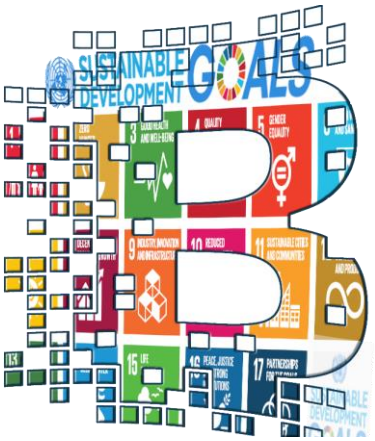

A Tamper-Proof Public Ledger of Crowdsourced Evaluations of SDGs: a Global Voice

In September 2015, the UN General Assembly adopts Agenda 2030 and the 17 Objectives of Sustainable Developments (SDG[1]). This global community move aimed at managing jointly, through increased co-operation, a number of major interconnected global challenges. To inform how actual policies advance toward these goals, an evaluation framework and measuring processes are necessary to ensure compliance with states' statistics standards. On the other side, crowdsourcing of voluntary evaluations from individuals linked to databases through user interface - a standard IT technology - could bring many benefits for this purpose. Allied with a major breakthrough in network technologies (blockchain) it offers various technical solutions to the barriers to voluntary contributions to trusted continuous SDG evaluations (=monitoring) from people. Together we argue below how it can also constitute a powerful and legitimate actor in the global community by imposing its voice at the highest national and global levels.

The argument below is structured in the IRAC form (Issue, Rules, Application, Conclusion).

ISSUE AND CONTEXT

Can crowdsourcing of Sustainable Development Goal's evaluation, secured by blockchain, be a legitimate tool to inform policies and foster collective action from citizenship?

1. Annual SDGs evaluation reporting and related displaying of accountability will allow growingly global community's scrutiny on policies and leadership committed to the UN 2030 Agenda. Similarly evaluation reporting will also be milestones that will

[1] https://sustainabledevelopment.un.org/?menu=1300

hopefully move sustainability onward.

2. Because it is a framework of global concerns and issues, broadly debated and agreed, the Sustainable Development Goals[2] as a whole is an entry point where all sectors (Public, Private, Third sector) will growingly focus on policies implementations and trade-offs on local and global scale. Considering the generally decentralized structure of the modern states, scrutiny and debate about respective policies will predictably be transversal, at all territorial levels (local-national-regional-global).
3. The measuring of SDG' advances are the charge of the States and International Organizations. It's a tedious and challenging office: for more than a third of the 232 indicators, methods and tools are partially or totally lacking. According to UN Secretariat and specialized Commissions, States capacities need to be improved in that domain (UN, 2016 y 2017).
4. To date, the first annual report on SDG has been issued by the UN General Secretary in 2016. Other International Organizations (World Bank, OECD, SDSN) have issued knowledge platforms, indices and maps based on national and regional official statistics. These efforts bring to the table trusted sets of data for official evaluations onward.
5. On the other hand, the citizen community also needs it's contribution in evaluating if the Agenda 2030 is on track. From the third sector, some initiatives have started as in the case of a UE project in Ecuador for local and national SDG's focal groups and observatories[3].
6. A global citizenship evaluation of SDG's 169 goals at local, national and global levels could help focus on locally pertinent interventions, inform policies and inform annual SDG's official statistics.
7. Another conceptual approach to monitoring goal achievement is through crowdsourcing voluntary evaluation by individual citizens. Individual evaluations differ from official statistics for its subjective nature. However, pooling significant numbers of precisely stated perceptions is of great value for it helps comparing measured achievement (official statistics) *vs*. perceived achievement. It also helps the community at large by focusing on priorities at local or national-global scale.
8. In 2016, the Digital community numbers 2.8 billion active users in the world and is expected to grow as far as having 1.5 smartphones per each person in the planet by 2021 (CISCO, 2017). A huge influence of this community is acknowledged to "*connect with people through the use of innovative technologies, and to inform them about important issues affecting their lives and their communities.*" (USAID, 2014).

[2] https://sustainabledevelopment.un.org/?menu=1300

[3] Proyecto EuropeAid/151580/DD/ACT/EC con el liderazgo de FFLA y del Grupo Faro.

