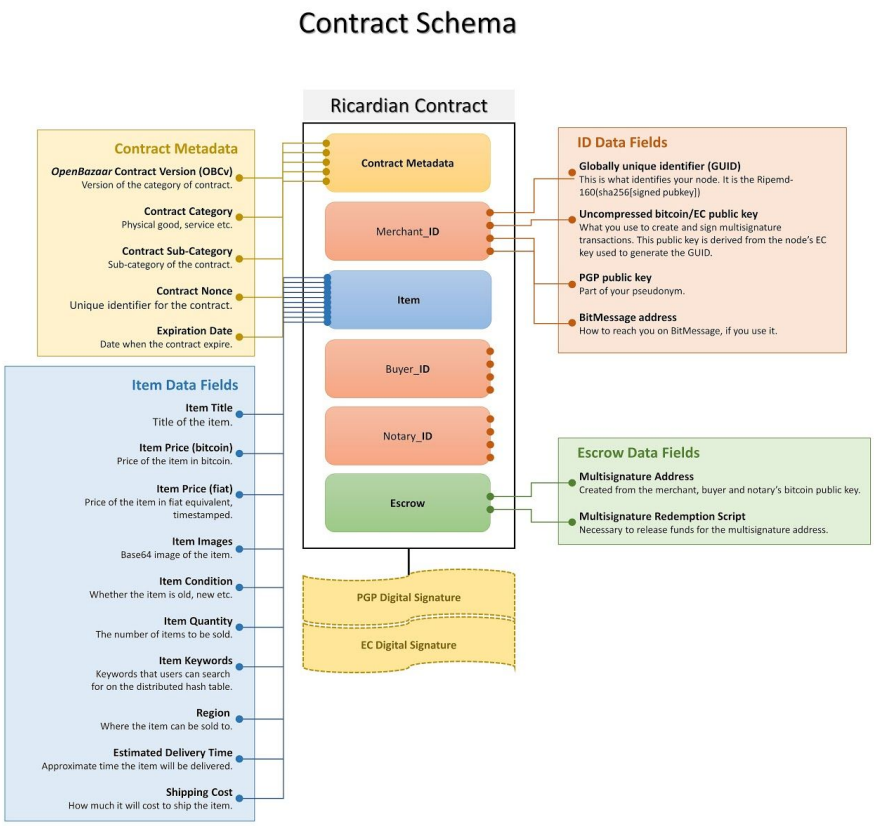
FundTrack is a modern-day, forward looking tool to facilitate timely *project accounting,*[3] *increase transparency*, *aid in decision-making* and *document the procurement and supply chain process* as it happens. Especially tuned to the charitably-funded international project environment. Where sponsors, separated by large distances from implementing partners, do not have active control of the project spending process.

[1] https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf

[2] https://www.un.org/en/content/datastrategy/images/pdf/UN_SG_Data-Strategy-one-pager.pdf

[3] https://www.projectmanagement.com/blog-post/33420/5-Differences-Between-Project-Accounting-and-Financial-Accounting

FundTrack operates within the same time-tested budgeting, project accounting, procurement and supply chain management processes, familiar to all organizations. But brings those processes into the 21st century. Building on Shelly, Goguen, Marlowe, Basho, Voltaire, Atala, Yoroi and, in part, on the concept of *"Ricardian Contracts"*.[4]



FundTrack design capitalizes on today's (and considers tomorrow's) telecoms' networks, widespread coverage of terrestrial & satellite-based internet service[5] [6], penetration levels of affordable smartphones, and Cardano blockchain protocols.

Technology

FundTrack harnesses features and capabilities of the whole of the blockchain-based Cardano Ecosystem built into

- Shelly (staking, smart contracts)
- Marlowe (Domain Specific Language for financial transactions)
- Goguen (meta-data, multi-assets and mobile and web front end UX)
- Basho (scalability, interoperability)
- Voltaire (governance)
- Atala (permissioned networks, identity, payments, supply chain management)
- Gerolamo (a platform that will bring together the Cardano and Atala blockchains)

[4] http://www.webfunds.org/guide/ricardian.html
[5] https://en.wikipedia.org/wiki/OneWeb_satellite_constellation
[6] https://www.space.com/spacex-starlink-satellites.html

- Yoroi Mobile Application.

Each component and its features plays an essential part in the FundTrack system and, when implemented, improves outcomes.

It is difficult to point to a single functionality that makes FundTrack valuable to the development industry. But the recently announced metadata as well as front end development features of Goguen is the breakthrough that makes the FundTrack concept viable. Charles Hoskinson made an announcement about the upcoming release of Goguen.

> *"One side of it is transaction metadata and starting to get to a point where you have non-monetary transactions, so basically saying I am not just sending ADA to somebody but now this transaction carries a payload with it which has a non-ADA related utility. So for example, this month we finished all the metadata stuff, dragged it into the Cardano wallet and then into the node."*

Whilst FundTrack appears to be aimed at Project Accounting, its value rests on access to the documents which underlie the cost data. Being able to see a *"proposed"* transaction that *"somehow does not look right"* before funds have been spent, gives the opportunity to exercise control. Perhaps just to ask for an explanation or more detail before approving. Sponsors never get that opportunity in typical grant management processes.

Grant Management Planner

	Task	Frequency	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	Submit donor financial reports	Monthly		X	X	X	X	X	X	X	X	X	X	X	X		
b	Submit donor narrative reports	Quarterly				X			X			X			X		
c	Submit disbursement requests	Quarterly				X			X			X			X		
d	Project Audit	Annual															X
e	Donor Liason	At least quarterly			X			X			X			X			X
f	Internal management meetings	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
g	Review internal management accounts	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
h	Visibility activity	Annual			X												X

Umoja – The UN Initiative

Implementing Partner Management

New capabilities for managing the entire life-cycle of dealing with implementing partners (UN agencies, NGOs, etc.) as well as beneficiaries of grant-awards, by allowing them online access to apply for partnership, request payments, report progress, and submit documentation.

As part of the UN's efforts to move into what they consider as the 21st century, the UN administrators initiated a program to centralize all aspects of the institution's business on an ERP system.

"Umoja is a complete re-working of the way the United Nations Secretariat manages its administration by transforming our work patterns, how we conduct our business and how we manage our resources. At the center of this transformation is the leading-edge Enterprise Resource Planning (ERP) software, which enables a harmonized and streamlined approach to the Organization's management of finance, human resources, procurement and assets."

"Umoja is being used by over 46,500 users across 420 locations. Umoja Foundation and Extension 1 covered a broad range of functions such as Finance, Payroll, HR, Procurement, Travel, Logistics, and Real Estate."

> ***"Umoja Extension 2 (UE2)**, UE2 will introduce many new technologies (software) to provide these new capabilities. It will also expand and diversify the Umoja user base, as donors, vendors, implementing partners and Member States will also interact with the system."*

Umoja deploys Implementing Partner Management Module

24 January 2020

In December, Umoja deployed the Extension 2 Implementing Partner Management/Grantor Management module to all Secretariat entities which work with implementing partners or issue grants to an entity.

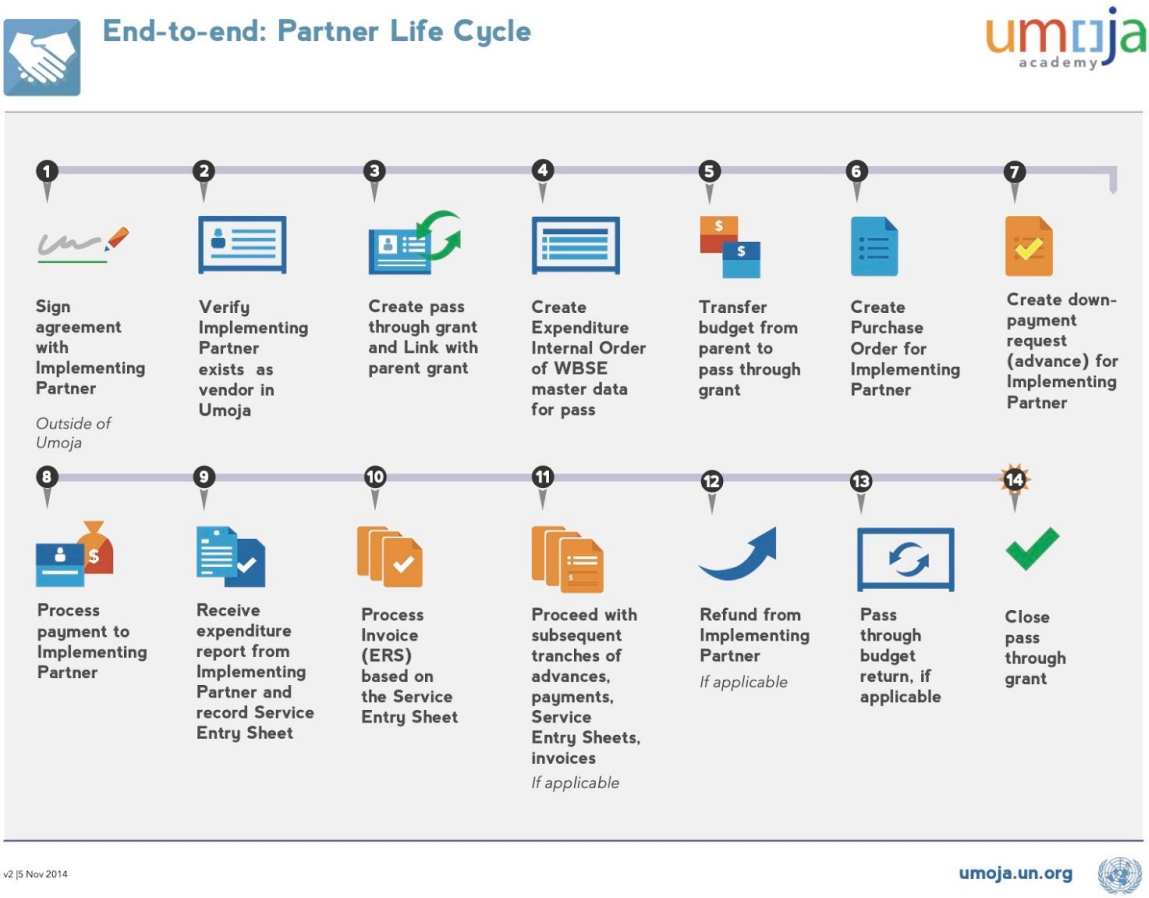
This implementation followed successful deployments to UNMAS, UNEP, and UN-Habitat in December 2018, and OCHA in November 2019.
The latest deployment included about 30 entities, including 12 peacekeeping and special political missions.

Umoja is a SAP system.

> *"SAP provides the core system from which Umoja is built on and enables the United Nations to create its own integrated system of components and functionalities specific to the UN."*

Anyone who has experience with ERP systems knows that change is a really big deal. Not to mention cost. FundTrack works at the bottom end of the food chain – where people and companies lack the resources (human and financial) to interface with a SAP enterprise resource system. The temporary nature of a project-based service provider (Implementing Partners) makes the economic equation to gather those skills ***unworkable***, for all but the very largest organizations.

Conceptually, the Umoja approach is quite similar to FundTrack. So that is half of the battle won. The UN recognizes the benefit of trying to harmonize implementing partner processes. However, the cost and effort to get all levels of Implementing Partners able to use SAP, will be prohibitive – in every dimension. Whereas FundTrack focuses on simplicity and user experience. (Later discussed as human-centered design). The Revolut inspiration is quite relevant to FundTrack usability and adoption, a demonstration there is no need to reinvent the wheel when it comes to effective "killer-app" UX .


End-to-end: Partner Life Cycle
umoja academy
1
Sign agreement with Implementing Partner
Outside of Umoja
2
Verify Implementing Partner exists as vendor in Umoja
3
Create pass through grant and Link with parent grant
4
Create Expenditure Internal Order of WBSE master data for pass
5
Transfer budget from parent to pass through grant
6
Create Purchase Order for Implementing Partner
7
Create down-payment request (advance) for Implementing Partner
8
Process payment to Implementing Partner
9
Receive expenditure report from Implementing Partner and record Service Entry Sheet
10
Process Invoice (ERS) based on the Service Entry Sheet
11
Proceed with subsequent tranches of advances, payments, Service Entry Sheets, invoices
If applicable
12
Refund from Implementing Partner
If applicable
13
Pass through budget return, if applicable
14
Close pass through grant
v2 |5 Nov 2014
umoja.un.org

Attribution: Photo by GraphicaArtis/Getty Images

The Signing of the Constitution of the United States – perhaps the most important project ever undertaken... With George Washington, Benjamin Franklin, and others at the Constitutional Convention, on the 17th of September, 1787; oil painting on canvas by Howard Chandler Christy, 1940. The painting is 20 by 30 feet and hangs in the United States Capitol building.

Why Effort and Cost Tracking in The Project Environment

FundTrack is a tool for all kinds of development projects. Useful across the entire range of the UN 17 SDG. It can serve institutions, large non profits, government agencies and non governmental organizations, companies and consultants.

> *A project is **temporary** in that it has a defined beginning and end in time, and therefore defined scope and resources.*
>
> *And a project is **unique** in that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal. So a project team often includes people who don't usually work together – sometimes from different organizations and across multiple geographies.*

To understand the purpose of FundTrack (the 'why') and 'how' and 'where' FundTrack works, consider all multi-party efforts to achieve the UN SDGs, as efforts according to the PMP- Project Management Process. They have a definite

beginning and end, and a specific purpose. Let's begin by looking at the Project Management Institute's definition of the Project Management Process 5 phases[7] as illustrated below.

FundTrack focuses on the most under-served segment at Phase 4 of this PMP: '*Effort and Cost Tracking.*'

While *Effort and Cost Tracking* might seem to be a small part of improving outcomes, it is actually critical to achieving the UN Secretary general's commitment to data-driven transformation. For, *Effort and Cost Tracking* is the only place in the process where problems can be identified and prevented. If the data is not available to the Program managers sitting far away from the work, in a timely manner, decision-making is always condemned to being too little, too late – after the fact.

Traditionally, *Monitoring & Evaluation* programs leave *Effort and Cost Tracking* to the purview of *Implementing Partners*. The one party in the equation that has the least incentive to report mistakes, problems, missteps, or in worst cases, fraud, waste or abuse. Suspect expenses, easily hidden, can be reported as "net costs" in reports - obscuring problems completely, or at least until too late to avoid.

FundTrack enables

- Authorizing expenditures according to the Project Budget.
- Revealing changes in the Project Plan, as they arise, via the procurement process.
- Providing local implementing partners with a standard project accounting system, while they continue to manage their own financial accounting system.[8]

[7] https://paravisiontechnologies.com/project-management-101/
[8] https://www.projectmanagement.com/blog-post/33420/5-Differences-Between-Project-Accounting-and-Financial-Accounting

UN SDG Projects are Large and Small

FundTract is designed to work for two levels of Projects. For example: Infrastructure and Sustainable cities (Goals 9 & 11) probably involve large complex multi-year projects - operating with sophisticated project controls and qualified financial and administrative staff.

Projects in other sectors like Education or Water (Goals 4,6) or Forests (Goal 15) may involve a series of or combination of smaller, short term projects, scattered over wide geographic areas, executed by several small *Micro-Small-Medium Sized Enterprises* (Goal 9 – MSMSEs) each managing work with unsophisticated financial accounting systems (not using Project Accounting Systems) and a small financial and administrative support staff.

Sponsors Rely on Monitoring and Evaluation Teams

Monitoring & Evaluation (M&E) activities are the main tools used to increase the likelihood of achieving Program and Policy objectives - *Outcomes* and *Impact.*

> *"**Monitoring** is the systematic process of collecting, analyzing and using information to track a programme's progress toward reaching its objectives and to guide management decisions. Monitoring usually focuses on processes, such as when and where activities occur, who delivers them and how many people or entities they reach.*
>
> ***Evaluation** aims at determining the relevance, impact, effectiveness, efficiency and sustainability of interventions and the contributions of the intervention to the results achieved.[9] (Adapted from Gage and Dunn 2009, Frankel and Gage 2007, and PATH Monitoring and Evaluation Initiative)"*

However, in neither mode does the M&E team get deeply involved, on a continuing basis throughout the project life cycle in project accounting, procurement processes, supply chain management or project documentation. At best, they discover problems or weaknesses after the fact.

M&E is useful to identify *Outcomes* and *Impact*, but not as useful in achieving efficiency and effectiveness of project implementation, especially *Use of Funds*.

Each UN agency has its own handbook describing M&E responsibilities and best practices.[10] [11] [12] [13]
Traditional mechanisms and systems, at their hearts, are founded in the pre-digitized world. Relying on personal interventions (field based Monitoring and Evaluation), after action reports, and lessons learned - codified in digital copies of paper documents. They do not capitalize on the extensive penetration of mobile communications and smartphones with cameras and mobile apps, in and around the edges of the developing world.

[9] *https://www.endvawnow.org/en/articles/330-what-is-monitoring-and-evaluation-.html?next=331*

[10] http://web.undp.org/evaluation/documents/handbook/me-handbook.pdf

[11] UNEG Norms & Standards for Evaluation_English-2017.pdf (1874 KB / English)
[12] https://www.unescap.org/partners/monitoring-and-evaluation
[13] https://www.undrr.org/publication/monitoring-and-evaluation-framework

All M&E teams – whether within the sponsoring agency or as consultants to the agency, deal in one way or another with outcomes. All provide what can be considered *"after-action"* reporting services and recommendations. Useful to formulate lessons learned at the program level, but not so useful in identifying, avoiding and managing risks – during project execution.

The current approach remains a single purpose, centrally directed system of controls, focused on measuring *Outcomes* and *Impact*. Not effort and cost tracking.

'Outcomes' in edge environment projects are – as often as not – different than intended or desired. Determined as much by externalities as the *project implementation process*. While the *project implementation process* is determined mostly by the implementing partner, its systems and the people involved.

So, to summarize its utility in an M&E context, FundTrack is NOT intended to measure *Outcomes, Impact* or *Performance*.

