COMP 695 Research Action Plan

Computer Science 695: Research Methods in Information Systems
M.Sc.(IS) Program, Athabasca University
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Research Action Plan

[1] Introduction: Area of research, background & why

introduction to your research, where you provide some background to the area of research and why you selected this area of research….
Context Links:

- CIAMIL: Laval Smart Mobility Incubator and Accelerator [1]
- ΚΕΔΕ: Central Union of Municipalities in Greece [2]
- CrowdPolicy: A boutique consulting firm based in Athens, Greece [3]
- FCM: Federation of Canadian Municipalities [4]

To you give you some brief context and background. The civic incubator/accelerator (CIAMIL) discussion came up in the context of trading of civic software services between Canada and Europe given the imminent CETA trade deal between Canada and Europe. [5] I had this discussion a current mentor and former senior manager of mine while at TD. He is currently the CIO and Director of Innovation for the city of Laval and formerly the EPMO Director for the city of Montreal. He's had considerable influence on the strategy and success of the Smart City program in Montreal. [6] When I approached this mentor with the question of does appetite to explore opportunities for sharing civic services with municipalities in Europe, I was directed to information about the development of an incubator, with a tactical focus on domestic smart mobility and strategic outlook of expanding its partnerships and or service offerings globally.

During a three month stay in Greece over the summer of 2017, I opted to learn more about the civic world in Greece and ventured to create awareness and assess desire for services trade in the context of CETA. I ended connecting with a VP at KEDKE.gr, the Central Union of Municipalities of Greece (the equivalent of FCM - The Federation of Canadian Municipalities). On that front, there's desire for collaborating and workshop(s) between KEDKE and FCM. I was also directed to the owner of Technology / Governance at KEDKE, who provided me background and context regarding their desire to centralize certain services and provide a central technology incubator and accelerator for Greek municipalities. *The first steps of this vision have been realized as of Spring 2018, here via the KEDKE GovHub***.** [7] The delivery of the (technology) accelerator has been delegated to third party consultants CrowdPolicy.com out of Athens, and I was directed to the Managing Director of this organization, specializing in crowd sourcing, open government, crowd apps [8] services for municipalities, fin-tech etc. When I raised CIAMIL

during discussions, there was desire to explore collaborating and partnering, including pooling of objectives and potentially resources. The rationale behind all of this is quite simple, that given today's emerging technologies in software services, the potential exists to pool objectives and resources in order to create open standardizes services that can then be tailored/extended for unique demographic needs. The assumption being that a number of municipalities can agree on shared desires/objectives and outcomes, exactly what CrowdPolicy is doing with its crowd apps service offering for municipalities in Greece.

Thinking out loud, and in the spirit of the context so far, with the EU-Canada Comprehensive Economic Trade Agreement at the forefront, I'm interested in exploring and discussing appetite to pursue collaboration opportunities between Canada and Greece in the civic domain. Potentially something that can start from Greece, plant the seed, then gradually expand/mobilize into the Balkans, given the geo-graphic location of Greece being the belly button of the world and central access point to so many continents.

See section ***[9] Research management strategies & timeline*** for the continuation of this story.

[2] Research questions and hypotheses

how they are derived, why they are unique, why this is important….

(Proposed) Hypotheses:

- [h1] A high degree of correlation (confluence) in shared desires between projects results in opportunities for pooling objectives and resources, thus reducing costs.
- [h2] A high degree of socialness in civic projects and civic process suggests a higher degree of potential for technology collaboration.

Research Question(s):

- [rq1] Are there opportunities to partner/collaborate/pool objectives and resources between civic entities (including cross cultural)?
    - Twinning: Today, primarily economics/social - driven.
        - How about technology driven twinning?
- [rq2] What role can Blockchain technology such as Decentralized Autonomous Organizations and Artificial Intelligence play in matching shared desires between communities / municipalities?
- [rq3] Is the degree of shared desires for civil/civic projects measurable using something like the dimensions of people, process, technology?
    - Are service areas or applied technologies used for services representative of such dimensions?

Why? (Cited from The Democracy of Things Vol 1)

- "New age cybernetics are on the horizon. (Cybernetics a.k.a. Governance)
- Smart city initiatives are on the rise. They embody the very essence of what can be considered progressive [socio]cybernetics, with accelerators popping up left and right meant to propagate the rapid adoption of shared desired outcomes, opportunities that will ultimately drive the reduction of operational expenditures at the civic level of government
- Recent developments and emerging technologies such as Internet of Things, Smart Cities, BlockChain and Decentralized Autonomous Organizations suggest a new age in governance is on the horizon. One that banks heavily on a proper combination of new (open and transparent) progressive governance techniques fused with Information Communications Technology (ICT) capabilities. " [9]

Economic twinning of cities may be somewhat something of the past. On the other hand, technology twinning? That sounds priceless, moreover, a feasible, and progressive alternative to building a global interaction eco-system.

[3] Sample literature and critical evaluation

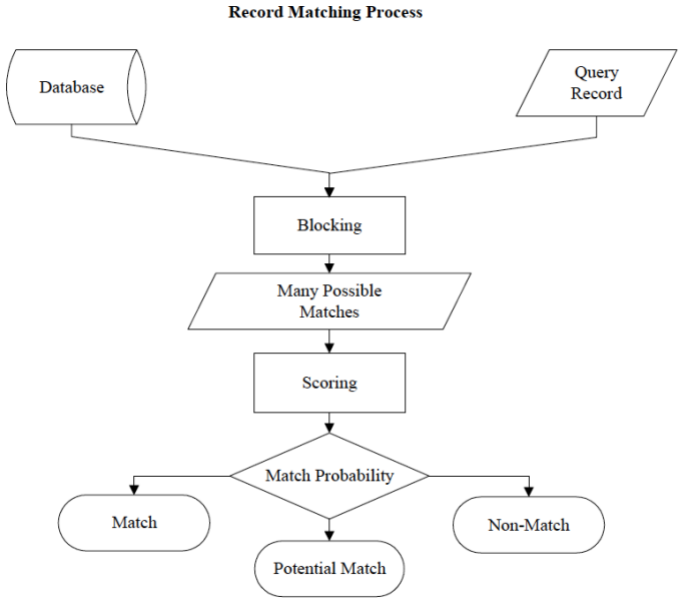
sample literature and a sample of the critical evaluation of current literature….