PATTERNS AND RULES:

9. SDG's evaluation credibility (i.e. trust) is linked with standards fulfillment and principles that must bind each State's data system. A legitimate approach for data accuracy must meet SDG's UN standard (UN, 2016[4]).
10. Since rights of users and privacy is involved, crowdsourcing must meet voluntary principles and agreements on data protection (*e.g.* EU's General Data Protection Regulation[5], Gates' Foundation policies on open data[6], Digital Impact four principles[7]).
11. Informing perception of advances of the 169 goals (232 indicators) through online survey is feasible. It requires development and deployment of a multi-platform App, a relational database, a system of survey and the corresponding User-Interface (UI)[8]. A multidisciplinary approach (*e.g.* economy, social psychologists, statisticians) is needed to harness goals and indicators to appropriate answering schemes. Furthermore, reporting results of evaluations and results dashboards is feasible and can benefit, for example, from geolocalization that would ease the location of individual records[9].
12. As for securing data and privacy, one of the "top 10" emerging technologies, *blockchain*, is exactly suited for this[10]. Blockchain is a decentralized public ledger of transactions cryptographically secured[11]. A Blockchain is scattered with copies of the same synchronized ledger all over the planet - through peer-to-peer servers acting as nodes - that makes it in effect resilient. As it is *per se* a database, the blockchain can be used in our case to record each individual evaluation of a goal or indicator, together with public information about the user (range location, gender, age range, etc.). As a fundamental characteristic the distributed database (=ledger) would present a continuous recording of "votes" (evaluations about SDG's Goal *x*), timestamp and public information of user.
13. Blockchain is part of an emerging ecosystem of new disruptive technologies. It allows to develop Decentralized Applications (DApp) using the blockchain as its core database[12]. It could be structured for the present purpose as a permissioned public blockchain, structured around voluntary nodes and using e.g. proof-of-stake as

[4] United Nations, Economic and Social Council, 2016a.- Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators, Economic and Social Council 47th sesion. https://unstats.un.org/unsd/statcom/47th-session/documents/2016-2-IAEG-SDGs-E.pdf

[5] General Data Protection Regulation (GDPR) de la Union Europea (Regulation (EU) 2016/679.

[6] http://www.gatesfoundation.org/How-We-Work/General-Information/Open-Access-Policy

[7] See the Four principles to guide civil society's use of digital data by Digital Impact: https://digitalimpact.io/digital-data/four-principles/

[8] See for example the Open source Usahidi.

[9] At precision range compatible with user privacy and security.

[10] See Top 10 Emerging Technologies of 2016, World economic Forum (2016): http://www3.weforum.org/docs/GAC16_Top10_Emerging_Technologies_2016_report.pdf

[11] "[A decentralized] platform for "applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference" is one of key technology components that will allow [the] Blockchain revolution to fully realize its potential, change economic and social structures, [and,] radically [transform] human society into a more equitable [and] decentralized configuration. It's hard to see what is more important than that" quote of one of the anonymous creator of one of the blockchain platforms. .

[12] See for example https://www.ethereum.org/

consensus mechanism[13] to secure data flow. The technology is spreading fast and will call for growing professional skills in development and deployment.

14. Representativity of the evaluation of a given goal or indicator for a given territory is linked with relative sample size. Sample size of pooled individuals needed for statistical accuracy can be calculated; for example, for a 1.000 inhabitant village the minimum sample size would be 278 individuals (Ind.). For a large city of 20 million inhabitants it would be 384 ind[14],[15].
15. The number of cities in the world (big or small) is considered to be around 380.000[16],[17]. Together the total coverage of all human communities in the globe for the evaluation system would then require a little less than 150 million active users (2% penetration)[18],[19].
16. To capitalize trust on a global SDG's community evaluation system, we advise it must reach achieve three basic requirements:
    a. A secured system that guarantee citizens right and data privacy;
    b. Transparent and strictly managed data storage and processes;
    c. A meaningful set of data gathering, accurate reporting, community management and knowledge management.

APPLICATION:

17. Crowdsourcing of citizen evaluation of the SDG's by distributed mobile application (DApp) could present an innovative way of monitoring Agenda 2030 achievements.
18. Technical barriers to both collecting and processing voluntary perception-based data are low and can be easily be coped by a multidisciplinary approach.
19. Exigence of an ideal system implies user rights to privacy, data transparency, and trust in the data integrity and inviolability. This can be met by blockchain technology.
20. There are no strong technological barriers to distributed data-base deployment, blockchain structure, DApp and Smart contract development, User interface (UI) and contents-knowledge management.
21. The system is sensitive to the number of, and the distribution of users and frequency of activity. On the one hand this drives representativeness, and on the other, the legitimacy of the whole system and appropriation.

CONCLUSION AND PROSPECTIVE

A blockchain secured global-community offers various technical solutions to barriers to voluntary contributions to SDG evaluations from people. It would allow citizens direct

[13] https://www.linkedin.com/pulse/consensus-mechanisms-used-blockchain-ronald-chan

[14] See https://www.surveysystem.com/sscalc.htm, confidence level of 95% and confidence interval of 5%.