FundTrack is a data-driven (objective, not subjective) tool designed to facilitate:

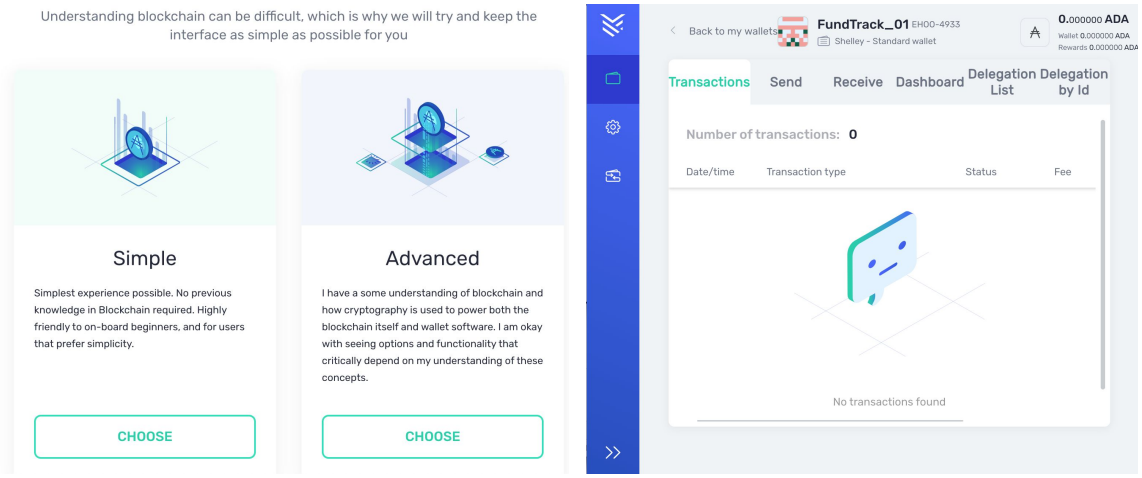
- Authorizing the disbursement of funds on as close to real-time basis as is practicable.
- Accounting for the use of funds in edge environments.
- Documenting the use of funds in less than normal circumstances.
- Increasing transparency of project implementation.
- Revealing needed improvements in project decision-making.

FundTrack is a blockchain solution that has been waiting for Cardano. Features & capabilities Cardano has and is releasing with Shelly, Goguen, Basho, Voltaire, Marlowe and Atala. The UN can begin to benefit from those features via FundTrack, now.

Mindset

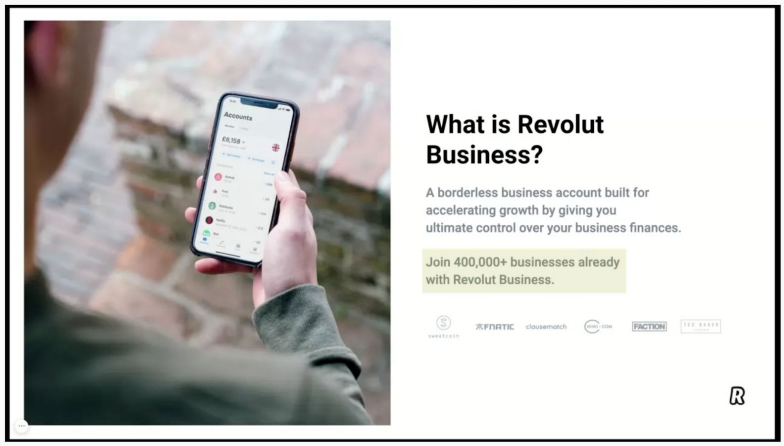
New ways of doing things must be easy to adopt and bring benefits to the organization and users. Invariably there are *'new tricks'* that *'old dogs'* must learn. Change and conformance to administrative requirements are always resisted. So, FundTrack requires that you *wash your hands, sit up straight* before you can have your breakfast, lunch or dinner (Funds). It promotes good habits. But in as simple a way as possible. Through the UX interface.
FundTrack creates a User Interface that masks what's happening under the hood on a smartphone. *Think Yoroi*. [14]

[14] https://yoroi-wallet.com/#/



It inserts a requirement to use formal processes (accounting, procurement, supply chain management) into the process of obtaining needed funds, on a granular level. When considering features of the FundTrack UX, *Think Revolut*.[15] Or mobile banking apps. In this sense FundTrack does not have to invent the features that users need and want.

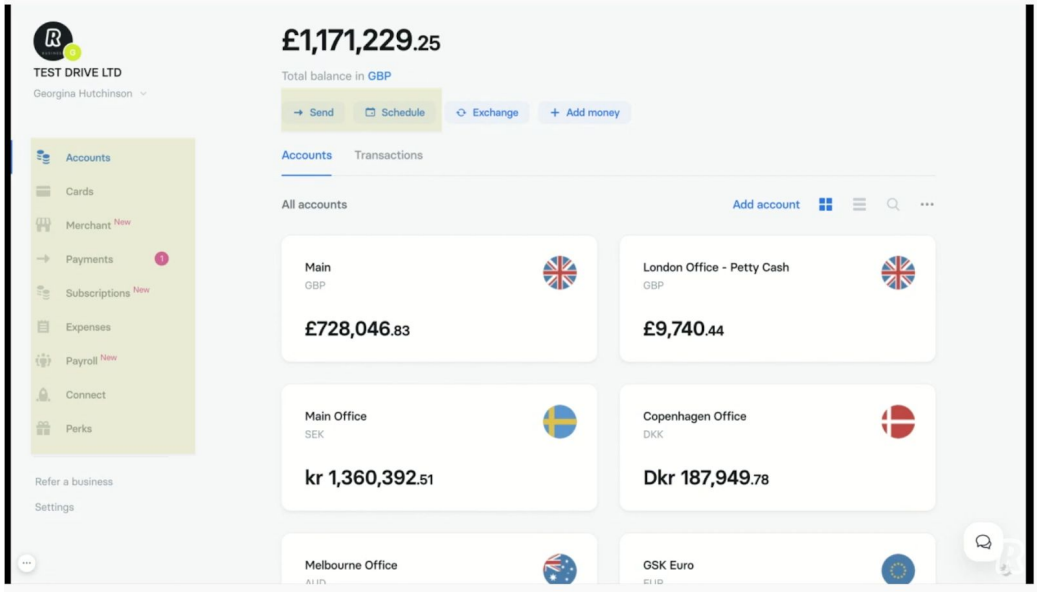
> *(Watch this introduction to Revolut Business Accounts, paying special attention to the Business Account features while Thinking FundTrack. Skip around if you are in a hurry.)*
> *https://www.youtube.com/watch?v=ukD4AV1gmuU*



Webinar: Introduction to Revolut Business accounts

Through Revolut's simple interface they make the important parts of banking, and business accounting and authorizing payments "work flow" easy. Hiding the bank security systems, identity systems behind the screen.
Using phone numbers and email addresses to enable money transfers. Just a small part of full banking services, but one of the most frequently used and important functions to individuals and small businesses.

[15] https://www.revolut.com/en-CY



User experience

FundTrack looks at disruptive financial organizations like Revolut for inspiration. FinTech, with neither a banking, nor an IT nor a security industry's obvious perspectives or constraints. All of those dimensions are present, but hidden behind a simple, functional user experience.

Goguen, Basho, Marlowe, Voltaire and Atala are back office blockchain components. The user does not need to see them.

The point here is that implementation and adoption don't have to be that clunky, complicated, and reserved to an educated & tech-literate elite. In fact, one aspect of human-centered design is to make humans who face social, cognitive, and linguistic challenges, feel like they're still being treated like humans. In addition to removing hassles for everyone.

Scalability

FundTrack scales in several dimensions, besides number of tx's per second

- Size of project (small, short duration to very large, multi-year)
- Sophistication of Implementing Partner (small NGO to large multinational corporation)
- Programs & Projects
- Multiple sources of project funding
- Number of projects across the same SDG
- Geographical distribution of projects within the same program.

Multi-User Functionality

Donors, funding agencies and implementing partners all benefit from the use of FundTrack.

- Donors and funding agencies: Transparency while the horse is still in the barn
- Implementing Partners: Easy Project Accounting, simple but robust project documentation
- Third Parties: Governments and regulators can audit projects easily
- Industry: Creates cross-border, cross-project, comparative cost data.

Achieving the UN Sustainable Development Goals

Achieving the UN SDGs requires a *distributed* effort, attacking the same problems in different places, continually, over time, in both a permissioned and permissionless, decentralized manner. Not so different from the Cardano mindset of a digital environment, directed and governed by people working at the edges.

Still, an organizing framework is required to empower the decentralized, permissioned or quasi-permissionless networks of people and organizations doing work funded by others.
Mechanisms and systems that empower those stakeholders to work in their own best interests offer the greatest chance for success.

Team Len & Chris may assert with confidence that FundTrack is a blockchain solution that has been waiting for Cardano. Features and capabilities that Cardano has and is releasing with Byron, Shelley, Goguen, Basho, and Voltaire, with Marlowe as Haskell-embedded financial transactions DSL. The UN can begin to benefit from those features via FundTrack. Now! (Or as soon as we can get to work.)

How FundTrack Works

As previously mentioned, to understand how FundTrack works, consider all multi-party efforts to achieve the UN SDGs, as a *Project Management Process (PMP)*. Let's return to the flow chart where the Project Management Institute defines a

PMP in 5 phases[16]. FundTrack may focus on the most under-served part of Phase 4 in this PMP:: '*Effort and Cost Tracking.*'

Let's review the initial phases through which UN SDGs relevant projects may be going, to see 'why', 'how' and 'where' FundTrack figures.

Phase 1- Conception and Initiation

The Sponsoring Agency, in this case the UN, has initiated two programs.

1. UN Secretary General's agenda for data-driven transformation
2. UN Department of Economic and Social Affairs (UNDESA) Identification of 17 Sustainable Development Goals

First, FundTrack is designed to respond to the UN Secretary General's agenda by providing SDG programs a data-driven tool to monitor projects. FundTack responds to the second program by delivering detailed data directly to the sponsoring agency, without filters or time delays that preclude meaningful efforts to achieve maximum impact.
Phase 2- Definition and Planning

UNDESA and other UN agencies define the programs and projects that it believes will achieve the 17 goals, and commit resources (people, funds, political leverage) to reach those goals.

Phase 3- Launch & Execution (aka Grant Management)

[16] https://paravisiontechnologies.com/project-management-101/

Once a project has been launched it demands consideration of many issues. Here is a John Hopkins University affiliate list of Grant Management activities[17]. Thinking about smaller local implementing partners, this list requires rather sophisticated skills, which might not be available. FundTrack is designed to help in this process by organizing data provided in almost raw form, with little effort.

Who Does What in Grant Management?

The table below lists the key tasks in grant management with recommendations for who should take the lead responsibility and provide additional support when required. Practice in your own organisation may of course be different, and you might like to go over the list and assign roles accordingly. Who does which task is less important than making sure that every task is assigned to someone so that nothing slips through the net.

Key: F = Finance staff, P = Programme staff

Areas Where FundTrack Interfaces

Task		Lead	Support
1.	Review donor contract and assess conditions	P	F
2.	Negotiate specific grant conditions	P	
3.	Sign donor contract (agreement)	P	
4.	Set up financial systems to manage contract obligations	F	P
5.	Establish lines of communication with donor representative(s)	P	
6.	Prepare reporting framework and timetable	P	F
7.	Where there are sub-grantees, prepare guidance manual and support structure	F	P
8.	Ensure new and existing staff are aware of the grant conditions	P	F
9.	Ensure all purchases are made according to donor procurement requirements	P	F
10.	Submit claims for income from donor	P	F
11.	Manage the donor funded budget	P	
12.	Monitor income and expenditure, including commitments	P	F
13.	Write narrative donor reports	P	
14.	Prepare project financial reports as per reporting schedule	F	P
15.	Submit reports to donor as per reporting schedule	P	F
16.	Review whether a contract amendment is needed (budget change, activity change or time extension)	P	F
17.	Submit change requests to donor	P	F
18.	Ensure project reports reconcile with the organisation's financial accounts	F	P
19.	Close the grant ensuring all conditions have been met	P	F
20.	Carry out a review to identify learning points	P	
21.	Prepare for project audit	F	P

Having been through the first 3 phases, and to understand what happens with Phase 4, where *'Effort & Cost Tracking'* matters and where FundTrack figures, let's have a further look at a sample project scenario, to demonstrate FundTrack.

A Relevant Project Scenario To Demonstrate FundTrack

To illustrate why & how FundTrack will work, we use UN SDGs *'Goal 15 - Plant A Tree To Help Protect the Environment*' and '*Goal 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all'* which focuses on the role Micro, Small and Medium Sized Enterprises (MSMSE) can play in achieving those goals.

[17] http://reprolineplus.org/system/files/resources/06_Managing_Donor_Funds.pdf

Goal 8: Decent Work and Economic Growth

Goal 15: Life on Land

In furtherance of Goal 15, the UN might identify an Implementing Partner in Tamil Nadu (South-East of India, facing Sri Lanka) and agree to support an agroforestry project like Project Green Hands - planting trees to reforest desertificated areas.

The project would, in theory, involve contracting with several MSMSE's for agricultural expertise (consultants), subcontracting for field work, purchasing, receiving, warehousing, delivering trees to the designated areas for planting. And perhaps include a separate contract for *Monitoring & Evaluation* services, as is most common. Either engaging a professional services company monitoring many projects or engaging a company to focus only on this project.

Once the project budget KPI's and Quality and forecasts are agreed the project would be launched. The implementing partner chosen might be a rather large non profit organization (NPO) which, as a general contractor, would coordinate the efforts of other smaller MSMSEs, performing some aspects of the project itself, and managing project funds on behalf of the sponsor. They might have strong financial accounting systems & adequate accounting support staff.
Or if the scope was manageable, the sponsor might act as a general contractor. Engaging small specialized implementing partners to perform different parts of the work in different locales. In this case the smaller MSMSEs would undoubtedly have limited financial accounting expertise and few accounting support staff. FundTrack's systems would help these organizations to fulfill the good practices of donor and grant management (see above).

Perhaps large numbers of individuals would be employed directly by the implementing partner to plant trees. While other entities managed procurement and supply chain. Planting, and intensive care of the trees for some initial period and then a less intense maintenance of the trees over a longer period of time. Maybe for years depending on weather conditions.

The sponsoring agency (whether the UN itself or a larger implementing partner) might combine funds provided by the UN, with matching funds from local government programs, or other donors as well as some funding support from the implementing partner, if itself was a charitable organization that supported Goal 15 initiatives.

Already with this limited hypothetical overview, one can imagine a rather complex project accounting process, and as in all undertakings the possibility for things to go awry - off project plan.

What Might Happen in a Traditional Scenario

In a typical situation the local implementing partner would be provided with funds by the sponsoring agency. Perhaps a lump sum for the entire project value. Perhaps a certain amount for start-up and mobilization, then monthly tranches based on a plan and progress.

Small subcontractors would likewise require mobilization funds and progress payments. Tree suppliers might require payment for trees at the time or order. Or cash on delivery. Or some credit arrangement over time. Perhaps with a guarantee that the trees would take root or be replaced and planted at no additional cost to the project.

The local implementing partner might be expected to make monthly, quarterly and semi-annual status reports (subjective, with perhaps some netted out numbers), and then an end of project or annual report at some inflection point.

Perhaps to enable the sponsoring agency to decide whether the outcomes and impact would suggest the project continue to be funded for another set of deliverables. In any case, the 'Effort & Cost Tracking' reporting requirements would pile up.

What Could Happen in a FundTrack Use Case: User Point of View

At the time of contracting with the Implementing Partner, the sponsoring agency would require use of the FundTrack platform / protocol for Project Accounting. Probably a Permissioned system. According to a popular definition of the Golden Rule - *"He who has the Gold, makes the Rules."*

The protocol would consist of the following components.

- A Permissioned Blockchain in the Cardano platform*
- Perhaps Project specific coins/tokens, perhaps ADA**
- Access to the FundTrack system via personal computers (desktops and laptops)
- A FundTrack user application.
- Smartphones with sim cards (for data via internet services), laptops and even desktops.
- FundTrack accounts (pre-configured for the particular project***)
- Training for the sponsoring agency, Monitoring and Evaluation contractor, and local implementing partners, online and or in person, digital reference material, and access to online trouble desk support

  **Permissioned Blockchain*

  Most likely, sponsoring agencies or institutions and their community (NGO's and Non-Profit Organizations and International Implementing Partners) would prefer that information about their projects (especially procurement,

supply chain, personal identities, and financial information) NOT be available to everyone. Thus, the likely need for a Permissioned blockchain.

***Project Specific Coins/Tokens*

The blockchain that FundTrack proposes can operate in different modes.

Project Accounting Without Monetary Value

- *Non-Monetary Value Project Specific Coins/Tokens forged*
- *Transmitting and organizing financial and procurement, supply chain information and progress reports (photos) into Project Accounting records, facilitating review and evaluation by others*
- *Authorizing disbursement of funds in fiat currencies via established smart contracts and standing banking instructions. (By way of a notice to release funds generated by the FundTrack smart contract).*

Project Accounting and Transferring Value

- *Project Specific Coins forged or purchased (by Sponsors) at the then current ADA nominal value*
- *Receiving and organizing financial and Procurement documentation and information into Project Accounting records, facilitating review by others*
- *Authorizing disbursement of Project Specific coins/tokens via established smart contracts in the Project Specific Currency for exchange into fiat as practicable.*
    - *Available to be spent on provision of certain documentation*
    - *Available to be spent on agreed schedules*
    - *Freezing previously authorized Project Specific Currency*

****Pre-configured accounts*

Based on the dimensions of the particular project, the FundTrack account would be pre-configured with

- *Project Chart of Accounts*
- *Project Budget (and overage limits)*
- *Project Schedule with Milestones*
- *Project Procurement Document Templates*
    - *purchase order forms*
    - *request for quotation forms (with protocols i.e number of quotes, etc)*
    - *vendor qualification details*
    - *delivery receipts with photographs and guarantee documents*
    - *vendor invoices cover sheets*
    - *payment vouchers and payment receipts*
    - *minimal conflict of interest rules*
    - *project schedule and milestones*
    - *oversight instructions*
    - *threshold values or type of expenditure under which oversight is optional*

        - *threshold values (or type of expenditure) above which oversight and approval is required*
    - *Agreed smart contracts*

FundTrack in Use During Project Implementation

Startup funding would be provided according to sponsor's normal procedures, and the Project Agreement by way of the FundTrack protocol for requesting funds. Funds would be provided in the form of cash or a Project Specific Cryptocoin (see above alternatives).

Subsequent operating expenses might be funded on two levels (depending on the strategy and ease of converting project crypto coins to fiat).

- A petty cash type fund (funded in cash or project crypto coins and refilled similarly when empty and vouchers had been provided via FundTrack)

- For expenses over a certain value, funds would be authorized/minted/provided in project specific cryptocoins (but not be released for use - meaning not spendable). Upon provision of procurement documents (as listed above) the smart contract would either release fiat funds or project crypto coins - for ultimate conversion to fiat.

Implementing partners would furnish procurement and supply chain documentation (scanned copies or even photographs of documents) attached to project cryptocoins as metadata sent to the sponsor's FundTrack (or Monitoring and Evaluation contractor) account for review and ultimate approval, disapproval or discussion.