- Key findings from assignment work
    - *[lit1] The Blockchain and Increasing Cooperative Efficacy: Malavika Nair and Daniel Sutter* [10]
        - Critical Evaluation Sample
        - *What was done was a comparison of some economic models that are meant to describe an example of the efficacy of a governmental scenario and then some shady correlation to blockchain technology which implies that blockchain tech, and voluntary involvement (of the citizen?) would have made a difference, essentially increasing the efficacy of the scenario.* [10]
        - [p531…533] Interest in determining how cooperative efficacy can impact the efficiency of governmental processes and decisions using some economic models that I definitely need to dig into to fully understand; and then follows up by relating the concepts to blockchain functionality and technology. [10]
        - *And furthermore*… [p530] "we provide examples of already existing and potential applications of the blockchain that illustrate cases of increasing voluntary cooperation outside of government-provided public goods. Specifically, we identify three mechanisms stemming from technological properties of the blockchain that help create trust between potential trading partners by replacing the need for a third-party watcher or enforcer of rules: a publicly verifiable ledger, open entry, and decentralization of power through a widely distributed mining network as well as the open-source nature of the underlying code…" [10]

- *[lit2] The Performance of the Smart Cities in China – A Comparative Study by Means of Self-Organizing Maps and Social Network Analysis.* [11]
  - Critical Evaluation Sample
    - *Section 3.2 lays out the framework on how to go about setting up the analysis (a little overwhelming math wise, something to work on), and states re: Social Network Analysis, "This method can be used for compare the different developing stages of selected smart cities and show the mutual influences between these cities." …"Mutual influences between cities." The article demonstrates, a high degree of influence in 2005-2007 between Guangzhou, Shenzen, Wuhan (in blue).* [11]
- *[lit3] Business Requirements of a Record Matching System* [12]
  - Critical Evaluation Sample
    - A component of the IS project that I intend to deliver, per the stated hypothesis, essentially intends to build a decentralized matching engine for shared desires between various civic campaigns or projects, with the drive being helping identify opportunities to pool objectives and resources, thus reducing capital or operational expenditures. Envision each campaign or project and its attributes as records, in this case Blockchain smart contracts. This literature provides a framework for developing the requirements and design of the matching system, or more specifically, the artificial intelligence.
    - Critically, a simple example of what can be done is leveraging simple representations of the process as described within the literature and tailor / extend the concepts, for example: [12]
      - Database: A database of campaigns suggests that Blockchain and smart contracts may not be the only solution route for managing the campaigns themselves, even though Blockchain posits opportunities given its Distributer Ledger Technology capabilities as a progressive solution, simpler, proven technology should be considered.
      - Query Record: Obviously, this is where the question or hypothesis and its defining criteria as attributes are posed (and scripted) as potential queries. For example, matching campaigns against X areas of focus or applied technologies as a means of identifying shared desires. It is here, or even somewhere further down the process line, where one can begin to consider how to integrate tooling or intelligence mechanisms such as Social Network Analysis.
      - Blocking: This posits an interesting design consideration. While the database may act as a comprehensive register of campaigns, the query record may act as a filter, depositing into Blocks on the

Blockchain only those campaigns whose criteria are representative of stronger correlation, in effect a campaign factory is what ultimately makes it onto the Blockchain.

- *And so on….*



- **Figure 1: A two-step record matching process** [12]

[4] Literature management

how you will obtain and manage the literature (e.g., using Mendeley)

- Literature has been obtained primarily from the Athabasca Library and or Google Scholar.
- Management of literature is being conducted fairly manually, why?
    - Most literature management systems are not consistent and do require a significant amount of micro-management to run smoothly
        - For example, sourcing citations and or using automated citation / reference systems are not always accurate (quite frequently inaccurate and freighting …i.e. only the one of many authors is listed)
    - AU has made available O365 Microsoft services that we should take more seriously and be encouraged to use.
        - Office OneNote: For keeping notes of literature reviews.
        - Office Word References Management: The reference system in Word has been recently optimized, fit for purpose information requested for each key standard (i.e. IEEE, APA, MLA)
        - Excel: Good old fashion spreadsheet up on SharePoint to list all resources, references and citations is a good idea. Good research plan opportunity includes quantifying the type of information derived from the source.

[5] Justification

justification of feasibility of the proposed research

- There's lots of information about the various research factors at play given the paradigm that I've chosen, domains (and keywords) include:
    - smart city technology,
    - big data,
    - blockchain,
    - artificial intelligence.
- Limitation and research constraints is mainly that these are emerging technologies and information about an integrated applied state of these technologies interacting doesn't exist or is at its infancy and mainly theoretical at this stage. But the main constraint or limitation is the lack of integrated research.
- Therefore, the focus of the research, and actions, is integrating the research into a confluent narrative that combines (integrates) the various domains in a civic context. Effectively, connecting the dots to the civic (domain) eco-system, with a breakthrough goal to demonstrate solutions and desires without borders.
- What particularly validates the above described points is Infrastructure Canada's activation of the Smart Cities Communities Program, launched June 7th, 2018. This program specifically aims to:
    - "We are looking for not-for-profit organizations that will work in the smart city domain to provide advisory services and bring people, communities, ideas and organizations together. A key role will be to generate and share knowledge and build broad awareness of important and complex emerging issues, including data ownership, data management, privacy and security. [13]

[6] Data

expected data; sampling, measurements, reliability, and validity comments; identification of data analysis that would answer the research questions; methods to obtain this data; and methods to analyze them.

Expected Data

ID ➔ [data1] *Infrastructure Canada (INFC) Smart Cities Challenge Proposals* [14]
ID ➔ [data2] *SmartCity2 Crowdhackathon Initiatives* [15]
ID ➔ [data3] *Civic Park DAO Prototype & Simulation*
ID ➔ [data4] *Survey*

Data	Description & Overview
[data1] **[data2]**	Infrastructure Canada has prepared, open data, consolidating the entries of the 200 Smart Cities Challenge proposals here as an interactive map, here as well as a csv. [14] • Data attributes are categorized by geography, problem/opportunity description strings, service areas and relevant technology areas. These will be the driving attributes behind the prototype social network analysis algorithm intended for Prototype A of the Civic Park DAO (see below). A request was submitted to the CrowdPolicy Managing Director, requesting any available data that would could considered open from the outcomes of Smart City labs that were conducted in 16 cities and of the ~100 hackathon team participants. Ultimately, the ask was for something that would be structured as to possibly align and integrate with the INFC Smart Cities Challenge proposals. • A list of the outcomes and ideas were published Friday July 13th, 2018, by CrowdPolicy ➔ Click here [15] ○ This list can be translated and fit into the format INFC has prepared, effectively increasing the population of data with a European slant, exploring (or addressing) geographic threats to validity (see validity notes for more)
[data3]	In most discussions that I've had with individuals about the Civic Park DAO concept, the most common response received has been a need for a show and tell **Prototype** in order to grasp the concept. See **Appendix A** for material so far that describes concept use cases, high level requirements and design for a prototype. Developing and demonstrating a prototype will facilitate discussions, augment the value of returned information via surveys, and create opportunities for creating simulations that tell a story. All of which will result in additional data to work with. See section **[10] Identification of potential project outcomes use/avenues and quality expectations** for more details.