[15] For a sample size for all the planet, the sample size would be of 17.000 Ind. considering that every person in the population have equal chance of being selected. Source: https://es.slideshare.net/ParasuramBalasubrama/adequacy-of-sample-size-in-population-surveys.

[16] https://www.quora.com/How-many-towns-and-cities-are-there-in-the-world

[17] Their is around 4,037 cities in the world that have over 100,000 people living in them: http://brilliantmaps.com/4037-100000-person-cities

[18] 384 ind. * 380.000 cities.

[19] By comparison, Facebook sumed 2 billion users early 2017.

expression of key societal global commitments, influencing the life and wealth of its community. It would allow maintaining indefinitely a unique series of evaluations from individuals (users) that would inform and reflect individual or pooled evaluations of goals/indicators in real time or historically. At the same time the system has to guarantee high standards of privacy and public data policies. One important issue of future development of such a digital community is the management of user identity, privacy and unique-access: in an early phase, a thorough scrutiny of the implication of data protection regulation will be necessary[20]. Technological aspects are challenging but not impossible. A decentralized structure would ensure lower costs. Key to success will be the ability of the social community management to aggregate a genuine community, around open source collaborative administration, maintenance, management and governance tools (see DAO on continuation). Legitimacy will derive from the above mentioned about data protection and the ability to maintain high standards of data collection by the collaborative, open source, decentralized community of global citizens.

According to experts[21] network architecture and cryptographic proofs prefigure a wide technological disruption that will affect economic, social, environmental and cultural aspects of our future. The reliability of technologies already available allows the building of a time-stamped, tampered-proof ledger of crowdsourced evaluations toward the SDGs and the Agenda 2030 implementation: an open system would provide trusted data and transparency.

But, what if the volume of users active in the system explodes to, let's say, hundreds millions, or even 2 billion users (yes, one quarter of the population!), like some social medias[22]. If the system is transparently tamper-proof and guarantee the uniqueness of its constituency (no multiple users for one individual[23], [24]: only one individual can get a personal key and a public key), its messages sanctioning implementation policies would be clearly powerful!

The Third sector represents those who do not traditionally fit either into State's or Business' (Private) affairs. The third sector is in fact an enormous and diverse universe of all sized organizations talking and caring about nature, spirituality, culture and people without a voice and little power of action. Structured as organizations, they have evolved as clusters of hierarchical structures loosely linked to the State sector and absent from Business. Clustered and hierarchical, they act as a sector that channels the "people's" voices tuned accordingly to their specific sectoral interests. Technology now puts on the table the tools for a genuine direct democratic voice on matters that we directly depend on.

Furthermore possibility afforded by the blockchain technology to build Decentralized

[20] The costs of cheating (i.e. creating multiple identities) should be bigger than benefit (=one additional evaluation set to vote on).
[21] World Economic Forum (2016 ibid.)
[22] Facebook, *Ibid*.
[23] See Sybil attack:https://en.wikipedia.org/wiki/Sybil_attack
[24] See also https://decentralized-identity.github.io/

Autonomous Organizations (DAO[25]) means that users can self-organize and establish governance systems and consensus rules. Moreover, Smart Contract - one feature of blockchain - can transparently organize votes for motions and guarantee that rules of the game are adhered to. A Global DAO community toward the evaluation of SDGs and the Agenda 2030 with a 2 billion organized constituency can be a very powerful movement. If issued in a key moment of a negotiation, a valid motion issued from a 2 billion constituency would certainly be heard in UN General Assembly sessions, UN Security Council, and other bodies. Of course this 2 billion constituency won't enter the decision space mentioned above (and many more) as real members, where membership is already bitterly disputed[26]. But it won't need it. Again, cryptographically protected identity and widely open sources and data would both impede initiative of coercion of individuals and strengthen legitimacy.

In summary, an initiative to help inform SDGs by crowdsourcing can terminate in a global constituency toward development policies. Its nature, intangible and omnipresent, designed as a tamper-proof system and a decentralized digital community can provide different services, opportunities and challenges. Forecasting a system gathering >150 million active users - homogeneously distributed in the inhabited territories of the globe -, would provide a permanent monitoring system of the 169 goals of the key components of our system of living. Though with methodological impairment comparing to more conventional statistics, historical and present-time analysis would inform policies timely and trustworthy. Adequate community management, knowledge system and contents would drive a massive education of the constituency itself, with a virtuous circle on evaluation accuracy and involvement to collective action through critical thinking. Powered by this, such a massive constituency would be heard at the highest level with the strongest influence in sustainable development.

[25] https://en.wikipedia.org/.../Decentralized_autonomous_organization , e.g. http://backfeed.cc/explore-in-depth
[26] See for example G4: https://en.wikipedia.org/wiki/G4_nations