Eventually there would be a project close-out phase when total accounts would be rationalized and Project Accounts closed or anomalies considered and actions taken. In cases where project funds had not been spent, sponsoring agencies could repurpose Project Specific Coins or "burn" those coins according to agency protocols.

Funding and Sustaining Development of FundTrack

Development of FundTrack could be funded by contracts for services with sponsoring agencies, initial grants from Cardano Treasury, or by commercial investments.

The FundTrack protocol could be sustained by similar mechanisms - contracts for services by sponsoring agencies, as an overhead or royalty payment linked to use, by grants from the Cardano Treasury, by a "fee" per transaction or by sale of

development services to create Project Specific Coins, smart contracts, project accounts, processing, training, creation and customization of "shelf" protocols ready for immediate use in the case of natural disasters, etc.

In the following Appendices, we provide:

- APPENDIX I- Suitability of the Cardano Ecosystem for FundTrack
- APPENDIX II- Relevance and use of Marlowe In FundTrack- a detailed review
- APPENDIX III- UN 17 sustainable development goals (SDGs) to transform our world
- APPENDIX IV- Methodology and process: objectives, criteria of control, and self-assessment
- APPENDIX V- Notes on U.N. / Europe (UNECE / UN/CEFACT) Summer 2020 online workshop on blockchain legal, governance, and technical interoperability
- APPENDIX VI- Potential Association Partners for Implementation and Adoption
- APPENDIX VII- PMP- Project Management Process: a description of Project Phases
- APPENDIX VIII- FundTrack Team
- APPENDIX IX- Notes on intra-/entre-preneurship and building for innovation, project development and implementation, adoption and change management
- APPENDIX X- Competitive space analysis and FundTrack team's competitive approach
- APPENDIX XI- FundTrack use cases examples and applications for DTSO – Digital Transformation Suggested Orientations

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APPENDIX I
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Suitability of the Cardano Ecosystem for FundTrack

FundTrack and the Cardano Ecosystem are mutually strongly relevant in three ways:

a. Strong fit between Goguen/Plutus/Haskell-embedded DSL Marlowe and FundTrack core functionalities

b. Strong FundTrack positioning to leverage Cardano's Basho (scaling) and Voltaire (governance, smart contract) capabilities

c. Strong FundTrack alignment with the Atala (Prism) enabling FundTrack deployment in both permissioned and permission-less contexts, and "portable economic identity" solution.

In the below we review a., b., and c. successively.

a. Strong fit between Goguen/Plutus/Haskell-embedded DSL Marlowe and FundTrack core functionalities

First, let's recall that FundTrack is a Monitoring tool. FundTrack is NOT intended to measure OUTCOMES or PERFORMANCE. It is a data driven (objective, not subjective) tool designed to facilitate:

- Routinely and immutably documenting the normal procurement process
- Authorizing the disbursement of funds on as granular basis as desired
- Providing a Project Accounting system where none may exist
- Increasing transparency of project implementation
- Documenting the use of funds in less than normal circumstances
- Revealing needed improvements in project decision-making.

As such, FundTrack needs to operate within a computational architecture that engineers such functionalities as a back office feature.

FundTrack operates in an environment where fiat currencies and contributions in kind (think relief goods, equipment, volunteers' time, muscles, and transportation means, etc.) primarily exist with some role for Cryptos.

First most salient point for FundTrack transaction environment and representation of value is that Marlowe allows for currencies, contributions in kind, (non-)fungible tokens, Ada / Fiat / Crypto conversion, CBDCs.

Non-fungible tokens are adequate to represent contributions in kind (in future, as digital twins, they might also be used for an escrow mechanism in conjunction with autonomous warehouses, transportation and delivery systems).

Second most salient point for FundTrack is that Marlowe's contract building is engineered with five core functionalities that match FundTrack's monitoring objectives: Pay, Let, If, When, and Close. In addition, (tutorial) "at each step of execution, as well as returning a new state and continuation contract, it is possible that effects – payments – and warnings can be generated too."

Third most salient point for FundTrack is that Marlowe's core engineering includes a strong transactional ecosystem that adequately matches FundTrack's deposits monitoring constraints: first and foremost, the escrow function, which provides for timeout and continuation, with the possibility to add timeout and commitments. Furthermore, with a set of adequate basic components, Marlowe allows for structured values, observations, and actions, while providing robust and self-correcting transactions building and slot ranges functionalities.

APPENDIX II just below, provides a more detailed review of FundTrack functionalities and Marlowe's mutual relevance by reviewing the Marlowe Tutorial point by point. We note that a usable implementation of this tool would require much more of the Cardano Platform than Marlowe code. Thus we devoted most of our efforts to presenting the use case.

b. Strong FundTrack positioning to leverage Cardano's Basho (scaling) and Voltaire (governance, smart contract) capabilities

Next, let's recall that, while Fundtrack is a Monitoring tool, NOT an Evaluation tool, and NOT intended to measure outcomes or performance, it is a data driven (objective, not subjective) tool which is also designed to position for scalability, and to facilitate external multi-user functionality and multi-layered governance, while supporting complex collective, multi-agents decision-making processes.

In that context, we characterize scalability, interoperability, multi-user functionality and multi-layered governance as follows:

Scalability, interoperability:

Size of project (small, short duration to very large, multi-year)
Sophistication of Implementing Partner (small NGO to large multinational corporation)
Programs & Projects
Multiple sources of project funding
Number of projects across the same SDG
Geographical distribution of projects within the same program.

Multi-user functionality, multi-layered governance, and supporting complex collective, multi-agents decision-making process:

Donors, funding agencies and implementing partners must all benefit from the use of FundTrack.
Donors and funding agencies: Transparency while the horse is still in the barn
Implementing Partners - Easy Project Accounting, simple but robust project documentation (established by the donors in the definition & planning phase)
Third Parties - Governments and regulators can audit projects easily
Industry - Creates cross-border, cross-project, comparative cost data

Clearly, Basho (scalability, interoperability) and Voltaire (governance) are exactly positioned to support above operational objectives for scalability, interoperability, and for multi-user functionality, multi-layered governance, and supporting complex collective, multi-agents decision-making processes.

Basho (scalability, interoperability)

The previous eras of Cardano (Byron, Shelley, and Goguen), were focused on decentralization & new functionality.

The Basho era of Cardano is an era of optimization, improving the scalability, interoperability, and underlying performance of the network. The Cardano network is now well positioned to better support growth and adoption for applications with high transaction volume, which matches adequately an application such as FundTrack.

Basho's introduction of sidechains may support FundTrack's own scaling and experimental features without affecting the security of the main chain: sidechains can be used as a sharding mechanism by off-loading work from the main to increase the capacity of the network.

Basho's introduction of parallel accounting styles may prove a rather handy feature for FundTrack: the ability to support and switch between UTXO and account-based models will be added to Basho using sidechains, resulting into greater interoperability for Cardano, as well as the ability to support new kinds of use cases on the network.

Voltaire (governance)

FundTrack stakeholders objectives may be aligned with Cardano's governance evolution.

The ultimate purpose of IOHK management is to let go of the management of Cardano.

So that Cardano may function as a truly decentralized ecosystem taken care of by its community, once IOHK will have completed construction of its secure foundations.

This means a secured voting and treasury system in place, for the Voltaire era of Cardano to provide as final pieces required for the network to become a self-sustaining system.

With the introduction of a voting and treasury system, network participants will be able to use their stake and voting rights to influence the future development of the network.

The Voltaire era will add the ability for network participants to present Cardano improvement proposals that can be voted on by stakeholders, leveraging the already existing staking and delegation process.

To fund the future development of the network, Voltaire will also see the addition of a treasury system, whereby a fraction of all transaction fees will be pooled to provide funds for development activities undertaken following the voting process.

Which means that FundTrack stakeholders may de facto consider becoming part of the Cardano ecosystem.

However, this may not be automatically granted for a variety of reasons, and may require an extra functionality that we review below in -c-.

c. Strong FundTrack alignment with the Atala (Prism) "portable economic identity" solution carried by the Cardano ecosystem and deployable in both permissioned and permission-less contexts.

Reference: [https://www.atalaprism.io/] & [https://www.youtube.com/watch?v=uZgDxPCXgPo]

As reviewed above in -b-, FundTrack stakeholders may de facto consider becoming part of the Cardano ecosystem.

However, this may not be automatically granted, for a variety of reasons, and may require an extra functionality that we review below.

FundTrack stakeholders, including but not limited to the UN, major NGOs, start-up NGOs, etc., may consider their transition toward systems that are distributed, partly disintermediated, and not necessarily decentralized, but solely on their own terms, and at their own pace.

It is critical, for FundTrack stakeholders, and boils down to the fact, to have the available option of operating into either permissioned on permission-less modes, and being able to naturally transit from one mode to the other.

This is exactly what the Atala (Prism) "portable economic identity" solution carried by the Cardano ecosystem, and deployable in both permissioned and permission-less contexts, will allow FundTrack stakeholders to do.

There is even more, in terms of how relevant the Atala development experience is to FundTrack stakeholders, as Team Len & Chris's decades of experience of operating in between developed and developing countries may attest.

In developing socio-economic contexts, you may encounter people who have strong "alacrity": they prove eager to discover, reverse-engineer, adapt, learn, adopt, overcome, because they want to solve a problem like "asap now".

Whereas in countries that think of themselves as developed and dominant, you're most likely to encounter smug, know-it-all types with jaded attitudes, while decision makers may drag their feet, as they think whatever legacy systems they have are already "good enough", too "sufficient" for considering serious change. And fine, it may be so.

Both Atala and FundTrack are designed for people who have, well, nothing, or, not much, in terms of systems.

As highlighted by Charles Hodkinson:

> *"The vantage point of the Atala is that not everything that happens on the local level has to be in public cloud storage or blockchain available for the whole world. The essential elements are, therefore, the transition during which the locally stored data are linked with the public network in case of an international transaction."*
>
> *" Such transition and the subsequent public operations ought to be trustworthy, an individual partaking in that particular transaction does not necessarily have trust in a transaction that was initiated in a completely different country. Seamless connection of systems means that the systems in question are fully compatible, that is, have a secured way of mutual communication. One of the pillars of Cardano is interoperability, considering the real world around and the compatibility with currently used systems. "*

Atala (permissioned) was designed for practical utility and application by developing countries governments, where, precisely, such systems do not even exist. In these untapped, blue ocean fintech markets, the Cardano ecosystem, together with FundTrack stakeholders, may find a localized fit.

Whereas projects such as e.g. Hyperledger, or Corda, target extremely competitive SaaS Software as a Service and BPM business process segments in already saturated mature corporate markets.

Atala is conveniently technology-agnostic... Its principal mission being to accelerate crypto-currency adoption, it remains primarily focused on dealing with user identity, payments, supply-chain management, while carrying out a "portable economic identity" nascent facility. That's why Atala may easily be linked to a blockchain environment, in case that makes practical utility sense. And this is something a human user doesn't even have to see.

> *" If people used Atala locally, they simultaneously would gain access to the whole world through Cardano, which could foster a large-scale adoption of cryptocurrencies as a whole. One of the current problems of crypto-currencies lies in the fact that if people do not know each other, or, are not in the same place at the moment of transaction, it is complicated to successfully realize a trade."*

The Atala (Prism) "portable economic identity" solution carried by the Cardano ecosystem, deployable in both permissioned and permission-less contexts, is a spot-on answer to FundTrack stakeholders need for convergence of functionalities toward real practical needs, now, particularly in developing economies.

Conclusion:

With:

a. strong fit between Goguen/Plutus/Haskell-embedded DSL Marlowe and FundTrack core functionalities,

b. strong FundTrack positioning to leverage Cardano's Basho (scaling, interoperability) and Voltaire (governance) capabilities, built on top of previous eras of Cardano (Byron, Shelley, Goguen), and,

c. strong FundTrack alignment with the Atala (Prism) "portable economic identity" solution carried by the Cardano ecosystem and deployable in both permissioned and permission-less contexts,

Team Len & Chris may assert with confidence that FundTrack is a blockchain solution that has been waiting for Cardano, and features and capabilities that Cardano has and is releasing with Byron, Shelley, Goguen, Basho, Voltaire, and Marlowe as a Haskell-embedded financial transactions DSL. The UN can begin to benefit from those features via FundTrack, now.

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APPENDIX II
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Relevance and use of Marlowe In FundTrack- a detailed review

In this Appendix II, we provide a more detailed review of FundTrack functionalities and Marlowe's mutual relevance by reviewing the Marlowe Tutorial point by point, having had an opportunity to familiarize ourselves, just in the past couple of days, with the many niceties of Marlowe as a Haskell-embedded DSL.

Use of Marlowe In FundTrack

Marlowe as an embedded DSL- Domain Specific Language, hosted in Haskell, for the financial industry, provides the core functionality that FundTrack requires: contracts that make payments. But FundTrack would not be a MVP without the functionalities provided by other elements of the Cardano platform. Thus, short of producing meaningful Marlowe code here, we'd rather go through the Marlowe tutorial step-by-step, annotating what capabilities are relevant to FundTrack.

Most salient aspect for FundTrack - the transaction environment and representation of value:

Currencies, contributions in kind, (non-)fungible tokens, Ada / Fiat / Crypto conversion, CBDCs

We note upfront the most salient aspect for us (more details below in Tutorial, 4.2), which is that:

> *"Cardano provides a simple way to introduce a new currency by forging it using monetary policy scripts. This effectively embeds Ethereum ERC-20/ERC-721 standards as primitive values in Cardano. We (Cardano) use custom tokens to represent participants in Marlowe contracts executing on chain."*

FundTrack operates in an environment where transactions are made primarily in fiat currencies and contributions in kind (think relief goods, equipment, volunteers' time, muscles, and transportation means, etc.).

FundTrack is agnostic as to the final form of transfer (payment) of value. FundTrack is able to serve its purposes operating either entirely in cryptocurrencies or partially in cryptocurrencies (for purposes of documentation, reviews and authorizations) allowing value ultimately to be released by donors to implementing partners either in a cryptocurrency or in fiat, through normal banking or money exchange facilities (as is appropriate in different countries, according to their regulations, and for convenience or cost efficiency).

Non-fungible tokens are adequate to represent contributions in kind (as digital twins they might also be used in future for escrow mechanisms in conjunction with autonomous warehouses, transportation and delivery systems).

The question of exchange transaction Ada / Fiat currencies (or Cryptos) remains, with rates and gains/losses.

Note on CBDCs- Central Banks Digital Currencies are still at feasibility study and testing stage: the latest BIS Bank of International Settlements Report from first-half October 2020, was published with 7 CBs, "without prejudging any

decisions on whether or not to introduce CBDCs in their jurisdictions." As long as payments operate in TARGET2 (national central banks settlements) and CBDCs are banned from ECB activities, it's hard to see the added value other than being some kind of second layer. Outcomes remain to be seen, and it is premature to jump to conclusions. [18]

As far as China is concerned, its emerging "CBDC" payment system is a combination of classic mobile electronic payment platform together with a form of digital yuan touted by the Government and PBoC in cohort with the private sectors (digital platforms majors), a definite recourse to blockchain/dlt remains to be further determined.

All of the above should be carefully considered when gauging the FundTrack transaction environment. We follow e.g. Chinese fintech information directly at the sources (national/city governments, PBoC), not media-types "hype".

Other salient point when implementing FundTrack with Marlowe

Next most salient point – found at **5. Marlowe step by step** in Tutorial - is that "Marlowe has five ways of building contracts. Four of these – **Pay, Let, If and When** – build a complex contract from simpler contracts, and the fifth, **Close**, is a simple contract. At each step of execution, as well as returning a new state and continuation contract, it is possible that **effects – payments – and warnings** can be generated too."

We are going to review how that fits FundTrack engineering requirements while combing through the Tutorial.

2.3. Timeouts, deposits and commitments

Any commitment is finite, and at this point in time, any unspent funds may be returned to participants. Payments are push, not pull.

3.1. A simple escrow contract

```
When [ Case aliceChoice
              (When [ Case bobChoice
                        (If (aliceChosen `ValueEQ` bobChosen)
                          agreement
                               arbitrate) ],
      Case bobChoice
              (When [ Case aliceChoice
                        (If (aliceChosen `ValueEQ` bobChosen)
                              agreement
                             arbitrate) ]       ]
```

In this contract, 'When' includes a list of scenario cases. Tutorial says: "In this contract, either Alice or Bob can make the first choice; the other then makes a choice. If they agree, then that is done; if not, Carol arbitrates. "

The proposed exercise is absolutely relevant to a situation that FundTrack may encounter often:

[18] https://www.bis.org/press/p201009.htm

> *"Suppose that Alice has already committed some money to the contract. What will happen if Bob chooses not to participate any further? We have assumed that Alice has already committed her payment, but suppose that we want to design a contract to ensure that: what would we need to do to?"*

In reality, a job for which funds have been committed may be performed only partially or not at all. Or, there could be a case of bait-and-switch, raise funding for cause A, but end up allocating funds for usage B, such as 'overhead', or worse (that keeps happening, and even if in a friendly and cordial fashion politely called 'Repurposing of Funds', that is still a problem).

Which leads us to the beauty of **Marlowe in escrow action**:

3.2. Escrow in Marlowe: "Marlowe contracts incorporate extra constructs to ensure that they progress properly. Each time we see a When, we need to provide two additional things: a *timeout* after which the contract will progress, and the *continuation* contract to which it progresses.

It turns out that Marlowe contains a fine mechanism for **3.3. Adding timeouts** and **3.4. Adding commitments.**

Marlowe is also mindful - **3.6. Notes** - of the fact that, while accounts names need to be provided manually in above example, these could be generated by **users' wallets** in a version of Marlowe deployed on a blockchain (which links to questions of users wallet and digital personal (self-sovereign) identity, etc.).

4. The Marlowe model

Tutorial: " Marlowe is designed to support the execution of financial contracts on blockchain, and specifically to work on Cardano. Contracts are built by putting together a small number of constructs that can be combined to describe many different kinds of financial contract. "

4.1. Contracts; "contracts in Marlowe run on a blockchain, but need to interact with the off-chain world. The *parties* to the contract, whom we also call the ***participants***, can engage in various ***actions***: they can be asked to ***deposit money***, or to ***make a choice*** between various alternatives. A ***notification*** of an external value (also called an ***oracle*** value), such as the current price of a particular commodity, is the other possible form of input." Running a contract will also produce external ***effects***, by making payments to parties in the contract.

Thus FundTrack engineering and its environment representation need to be consistent with such features: participants and roles (party, counterparty, tokenization), Accounts, Steps and States (continuation).

Marlowe's polyvalent **4.2. Blockchain** environment operates with classic features such as UTxO and wallets, and introduces omniscient and wallet-level simulation. "The *"wallet"-style* simulation explicitly models different wallets (i.e. different participants) and their participation in multiple roles in multiple contracts. This model thus presents a more faithful perspective of contract execution for a particular participant in the contract." Which sound directly relevant to the diversity of participants that FundTrack might need to deal with.