[data4]	The Smart Cities Shared Desires survey is designed to assess sentiment and desire to act upon shared desires, essentially the pooling of objectives and resources between civic entities (i.e. municipalities / communities). Leveraging the framework provided by the Government of Canada Smart Cities Challenge (Proposals) data, the questions attempt to secure an understanding of what service areas and or technologies are most adept to the possibility of partnering and collaboration to achieve a common goal or purpose as well as consideration of using a tool/service to support the process of identifying potential partners. The initial (draft) survey takes a closed questions approach with a focus on applying codifying of questions/responses. There a significant emphasis and desire in leveraging the Likert approach. The Survey via AU SharePoint ➔ Intro Page | The Survey The survey would go to: • All of the top 20 finalists • A random selection of non-finalists (say another 20 from the remaining 180 who didn't make the final cut)

Reliability & Validity Notes & discovering relevant data analysis methods:

ID ➔ [data1] *Infrastructure Canada (INFC) Smart Cities Challenge Proposals* [14]
ID ➔ [data2] *SmartCity2 Crowdhackathon Initiatives* [15]
ID ➔ [data3] *Civic Park DAO Prototype & Simulation*
ID ➔ [data4] *Survey*

Sample Reliability and Validity Notes					
Data by ID		**Social Network Analysis**	**Correlation (r coefficient)**	**ANOVA (Covariance)**	**Simulation**
[data1]	***Infrastructure Canada (INFC) Smart Cities Challenge Proposals*** **Reliability** • Not being in control of the setup and management of the data. • Understanding the factors that went into selecting the finalists. • Challenge proposal application guidelines were ended. • Quality of the subject matter expertise of the individual responsible for completing the application. Researching a few may suggest an overall lack of awareness and subject matter expertise in this domain that even made it into the top 20 (finalists). **Validity (i.e. Threats)** • Demographic variances such as geographic location bias • Prize driven competition (fairly high stakes $50M prize for the city that wins) • Regarding validity and relating it to some of the research and data that I'm working with, the two concepts/types that stand out for me right now is construct validity and pattern matching. By looking at the smart cities challenge data, actual operational data, I'm	✓	✓	✓	✓

	attempting to determine if shared desires and the potential to pool objectives and resources exists by observing for matches in areas of focus, service areas or technologies applied between the proposals that have been submitted.				
[data2]	***SmartCity2 Crowdhackathon Initiatives*** **Reliability** • Ask for data to match IFNC (Infrastructure Canada) formatting of SC Challenge Proposals • This data request may not materialize officially and may require manual intervention to create the data, as per **Expected Data** section • Manual intervention to create the data may result in misrepresentations and any assumptions should carry and will require validation or support from any generating party, this is relevant to **[data1]** as well **Validity (i.e. Threats)** • Geographic threat to validity as a result of alignment with INFC data to increase population size from 200 to ~300, the driving assumption being to discover cross border opportunities or more effectively solutions without borders	✓	✓	✓	✓
[data3]	***Civic Park DAO Prototype & Simulation*** **Reliability & Validity Notes** • This is subject to further thought; imminent focus is feasibility of rapid development of a prototype A that will drive discussions and realization of reliability and validity notes that will ultimately have an impact during ethics review. • Upon developing a prototype and structuring a proof of architecture, per the section below, thought will be put into leveraging the prototype as a means of discovery reliability and validity issues by way of working with and manipulating data to simulate different scenarios and specifically assess key factors (per section below) that should be considered for testing reliability and validity. • As suggested by participation in several Hackathons. There's no better way to get the idea out there for discussion than a prototype.				✓

[data4]	***Survey*** **Reliability & Validity Notes** • Upon doing some research on the topic, here are some interesting points for consideration retrieved from the following reference "Validity and Reliability in Surveys"➔ here: [16] ○ **Validity Notes:** ▪ "Content Validity: This is related to our ability to create questions that reflect the issue we are researching and make sure that key related subjects are not excluded." [16] ▪ "Internal Validity: This asks whether the questions we pose can really explain the outcome we want to research." [16] ▪ "External Validity: This refers to the extend in which the results can be generalized to the target population the survey sample is representing." [16] ○ **Reliability Notes:** ▪ "Reliability is concerned with the consistency of our measurement, that's the degree to which the questions used in a survey elicit the same type of information each time they are used under the same conditions." [16] ▪ "Reliability is also related to internal consistency, which refers to the degree different questions or statements measure the same characteristic." [16]			✓	

Sampling, Measurements, Notes ➔ Data Analysis & Methods re: Research Questions

Analysis Type	***Key Notes***
Social Network Analysis	Running a quick search using 'Smart City Social Network Analysis' via the AU Library, I came up across a publication "The Performance of the Smart Cities in China – A Comparative Study by Means of Self-Organizing Maps and Social Network Analysis." [11] Section 3.2 lays out the framework on how to go about setting up the analysis (a little overwhelming math wise, something to work on), and states, "This method can be used for compare the different developing stages of selected smart cities and show the mutual influences between these cities." [11] "Mutual influences between cities." [11] Social Network Analysis measures interaction(s) and connections between entities (as units) by way of both individual factors and factors that make up and represent the entire network (global); facilitating identifying relationships, clustering and classification through mutuality, commonalities, or shared characteristics. What's really neat about this tool is playing between micro, meso and macro. What does the network look like when we're dealing with a small number/level, say dyadic/triadic as compared to a meso or macro level network, i.e. 200+ communities. A personal reflection that I'm having is that social network analysis, in some ways, does not only measure data, nut it is a means of measuring a voice or collective voice or collection of voices. Something that I'm pondering inside of my interpretation as I'm learning. Cambridge Intelligence, here, [17] provides a rather concise overview of Social Network Analysis measurement techniques for consideration and when to use them, including: • *"Degree Centrality: assigns an importance score based purely on the number of links held by each node"* [17] • *"Betweenness centrality: measures the number of times a node lies on the shortest path between other nodes."* [17] • *"Closeness: scores each node based on their 'closeness' to all other nodes within the network."* [17] • *"Eigen Centrality: measures a node's influence based on the number of links it has to other nodes within the network…also taking into account how well connected a node is."* [17]
Correlation (r coefficient)	I think there's ample opportunity to work with the data set and discover/prove linear relationships between different units of analysis and variables, i.e. for service areas or technologies applied. Rank correlation rang a bell here. For example, as population size of the community increases, what is the correlation to services areas being affected by the proposed project and or technologies applied.

	I believe it will be important to highlight interest in identifying both direct/positive correlation and inverse/negative correlation as I dig deeper into the data that I'm proposing to use for building a prototype of the Civic Park DAO (IS Project). All the while, developing a mechanism that highlight's potential spurious relationships as actual opportunities. Let's not discount the spurious relationships and how to accomplish that, is what I need to think about (without biting more than one can chew). Fundamentally, the Big Data paradigm is bringing this very problem (or opportunity) to light, more data, while building capacity and capabilities to squeeze fat off of a fly, no stone is left unturned.
ANOVA (Covariance)	• ANOVA (Analysis of Variance) / MANOVA (Multivariate analysis of variance) ○ *ANOVA* ➔ i.e. Assess variation of areas of focus, services areas and technologies by communities grouped by province. So I would group the communities and their respective data by province and then potentially pick the top three or four active provinces (i.e. Ontario, Quebec, British Columbia and Alberta) and run an ANOVA sequence between the provinces to understand variations/differences in focus areas and technologies applied. ○ *MANOVA* ➔ i.e. If I can convincingly draw a dependency (however causal, as I'm stepping on the toes of some of the questions below), maybe I can build some analysis to help understand the relationships between independent variables and potentially dependent variables. Thinking aloud, I can begin by fooling around with, let's say community population size and prize category applied for.
Prototype & Simulation	If a prototype is setup correctly, I could potentially find ways to run a Randomized Experimental Design (RED) or Nonequivalent Group Design (NGD). Given the data that I have on hand right now, let's say the smart cities challenge, I'm toying with the fact of event driven simulation, which I'm used to and a real advocate of, vs modeling a simulation for something that I don't have event driven data for. I need to figure out what data, if any can potentially describe a system of decision making (i.e. To pool objectives/resources or not to pool objectives/resources) and I need to spend more time learning about agent-based modeling (ABS models) / simulation vs. event driven simulation. Key factors or variables that are required to shape the model to be simulated include: • Key Partners, Key Activities, Key Resources, Value Proposition, Customer Relationships, Channels, Customer Segments, Cost Structure, Revenue Streams **IMPORTANT HIGHLIGHT RE Prototype & Simulation:** Data from open sources can be also leveraged as data framework and what can be done is a complete manipulation of the data to demonstrate the business model being built, for example, matching of shared desire by manipulating data to demonstrate what a strong Social Network Analysis output or strong correlation (Pearson test) would look like and why.

