Investment, Innovation, and Compulsory Spending: A Model of Public-Private Partnerships in Smart City Initiatives

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***Abstract*—This paper examines how public-private partnerships in smart city development may impose compulsory spending through intellectual property costs, impacting local fiscal autonomy and increasing taxpayer burdens. While existing research often highlights the benefits of smart city projects, the assignment of intellectual property rights, particularly patents, remains under-explored. This paper investigates how public-private partnerships in one city can result in assignment of intellectual property rights, and how that in turn can establish mechanisms for compulsory spending in many other cities. Furthermore, this article suggests that such compulsory spending can impact local fiscal autonomy and increase taxpayer burdens. Scenarios where the same investor groups finance multiple projects across different jurisdictions are analyzed, raising concerns about monopolistic control over essential technologies through strategic patent portfolios. This paper concludes that the financial implications for local taxpayers, who ultimately bear the burden and risk of these projects, are frequently overlooked. A framework is proposed to help stakeholders identify such scenarios.**

Keywords-smart cities; governance; United Nations (UN); World Economic Foru (WEF).

I. INTRODUCTION

It is a city's legal obligation to a Public-Private Partnership (PPP) which create the connective tissue between compulsive taxation and the intellectual property owned by the city's contractors. The contractor's control on intellectual property, which is spelled out in the partnership agreements, is structured for the explicit purpose of allowing the contractor to recoup its investment in the partnership [1]. The contractor retains control of intellectual property rights the city relies on and takes control of any new intellectual property. The intellectual property rights on the technology, transferred to the contractor, are what allows the contractor to generate revenue streams far beyond the boundaries of the city where the partnership was created. The revenue streams will be in the form of product sales, contracted services, and technology licensing fees that are paid for by anyone and any city that purchases products based on the contractor's technology. In this way, smart city products and services combined with intellectual property rights give the contractor the ability to not only control who may provide them but also secure a revenue stream from any country that recognizes the contractor's patents. The global scope of the resulting revenue streams allows the contractor to harvest returns that far exceed their costs of developing the technology in the original smart city project. What was once a single's city investment into a novel technology, thus becomes compulsory spending from other cities that rely on it. Ergo, since these cities' resources come from taxes, and tax payments are never voluntary, compulsory spending by these cities to purchase smart city technology can be said to result in taxation.

Sifting through the available information to detect which smart city projects result in compulsory spending can be aided by an analytical framework. However, the vast amount of data available for each project requires a person to choose a framework that can help them put a lens on a smart city project with that purpose in mind. Answering some key questions can help, such as *What framework can help simplify all the available information? What models can be used within the framework? Can the framework be used to determine the value propositions for all stakeholders? And more fundamentally, does the framework rely on a proportional metric of "value" that can be derived for each stakeholder?*

The research project to find analytical frameworks which could answer such questions for smart city projects resulted in the present paper. The research revealed two distinct challenges. First, the definition of "value proposition" is subjective (e.g. financial gain, policy influence, etc.). One person's financial gain on a smarty city project could become another person's financial liability, for example. Second, determining whether the value proposition exists requires the stakeholder to apply an analytical framework to the rich tapestry of information and institutional knowledge attached to the project, which is woven into artifacts such as contracts, documents, policies, databases, lawsuits, and technological innovations. Consequently, defining a proportional metric of "value" that can be derived objectively for all stakeholders is at once challenging and very useful.

We present a framework capable of addressing all three challenges. The framework is based on a proportional metric of value commensurate with each stakeholder's obligations and consequences, not financial picture. Stakeholders are assigned a higher weight of value when they have an obligation to support the smart city project, and a null value when their support of the project is inconsequential. This obligations-based metric simplifies the analysis framework and modeling considerably.

The framework presented is intended to create opportunities to reframe the debate about smart-city projects around an objective analysis, with the taxpayer's interests as stakeholder being a key focus.

This paper is structured as follows. After describing the research method in Section II, the information found about public-private partnerships which is relevant to the framework and model presented in this paper is discussed in Section III. Section IV details the nexus between compulsory taxation and intellectual properties. Section V describes a simplified version of an analysis framework that is typically used to deconstruct and understand smart city projects, and that framework is updated in Section VI.