Then comes the representation of value, first and foremost salient point we mentioned in this section, since it covers the variety of value that FundTrack may have to operate with, from fiat to digital currency to in-kind:

"Marlowe offers a more general concept of value, though, supporting custom fungible, non-fungible, and mixed tokens. What is a Value in Marlowe?

```
newtype Value = Value
      {getValue :: Map CurrencySymbol (Map TokenName Integer)}
```

The types `CurrencySymbol` and `TokenName` are both simple wrappers around `ByteString`.

This notion of *value* encompasses Ada, fungible tokens (think currencies), non-fungible tokens (a custom token that is not interchangeable with other tokens), and more exotic mixed cases:

- Ada has the *empty bytestring* as `CurrencySymbol` and `TokenName`.
- A *fungible* token is represented by a `CurrencySymbol` for which there is exactly one `TokenName` which can have an arbitrary non-negative integer quantity (of which Ada is a special case).
- A class of *non-fungible* tokens is a `CurrencySymbol` with several `TokenNames`, each of which has a quantity of one. Each of these names corresponds to one unique non-fungible token.
- Mixed tokens are those with several `TokenNames` *and* quantities greater than one.

Cardano provides a simple way to introduce a new currency by *forging* it using *monetary policy scripts*. This effectively embeds Ethereum ERC-20/ERC-721 standards as primitive values in Cardano. We use custom tokens to represent participants in Marlowe contracts executing on chain." In Tutorial:

4.3. Executing a Marlowe contract – it is worth noting a feature that may help reduce FundTrack costs of contract execution: "the behaviour of Marlowe is independent of how inputs are collected into transactions, and so when we simulate the action of a contract we don't need to group inputs into transactions explicitly. For concreteness we can think of each transaction having at most one input. While the semantics of a contract is independent of how inputs are grouped into transactions, the *costs of execution* may be lower if multiple inputs can be grouped into a single transaction. In the *omniscient* simulation available in the Marlowe playground we abstract away from transaction grouping, while in the role-based "wallet" simulation transactions are explicit."

5. Marlowe step by step

FundTrack may be engineered along these lines considering that "Marlowe has five ways of building contracts. Four of these **– Pay, Let, If and When –** build a complex contract from simpler contracts, and the fifth, **Close**, is a simple contract. At each step of execution, as well as returning a new state and continuation contract, it is possible that effects – payments – and warnings can be generated too. In explaining these contracts we (Cardano) will also explain Marlowe *values*, *observations* and *actions*, which are used to supply external information and inputs to a running contract to control how it will evolve."

Note: besides Haskell, **6. Marlowe** is also available **in Blockly.**

It boils down to FundTrack mastering Haskell's environment for data, transaction, and value representation!

It is therefore essential for FundTrack implementation to master 7. The Marlowe data types:

7.1. Marlowe

The Marlowe domain-specific language (DSL) is modelled as a collection of algebraic types in Haskell, with contracts being given by the Contract type:

```
data Contract = Close
              | Pay AccountId Payee Token Value Contract
              | If Observation Contract Contract
              | When [Case] Timeout Contract
              | Let ValueId Value Contract
              | Assert Observation Contract
```

See 7.2. Basic components, 7.3. Values, observations and actions, 7.4. Building Transactions, 7.5. Slot ranges.

Note for FundTrack on Values, observation, and actions:

These are relevant to precise mechanisms that allow for transactions monitoring, control, and error prevention.

Note for FundTrack on Building Transactions:

A transaction is built from a series of steps, some of which consume an input value, and others produce effects, or payments. In describing this we explained that a transaction modified a contract (to its continuation) and the state, but more precisely we have a function

```
computeTransaction :: TransactionInput -> State -> Contract -> TransactionOutput
```

The `TransactionInput` type has two components: the `SlotInterval` in which it can validly be added to the blockchain, and an ordered sequence of Input values to be processed in that transaction.

A `TransactionOutput` value has four components: the last two are the updated State and `Contract,` while the second gives an ordered sequence of `Payments` produced by the transaction. The first component contains a list of any warnings produced by processing the transaction.

Remaining content of the Marlowe Tutorial (not covered here):

8. Embedded Marlowe
9. Using Marlowe from the ghci command line
10. The Marlowe Playground
11. Potential problems with contracts
12. Static analysis
13. ACTUS and Marlowe
14. Migrating to Marlowe 3.0

15. Wallets Simulation
16. Actus Labs
17. Marlowe in JavaScript

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APPENDIX III
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UN' 17 sustainable development goals (SDGs) to transform our world

In order to streamline any FundTrack performance review, we simply parse the UN' 17 sustainable development goals (SDGs) to transform our world" along 3 categories as follows:

Category A: Ecological & Environmental SDGs (Goals 13, 14, 15)
Category B: Infrastructure & Economy SDGs (Goals 6, 7, 8, 9, 11, 12)
Category C: Societal & Political SDGs (Goals 1, 2, 3, 4, 5, 10, 16, 17)

While these SDGs categories, in particular B and C, may overlap, their logic works as follows:

- Category A addresses the odds of a livable planet and simply of our survival as a biological species.

- Category B represents adjustments in design and operations of our infrastructures and economies.

- Category C marks necessary progresses that also require substantial gains in categories A and B.

While these categories are intended to streamline any FundTrack performance review, we also like to use them for our own Team self-assessment:

"How did we recently contribute to achieve the SDGs in our societal, professional and personal lives?"

is a question we ask ourselves regularly. Because any community improvement starts with individual initiative from the ground up and taking personal responsibility.

Category A: Ecological & Environmental SDGs

GOAL 13: Climate Action /// GOAL 14: Life Below Water /// GOAL 15: Life on Land

Category B: Infrastructure & Economy SDGs

GOAL 6: Clean Water and Sanitation /// GOAL 7: Affordable and Clean Energy ///

GOAL 8: Decent Work and Economic Growth /// GOAL 9: Industry, Innovation and Infrastructure

GOAL 11: Sustainable Cities and Communities /// GOAL 12: Responsible Consumption and Production

Category C: Societal & Political SDGs

GOAL 1: No Poverty

GOAL 2: Zero Hunger /// GOAL 3: Good Health and Well-being

GOAL 4: Quality Education /// GOAL 5: Gender Equality

GOAL 10: Reduced Inequality

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

WYOHACKATON 2020

Blockchain for Social Good - Supporting the United Nations Sustainable Development Goals [Les Objectifs de Développement Durable]

Proposed <FundTrack> Solution

Second & final part of proposal - Appendices IV to XI

2020 - Len Delunas and Christophe Bosquillon

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APPENDIX IV
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Methodology and process: objectives, criteria of control, and self-assessment.

Internalizing objectives and criteria of control are foundational steps in any management process. In this section we review "Judging Criteria", "UN/Cardano Specifications", and UN SDGs most salient points, as described below using a matrix.

To which we add a detailed version of the most salient points in recommendations of the UN's Digital Finance Task Force, and in the UN Secretary General's Data Strategy, relevant to this Wyohackaton.

We fill-in a layered self-assessment, which reflects the team's considerations underwriting this proposal.

-a- The 5 (five) basic WyoHackathon "Judging Criteria" and 7 (seven) "UN/cardano Specifications"
-b- Matrix intersecting above 5 basic WyoHackathon "Judging Criteria" and 7 "UN/cardano Specifications"
-c- Most salient points in recommendations of the UN's Digital Finance Task Force Report
-d- Most salient points in UN Secretary General's Data Strategy

[as relevant to this Wyohackaton for both -c- and -d-]

-a- The 5 basic WyoHackathon "Judging Criteria" and 7 "UN/Cardano Specifications"

The 5 basic WyoHackathon "Judging Criteria":

i. Execution

ii. Design

iii. Creativity

iv. Utility

v. Impact

The 7 "UN/Cardano Specifications":

-b.1. Social Impact for the SDGs - *Does the project advance solutions for the UN's Sustainable Development Goals using blockchain technology*?

-b.2. *Scalability - Would this solution scale in its scope and beyond its presented context?

-b.3. *Technical Prowess - Does this submission address the technical challenges of its implementation*?

-b.4. *Does this solution complement or expand upon IOHK technologies*?

-b.5. *Does this solution have an innovative component that supports volunteering for the SDGs*?

-b.6. *Financing for the SDGs* - *Does the solution address either microfinancing, continuous funding, de-risking investments, incentivize crowdfunded donations, multi-stakeholder allocation of resources, or otherwise *fall under the recommendations of the UN's Digital Finance Task Force Report*?

-b.7 *Does this solution address one of the priorities in the UN Secretary General's Data Strategy*?

The FundTrack team did pay attention to this statement and heeds its methodological implications:

> *"We are determined to *inspire those who currently have little or no knowledge of blockchain* and the *slide decks* produced by winning participants *will be used to illustrate to the public, governments, and other organisations* how blockchain can overcome many of the barriers to sustainable development - particularly in the rapidly developing nations where the UN works."*

Proposed FundTrack solution compliance with WyoHackathon Social Good Objectives, in a nutshell

The inability of organizations to properly track their projects' 'effort and cost' may look like *only* a data coordination problem. But that data coordination problem ultimately can spawn social coordination problems, owing to fraught governance, financial allocation decisions, and policy making.

-1- FundTrack solves above data & social coordination problem for UN SDGs implementation:

1.a. Immediately transferrable into existing UN programs.
1.b. UN SDGs projects achievement back-on-track.
1.c. Volunteers incentivized exponentially from the ground up.

-2- FundTrack accelerates UN data-driven digital transformation with immediate impact on projects:

2.a. Contributes to UN data enabling capabilities with direct in-project build-up.
2.b. Consolidates exponential data feed-back loops to facilitate digital governance.
2.3. Revitalizes UN project management digital processes in developing countries.

-3- FundTrack fosters the Cardano Ecosystem implementation & adoption by the development community:

3.a. Deploys "portable economic identity" solutions in permissioned & permissionless contexts.
3.b. Accelerates implementation of metadata-fueled financial contracts scaling from-the-ground-up.
3.c. Turbocharges core functionalities with Haskell-embedded DSL Marlowe's exponential adoption.

How does the proposed FundTrack solution comply with the 7 "UN/Cardano Specifications" in details

-b.1. *Does the project advance solutions for the UN's Sustainable Development Goals using blockchain technology*?

Our self-assessment: the proposed FundTrack solution addresses issues of monitoring and reporting as part of Project Management Process, which, if solved, will greatly increase the odds of projects remaining on track to contribute to achieve UN SDGs. And FundTrack does so by harnessing features and capabilities of the whole of the blockchain-based Cardano Ecosystem built into:

- Shelley (staking, smart contracts)
- Marlowe (Domain Specific Language for financial transactions)
- *Goguen (metadata, multi-assets and mobile and web front end UX)*
- Basho (scalability, interoperability)
- Voltaire (governance)
- Atala (permissioned networks, identity, payments, supply chain management)
- Gerolamo (a platform that will bring together the Cardano and Atala blockchains)
- Yoroi Mobile Application.

Each component and its features play an essential part in the proposed FundTrack solution, and, when implemented, improves outcomes. It is difficult to point to a single functionality that makes FundTrack valuable to the development industry. *But the recently announced metadata as well as front end development features of Goguen (meta-data, multi-assets and mobile and web front end UX) is definitely the blockchain technology breakthrough that makes the FundTrack concept viable.*

-b.2. *Scalability - Would this solution scale in its scope and beyond its presented context

Our self-assessment: the proposed FundTrack solution scales on its own, and as embedded with Cardano, for all NGOs involved in SDGs. As a monitoring, accountability, and supporting tool for both embedded digital governance and senior human decision-makers, the proposed FundTrack solution can certainly scale even beyond its present context, to all situations where such functionalities are required, in both permissioned and permissionless architectures.

-b.3. *Technical Prowess - Does this submission address the technical challenges of its implementation?

Our self-assessment: the proposed FundTrack solution addresses the double challenge of 1/ mutual technical adequacy and relevance with the Cardano Ecosystem, including Marlowe's functionalities as a Haskell-embedded financial transaction DSL ; and 2/ implementing partner level training in Marlowe, Haskell DSL environment, and Cardano features. Meanwhile, a human-centered design makes sure to keep proposed FundTrack solution components "under the hood" in ways that keep human-users happy.

-b.4. *Does this solution complement or expand upon IOHK technologies?

Our self-assessment: the proposed FundTrack solution does a bit of both. It complements IOHK technologies by bringing in the toolbox a very focused monitoring and reporting tool. But it also expands upon IOHK technologies: by leveraging the Cardano Ecosystem, any adopter of FundTrack may de facto adopt Cardano. In particular, since the last barrier to adoption, permissioned systems, is lifted by Atala/Gerolamo, FundTrack may contribute as an accelerator of Cardano's adoption in the permissioned organizations world. FundTrack expands upon tech via Marlowe's exponential adoption.

-b.5. *Does this solution have an innovative component that supports volunteering for the SDGs*?

Our self-assessment: the proposed FundTrack solution suggests opportunities for volunteer trainers and allows volunteers to directly keep track of their own efforts and costs and have a fair record of their contribution as part of monitoring & reporting. As such, FundTrack features become part of their natural life & work flows. Thus, volunteers become happy with what they perform on a regular, repetitive, yet quite satisfactory and empowering basis. Part of the problem is, people of good will may get deterred and disheartened to become involved in cronyism, corruption & FWA-fraught environments. With little professional ethics, no accountability whatsoever, nor recognition for the efforts of "bottom-of-the-food-chain volunteers". From now on, the proposed FundTrack solution sends a clear signal to all SDGs

stakeholders that this doesn't have to be the case anymore. The proposed FundTrack solution restores balance for volunteers for the SDGs.

-b.6. *Financing for the SDGs* - Does the solution address either microfinancing, continuous funding, de-risking investments, incentivize crowdfunded donations, multi-stakeholder allocation of resources, or otherwise *fall under the recommendations of the UN's Digital Finance Task Force Report*?

Our self-assessment: the proposed FundTrack solution addresses these questions – head-on. Any system that offers visibility in the project spending process, and allows the opportunity for timely intervention, does make a major contribution to de-risking investments! It provides a fine-tuned picture and monitoring of each stakeholder's resources requirement.

A crucial and often lacking component in any kind of project management and financial decision-making process is timely financial reporting. Mainly because traditional financial management systems all operate as institutionalized historical records, not as proactive management tools for multi-stakeholders endeavors. This issue exists at any level, scale, and in any context of the larger SDGs meta-context. As such, the proposed FundTrack solution is a spot-on solution, in all of the contexts enumerated above. In addition, the FundTrack team conducted a thorough assessment of the recommendations of the UN's Digital Finance Task Force Report, ***for which you can see our self-assessment in below -c- "Most salient points in recommendations of the UN's Digital Finance Task Force Report relevant to this WyoHackathon".***

-b.7 *Does this solution address one of the priorities in the UN Secretary General's Data Strategy*?

Our self-assessment: yes, in fact more than one priority. The proposed FundTrack solution team conducted a thorough assessment of the priorities in the UN Secretary General's Data Strategy, "Data Strategy of the Secretary General for Action by Everyone, Everywhere: With Insight, Impact and Integrity", ***for which you can see our self-assessment in below -d-*** **"Most salient points in UN Secretary General's Data Strategy relevant to this Wyohachathon**", as we synthesized the priorities.

It turns out that the proposed problem-driven FundTrack solution addresses head-on the issue of fostering sound data governance through monitoring and reporting. By providing a robust digital engine for 'Effort and Cost Monitoring', FundTrack may completely fluidify the treatment of NGOs' field/ground-level action data, away from a bloated paper-only paradigm, root of all bureaucratic ineffectiveness.

This accelerates implementation of feed-back loops, in effect supporting stronger decision-making and policy advice.

Furthermore, the proposed FundTrack solution demonstrates, in the main body and Appendices, how it is designed in a human-centered way, to contribute to means, ways, and practical implementation, of SDGs and of key priority agendas: starting with the Decade of Action to deliver the SDGs by 2030, that includes Climate Action, Gender Equality, Human Rights and Rule of Law, Peace and Security, Governance and Ethics for the Future, and UN Reform. Finally, the proposed FundTrack solution, by tackling head-on the 'Effort and Cost Monitoring' problem, and solving it, provides, in cohort

with the Cardano Ecosystem, a spot-on capability building asset, that accelerates "*data analytics and management, while fostering enablers such as education and collaborative culture, data governance mechanisms and strategy oversight."*
The FundTrack team conceived the proposed FundTrack solution in a human-centered design way, that delivers actionable insights and empowers all stakeholders across the whole of the SDGs ecosystems & agendas.