Survey Analysis re: Likert	Measurement thoughts • Inter-Rater or Inter-Observer Reliability: I could look for consistency between any categorical type questions. • Test-Retest Reliability: I could ask respondents to repeat a portion of a survey after they've had an opportunity to play with a working prototype (proof of design/architecture) of the IS project I intend to deliver. Potential Conclusions: • Validation of willingness to collaborate and share assets between communities. • Service areas and or technologies that are more prone to cross-municipal consistencies and thus better candidates for pooling of objectives and resources • Sentiment towards tactical (short term) investment in Technology • Willingness to use technology as a means of identifying opportunities for partnership and collaboration. Conducting interviews rationale: The initial set of questions I've come up with takes a closed questions approach. Some thought needs to be put into open ended questions, though strategically, a follow up questionnaire with three of four key open-ended questions may position for productive interviews with sample subsets. I'm thinking about three sample types for following up interviews: • A subset of the finalists by random selection • A subset of non-finalists by random selection • The top three of finalists with high degree of willingness to act upon shared desires ○ Potentially the bottom three as well (for contrast) • A random selection of 5 finalists that respond to 'Yes' for using an online campaign/project matching service • A random selection of 5 non-finalists that respond to 'Yes' for using an online campaign/project matching service

[7] Novelty

the novelty of concepts, approaches, techniques, and tools you propose to use.

To describe novelty, I'm delving into the conclusions of each Democracy of Things Volumes in summary here:

- ***Democracy of Things Vol 1: A progressive cybernetics eco-system & interaction model concept*** [9]
  - "Democracy of Things (DoT), and the described eco-system, is by no means a stated paradigm.
  - DoT touches on untested waters in its proposal, and until the waters clear and we learn more about tools such as IoT, AI, BlockChain and DAOs, through continued experimentation and application, DoT will always be an evolving and progressive paradigm.
  - Technology is becoming ever more easy and affordable to implement and adopt, more importantly, any investment in technology is unforgivingly beginning to ensure the citizen is at the heart of that investment, giving way to IoT's real bearing of fruit which is affording society capital expenditures that will be forcefully and by nature more people and process centric with the reduction of operational expenditures at the heart of the objectives and shared desires. A quintessence combination of people, process and technology.
  - Embracing the value of centralizing and empowering the citizen as a key operator and contributor by way of increased direct engagement, crowdsourcing for innovation and partnerships as well as ensuring the accelerators are in place to propagate these values, techniques and frameworks rapidly, means we're on the right footing.
  - Enabling Artificial Intelligence and tech such as Blockchain, smart contracts and Decentralized Autonomous Organizations to systematize capabilities and processes, we will be championing a faster pace of realizing opportunities and shared desires.
  - These days, it's hard to keep our eyes above the horizon, with all of the cyber tech stuff that keeps us heads down busy. As technology evolves to be more hands free, and self-sustainable via capabilities such as AI, Deep Learning and Machine Learning, coupled with taking some time to appreciate and expand one's own knowledge of the root of what cyber really means, we can start to raise our eyes and meet the horizon. Still having trouble? See Ethereum's take on democracy (https://www.ethereum.org/dao). Step by step instructions on "How to build a DEMOCRACY on the blockchain" [3]; sometimes, seeing is believing. Yet, let's not get lost in the technology of things, and rather, let's focus on the democracy of things. We can start by being engaged citizens." [9]
- ***Democracy of Things Vol 2: An exploration of digital democracy & citizen IS applications*** [19]
  - "There is no shortage on information or research on the topic of democratic participation and digital engagement. Popularization of the movement is becoming evident via a multitude of awareness campaigns and propaganda to drive citizen engagement by use of a diverse set of IS applications, including applications of social media platforms and or applications specifically design for civic purpose.

- Furthermore, data has become a central figure in this domain, with a recursive/circular effect, where data is central in both conceptualizing and developing these solutions as much as the solutions are geared to iteratively and continuously create data. As the digital divide that has kept many far from accessing and employing such solutions comes to closure, the focus is shifting on an abundance of data being more accessible and meaningful to both civic entities and citizens, a defining moment in the evolution of open government and the Democracy of Things." [19]

- ***Democracy of Things Vol 3: The Future of Online Gaming as a Civic Service*** [20]
  - "Online gaming and open worlds have evolved into self-sustainable entities. Without a doubt citizen of all ages are probably more engaged with this form of entertainment than they are with politics, this is inevitable given that such games appeal to young adults and these are endearing target for civic organizations, after all they are the future.
  - Civic organizations such as municipalities have embarked on the monumental task of digital transformation and recreating themselves to be digital friendly in this digital era, where everything is digital digital digital. Digital is clearly becoming the means for access to the citizen. Digital open worlds are tested examples of virtual democracy. Millions of people emulate real world semantics in vast online worlds, their own democracy, their own terms. Civic organizations are starting to take notice, we're seeing examples of these digital worlds being tapped into and we're seeing it happen repeatedly and being formalized by the likes of organization's such as the United Nations.
  - There is absolutely no question that gaming platforms information systems have evolved into assets that civic organizations can only dream of, full on open worlds, artificial intelligence and machine learning, it's all been done full blast inside of these games.
  - Civic entities can potentially integrate open data with [these] platforms by presenting and discussing some simple real-world Lego like case studies, insinuating that integrating such platforms into a civic organizations operation (or eco-system) is definitely possible. With
  - The ultimate question to be asked is what if civic entities had access to gaming assets and specifically the artificial intelligence that's been developed for such open worlds? What if civic entities knew how to use such assets? Where could we go?" [20]
- ***Democracy of Things Vol 5: RLO: Progressive Cybernetics – Smart Contracts (& The Blockchain)*** [21]
  - "Current popular applications and investment is being made in public Blockchain network's with ICOs being managed by smart contract driven DAOs, this is resulting in an isolative nature of being constrained to currency as tokens.
  - Currency, in effect may be constraining the realization of great potential for smart contract and dApp technology. As the brief description of non-currency-based applications imply, by simply taking BitCoin (token) out of the Blockchain picture, and putting emphasis on the Blockchain mechanism managing smart contract code, more innovative and promising applications are slowly and surely being thought about and realized." [21]

[8] Ethical issues

Identification of ethical issues.