II. RESEARCH METHOD

Research for this paper was done using a manual review of multiple databases that could provide authoritative sources. A focused literature review was performed, and priority was given to papers and documents that addressed multiple aspects of smart city projects: public-private partnerships, intellectual property, governance, public policy, and technology.

The number papers and relevant documents found were maximized by searching in multiple publication databases that cover the legal, technical, legislative and public policy areas. In general, the databases that provided results for a specific city, in this case Seattle, Washington, USA, contained papers that spanned the broadest set of disciplines. For example, searching for smart city papers in databases maintained by Seattle based organizations yielded papers and documents related to smart city public-private partnerships in academic, legal, technical, public policy, and Seattle specific projects. The same search in databases with a more global reach yielded search results that were relevant to more general technical aspects of smart cities.

Consequently, focusing on Seattle use cases and examples make it possible to tease out the parameters that can be used as the basis of a single analytical framework. The Seattle case is rife with examples that illustrate the challenges of establishing a framework of analysis that provides an objective observer with the means to understand when a smart city project impacts the taxpayer burden in other cities.

The research also revealed that prioritizing papers associated with a specific city, in this case Seattle, yielded very detailed papers addressing legal compliance for smart city projects. For example, the Washington State constitution prohibits the donation of public money to private companies. The legitimacy of a Seattle smart city public-private partnership could be questioned if the financial benefit realized by the city was minuscule compared to the worldwide revenue from the intellectual property tied to the project [2].

All abstracts of ICDS conference papers from 2011 - 2024 were reviewed manually. The body of papers were narrowed down based on abstract content, and a subset of those papers were read in full. The papers that most directly related to the present research topic were selected.

The most productive search terms used included “public-private partnerships”, “ppp”, “smart city public-private partnerships”, “smart city patents”. These same terms were used to find publications at the following places:

- Seattle University Law Review [3].
- The City of Seattle [4].
- King County, Washington. [5].
- The American Journal of Comparative Law [6].
- Elsevier [7].
- Taylor and Francis Online [8].
- World Economic Forum [9].
- US Census Bureau Official Website [10].

In addition, some general google searches were performed using the query “smart city PPP” to find relevant industry information such as Jacobsen’s presentation entitled “Leveraging PPPs for smart city infrastructure” [11].

III. PUBLIC-PRIVATE PARTNERSHIPS IN THE SMART CITY CONTEXT

Public-private partnerships for smart city projects are structured in the same way as other municipal public-private partnerships. A first distinguishing feature about smart city projects, however, is that the city’s choice to form a public-private partnership can be a sign that the project is a “smart city project.” A second distinguishing feature is that the city relies heavily on tech companies to provide products and services [12]. To understand how this might be the case, it is useful to deconstruct that kind of partnership and discuss how it relates to smart city technologies.

Figure 1 shows some common components of a smart city public-private partnership and their relationship to each other.

A. Connecting Stakeholders

In the United States the term public-private partnership denotes government contracts in which the private contractor takes on more responsibility than has been customary [14]. However, a public-private partnership can refer to any type of arrangement that allows the city to shift financing, maintenance and operating costs for public infrastructure to private contractors. The contractors do not bear 100% of the costs of the partnership but share them with the city. Cities have a wide menu of public-private partnership structures to choose from — ranging from contracts for specific services to long-term joint ventures — depending on the city’s role. [11]. While the city’s commitments to the partnership are funded by taxation, the private contractors are allowed to recoup their investment and ongoing costs by charging the public to use of the infrastructure, such as road tolls or usage fees [15]. In the context of smart city infrastructure, the city relies on tech companies to equip the city, and the charges are built into products and services that incorporate intellectual property owned by the contractor [12].

Regardless of the partnership type, however, contractors rely on patents to recoup costs and generate revenue. In addition to providing new revenue streams, patents can be used as a defensive measure - to prevent anyone from interfering with their work on the partnership. They can also generate returns that fund new research programs unrelated to their immediate partnership, which suggests that smart city projects are lucrative enough to regard them as a strategic

growth opportunity, as opposed to just providing a public service [1].