-b- Matrix for above 5 basic WyoHackathon "Judging Criteria" and 7 "UN/cardano Specifications"

UN SDG's	Execution	Design	Creativity	Utility	Impact
-b.1. Social Impact for the SDGs - *Does the project advance solutions for the UN's Sustainable Development Goals using blockchain technology*?	The proposed FundTrack solution tackles aggressively and solves a nagging monitoring and reporting problem that incapacitates effective governance and plagues these thousands of organisations that try to deliver on SDGs but can't.	*The proposed FundTrack's design is effective in a human-centered way: intrinsically on how it figures with the Project Management Process, and extrinsically on how it links with & leverages the Cardano ecosystem.*	FundTrack is an innovative solution, putting together legacy, newly developed, and emerging systems, to quite elegantly solve a problem in ways that were never implemented before.	FundTrack is designed for all multi - stakeholders purposes, flexible, easy to fix and maintain, and mindful of interoperability.	No more dereliction of duty by NGOs that allow FWA to persist by slacking on the Phase 4 'Effort & Cost Monitoring' segment of Project Management Process. Better odds for SDGs achievements through significantly improved governance, accountability & transparency.
-b.2. *Scalability - Would this solution scale in its scope and beyond its presented context?	The proposed FundTrack solution scales on its own, and as embedded with Cardano.	The design leverages the quality of the Cardano Basho scalability component, in a human-centered way.	The scalability aspect of the proposed Fundtrack solution is innovative, as it pervades permissioned systems where they exist, but also leverages the Cardano ecosystem especially in system-less countries.	The scalability aspect of the proposed FundTrack solution is designed to address concerns such as use across borders, across situations (conflict, disaster relief), minimal training required (for donors, implementing partners, vendors and suppliers), conversion to fiat in a wide variety of situations. When confronted with externalities such as volatility, at least the proposed solution enables close monitoring & better-informed	The proposed FundTrack solution can spread among developed countries' organizations that are governance-minded and eager to clean up their FWA act. But, even more effectively, among developing countries that are eager to achieve SDGs and are just getting started into putting relevant systems in place.

				decision-making, faster.	
-b.3. *Technical Prowess - Does this submission address the technical challenges of its implementation*?	The proposed FundTrack solution addresses the technical challenges of its implementation to the extent that it has carefully reviewed the mutual technical adequacy between FundTrack and the Cardano ecosystem, and the mutual technical relevance between FundTrack objectives and Marlowe's functionalities as Haskell-embedded financial transaction DSL. While high-level functions of both FundTrack and the Cardano ecosystem are designed for broad understanding, clearly a Marlowe and Haskell DSL environment training is required, at the implementing partner level, but so would be the case for any item of digital transformation the partner may face, including and not limited to data literacy.	The technical prowess of the FundTrack solution is based on a simple, effective, human-centered design, that also reflects the prowess in quality design of the whole of the Cardano ecosystem.	Governance- and performance-minded users, who are genuinely motivated to contribute to achieve the UN SDGs, by solving problems at their level, have an intrinsic motivation to use the proposed FundTrack solution. Those who intend to push out FWA, incompetence, and corruption,] may find a competitive incentive to adopt FundTrack, in order to suck funding away from dishonest users who dwell in FWA by slacking on Project Management due-process.	The difficulty is "professional-ethics-grade" no more, no less. For example, compared with BPM SaaS- Business Process Management Software as a Service, there is nothing immensely difficult with FundTrack nor with implementing Marlowe based solutions as Haskell-embedded DSL for financial transactions, really. The Cardano ecosystem is sophisticated but engineered so as to be mastered if you put enough hard work in it. In the age of data and complexity, only the honest, serious, hard working, ethically-professional types may gain a competitive edge.	We are cautiously optimistic that such professional ethics & hard work may prevail. Therefore we may wager for a significant impact, as organizations across the board get with the program.
-b.4. *Does this solution complement or expand upon IOHK technologies*?	While the implementation and adoption odds of the proposed FundTrack solutions mutually support the on-going implementation and adoption of Basho (scalability, interoperability), Atala/Gerolamo (permissioned <--> permissionless, portable economic identity), and Yoroi (wallets), it can operate before Voltaire comes on	The proposed FundTrack solution is designed in a human-centered way to fit "symbiotically" with the Cardano/IOHK ecosystem.	The proposed FundTrack solution design is scalable with existing Cardano tech prior to Basho (Byron, Shelley, Goguen), and it can accomodate on-going and future developments (Basho, Atala / Gerolamo, Yoroi, Voltaire).	The FundTrack solution will get better in implementation and adoption as Cardano evolves, with a particular emphasis on Basho (scalability, interoperability), Atala/Gerolamo (permissioned vs permissionless, portable economic identity), and Yoroi	We believe it is wiser for the proposed FundTrack solution adoption to secure a niche first, then grow its impact on its domain of implementation and adoption. Since FundTrack works well in cohort with the Cardano Ecosystem, any improvement on

	stream. The Marlowe review indicates direct relevance to FundTrack functionalities. Other completely new technologies external to IOHK aren't urgently required, since most of the peripheral function relevant to data capture and processing may be operated through APIs.			(wallets). Once this first foundation is secured, next challenge is to get Voltaire and FundTrack co-adopted as new SDGs governance monitoring model.	FundTrack core and peripheral functionalities, may reflect positively on the IOHK technology stack as well.
-b.5. *Does this solution have an innovative component that supports volunteering for the SDGs*?	The proposed FundTrack solution allows volunteers to directly keep track of their own efforts and costs and have a fair record of their contribution as part of monitoring & reporting. As such, FundTrack features become part of their natural life & work flows. Thus, volunteers become happy with what they perform on a regular, repetitive, yet quite satisfactory and empowering basis. Part of the problem is, people of good will may get deterred and disheartened to become involved in a cronyism, corruption and FWA-fraught environment. With little professional ethics, no accountability whatsoever, nor recognition for the efforts of "bottom-of-the-food-cha in volunteers". From now on, this doesn't have to be the case anymore. The proposed FundTrack solution restores balance.	The proposed FundTrack solution is designed in a human-centered way: the UX quality is so good and volunteer-friendly that they'll be very happy to share an experience where they contribute to make the SDGs system work much better and upgrade on the professional ethics scale.	When you track & record, you can explain and negotiate what you do based on facts and data, not merely on hype, opinions or trends. You can expand your reach, by developing a better support-system for governance and policy-making from the ground up. The proposed FundTrack solution will allow permanent objective feedback loops, that will expand the field of new creative applications, while constantly honing the tool and its human users skills.	First and foremost volunteer need to identify the circumstances of where they operate and catalog a number of realistic scenarios that have various probabilities to unfold with all stakeholders involved. Then they can start to design how they may tackle their own contribution to the Project Management Process in any given circumstances, and as early-responders if and when they detect that a project is going off-track. The proposed FundTrack solution is rather empowering.	To summarize, for all the intrinsic motivation, empowerment, professional ethics, and the ability to make a difference with, ultimately, a much better monitoring, governance, and policy decision-making feedback loop, we would anticipate that the proposed FundTrack solution may attract and encourage volunteers to make sure their organizations do contribute to SDGs achievement.
-b.6. *Financing for the SDGs* - *Does the solution address either microfinancing, continuous funding, de-risking investments,	Not only can the proposed FundTrack solution work in the UN current legacy systems	The proposed FundTrack solution is designed in a human-centered way which is appealing to all types of financial	The proposed FundTrack solution is a creative innovation partner for the UN, as the UN sails through its	While intrinseque motivation and professional ethics do matter, extrinseque motivation to change is mostly linked to	The proposed FundTrack solution will lead to appreciable improvements in several ways. Poorly

incentivize crowdfunded donations, multi-stakeholder allocation of resources, or otherwise *fall under the recommendations of the UN's Digital Finance Task Force Report*?	*(such as SAP / UMOJA ERP)*, but it can directly contribute to any kind of internal and external Project Management Process improvements the UN might be willing to conduct as part of its larger digital finance transformation.	partners and stakeholders in the UN SDGs ecosystem. Technically articulated with the Cardano Ecosystem and engineered with "Marlowe inside" as Haskell-embedded financial transactions DSL, FundTrack's design is right down the alley of what stakeholders want.	digital finance transformation journey. The purpose of creative innovation is not for everything to be new and out of the blue, but for the sake of reaching a clearly defined strategic objective. It is to put together, in an innovative fashion, legacy components, recently created but proven components, and more cutting-edge components, in ways that haven't been tried before, and after other attempts failed for lack of adequate solutions. This is exactly what FundTrack does.	incentives, both encouraging and dissuasive incentives. So for example, if regulators, and/or UN et al. policies, eventually decide to seriously take measures against FWA, and make good on threats to de-fund, for lack of proper PMP Phase 4 monitoring/ reporting of effort & cost, and overall poor governance and accountability practice, then, most likely, most FWA-fraught organizations may comply, albeit reluctantly. On the other hand, compliant, honest, but also new, innovative organizations, will have a field day. In both environments, the proposed FundTrack solution does positively reinforce the UN in steering its own digital finance transformation.	governed organizations may clean up their act and preserve their funding, first and foremost on condition (but not only) of proper effort and cost monitoring and reporting, and then on more effective decision-making with regard to their SDGs of concern. Adequately governed organizations may further innovate, and thrive to contribute to SDGs achievements. Either way, UN Programs will have an inescapable tool to conduct own Project Management Process assessment. ***See also our self-assessment in paragraph -c- below "Most salient points in recommendations of the UN's Digital Finance Task Force Report relevant to this WyoHackathon"***
-b.7 *Does this solution address one of the priorities in the UN Secretary General's Data Strategy*?	In fact more than one. As detailed in -b-7 above this matrix, the proposed FundTrack solution is meant	As per above, the FundTrack team conceived the proposed FundTrack solution in a human-centered design way, that	The proposed FundTrack solution clearly brings several innovative data-driven approaches that will support and foster UN priorities and	The proposed FundTrack solution isn't in itself a tool that evaluates outcomes, nor establish governance structure, nor is it a policy decision-making body. The tool is just a	The proposed FundTrack solution is primarily intended to support and foster UN priorities. It will be some constructive contribution if the tool provides data and

	to fully support and foster these existing UN priorities.	delivers actionable insights and empower all stakeholders across SDGs ecosystems & agendas.	accelerate their materialization.	tool, that provides data-driven better monitoring and reporting for the purpose of the Project Management Process, and ultimately the above goals and agendas. It is primarily intended to support and foster UN priorities. However, by the data-flow and field/ground level assessment that FundTrack will help provide, it is not to be excluded that ensuing feedback loops may lead to some sort of changes, including and not limited to priorities.	ensuing feedback loops that consolidate, facilitate, and accelerate UN reforms as a whole. ***See also our self-assessment in paragraph -d- below "Most salient points in UN Secretary General's Data Strategy relevant to this WyoHachathon "***
UN SDG's	Execution	Design	Creativity	Utility	Impact

In the below, as per above matrix content, we review the **7 "UN/cardano Specifications"** while taking into account each of the **5 basic WyoHackathon "Judging Criteria"** with our own questions**.**

*-b.1. *Does the project advance solutions for the UN's Sustainable Development Goals using blockchain technology*?*

Our self-assessment: the proposed FundTrack solution addresses issues of monitoring and reporting as part of Project management Process, which, if solved, will greatly increase the odds of projects remaining on track to contribute to achieve UN SDGs. And FundTrack does so by harnessing features and capabilities of the whole of the Cardano Ecosystem built into:

- Shelly (staking, smart contracts)
- Marlowe (Domain Specific Language for financial transactions)
- Goguen (meta-data, multi-assets and mobile and web front end UX)
- Basho (scalability, interoperability)
- Voltaire (governance)
- Atala (permissioned networks, identity, payments, supply chain management)
- Gerolamo (a platform that will bring together the Cardano and Atala blockchains)
- Yoroi Mobile Application.

Each component and its features play an essential part in the proposed FundTrack solution, and, when implemented, improves outcomes. It is difficult to point to a single functionality that makes FundTrack valuable to the development industry. *But the recently announced metadata as well as front end development features of Goguen is definitely the blockchain technology breakthrough that makes the FundTrack concept viable.*

***-b.1.i. Execution** - Does the project address UN SDGs? (Some, all, which ones, in what way?)*

Our self-assessment: yes. The proposed FundTrack solution tackles aggressively and solves a nagging monitoring and reporting problem that incapacitates effective governance and plagues these thousands of organisations that try to deliver on SDGs but can't.

***-b.1.ii. Design** – Is the design of good Quality*
Our self-assessment: yes. The proposed FundTrack's design is effective in a human-centered way: intrinsically on how it figures with the Project Management Process, and extrinsically on how it links with & leverages the Cardano ecosystem.

***-b.1.iii. Creativity** – Is the solution innovative, is it aesthetically appealing, do others think the fit and finish is attractive.*

Our self-assessment: yes. FundTrack is an innovative solution, putting together legacy, newly developed, and emerging systems, to quite elegantly solve a problem in ways that were never implemented before.

***-b.1.iv. Utility** - Is the solution useable by the target audience (users), is it easy to maintain (fix), is it flexible - adaptable to unforeseen circumstances, can it integrate with other platforms.*

Our self-assessment: yes. FundTrack is designed for all such purposes, mindful of interoperability.

***-b.1.v. Impact** - Will the solution appreciably improve the existing situation (the "problem") ?*

Our self-assessment: yes. No more dereliction of duty by NGOs that allow FWA to persist by slacking on the Phase 4 'Effort & Cost Monitoring' segment of Project Management Process. Better odds for SDGs achievements through significantly improved governance, accountability & transparency.

-b.2. *Scalability - Would this solution scale in its scope and beyond its presented context

Our self-assessment: the proposed FundTrack solution scales on its own, and as embedded with Cardano, for all NGOs involved in SDGs. As a monitoring, accountability, and supporting tool for both embedded digital governance and senior human decision-makers, the proposed FundTrack solution can certainly scale even beyond its present context, to all situation where such functionalities are required, in both permissioned and permission-less architectures.

***-b.2.i. Execution** - Does the proposed solution scale?*

Our self-assessment: yes. The proposed FundTrack solution scales on its own, and as embedded with Cardano.

-b.2.ii. Design *- Is the design of good Quality*

Our self-assessment: yes. The design leverages the quality of the Cardano Basho scalability component, in a human-centered way.

-b.2.iii. Creativity *- Is the scalability aspect of the solution innovative, does it appear to address known issues and known unknowns?*

Our self-assessment: yes. The scalability aspect of the proposed Fundtrack solution is innovative, as it pervades permissioned systems where they exist, but also leverages the Cardano ecosystem especially in system-less countries.

-b.2.iv. Utility *- How well will the solution perform at large scale? Will it be useful across borders, across situations (conflict, disaster relief) does it require minimal training (for the donors, for the implementing partners. for their vendors and suppliers), how is the conversion to fiat accomplished in a wide variety of situations? How does volatility of the currency affect the functionality?*

Our self-assessment: the scalability aspect of the proposed FundTrack solution is designed to address all above concerns. When confronted with strong externalities such as volatility, at least the proposed solution enables close monitoring and better-informed decision-making, faster.

-b.2.v. Impact *- How far can this solution spread?*
Our self-assessment: the proposed FundTrack solution can spread among developed countries' organizations that are governance-minded and eager to clean up their FWA act. But, even more effectively, among developing countries that are eager to achieve SDGs and are just getting started into putting relevant systems in place.

-b.3. *Technical Prowess - Does this submission address the technical challenges of its implementation?

Our self-assessment: the proposed FundTrack solution addresses the double challenge of 1/ mutual technical adequacy and relevance with the Cardano Ecosystem, including Marlowe's functionalities as a Haskell-embedded financial transaction DSL ; and 2/ implementing partner level in Marlowe, Haskell DSL environment, and Cardano features. Meanwhiles, a human-centered design makes sure to keep the proposed FundTrack solution components "under the hood" in ways that keep human-user happy.

-b.3.i. Execution *- What training is required for user adoption? Are their programming requirements that demand Haskell training- at the implementing partner level? Are the concepts easily grasped at the large organization (donors, institutions) level and at the small UN local implementing partner level.*

Our self-assessment: the proposed FundTrack solution addresses the technical challenges of its implementation to the extent that it has carefully reviewed the mutual technical adequacy between FundTrack and the Cardano ecosystem, and the mutual technical relevance between FundTrack objectives and Marlowe's functionalities as a Haskell-embedded financial

transaction DSL. While high-level functions of both FundTrack and the Cardano ecosystem are designed for broad understanding, clearly a Marlowe and Haskell DSL environment training is required, at the implementing partner level, but so would be the case for any item of digital transformation the partner may face, including and not limited to data literacy.

-b.3.ii. Design - Is the design of good Quality

Our self-assessment: the technical prowess of the FundTrack solution is based on a simple, effective, human-centered design, that also reflects the prowess in quality design of the whole of the Cardano ecosystem.

-b.3.iii. Creativity - Will the solution attract users? Or alienate them?

Our self-assessment: governance- and performance-minded users, who are genuinely motivated to contribute to achieve the UN SDGs, by solving problems at their level, have an intrinsique motivation to use the proposed FundTrack solution. Those who intend to push out FWA, incompetence, and corruption,] may find a competitive incentive to adopt FundTrack, in order to suck funding away from dishonest users who dwell in FWA by slacking on Project Management due-process.

-b.3.iv. *Utility - How difficult will it be for the ecosystem to adopt?*

Our self-assessment: the difficulty is "professional-ethics-grade" no more, no less. For example, compared with BPM SaaS-Business Process Management Software as a Service, there is nothing immensely difficult with FundTrack nor with implementing Marlowe based solutions as Haskell-embedded DSL for financial transactions, really. The Cardano ecosystem is sophisticated but engineered so as to be mastered if you put enough hard work in it. In the age of data and complexity, only the honest, serious, hard working, ethically-professional types may gain a competitive edge.

-b.3.v. *Impact - Small, medium significant?*
Our self-assessment: we are cautiously optimistic that such professional ethics & hard work may prevail. Therefore we may wager for a significant impact, as organizations across the board get with the program.

-b.4. *Does this solution complement or expand upon IOHK technologies?

Our self-assessment: the proposed FundTrack solution does a bit of both. It complements IOHK technologies by bringing in the toolbox a very focused monitoring and reporting tool. But it also expands upon IOHK technologies: by leveraging the Cardano Ecosystem, any adopter of FundTrack may de facto adopt Cardano. In particular, since the last barrier to adoption, permissioned systems, is lifted by Atala/Gerolamo, FundTrack may contribute as an accelerator of Cardano's adoption in the permissioned organization world.

-b.4.i. Execution *- Can the proposed solution be implemented in the Cardano environment as it exists now, or must the Cardano environment evolve further? When? Can the proposed solution be implemented with IOHK technologies or must other technologies be utilized?*

Our self-assessment: while the implementation and adoption odds of the proposed FundTrack solutions mutually support the on-going implementation and adoption of Basho (scalability, interoperability), Atala/Gerolamo (permissioned <--> permissionless, portable economic identity), and Yoroi (wallets), it can operate before Voltaire comes on stream. The Marlowe review indicates direct relevance to FundTrack functionalities. Other completely new technologies external to IOHK aren't urgently required, since most of the peripheral function relevant to data capture and processing may be operated through APIs.

-b.4.ii. Quality *- Is the design of good Quality?*

Our self-assessment: yes. The proposed FundTrack solution is designed in a human-centered way to fit "symbiotically" with the Cardano/IOHK ecosystem.

-b.4.iii. Creativity *- Is the solution scalable with existing CARDANO tech? Can it accommodate planned development of the Cardano environment? Does the solution innovate on IOHK technologies?*

Our self-assessment: yes and yes. The proposed FundTrack solution design is scalable with existing Cardano tech prior to Basho (Byron, Shelley, Goguen), and it can accomodate on-going and future developments (Basho, Atala / Gerolamo, Yoroi, Voltaire).

-b.4.iv. Utility *- Will the solution get better as Cardano evolves? What will the challenges be? Does the solution demand or suggest changes or evolution or addition of new features to iOHK technologies?*

Our self-assessment: the FundTrack solution will get better in implementation and adoption as Cardano evolves, with a particular emphasis on Basho (scalability, interoperability), Atala/Gerolamo (permissioned vs permissionless, portable economic identity), and Yoroi (wallets). Once this first foundation is secured, next challenge is to get Voltaire and FundTrack co-adopted as new SDGs governance monitoring model.

-b.4.v. Impact *- Small, medium significant? Will the solution lead to appreciable improvements in IOHK technologies?*

O*ur self-assessment:* we believe it is wiser for the proposed FundTrack solution adoption to secure a niche first, then grow its impact on its domain of implementation and adoption. Since FundTrack works well in cohort with the Cardano Ecosystem, any improvement on FundTrack core and peripheral functionalities, may reflect positively on the IOHK technology stack as well.