This is a sample of what will be shared with the Athabasca University Ethics Review Board, a process the IS project is subject to before approval to proceed.

- **Monetization / Revenue Potential, i.e. Not for Profit:**
  - Review Opportunities to monetize as a revenue stream for the researcher / student, given experience and the personal investment that is being made in subject matter expertise build and establishing progressive networks. A contribution can be made to the Smart Cities Communities Support program – given the not for profit approach being taken by Infrastructure Canada, there has been a capital investment made by a citizen (Mickael Yusufidis) to date that may warrant some recognition at the industry level, to say the very least.
- **Use of open data** (retrieved from: ***Democracy of Things Vol 2: An exploration of digital democracy & citizen IS applications***) [19]:
  - "It is important to note here that as implied in a paper, "Empowering Citizens with Open Data by Urban Hackathons" (Concillo G., 2017), The Internet of Things (IoT), the underlying infrastructure of smart city solutions, is driving the automated creation of data with the multitude of tech (mobile phones) and sensors gathering data, the creation and collection of data is not just something that will happen today and stop tomorrow, it will continue for the foreseeable future; citizen engagement solutions thrive on and depend on (open) data, both for successful creation and application of solutions.
  - More importantly, we're learning how to make that data, or transform the (open) data into meaningful information; actually, this is the real phase we're at right now, we're still learning, we're focused on flowing from why we're doing it, into the how and what we're doing with the data.
  - That being said, while citizens are part of producing this data with their everyday actions (direct and indirect), we're still restricted and constrained from truly accessing it. Open data reform policies are rampant to address this issue, especially in the wake of a 2009 Obama administration directive to make all government data "open by default, except for personal information or related to national security" [(Concillo G., 2017), pg. 126], which is consistent with the way many cities are now approaching data." [19]
- **Global Markets:**
  - What ethical considerations come into play when factoring global markets into the picture, clearly a Canadian economic objective. How to measure the value add to the Canadian economy vs. Global potential is an important ethical consideration.
  - Connect the dots to the ethics, considering commercial potential vs. civic (who owns what)
- **Intellectual Property:**
  - The concepts described re: Civic Park DAO are relevant to commercial opportunities as well. How does a progressive organization that wants to share such information with the civic world retain some form of monetization rights for a potential service that will be built for the civic (or government) sector and retain commercial rights to the intellectual property.

[9] Research management strategies & timeline

identification of research management strategies, including a timeline.

Timeline	Log & Description

Summer 2017	• **July**: Met the Mayor of Pylos, Greece. Vice-President of KEDE [2](Central Union of Municipalities in Greece); introduced to the mayor of Chalkida, Greece & the KEDE Director of Technology & Governance
	• **August**: Met with the Mayor of Chalkida, Greece. The city was still in the process of finalizing a pilot for its smart parking and smart LED program
	  ○ Intend to follow up Summer of 2018
	• **August**: Met KEDE Director of Technology & Governance
	  ○ Discovered plans to develop a centralized municipal accelerator for Greece, was introduced to CrowdPolicy [8], the consulting firm that has been delegated with the task of developing the accelerator
	• **September**: Met with CrowdPolicy [3] Managing Director, began fostering a relationship and exploring opportunities to collaborate, specifically creating a bridge between Greece and Canada

Fall 2017	• **November:** Attended the CrowdPolicy CrowdInsurance 2.0 Hackathon in Athens
	  ○ While not Smart City related, provided hands-on feel for how CrowdPolicy runs hackathons
	  ○ Met and fostering a relationship with the winner of the Hackathon, a Greek-Canadian, Harry Toloupas, whom I am now mentoring and intend to collaborate with on projects
	• **December:** Submitted DoT Vol 1, an essay/research paper for COMP 607: Ethics in IS
	  ○ *Democracy of Things Vol 1: A progressive cybernetics eco-system & interaction model concept* [2]

Winter 2018	• **January:** Submitted DoT Vol 2, an essay/research paper for COMP 601: Survey of IS
	  ○ *Democracy of Things Vol 2: An exploration of digital democracy & citizen IS applications* [4]
	• **February:** Submitted DoT Vol 3, an essay/research paper for COMP 601: Survey of IS
	  ○ *Democracy of Things Vol 3: The Future of Online Gaming as a Civic Service* [5]

Spring 2018	• **March:** Submitted DoT Vol 4, an essay/research paper for COMP 601: Survey of IS
	  ○ *Democracy of Things Vol 4: RLO: Process Tailoring & Creation Unified Process* [9]
	• **April:** Submitted DoT Vol 5, an essay/research paper for COMP 501: Sys Dev w/ET (Java)
	  ○ *Democracy of Things Vol 5: RLO: Progressive Cybernetics – Smart Contracts (& The Blockchain)* [6]
	• **May:** Canadian Roadshow
	  ○ Brantford: Not actively participating in the Smart Cities Challenge, need to determine why

	○ Guelph: Working on opening up this door, Guelph/Wellington, and their recently established civic accelerator is a Smart Cities Challenge top 20 finalist (will follow up in the Summer, between July-August, with another visit) ○ Markham: Visited the Markham ventureLab, and initiating a relationship. They are key partners and contributors to Markham's smart cities challenge proposal. Considering setting up shop or leasing space at their location. Considering asking Markham to become an early adopter of the IS project. • **June:** Attended the Federation of Canadian Municipalities Annual Conference in Halifax, Nova Scotia (May 31-June 3) • **June:** Connected with the Infrastructure Canada Smart Cities Challenge team ○ Received invite to apply for the Smart Cities Communities Support Program [13] • **June:** Connected with several communities that are prepared to collaborate with me and potentially become early adopters of the IS project solution I intend to deliver (generated support for the idea) ○ Learned about communities' state of mind re: Technology, being 3rd (or last) priority for the majority of Canadian communities (by an FCM real time poll at the conference), highlighting the need for the IC Smart Cities Communities Support Program
Summer 2018 [Forecasted / Assumptions]	• **June:** Attending the KEDE (Central Union of Municipalities in Greece) Smart City2 CrowdHackathon in Athens, Greece ○ Between June 28 to July 1, The Central Union of Greek Municipalities (ΚΕΔΕ), orchestrated by CrowdPolicy, successfully completed one of the largest smart city hackathons in Europe (purported and reported as the largest). I actively participated in the Hackathon as a mentor to a team, DogsVoice.GR which won 4th prize, a fully funded trip to Manchester, UK, https://www.mi-idea.com Innovation (Smart City) Labs. [23] ○ In the process of asking KEDE (and CrowdPolicy) to become an early adopter of the IS project outcome/deliverable ○ Securing outcomes of the hackathons as data, and collaborating to determine if the data can be managed or presented in such a way to match the way the data for the Canadian Smart Cities Challenge Proposals data was structured; this way I can supplement my population data to represent to different countries across two key continents • **July-August:** Development of high level requirements and design for a Prototype A of the Civic Park DAO. ○ Learned about the outcomes of Smart City Labs [10]that took place in 16 cities in preparation for the Athens based Hackathon and all of the ideas that came out of there ○ Chris Zacharopoulos (LI profile), the technical lead for the Dog's Voice team during the Hackathon, will collaborate with Mickael Yusufidis to build a prototype of the Civic Park DAO • **September:** Demonstration of Prototype A of the Civic Park DAO and Surveys ○ See section ***[10] Identification of potential project outcomes use/avenues and quality expectations*** for more details

[10] Identification of potential project outcomes use/avenues and quality expectations

identification of potential publication avenues and publication quality expectations.