-b.5. *Does this solution have an innovative component that supports volunteering for the SDGs*?

-b.5.i. Execution *– Why and how do volunteers participate?*
Our self-assessment: the proposed FundTrack solution allows volunteers to directly keep track of their own efforts and costs and have a fair record of their contribution as part of monitoring & reporting. As such, FundTrack features become part of their natural life & work flows. Thus, volunteers become happy with what they perform on a regular, repetitive, yet quite satisfactory and empowering basis. Part of the problem is, people of good will may get deterred and disheartened to become involved in a cronyism, corruption and FWA-fraught environment. With little professional ethics, no accountability

whatsoever, nor recognition for the efforts of "bottom-of-the-food-chain volunteers". From now on, this doesn't have to be the case anymore. The proposed FundTrack solution restores balance.

-b.5.ii. Design *- Is the design of good Quality*

Our self-assessment: the proposed FundTrack solution is designed in a human-centered way: the UX quality is so good and volunteer-friendly that they'll be very happy to share an experience where they contribute to make the SDGs system work much better and upgrade on the professional ethics scale.

-b.5.iii. Creativity *– Does the proposed solution promote or inspire creative ways of use*

Our self-assessment: yes. When you track & record, you can explain and negotiate what you do based on facts and data, not merely on hype, opinions or trends. You can expand your reach, by developing a better support-system for governance and policy-making from the ground up. The proposed FundTrack solution will allow permanent objective feedback loops, that will expand the field of new creative applications, while constantly honing the tool and its human users skills.

-b.5.iv. Utility *– What can volunteers do with the solution or to implement the solution*

Our self-assessment: first and foremost volunteers need to identify the circumstances of where they operate and catalog a number of realistic scenarios that have various probabilities to unfold with all stakeholders involved. Then they can start to design how they may tackle their own contribution to the Project Management Process in any given circumstances, and as early-responders if and when they detect that a project is going off-track. The proposed FundTrack solution is rather empowering.

-b.5.v. Impact *- Will the solution encourage (large impact) or discourage (small impact) volunteers*?

Our self-assessment: to summarize, for all the intrinsic motivation, empowerment, professional ethics, and the ability to make a difference with, ultimately, a much better monitoring, governance, and policy decision-making feedback loop, we would anticipate that the proposed FundTrack solution may attract and encourage volunteers to make sure their organizations do contribute to SDGs achievement.

-b.6.i. Execution *- Can the solution work within existing UN financial systems, rules, operating environment, governance, structure?*

Our self-assessment: yes. Not only can the proposed FundTrack solution work in the current legacy systems (such as SAP / UMOJA ERP), but it can directly contribute to any kind of internal and external Project Management Process improvements the UN might be willing to conduct as part of its larger digital finance transformation.

-b.6.ii. Design *- Is the design of good Quality*

Our self-assessment: the proposed FundTrack solution is designed in a human-centered way which is appealing to all types of financial partners and stakeholders in the UN SDGs ecosystem. Technically articulated with the Cardano Ecosystem

and engineered with "Marlowe inside" as Haskell-embedded financial transactions DSL, FundTrack's design is right down the alley of what stakeholders want.

-b.6.iii. Creativity *- Does the solution tend to innovate in the UN?*

Our self-assessment: the proposed FundTrack solution is a creative innovation partner for the UN, as the UN sails through its digital finance transformation journey. The purpose of creative innovation is not for everything to be new and out of the blue, but for the sake of reaching a clearly defined strategic objective. It is to put together, in an innovative fashion, legacy components, recently created but proven components, and more cutting-edge components, in ways that haven't been tried before, and after other attempts failed for lack of adequate solutions. This is exactly what FundTrack does.

-b.6.iv. Utility *- Does the solution demand or suggest changes or evolution or addition of new features to UN Systems?*

Our self-assessment: while intrinseque motivation and professional ethics do matter, extrinseque motivation to change is mostly linked to incentives, both encouraging and dissuasive incentives. So for example, if regulators, and/or UN et al. policies, eventually decide to seriously take measures against FWA, and make good on threats to de-fund, for lack of proper PMP Phase 4 monitoring/ reporting of effort & cost, and overall poor governance and accountability practice, then, most likely, most FWA-fraught organizations may comply, albeit reluctantly. On the other hand, compliant, honest, but also new, innovative organizations, will have a field day. In both environments, the proposed FundTrack solution does positively reinforce the UN in steering its own digital finance transformation.

-b.6.v. Impact *- Will the solution lead to appreciable improvements in UN Programs?*

Our self-assessment: yes. The proposed FundTrack solution will lead to appreciable improvements in several ways. Poorly governed organizations may clean up their act and preserve their funding, first and foremost on condition (but not only) of proper effort and cost monitoring and reporting, and then on more effective decision-making with regard to their SDGs of concern. Adequately governed organizations may further innovate, and thrive to contribute to SDGs achievements. Either way, UN Programs will have an inescapable tool to conduct their own Project Management Process assessment.

Note: see also our self-assessment in paragraph -c- below "Most salient points in recommendations of the UN's Digital Finance Task Force Report relevant to this Wyohackathon".

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-b.7 *Does this solution address one of the priorities in the UN Secretary General's Data Strategy*?

Our self-assessment: yes, in fact more than one priority. The proposed FundTrack solution team conducted a thorough assessment of the priorities in the UN Secretary General's Data Strategy, "Data Strategy of the Secretary General for Action by Everyone, Everywhere: With Insight, Impact and Integrity", ***for which you can see our self-assessment in paragraph* -d- below "Most salient points in UN Secretary General's Data Strategy relevant to this Wyohachathon**", as we synthesized the priorities.

It turns out that the proposed problem-driven FundTrack solution addresses head-on the issue of fostering sound data governance through monitoring and reporting. By providing a robust digital engine for 'Effort and Cost Monitoring', FundTrack may completely fluidify the treatment of NGOs' field/ground-level action data, away from a bloated paper-only paradigm, root of all bureaucratic ineffectiveness. This accelerates implementation feed-back loops, in effect supporting stronger decision-making and policy advice.

Furthermore, the proposed FundTrack solution demonstrate in main body and Appendices how it is designed to contribute to means, ways, and practical implementation, of SDGs and of key priority agendas starting with the Decade of Action to deliver the SDGs by 2030, that includes Climate Action, Gender Equality, Human Rights and Rule of Law, Peace and Security, Governance and Ethics for the Future, and UN Reform. Finally, the proposed FundTrack solution, by tackling head-on the 'Effort and Cost Monitoring' problem, and solving it, provides, in cohort with the Cardano Ecosystem, a spot-on capability building asset, that accelerates "*data analytics and management, while fostering enablers such as education and collaborative culture, data governance mechanisms and strategy oversight.*"

The FundTrack team conceived the proposed FundTrack solution in a human-centered design way, that delivers actionable insights and empower all stakeholders across SDGs ecosystems & agendas.

-b.7.i. Execution *- Can the solution work within existing UN priorities ?*

Our self-assessment: yes. As per above, the proposed FundTrack solution is meant to fully support and foster these existing UN priorities.

-b.7.ii. Design *- Is the design of good Quality*

Our self-assessment: yes. As per above, the FundTrack team conceived the proposed FundTrack solution in a human-centered design way, that delivers actionable insights and empower all stakeholders across SDGs ecosystems & agendas.

-b.7.iii. Creativity *- Does the solution tend to innovate in the UN priorities?*

Our self-assessment: the proposed FundTrack solution clearly brings several innovative data-driven approaches that will support and foster UN priorities and accelerate their materialization.

-b.7.iv. Utility *- Does the solution demand or suggest changes or evolution or addition of new UN priorities?*

Our self-assessment: the proposed FundTrack solution isn't in itself a tool that evaluates outcomes, nor establish governance structure, nor is it a policy decision-making body. The tool is just a tool, which provides data-driven better monitoring and

reporting for the purpose of the Project Management Process, and ultimately the above goals and agendas. It is primarily intended to support and foster UN priorities. However, by the data-flow and field/ground level assessment that FundTrack will help provide, it is not to be excluded that ensuing feedback loops may lead to some sort of changes, including and not limited to priorities.

-b.7.v. Impact *- Will the solution lead to appreciable changes to UN Priorities?*

Our self-assessment: only time will tell. Again, the proposed FundTrack solution is primarily intended to support and foster UN priorities. It will be some constructive contribution if the tool provides data and ensuing feedback loops that consolidate, facilitate, and accelerate UN reforms as a whole.

Note: see also our self-assessment in paragraph -d- below "Most salient points in UN Secretary General's Data Strategy relevant to this Wyohachathon".

-c- Most salient points in recommendations of the UN's Digital Finance Task Force Report relevant to this WyoHackathon

While we may stick to the Report language such as "Digitalization", it is clear that we seem to be all more or less talking about the same things whenever we mention e.g. digital "disruption", "transformation", "evolution" or post-covid-19 "acceleration" or "remote / online migration".

-c.1. Digitalization may be harnessed to achieve SDGs faster, we yet need to be mindful of its flip side. It creates an historic opportunity of access to finance, including on mobile platforms, for a world population numbering in the 8-10 Bn by mid-end century, whereas it's already accessed online by 2+ Bn people spending trillions. It may have a transformative impact by empowering people as savers, lenders, borrowers, investors, and taxpayers.

Our self-assessment: the proposed FundTrack solution, by combining sound management practices with a data-safe environment, and clearly motivating incentives for volunteers with a rather human-friendly UX design, may accelerate the federation of people of good will to contribute to SDGs, especially in the developing world.

-c.2. *Digitalization catalytic opportunities may align finance with the SDGs. Notable accelerations include the use of domestic savings for long-term development, enhancing accountability of public financing, making SDGs count in global financial markets, financing SMEs, and promoting SDG-aligned consumer spending. Headwinds include barriers (inadequate digital infrastructure, and access, affordability and capabilities), and digital risks (gender and minority biases, increased short-termism, cyber vulnerability, and market concentration).*

Our self-assessment: the proposed FundTrack solution is designed to align finance with the SDGs by accelerating the professionalization of (among stakeholders) NGOs management practice, with an emphasis on monitoring that supports

automatization of reporting and de-facto accountability. It is also mindful of implementing for adoption with a particular effort on educating all stakeholders and, thanks to the Cardano Ecosystem, providing structure where proper systems are lacking.

-c.3. While it matters that SDGs inform the governance of a new generation of global digital financing platforms with cross-border and spillover impacts, the UN can play a key role, through support to Member States, in realizing opportunities, overcoming barriers and mitigating risks in harnessing digitalization in financing the SDGs. The historic opportunity to harness digitalization in reshaping finance must be grasped now, given the urgency to finance the SDGs, the short window of change resulting from a period of digital disruption, and the potential to maintain the digital momentum of the current [covid-19 pandemic] crisis.

Our self-assessment: the proposed FundTrack solution is designed to provide an opportunity for the UN to evolve toward the next level of management & accountability, staying on track to achieve the SDGs. Should the UN deem it appropriate to adopt tools, such as FundTrack, and ecosystems, such as Cardano, which demonstrate an ability to bring NGOs away from FWA and to the place where they need to be in order to contribute to the SDGs achievement, the UN may be able to redirect financing toward these entities who adopt sound financial management & professional accountability ethics.

-d- Most salient points in UN Secretary General's Data Strategy relevant to this WyoHachathon

Data Strategy of the Secretary General for Action by Everyone, Everywhere: With Insight, Impact and Integrity

-d.1. With a long-term vision based on gradual implementation that favors sound data governance rather than bureaucracy, the whole-of-UN ecosystem is built on a problem-driven approach. This problem-driven approach aims at delivering, on top of sound data governance, specific outcomes of planetary and societal betterment, that are engineered with stronger decision-making and policy advice.

Our self-assessment: the proposed problem-driven FundTrack solution addresses head-on the issue of fostering sound data governance through monitoring and reporting. By providing a robust digital engine for 'Effort and Cost Monitoring', FundTrack may completely fluidify the treatment of NGOs' field/ground-level action data, away from a bloated paper-only paradigm, root of all bureaucratic ineffectiveness. This accelerates implementation feed-back loops, in effect supporting stronger decision-making and policy advice.

-d.2. Data action follows key priority agendas starting with the Decade of Action to deliver the SDGs by 2030, and includes Climate Action, Gender Equality, Human Rights and Rule of Law, Peace and Security, Governance and Ethics for the Future, and UN Reform.

Our self-assessment: the proposed FundTrack solution demonstrates in the main body and Appendices how it is designed to contribute to means, ways, practical implementation, of SDGs & above agendas.

d.3. In order to achieve these goals, required nurturing capabilities building may focus on data analytics and management, while fostering enablers such as education and collaborative culture, data governance mechanisms and strategy oversight. Strong partnerships across various ecosystems may empower all users and deliver actionable insights in a human-centered fashion.

Our self-assessment: the proposed FundTrack solution, by tackling head-on the 'Effort and Cost Monitoring' problem, and solving it, provides, in cohort with the Cardano Ecosystem, a spot-on capability building asset, that accelerates "*data analytics and management, while fostering enablers such as education and collaborative culture, data governance mechanisms and strategy oversight."* The FundTrack team conceived the proposed FundTrack solution in a human-centered design way, that delivers actionable insights and empower all stakeholders across SDGs ecosystems & agendas.

Additional remark 1: the team takes inspiration in the *MIT's Five Computational Law Development Goals (5 CLDGs listed below)*, and would like to note the intersection with above orientations [which is in no way intended nor meant to imply any kind of validation or endorsement by the MIT Computational Law Report in the context of this hackathon.]

The *MIT's Five Computational Law Development Goals (5 CLDGs) are:*
{CLDG-1: Human-Centered Law}
{CLDG-2: Measurable Law}
{CLDG-3: Law as Data}
{CLDG-4: Universal Interoperability}
{CLDG-5: Industry & Civic Partnerships}
(with an interdisciplinary mindset)

The FundTrack proposal and complementary implementations may inspire themselves from these 5 CLDGs, because when expanded to logical scale eventually the digital ecosystem cannot function unless appropriately articulated with the computational infrastructure of laws & regulations, part & parcel of mobile digitalization and away from a paper paradigm.

Additional remark 2: the team proposes to add *three Digital Transformation Suggested Orientations (3 DTSO) of its own*. The team choose "Suggested Orientations" considering that "Development Goals" should be reserved to institutions with status and legitimacy to decide and implement them:

{DTSO-1: Human-as-part-of-Biosphere-mindful Digital Transformation}
{DTSO-2: Ecosystem-restorative Digital Transformation}
{DTSO-3: Space-Expansive Digital Transformation}

While DTSO-1 and -2 sound self-explanatory, let's briefly describe DTSO-3.

Considering Space as maritime medium [Mahan's naval strategy, or as popularized in "The Expanse" series], one may parse Earthling's 2030-2060 Space action horizon in 3 areas from the furthest to the closest to Earth:

-a- settlement and economic valorization of Solar systems planets, satellites, and asteroids "blue ocean"
-b- settlement and economic valorization of cis-Lunar Space (evident in the case of China) "near seas"
-c- Low to High Orbit Earth observation, data collection, communication, energy, and "coastal" defense

While -a- and -b- remain a bit far-fetched as of 2020, it appears that -c- is already developed and further on its way to contribute to practical, energy, security, and data-oriented SDG needs back on Earth. As such, -c- should already be considered as extra-layer (a bit like an "emerging market") to be integrated in above considerations.

This appears critical in order to achieve Data and SDGs goals that inform FundTrack ecosystem decision making.

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APPENDIX V
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Notes on U.N. / Europe (UNECE / UN/CEFACT) 2020 online workshop on blockchain legal, governance, and technical interoperability

Team member Chris participated into UN / Europe (UNECE / UN/CEFACT) 2020 online workshop on blockchain legal, governance, and technical interoperability. Most of the slides are available on the site (check the window: agenda, speakers bio and ppt): http://www.unece.org/index.php?id=54682

Panelists, mostly from countries of population 2 to 6 million, looked at interoperability along three plans: legal, governance, technical, and catalogued thorny issues in high level terms.

Use cases such as agrifood supply chain and energy were briefly covered by real people who work on specific implementations.

UNECE suggests its role is to recommend solutions to cross-border issues. The European Blockchain Center, led by Prof. Dr Roman Beck from Denmark, is one of the articulations with EU/EC proper.

When faced with issues pertaining to interoperability between somewhat distributed, disintermediated, decentralized systems, a reflex is often to add one more layer of supra-national, supra-chain governance.

This workshop signaled policy and operational acknowledgement of a need for blockchain interoperability, not just in terms of protocol, but from a combined business - legal/governance - technical standpoint.

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APPENDIX VI
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Potential Association Partners for Implementation and Adoption

1. INATBA (Int'l Association for Trusted Blockchain Application) were launched in Spring 2018. https://inatba.org

INATBA have a "Climate Action Working Group", but also many other WGs on a flurry of critical issues, such as Identity, Interoperability, Education, etc.

Link to the survey "INATBA - Social Impact & Sustainability Survey": surveymonkey.com/r/siswg (reserved exclusively to representatives of blockchain companies/projects that use blockchain/dlt for impact).

2. **OECD Computational Law publication: Cracking the code - Rules making for humans and machines**

OECD Computational Law publication: Cracking the code - Rules making for humans and machine

http://www.oecd.org/gov/cracking-the-code-3afe6ba5-en.htm Available from October 12, 2020.

" Rules as Code (RaC) is an exciting concept that rethinks one of the core functions of governments: rulemaking. It proposes that governments create an official version of rules (e.g. laws and regulations) in a machine-consumable form, which allows rules to be understood and actioned by computer systems in a consistent way. More than simply a technocratic solution, RaC represents a transformational shift in how governments create rules, and how third parties consume them. Across the world, public sector teams are exploring the concept and its potential as a response to an increasingly complex operating environment and growing pressures on incumbent rulemaking systems. *Cracking the Code is intended to help those working both within and outside of government to understand the potential, limitations and implications of RaC, as well as how it could be applied in a public service context."*

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APPENDIX VII

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PMP- Project Management Process: a description of Project Phases

Initiation

Donors (or sponsoring agencies like the UN) conceive programs, and within programs, identify projects that will advance development goals, or respond to natural disasters (tsunami, typhoon, earthquakes) or help rebuild post-conflict societies. In one way or another these sponsors make funds available to undertake those programs and projects.

Planning

Sponsors make general budgets for programs and projects within programs.