- Civic Park DAO Prototype A ➔ See Appendix 1
    - "Level 7 (Innovation Canada Definition): Prototype ready for demonstration in an appropriate operational environment"
        - "Prototype at planned operational level and is ready for demonstration in an operational environment. Activities include prototype field testing."
    - Consideration and attempts for demonstration(s) to:
        - **Proposed Lead ➔ Chris Zachararopoulos – Greece and Europe**
            - Manchester, UK, https://www.mi-idea.com Innovation (Smart City) Labs.
            - KEDE – The Central Union of Greek Municipalities (ΚΕΔΕ)
            - CrowdPolicy (Greece)
        - **Proposed Lead ➔ Mickael Yusufidis – Canada and North America**
            - Infrastructure Canada: Smart Cities Communities Program
            - CIAMIL (Laval) Smart Mobility Incubator (City of Laval)
            - Civic Accelerator: Open Guleph – City of Guelph
            - City of Kamloops – British Columbia
- Application to become an Advisor for the Infrastructure Canada Smart Cities Communities Program
- Core theme of the MSc IS project for Mickael Yusufidis

Appendix 1: Civic Park DAO

Storyboard

Civic Park DAO (Dapp)

Storyboard: Decentralizing Shared Desires into Realizable & Integrated Opportunities

Create your own at Storyboard That

The following storyboard is a practical representation of how the Civic Park (DAO) service will work & represents the fundamental functionality of the initial prototype.

The primary focus of the Civic Park (DAO) is driving active matchmaking between city/community desires, both domestically & globally.

https://www.storyboardthat.com/storyboards/shareconomy/blockchain

Concept Storyboard (for early adopters)

The Blockchain Storyboard	Civic Park DAO Storyboard
A group of friends live on the street with shops that each of them own. The friends go to each shop and make a purchase using a card, which is issues from the bank that all the friends are connected to.	A group of cities / communities which offer common services exist in the same vicinity, domestically, and or collaborate virtually with similar entities globally. The entities list their products, services, or projects / initiatives as a campaign in a register (ledger) as smart contracts via a private Blockchain (network) service that all the organizations are connected to.
As each friend makes a purchase, the others simultaneously keep track of the transaction and account for it against that friend's bank balance.	As each entity adds new or modifies smart contracts on their register(s), the others are simultaneously informed of the campaign (smart contract / transaction) and its attributes, especially if it matches with the nature of their own desires or goals.
Each transaction is seamless across all parties involved, since everyone sees the details together.	Each campaign (smart contract) is seamless across all parties involved, since everyone sees the details together.
These transactions are recorded in chronological order by all the friends. Everyone is privy to the same info, of which the math keeps them honest.	These campaigns are recorded in chronological order by all the entities. Everyone is privy to the same info, of which the Blockchain keeps them honest. Blockchain (oracles) are leveraged to manage access control (public, private, restricted) to specified attributes within every campaign (smart contract).
All transactions, by every friend, are updated and accounted for in real time 24/7. Everyone knows how much money the others have at all times, and without having to be processed through a central authority.	All campaigns, by every entity, are updated and accounted for in real time 24/7. Every entity knows about how essential attributes of a campaign change or evolve at all times, and without having to be processed through a central authority.
When John tries to make a second purchase on the same day, his friends instantly know that he does not have sufficient funds to cover it. Sarah wants to send John enough to cover the purchase. Since everyone knows that Sarah has the money, the payment is immediately funded, which allows John's charge to be approved.	As new campaigns are added, friendly entities instantly know if there are shared desires, goals or obstacles and have the option to join campaigns, assuming desires and goals are shared, in order to pool objectives and resources as a means of realizing the campaign goals, effectively reducing effort and cost given the match is an incentive for friendly entities to collaborate on an initiative where there are common objectives.

Action Research Notes as a Use Case

Stages(s)	**[O'Brien] Description** [11]	**DAO: Notes for IS Project High Level Requirements, Use Case(s) & Design**
Pre-conference process	• set up Advisory Group of local representatives • agree on process design and participants • use focus groups for preparation • invitations, distribution of introductory materials	• Organizations or entities establish themselves represented by a parent contract (almost like a Master Services Agreement), which holds standard terms of service/agreement • Projects are setup as campaigns (similar to Kickstarter) and each campaign is a smart contract, child to the parent (MSA) • The smart contract holds details about projects/campaigns and relevant terms of service, scope, process and roadmap • The details are available for anyone or any entity to see • Each campaign / smart contract acts as invitation or call for action to collaborate
Introductory plenary	introductions, review objectives, outline process, introduce first stage	A key DAO function is use of Blockchain oracles functioning as matching agents that review campaigns to identify and communicate where desires are shared
Small group session 1	SCANNING THE ISSUE • past and present context • assess current situation • outline probably futures	SCANNING FOR SHARED DESIRES: Matching Properties • Current state, need and area(s) of focus • Project/Campaign scope • Desired outcome(s) (future state)
Presentation plenary	reports from small groups, discuss directions, introduce second stage	Dashboard analytics of identified shared desires based on correlation/alignment (matching) scores: • area(s) of focus • scope • desired outcome(s)
Small group session 2	DESIRED FUTURES • long-range visions • alternative/preferred futures	SHARED DESIRES & OUTCOMES (focus on opportunities to **pool objectives**) • Vision Alignment • Objectives/resources integration opportunities • Scope integration & alternatives and solution(s) option analysis – how does one campaign/project complement another?
Presentation plenary	reports from small groups, discuss directions, introduce second stage	Dashboard analytics of solutions options and alignment (pooling objectives/resources) opportunities

Small group session 3	OPTIONS FOR CHANGE • constraints and opportunities • possible futures	INTEGRATION & SOLUTIONS OPTIONS ANALYSIS (focus on opportunities to **pool resources**) • options and alignment analysis • voting/quorum capabilities on alignment threshold or yield of shared assets (range?)
Presentation plenary	reports, define strategic tasks / actions, select key tasks, form task groups	Process, work items and work breakdown analysis for alignment (reduce redundancy and equitable distribution of resources) with a focus on operational expenditures reduction
Task Group sessions	TASK GROUP MEETINGS	TASK GROUP MEETINGS
Final plenary	Task Group reports, discuss future contacts, create new Advisory Group	Smart contracts and DAO functionality to manage / govern the details i.e. Ethereum DAO structure
Post-conference process	• report distributed • follow-up contacts • Advisory Group facilitates meetings of Task Groups • Feedback on proposal actions • Further search conferences • Widen network • Continuing evaluation of outcomes	Smart Contract features / Dashboard • Blockchain Congress • Stakeholder (Shareholder) Association • [Liquid] Democracy – Delegation capabilities • Governance / Approval mechanism (i.e. Time-Locked Multisig) • Conditions for widening the DAO as a means of continuing to pool resources and objectives (spreading costs and reducing Operational Expenditures)

Additional High-Level Requirements and Design Notes

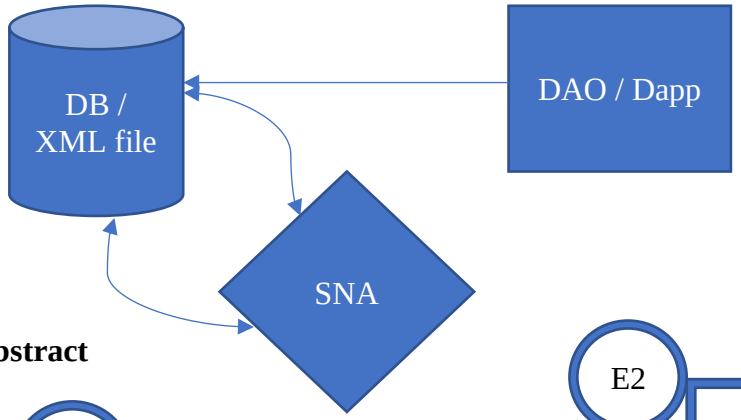
Conceptual Vision, Technical Requirements & Design Authored by:
Mickael Yusufidis & Chris Zacharopoulos
Comments: Transcribed from Chris' notes representative of conceptual discussions with Mickael
Date: July 9, 2018
Location: Stavros Niarchos Cultural Centre, Athens, Greece

System Parts

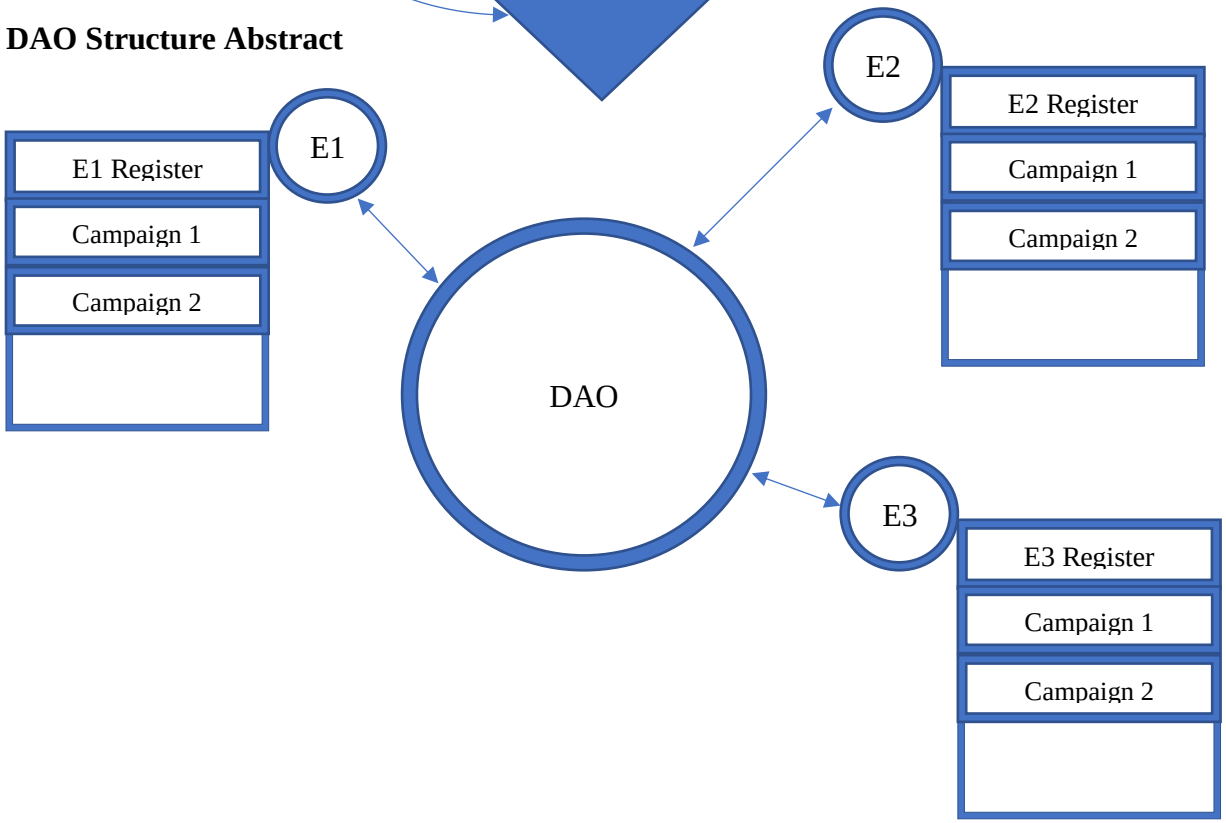
- Blockchain platform (DAO), smart contracts => ERC20
    - Manage campaigns
    - Entities (community, organization, etc.) have a register of campaigns
    - Each entity can issue a new campaign ad it is added to the register, creating a smart contract
    - Entities can collaborate (pool objectives or resources i.e. funding) based on common goals
    - Transparency ➔ All campaigns (all?) are visible
        - Each time a new campaign is added ➔ Notify All () + SNA analysis recommendations
- Database
    - Keep the majority of details off the blockchain.
    - Keep the lights on (server on / off), sustain the chain

- Social Network Analysis
    - Objective ➔ Find shared desires, common interests, goals
        - Run Social Network Analysis on the data to demonstrate collaboration opportunities, eg. Mutual influence criteria such as
            - Similarities in population
            - Vicinity (close to each other)
            - Shared/Common => Areas of Focus
            - Shared/Common => Service Areas
            - Shared/Common => Applied Technologies