Execution

Eventually through different selection, negotiation and award processes implementing partners (large or small) are selected to complete the projects. Project budgets and time for completion (start and finish dates) are agreed. Generally, the end dates are fixed. Projects are not greenfield. They do not continue for as long as necessary to achieve the expected outcome. Sponsors may provide funds all in advance, or on a schedule or according to milestones. according to the agreed budget. Ideally, all the project funds will have been spent by the end of the project. Spending less than the funds provided is not part of the equation. Returning unused funds is, in general, a problem.

Performance and Control

But as often as not, things change during execution. Costs increase. Unexpected circumstances demand that funds be re-allocated, perhaps re-purposed to items not included in the budget.

> *A vehicle breaks down and needs replacement. Goods cost more than anticipated. Travel to distant worksites becomes more difficult and more expensive. Vendors or subcontractors fail to perform as agreed. Rework becomes needed. Schedules slip because of weather or safety concerns. Dynamic security situations may increase the amount of support needed to achieve the desired outcomes.*

Project funds may be diverted from their proper use. Sometimes the result of incompetence. Collusion with friendly vendors to inflate costs can cause overruns, unjustifiably. Or result in inferior products or services. In other cases there is outright fraud. In such cases, the party responsible to track costs is probably not willing to do so. Transparency in reporting FWA- Fraud, Waste, and Abuse, or "re-purposing funds" is generally not rewarded by the funding agency. So pressure exists to cover up, or at least delay revealing problems.

Netting Out

Effort tracking and cost control is the ONLY PLACE to understand the status and progress of the projects. The easiest way to hide mistakes and misdeeds is through "netting out" financial reports. That is, showing summaries of particular cost centers not individual transactions. A technique often combined with infrequent or delayed reporting. At which time, even if discovered, it is too late to make corrections.

Audit

Large international donors and sponsors have Audit and Risk management committees like the World Agro Forestry Centre and produce sophisticated annual audit reports. [19]

> *"The Audit and Risk Management Committee (ARMC) advises the Board on all matters relating to accountability and oversight with respect to financial and risk management practice including:*
>
> - *The integrity of financial statements, the Centre's financial and management control systems, the internal and external audit function, the risk management policy and process, governance structure, management action plans, fraud, values and ethics and financial statements;"*

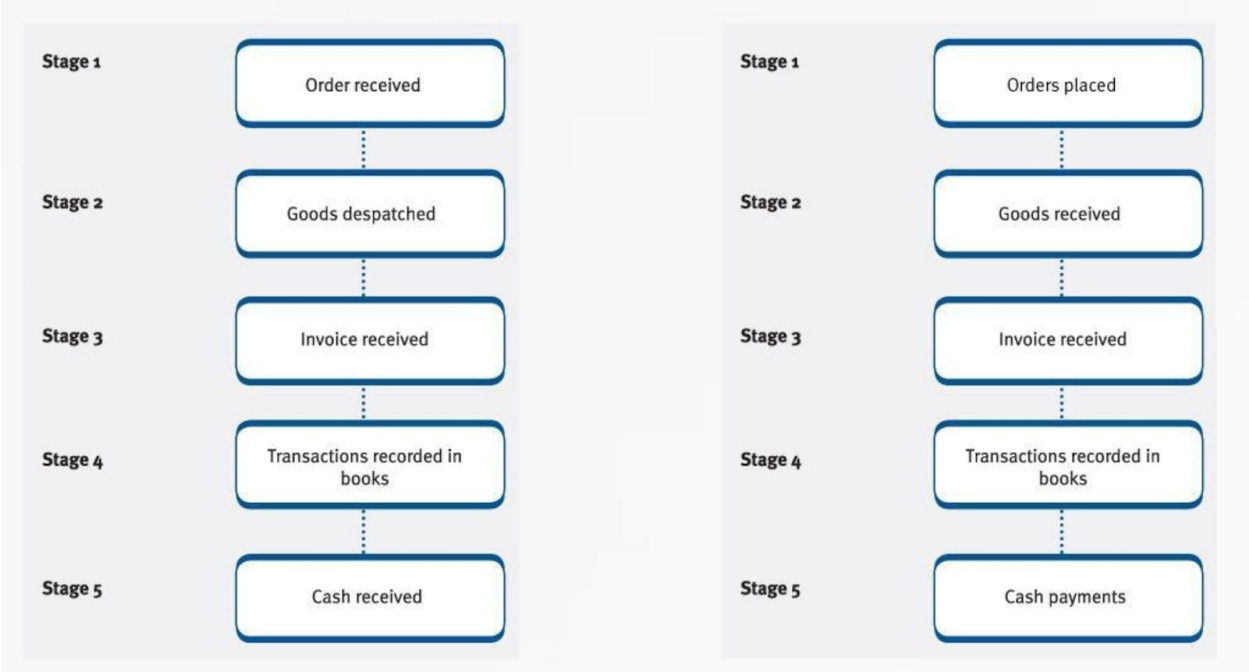
Small implementing partners do not. They are most often limited to financial accounting systems to comply with local regulatory requirements. Lacking accounting expertise to integrate Project Accounting and Financial accounting. Thus project data is never organized in a manner that would allow Effort and Cost control needed to satisfy donor or sponsor needs. Nor to meet the UN Secretary General's initiative for data-driven transformation.

FundTrack processes link reporting at each of the steps that are normal for business management with approval and disbursement of funds. Leaving the decision of degree of oversight and control of funds up to the *Monitoring and Evaluation* team to make. It can be as granular as desired. But the reporting and approval process ties directly into funding.

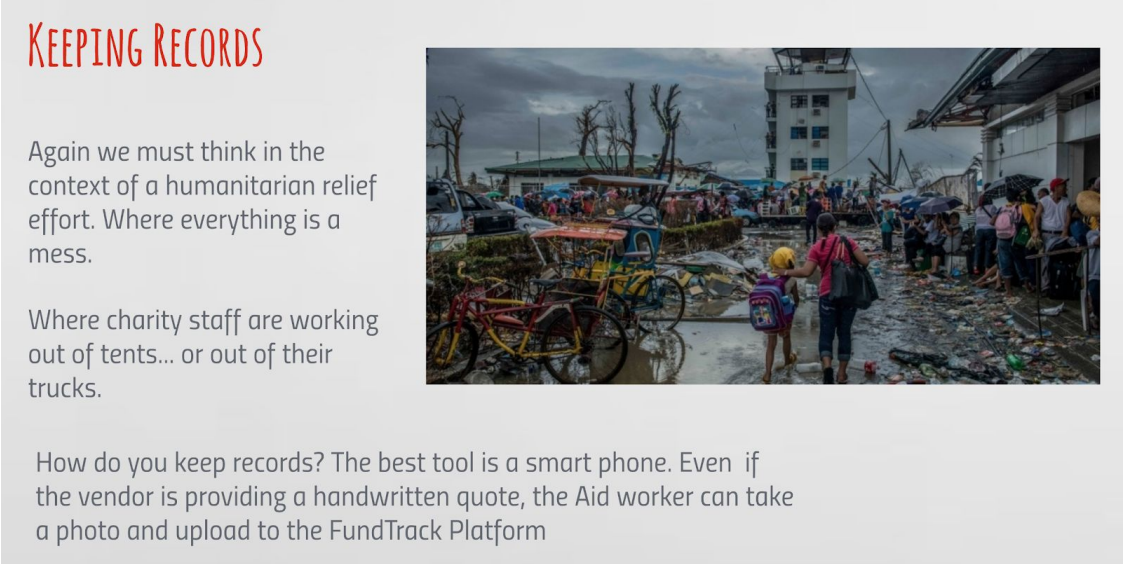
Project Accounting vs. Financial Accounting

The Procurement Process

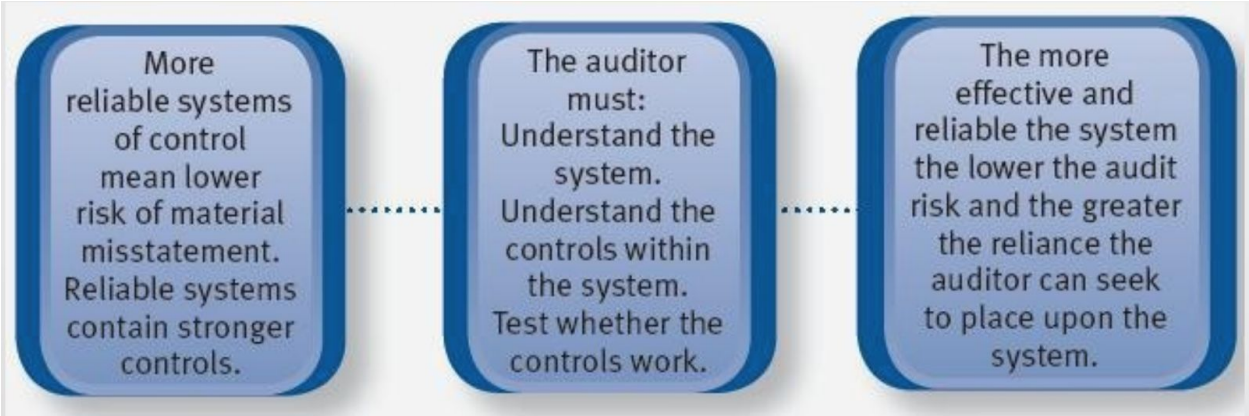
[19] https://www.worldagroforestry.org/sites/default/files/users/admin/AFS%202017%20Low%20Res.pdf

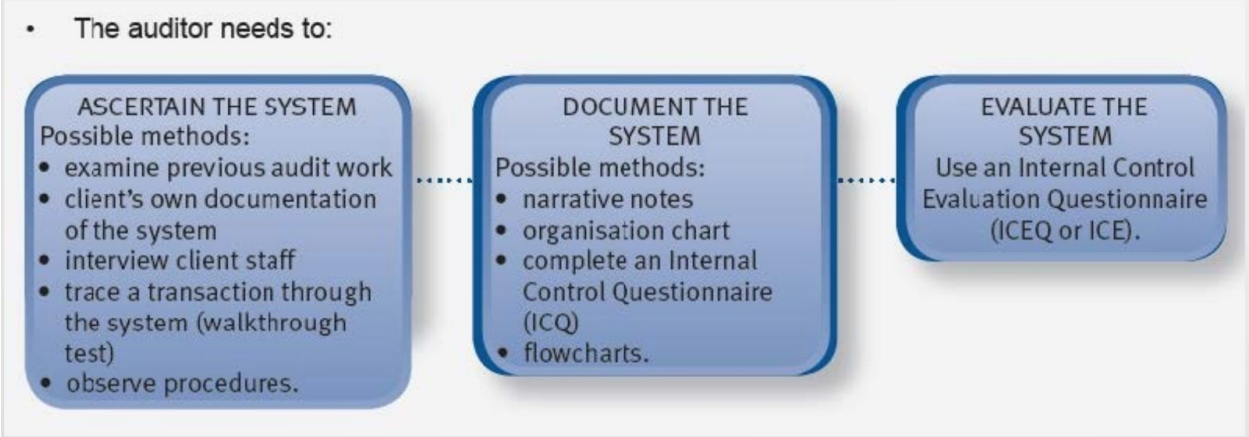


Documentation



Auditing





https://www.un.org/development/desa/disabilities/envision2030-goal15.html

https://sdgs.un.org/goals/goal15

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APPENDIX VIII

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FundTrack Team

This team of two (Len, Irish, and Chris, French) packs in three quarters of a century of leadership experience. While for the best part of these decades living and operating in the Indo-Pacific region, a formative path for Westerners to adapt to and deal with a fragmented world, that shows great disparities in wealth and quality of life, and proves occasionally a zone of human-made conflicts and natural disasters.

Even before they met in Fall 2017, their respective experiences had convinced Len and Chris that nothing really exists until it has been implemented for and adopted by not just the "client", but society at large. It implies mutual respect and understanding with non-condescending empathy toward people left behind. Especially when foreign practices may prove partly or fully “alien” to a prevalent societal or tribal order, be it, say, in Japan, or Afghanistan. This may in no small part be achieved on condition that human-centered design approaches from the ground up, have been considered at the onset, with first and foremost the personal experience and relationship in mind. Which is easier said than done, when operating in a highly centralized, permissioned, top-down & siloed decision-making context. Good luck with implementation of any kind of “change management” if these necessary prerequisites haven’t been seriously tackled first.

Len, an early Boomer, is an Entrepreneur and Angel Investor with experience in building and managing successful businesses in edge, emerging and conflict markets. He built and managed a business in Afghanistan employing more than 1200 persons, operating successfully for 12 years, nationwide in a conflict market. He conceived and assembled the team that created Thailand's largest and most successful privatised infrastructure project - the Second Stage Expressway. This period of civilian service was built upon a substantial time of military service in the U.S. Navy during the Vietnam War.

Len has substantive leadership and operational experience dealing with NGOs, clearly reflected in this FundTrack solution.

Chris, a late Boomer, has lived and operated off- and on-line in finance, a number of industries, and in academia, in the Indo-Pacific region for 3/4 of the last 35 years, with a concentration on NE-Asia (Japan, S-Korea, Taiwan, China) followed by S'pore & Asean. Because Chris had to act as a "boss" at a young age, in-between large corporate and small entrepreneurial setups, with diversely evolving degrees of autonomy and agency, in foreign lands with different cultures that speak languages “other than English”, he quickly learned to learn to speak these, to fit in the decor, and constantly adapt and negotiate for survival. All the while dealing with complex systems of governance and decision-making in between Asian and Western counterparties. Thus, in Design Thinking old school fashion, Chris prefers to simply call himself a “T-shaped professional” who keeps learning by doing and experimenting, constantly. Who’s good at adapting “like a chameleon”, who loves (Asian) languages, and is keen to build and operate cross-cultural, interdisciplinary teams, that deliver sustainable achievements with an adaptive mindset, based on metrics of success- and depending on whom decides said metrics.

A two decades directorship with the raw material mining, agrochem, and shipping industries, led Chris to a hands-on grasp of the flip side of issues, such as sustainable logistics & ecological development for rural communities and agri-food security (especially for Japan, Korea, China, and India). Meanwhile, he was constantly involved in some form of FDI Foreign Direct Investment and economic development activity, covering some manufacturing sectors, digital tech-based services, and life

sciences. This taking place in either corporate or government agency context, between the Indo-Pacific region, Europe and North-America, where he could deliver deal flows, and negotiate improvements in cross-border human, business, legal/ governance and technical interoperability issues, as well as human resources & fiscal incentives for jurisdiction arbitrage.

Chris has first hand experience in designing, self-funding, and implementing disaster relief efforts in those locations, including improvised and decentralized supply chains for direct relief goods deliveries calibrated to pre-identified survivors, thus exempt of FWA- Fraud, Waste, and Abuse. From Kobe, Japan, January 1995, to Banda Aceh, Indonesia, Boxing Day 2004, to Fukushima & North-East Japan (Tohoku) March 2011, while Sichuan, China, August 2008, was a bit off-limits to foreigners, but some actions could be indirectly implemented. Through a longstanding interest in participating in "Track-2" processes, over conflict resolution and traditional defense & security policy-making analysis, as well as over emerging "human security" problematics, Chris has been involved in solution and implementation-driven think-tanks on issues such as human trafficking, in collaborative contexts involving government, the private sector, and NGOs. Over the years Chris has funded ("angel" or seed) several initiatives that focused on solving some human security & sustainability logistical issues.

Chris has a longstanding interest in Space-based defense, economic development, and biosphere settlement. Considering Space as maritime medium [Mahan's naval strategy, or as popularized in "The Expanse" series], starting with "coastal" (orbital) Earth observation, data collection, communication, and energy generation, all for SDGs achievements. It may be underlined that the evolution of *Legal Frameworks for Outer Space* is a critical element in a competitive multipolar world.

Len and Chris first met in Fall 2017, having then joined the University of Nicosia Digital Currency & Blockchain MSc community, while pondering "the next level" in their respective lives and digital transformation paths, following decades of waves after waves of tech-driven societal change. There they quickly set up several parallel information channels and discussion groups to keep abreast of developments in the Crypto space (from blockchain as SaaS to CBDCs to DeFi to regulations) and to expand the conversation beyond Tech to what really matters to them: ethical, legal, governance, economic, societal, (geo-)political implications of digital transformation where data/IoT, autonomous systems/ML and fintech/blockchain may converge.

During the 2010's, Chris has gradually re-skilled and up-skilled in matters of digital transformation, data, autonomous systems, blockchain and decentralized governance,, digital/crypto-assets, fintech, legaltech, more recently computational law and traditional law. While keeping an eye on the action in both the West and the East (such as following China's blockchain, AI, and CBDC evolution in the original Mandarin government and private sector data sources), Chris is among several active contributors to the *MIT Computational Law* group since Fall 2018, including and not limited to the matter of Automated and Autonomous Legal Entities and fintech/legaltech digital regulatory evolution. After a couple of quick projects iterations, *MIT Computational Law* leaders nominated Chris as *Legal Hacker*. In 2019, Chris joined the *Interaction Design Foundation* in order to figure out Human-Centered Design practical hands-on implementations.

The *MIT Computational Law Report* publications do inspire the team substantively, because, when expanded to logical scale, eventually the digital ecosystem cannot function unless it is appropriately articulated with the computational infrastructure of laws and regulations, while these converge as part and parcel of mobile digitalization and away from a paper paradigm. Chris is also a member of the *Bucerius (Law School) Legal Tech Essentials 2020 group*, an auditor at the *Suffolk Law, Massachusetts 'Coding the Law' series*, and participant in the *UN Europe (UNECE/UN/CEFACT) 2020 online workshop on blockchain legal, governance, and technical interoperability*, in *TechLawFest Singapore online 2020*, and in

Future of Law Virtual Summit 2020 ('Negotiating the New Normal'). Technology intervenes for "how's" & "where's" of change, but "why's" means collective coordination for certain political & societal aims. Navigating issues between permissionned and permissionless organizations, competition between bureaucracies and governance from the ground-up, looms large.

This environment, and his own research, prompted Chris to look at problems statements through a prism of B/L/T/ Business/Legal/Tech constructs (as coined by MIT Computational Law leaders) that need to operate within an agencement of legal, governance, societal (tribal), political, cultural, and also religious, complex adaptive systems. Even before considering frameworks like the UN-driven SDGs and digitalization, the questions of B/L/T/ Business/Legal/Tech cross-border interoperability, and of digital standardization worldwide away from a paper paradigm, do loom large.

In that MIT Computational Law context, and while having followed the briefings byMs Caitlin Long for a couple of years, Chris became aware of the initial *Wyoming Legislature* working group that led to the establishment of its *Select Committee on Blockchain, Financial Technology & Digital Innovation Technology*. In 2020, this Committee dealt efficiently with its regular online meeting transition, and as a result, made impressive progress on issues pertaining to e.g. digital (crypto) assets transactions and custody, business facilitation via portable economic identity, and the concept of a digital personal identity.