Abstract System Representation



DAO Structure Abstract



Entity

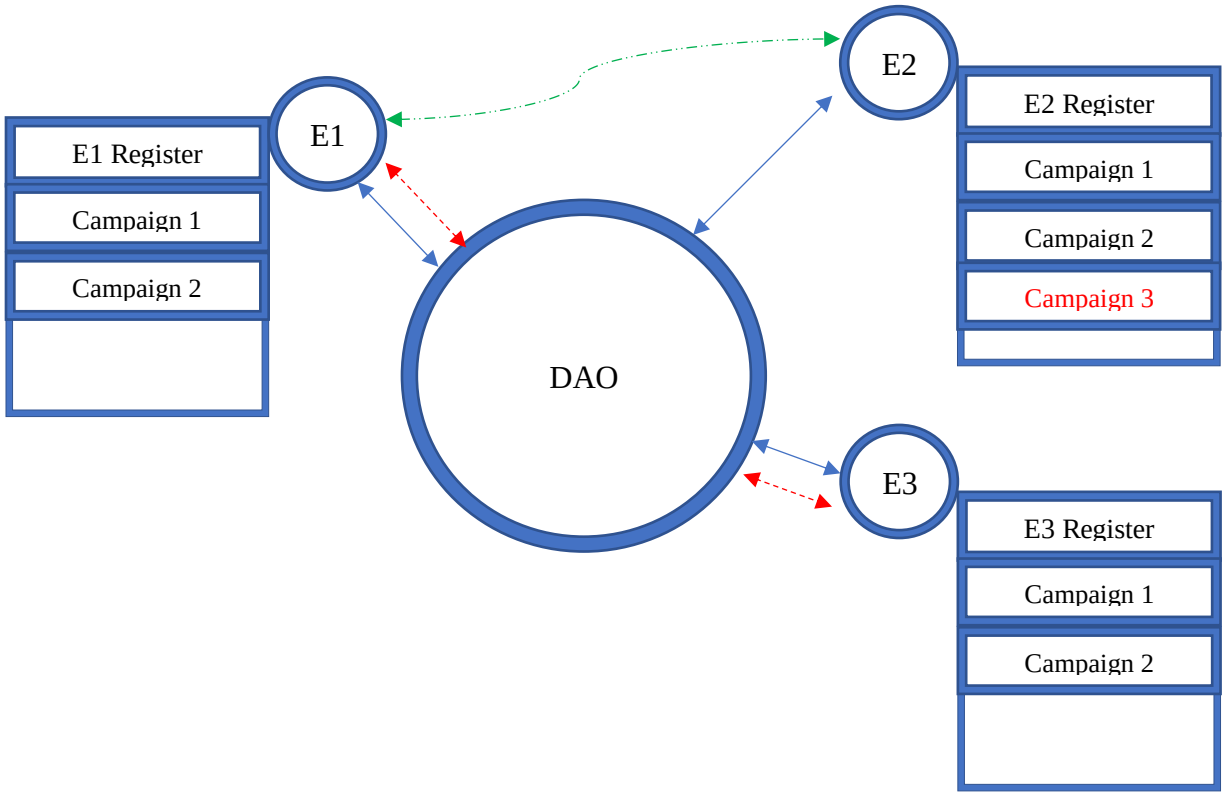
- Attributes (Refer to data that is part of the Smart Cities Canada Challenge Proposals)
- Register
    - List <campaigns>
    - More things can be added like contributions, awards, partners

Campaign

- Attributes (Name, Description, Goals, Tech fields, funds)

DAO Scenarios

- Entity 2 issues new campaign (C3)



- Entity 1 and Entity 3 are notified that a new campaign has been issue
    - OR => The campaign is available for Entity 1 and Entity 3 to see
        - Notification functionality is not required for Prototype A
        - 
- Entity 1 has shared desires and identifies common objectives, so it drills down into Entity 2's new campaign
- Entity 1 decides to collaborate with E2 to reduce costs (or other reasons) and issues a token representing desire to collaborate and seeking agreement from Entity 2 (i.e. the token may be representative of a memorandum of understanding or foundation of)
    - 

Actions (by Entity)

1. Access ecosystem Entities (READ)
    1.1 Access selected Entity Register, browser campaigns (READ)
    1.2 Access campaign (READ)
    1.2.1 Collaborate (e.g. MOU, fund) on selected campaign (WRITE)
2. Issue new campaign (WRITE) ➔ fill in form and submit to ledger (DB)

Actions/functions of DAO

- When [2]: update.ledger()
    +
    notifyAll() "a new campaign has been issued by…. "
    +
    newOpportunity(Entity) => based on Social Network Analysis (SNA)
- When [1.2.1]: update.ledger()
    +
    notifyAll()??
    +
    Notify Collaborators (E1, E2) ➔ E1 has funded your campaign or demonstrated interest in collaborating due to shared desires

Use Case: SharedDesires.dao as a Service

Described below, is a use case, which has been elected as the foundation for the requirements of this project. The template for the use case has been adapted from the Eclipse OpenUP Process Framework [2] and tailored accordingly for the needs of this project.

Brief Description

This use case describes how two individual entities use a DAO/Dapp to match shared desires.

Actors: Brief Description

- 1slap User(s) X & Y
- 1slap DAO Smart Contracts Factory and Campaign Manager
- 1slap DAO Blockchain Oracle

Preconditions

- There is an active network connection to the 1slap DAO BlockChain service for all entities.
- The campaign owner has campaign attributes (i.e. desires and goals) clearly documented

Basic Flow of Events

1. The use case begins when an individual entity, 1slap User X, wants to start a campaign that will sponsor a particular product, service, property or initiative (project/program) and is seeking other entities with shared desires or goals. The campaign is created and becomes part of the Blockchain.
2. A Blockchain oracle, a smart contract in itself, uses Artificial Intelligence techniques (Deep and Machine Learning algorithms) to match the attributes (properties) of the campaign with campaigns created by other entities 1slap User X typically interacts with and or where campaign attributes (properties) score an extremely high match in correlation.
3. Users (i.e. User Y) are notified of matches based on provided filtering criteria.
4. User Y is provided with the ability to acknowledge the match and provision an ask for collaboration or contribution to the campaign (in various ways) or to perform an exchange (transaction) of products/services/goods (in exchange for a token of choice). **Note:** Tokens can be fungible or non-fungible, meaning, tokens can be anything from currency, resources, digital assets, actual contractual or legal documentation such as Memorandum of Understandings or letters of (collaboration) intent etc. and are defined by the campaign (smart contract) attributes.
5. User Y is validated, where User Y's hashed public key is paired with a private key to be leveraged to verify the specific transaction that is about to occur
6. The 1slap service displays options that are available on this service. In this case, User Y always selects "Collaborate"
7. The 1slap service prompts for token of agreement, in this case an MOU.

8. User Y selects an MOU.
9. The 1slap service prompts for terms (i.e. of service).
10. User X enters terms and confirms the transaction
11. At this point a block is generated by the 1slap (Blockchain) service that consists of a timestamp and the hashed transaction details along with User X's private and public key
12. The block is transferred to User Y for agreement by signature, where once the nonce is solved, the block is accepted and added to a chain that can no longer be tampered with
13. Once the block is accepted and generated, the transaction is completed, and the token is transferred to User X
14. User X is notified automatically of the incoming transaction
15. Validation is repeated where User X is logged as in agreement in the Blockchain
16. User Y selects digital store as a desired destination to receive token(s) and confirms the transaction
17. Token(s) transferred to the desired destination defined by User Y
18. A notification is generated to both User X and Y that the transaction has been completed successfully
19. The campaign attributes are updated to showcase the collaboration for other potential prospects to peruse and consider (should multiple contributions to the campaign be eligible)
20. The use case ends successfully

Alternative Flows

Invalid User

If User X or Y is not validated, then

1. The use case ends with a failure condition

Insufficient Currency / Token / Terms of service or agreement

If in step User X or Y enters that are not agreeable, then

1. The 1slap service shall display a message indicating that the terms are not agreeable and ask for them to be revisited or refined.

No Response from 1slap.dao Service

If in any step there is no response from the network

1. The 1slap service will re-try, up to # times
2. If there is still no response from the network, the 1slap service shall display the message "Network unavailable – try again later"
3. The use case ends with a failure condition

Quit

If at any point a user (X or Y) select Quit, then

1. A notification will be generated indication the transaction was cancelled
2. The use case ends

Post-conditions

Successful completion

User Y has received the token and the Block log has been updated. The successful transaction (contribution) is disseminated to the network as a form of promotion notifying other users.

Failure completion

The logs have been updated accordingly

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