Meanwhile, Len, who had long been a Cardano ecosystem follower and early adopter, had kept sharing his interest with somewhat blockchain agnostic Chris. Indeed, Chris' interest in the Cardano ecosystem ended up gradually increasing, due to its special focus on governance and decision making mechanisms (Liquid Democracy), but also because Cardano had identified, early on, interoperability as a key feature of quantitative and qualitative success metrics for implementation and adoption. Furthermore, back in Summer 2020, Chris had participated in the UN/Europe (UNECE/UN/CEFACT) online workshop on blockchain legal, governance, and technical interoperability. It turned out, after Len and Chris had noticed Cardano's regulatory moves toward the Wyoming legislature, that they decided to move ahead with the WyoHackaton, an opportunity to exemplify the Cardano ecosystem path of implementation and adoption, with FundTrack as a solution.

Team Len & Chris is well positioned to act as catalyst and accelerator between innovators, early adopters, and early majority, for implementation and adoption of FundTrack-based NGOs solutions, in cohort with the Cardano ecosystem, and this with an international scope, including and not limited to the Indo-Pacific region.

Note and Disclaimer: matter of fact is, neither Len nor Chris are professional developers, even though they have a little background in coding old and new languages (e.g. Chris from 1980's Expert Systems inference engines and decision trees to 2010-20's "Coding The Law."). So they figured they'd use these few days to familiarize themselves with the Marlowe DSL. The team was mindful to respect the hackathon rules to not use the platform itself to "recruit people" e.g. professional developers. Thus, while no substitute for coding, the high-level only Marlowe contribution here may focus on the mutual relevance between FundTrack functionalities and basic specs, Marlowe as an Haskell-embedded DSL, and the Cardano ecosystem. The overall content reflects the team's focus on the body of considerations underwriting this slide deck.

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APPENDIX IX
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Notes on intra-/entre-preneurship and building for innovation, project development and implementation, adoption and change management

Notes on intra-/entre-preneurship and building for innovation

Team Len & Chris are battle-hardened when it comes to the pitfalls of intra-/entre-preneurship: they're aware of the obligations and priorities on starting new businesses, regulatory, administrative, financial, human, and otherwise.

It's all about people and not making the usual mistakes in hiring associates and banding together co-founders (two types of "friends" e.g. to avoid at the onset: "interested but lazy", and "greedy and might even sue you").

However, one lesson stands out. Under guise of "building an ecosystem", don't build a complicated refinery or chemical factory with pipes and gizmos that pop up nonsense in any direction (in French, "une usine à gaz").

Build a simple pipeline that works with a "payment valve" and delivers the user experience that it needs to deliver.

Precisely because Cardano is already supplying a viable and rapidly evolving ecosystem, FundTrack as a product can leverage the Cardano ecosystem, and focus on just building that simple pipeline that works with a "payment valve", and delivers the user experience that it needs to deliver.

Notes on project development and implementation

"**Don't sell the window, sell the view!**"

You won't have adoption unless you first have an implementation that focuses on the process and human-user experience, not merely the product and its development, an implementation that you can effectively ***sell***.

Team Len & Chris have had to sell themselves, their ecosystems, and whatever they were selling, all their lives.

If you don't care about sales, marketing, and customer relationship management, don't even pretend to do business.

Which means that you need to focus first on a limited number of partner-clients of the highest quality, because, as early adopters, they will be your compass, your benchmark, your representatives, and your tickets to the market.

Everytime you read about "total addressable market" only, it means people haven't been doing real market research.

Which starts with talking to real customers and empathizing with their personal views and (perceived) needs as in Human-Centered Design Thinking 101. Which then allows you to focus on process and human-user experience.

Your customers, your team of professionals, and the "Technologists", simply won't speak the same language...

Which is why Team Len & Chris not only do take inspiration from the Human-Centered Design Thinking school(s), but also from the MIT Computational Law approaches: which include, and aren't limited to, looking at B/L/T/ Business / Legal / Tech constructs, for goals setting, problem statements, problem solving, opportunities spotting.

Instead of jumping straight away into development mode and deep-diving into coding rabbit holes, you need to first and foremost bring people around the table, so concerned parties may reasonably calibrate expectations, together.

So that Technologists understand the nature and raison-d'être of what they're expected to build. And professionals understand both the potential and limitations of Tech building blocks. And all parties involved do understand the regulatory and institutional risks and pitfalls for implementation and adoption.

Notes on adoption and change management

What you're doing most of the time is simply suggesting people that they might want to try and replace their square wheel with a round one.

And most of the time they tell you think they're simply too busy dealing with the square wheel to care about even merely considering the round wheel. Adoption and change do not happen magically overnight.

You need an adoption and change management leadership, strategy, and a process that goes with these.

That includes transferring clout and having people internalize the fact that their return on technology investment is only proportional to their own personal and community investment into making that technology work.

People, your human-users and partner-clients, are interested in much more than using a new product or system: they care about value because they most certainly run a tight ship. Starting with the human experience and process.

You need to bring them more clout and the benefits of your own diversified networks.

Your network is your net worth and that goes way beyond direct professional relationships. You need to know somebody anywhere with relevant answers to your questions and clout about adoption of your solution.

And yes, Social Media matter for business development, but ... a "B'Zoomer" Note:

"Age is only a number" until you're being reminded of it by your bones.

Re-decentralized Web 3.0 is coming, with an IoT data tsunami and Algorithms/AI as a Service [AlaaS].

Social Media, as engineered by Millenium, and appreciated by Gen-X, may then evolve a lot, again, beyond their many current "issues", not the least acting out of centralized and polarizing monopoly-platforms.

Team Len & Chris like to call themselves "B'Zoomers": they have long graduated from online and remote practice, and are willing to embrace the next level, such as AR/VR/MR augmentation, Web 3.0, and mega-data.

However, and not unlike Zoomers (inter-generational convergence), they strongly believe that a relationship isn't a relationship until it has taken place in presence and in person (that includes dealing appropriately with biohazards).

That is, a prerequisite to still necessary trust, even and precisely within a larger trustless environment. There's only so much online and remote can achieve for community organizing and adoption.

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APPENDIX X

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Competitive space analysis and FundTrack team's competitive approach

Once some virtues of blockchain became more widely publicized circa 2016, it soon appeared evident that they might be able to remedy some of NGOs well-known issues such as FWA- Fraud, Waste, and Abuse.

Team Len and Chris have substantial overseas experience with how ERP systems operate with massive principal HQs: it is rather difficult to expand such systems for example to micro, small, and medium-size overseas partners & agents. Legacy ERP systems are mostly implementable between giant corporate JV & alliance partners with similar budgets and means.

Which is also a reason why Len & Chris have been looking at micro, small, and medium-sized enterprises ERP-ish solutions that could leverage blockchain applications by also using IPFS- InterPlanetary File Systems, etc, for small entities and teams.

Team Len & Chris have monitored that NGO+Blockchain "Cambrian explosion" since 2017, not just for respectable & fairly effective new NGO projects incorporating blockchain & cryptos (such as BitGive/GiveTrack) but for some adoptable management solutions that would address endemic issues of a number of legacy NGOs. While there are a number of ideas around, one comes across a question that occasionally pops up in blockchain space: "so, what?".

Part of the problem is, that business is much more than a nice concept that looks right on paper, or rather, on a smartphone screen. You need to consider at the onset your implementation strategy and adoption process.

You need to consider what ecosystems you'll be dealing with, since there will be political friction and societal coordination issues at stake, in addition to possibly competitive corporate fintech solutions already in the fight.

You need to consider that for many of your potential stakeholders, blockchain isn't the alpha and omega of all problem statements, as they're transitioning toward more distributed systems, partly disintermediated, and not necessarily decentralized. In addition to the fact your stakeholders may simply not be First-World-Tech types.

The FundTrack team holds no such pretense as to claim to represent the best idea or project around. What the FundTrack team made sure of, is, to dwell into a substantive and thorough effort, based on experience, to prioritize some proper implementation and adoption process, for a clear monitoring system aimed in particular at developing economies. And to partner with a constantly evolving robust ecosystem such as Cardano, to deliver reasonably calibrated expectations, in both permissioned and permission-less contexts, to FundTrack stakeholders.

Some relevant analysis and commentary on the NGO+Blockchain limited "Cambrian Explosion" since 2017… there are many good people in this space and the FundTrack team respects them all:

-1- Impact analysis and proposed solutions:

January 2020 - Blockchain for non-profits: analysis by iTransitions
https://www.itransition.com/blog/blockchain-for-nonprofits

June 2019 - List of relevant projects for NGOs
https://www.cryptomorrow.com/2019/06/07/blockchain-can-help-charities-and-donations-and-philanthropy/

October 2018: 10 ways impact analysis of blockchain on non-profit sector
https://www.disruptordaily.com/blockchain-use-cases-non-profit/

-2- Broad considerations:

June 2020 - Australian CFO perspective
https://cfotech.com.au/story/interview-blockchain-s-opportunities-for-ngos-charities-not-for-profits

January 2020: blockchain for social cause
https://blockchainsimplified.com/blog/blockchain-for-social-cause-solving-the-ngo-crisis/

September 2019: Uulala perspective on NGO management
https://medium.com/uulala/how-blockchain-can-help-solve-the-ngo-crisis-of-confidence-a5d3f9087c0

January 2018 - Accenture - Blockchain for Good
(Accenture, and, to be fair, Deloitte, were among the first to "get" 'Blockchain for Good')
https://www.accenture.com/lu-en/insights/technology/blockchain-for-good

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APPENDIX XI
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FundTrack use cases examples and applications for DTSO – Digital Transformation Suggested Orientations

A reminder that:

- The Project Management Institute defines the Project Management Process in 5 phases, and,
- FundTrack focuses on one specific part of the PMP Phase 4 - '*Effort and Cost Tracking.'*
- Implementation also depends on context timeline, emergency level, and monitoring criteria/data design.

We consider three levels of emergency: fair, intense, extreme.

Fundtrack use cases examples-:

/// Education NGO in Afghanistan

Contributes to SDG 4- Quality Education

Context timeline is mid- to long term, emergency is fair, challenge is to build education monitoring criteria/data design, with something relevant to the education of both the educated and the educators.

/// ISO-like Project Quality Auditing

Contributes to SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation and Infrastructure, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production
Context timeline is short- to long-term, emergency is intense, challenge is to build contractors and project stakeholders monitoring criteria/data design, that provide a reliable enough data feed for decision makers, and weeds out cronyism.

/// Development initiatives for communities' autonomy and established societal/tribal and/or religious systems, such as training for digitalization of Portable Islamic Personal Finance in relevant W- & SE-Asian countries

Contributes to SDG 1- No Poverty, SDG 4- Quality Education, SDG 8- Decent Work and Economic Growth, SDG-10 Reduced Inequality

Context timeline is short- to mid-term, emergency is fair, challenge is to build training monitoring criteria/data design, with something relevant to the training of both the trainees and the trainers.

/// **Agri-food development and ecosystem restoration:**

In a nutshell, there is an interlinked relationship between three factors, worldwide: reduction of green-house effect by carbon capture in green fields and forests soils ; soil health and biodiversity (including underground mycorrhizae i.e. fungal-roots networks ecosystem) ; a balanced and sustainable agri-food-culture field and forest network ; worldwide.

Contributes to SDG 1- No Poverty, SDG 2- Zero Hunger, SDG 3- Good Health and Well-Being, SDG 11- Sustainable Cities and Communities (rural), SDG 12- Responsible Consumption and Production, SDG 13- Climate Action, SDG 15- Life on Land. And it might even help for Goal 5- Gender Equality, and Goal 10- Reduced Inequality.

Context timeline is short- to long-term, emergency is intense, challenge is to build contractors and project stakeholders monitoring criteria/data design, that provide a reliable enough data feed for decision makers.

/// **Mitigation of human trafficking through digital personal (self-sovereign) ID and rescue finance:**

Note: incidentally the use of digital ID in a human-trafficking context was alluded to by Ms Caitlin Long, in a recent session of the Wyoming Legislature Select Committee on Blockchain, Financial Technology & Digital Innovation Technology (online).

In a nutshell, persons who are trafficked (for e.g. slave labor, or sexual exploitation) often see their IDs and/or passports, and smartphones, being confiscated by their exploiters. Should standards of blockchain-supported, smartphone manageable, digital personal (self-sovereign) ID, be developed and adopted, a person at risk, such as planning to travel for the purpose of getting a job overseas or in country, could beforehand get organized with family and friends, to constitute their digital ID and make sure everyone can retrieve it urgently, if need be.

In case of trouble, that person, if managing to escape her exploiters, should be able to recover proof of her blockchain-supported digital ID on, say, a police station smartphone or computer, with the remote help of family/ friends back home if needed. That should enable the editing of an electronic/paper laissez-passer as temporary substitute to passport (which requires proper regulations in most affected countries). This, combined with help of family/ friends back home via a quick transfer of cryptocurrency, could help her obtain a flight ticket at a UN pre-arranged discount rate agreed with airlines.

NGOs could be active in that field at several required levels, from training people to get their digital ID organized beforehand, to monitoring cases, to support the adoption of, and contribute to, cryptocurrency funding for emergency flights back home. Considering the FWA potential, Fundtrack is ideally positioned to operate in this particular context.

Contributes to SDG 1- No Poverty, SDG 5- Gender Equality, SDG 8- Decent Work and Economic Growth, and SDG 10- Reduced Inequality.

Context timeline is short- to long-term, emergency is intense, challenge is to build contractors and project stakeholders monitoring criteria/data design, that provide a reliable enough data feed for decision makers.

/// Improvised (decentralized) supply chains for post-earthquakes/tsunami responders and survivors

After an earthquake/ tsunami struck, some NGOs might find their warehouses bloated with (damaged or too worn-out) goods donated by citizens, with no idea to whom, where, and how to dispatch them. After the March 2011 Fukushima / Tohoku earthquake/ tsunami event, a model of improvised (decentralized) supply chains went viral, which prevented FWA, especially Waste. Team members would first contact shelters, hospitals, and schools, to make a precise list of required goods specs and quantities. Business and individuals known from the team members, would band together to secure goods but also transportation, from massive trucks to minivans, all on their own account, contributions in kind, not cash transfers, people paying for own gasoline and highway rest area meals/green tea (very first responders would create improvised chains of solidarity, by friends waiting on the roadside with 3 or 5 liters of gasoline, for the few weeks it took for gas stations to reopen). Also, 10-20% of each carefully targeted and calibrated delivery, would be set aside for, this time, some random additional supply, to these communities and individuals who had chosen to survive out in the cold, off the shelters grid.

Contributes to SDG 1- No Poverty, SDg 2- Zero Hunger, SDG 3- Good Health and Well-Being.

Context timeline is short- to long-term, emergency is extreme, therefore a primary challenge is to already have built, tested, implemented and gotten adopted a resilient system before disaster strikes. So that, in the post-disaster circumstances, in the middle of total destruction (and radioactive fallout), assuming smartphones and electricity generators are available and the networks still work, such usage can be done almost "routinely", while loading metadata with smartphone pics, etc.

While these events strike only a couple of times in a century in any given country, there are enough of them worldwide, to perhaps warrant a better system to monitor both heavily bloated NGOs and decentralized initiatives such as the above. In addition to monitoring criteria and data design, this would require a standard framework to structure and characterize non-fungible tokens for relief supply-in-kind situations. Perfect fit for FundTrack and Cardano. Based on this reporting in real time, bloated NGOs might even get involved to support the agile and nimble initiatives on clear FWA-exempt terms.

Application of DTSO – Digital Transformation Suggested Orientations

The FundTrack team proposes to add three Digital Transformation Suggested Orientations (3 DTSO) of its own (the team choose "Suggested Orientations" considering that "Development Goals" should be reserved to institutions with the status and legitimacy to decide and implement them):

{DTSO-1: Human-as-part-of-Biosphere-mindful Digital Transformation}
{DTSO-2: Ecosystem-restorative Digital Transformation}
{DTSO-3: Space-Expansive Digital Transformation}

While DTSO-1 and -2 sound self-explanatory, let's briefly describe DTSO-3.

Considering Space as maritime medium [Mahan's naval strategy, or, as popularized in "The Expanse" series], one may parse Earthling's 2030-2060 Space action horizon in 3 areas from the furthest to the closest to Earth:

-a- settlement and economic valorization of Solar systems planets, satellites, and asteroids "blue ocean"
-b- settlement and economic valorization of cis-Lunar Space (evident in the case of China) "near seas"
-c- Low to High Orbit Earth observation, data collection, communication, energy, and "coastal" defense

While -a- and -b- remain a bit far-fetched as of 2020, it appears that -c- is already developed and further on its way to contribute to practical, energy, security, and data-oriented SDG needs back on Earth. As such, -c- should already be considered as extra-layer (a bit like an "emerging market & resources domain") to be integrated in above considerations.

This appears critical in order to achieve Data & SDGs goals that inform FundTrack ecosystem decision making. It may be underlined that the evolution of *Legal Frameworks for Outer Space* is a critical element in a competitive multipolar world.

NGOs primary involvement in near-Earth orbital Space doesn't even have to be limited to EO- Earth Observation and communication related data, although that already covers several SDGs from climate to ecology to migrations. NGOs, or appropriate legal entities with similar monitoring, reporting, and decision-making concerns, could get involved in the Space game, so far controlled mostly by governments, in association with major corporations & successful ventures (Elon) having for customers, mostly, governments. To develop an economically viable Space ecosystem starts with involving civil society, so that citizens of Earth may get involved in Space business, mutualize risks, and reap the rewards, rather than sit passively.

That could start to happen with basic goals such as drug development for mitigating muscle & bone loss in micro- and low gravity, systems for plant & food growth in micro- and low gravity, and additive manufacturing (3D printing) for habitat construction, using Moon regolith, or Martian soil, with Earth-manufactured binders (until these are made in Space too).

Because near-Earth orbital Space is the ultimate "remote work location" for human and autonomous systems, NGOs intended to work on operations with strong Space-based components, might be delighted to benefit from a tool like FundTrack, combined with the Cardano Ecosystem. Also considering the prospective availability, in near-Earth orbital Space, of blockchain protocol-enabling nodes, and hardware infrastructure to support e.g. distributed data storage such as IPFS InterPlanetary File System, on the 2030-60 horizon, for the whole Earth. Space needs Earth and Earth needs Space, if we are to survive as a species & evolve across the Solar System. FundTrack combined with the Cardano ecosystem can help.

"Major Tom to Ground Control...
For here am I sitting in a tin can, Far above the world, Planet Earth is blue, And there's nothing I can do."

"Space Oddity' Lyrics, David Bowie (R.I.P.)