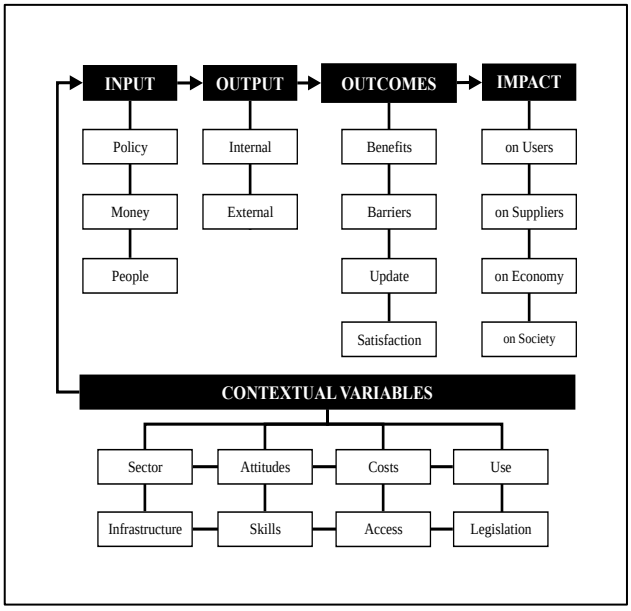

Figure 1. Components of a smart city public-private partnership [13].

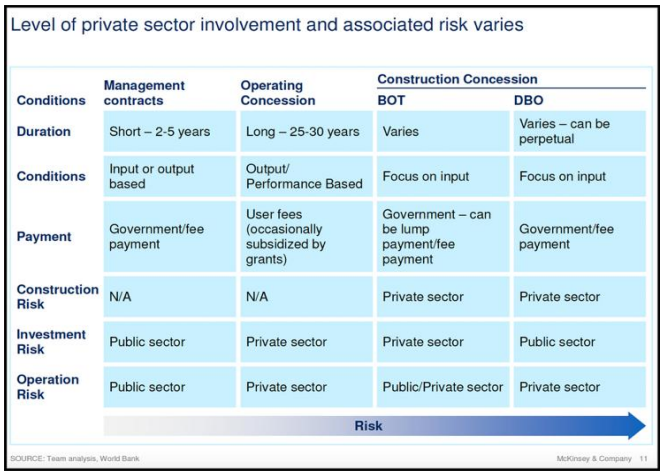

Figure 2. The type of partnership affects how much and type of risk the government entity assumes [11].

Furthermore, the contractor's control on intellectual property, which is spelled out in the partnership agreements, is structured for the *explicit purpose* of allowing the contractor to recoup its investment in the partnership. In such an arrangement the contractor retains control of intellectual property rights the city relies on and takes control of any new intellectual property. The rights assignment aspect of the project emphasizes the important role intellectual property rights have in smart city projects. These rights are often bundled into larger intellectual property portfolios, which can include things like trademark and copyright [15]. A survey of patents related to smart cities indicates that the larger corporations seem to be accumulating patent portfolios related to smart city technology. A portion of the patent counts is presented below in Table I [16].

TABLE I. TOP PATENT FILING COMPANIES IN 2023 [16].

Company	Patent Count
Samsung Electronics	4,035
LG	1,093
Huawei	977
Cisco	966
Intel	446
Vietnam	259
IBM	207
Strong Force IOT	185
Qualcomm	183
AT&T	133

B. *Risk Management*

Contractors, as all city vendors, who participate in smart city projects contend with the same risks that affect any other municipal project [12]. The risks originate from many sources. Some examples include policy goals, local political contexts, availability of federal funding, regulations affecting vendors, and debates over intellectual property. Figure 2 depicts the risks associated with various types of public-private partnerships.

Another risk discussed in literature is corruption. Public-private partnerships are susceptible to corruption risk as well, although it is challenging to document. Some attempts to measure government corruption have been attempted, however they do not address policy issues that lead to it. The design of the contracts involved, the duration of the contracts, and the composition of the actors can make public-private partnerships vulnerable to corruption [17][18].

Given the risks mentioned, clearly the local municipal context has a significant impact on how well smart city partnerships can be managed, especially with respect to the contracts used to set up the project.

C. *Global Agendas*

Companies claim that their research combined with strong patent protections empower them to use smart city projects as technological proving grounds that solve problems facing urban centers such as first/last mile, logistics, traffic congestion, and delivery of e-Government services [19]. However, not all companies are developing new products and technologies. In some instances, venture capital firms are using smart city projects to refresh patent portfolios [16][20][21]. And for some organizations like the World Economic Forum (WEF), the concept of "smart city governance" is marketed as a justification for agendas like the WEF C40, UN 2030 [22]. While a city may only allow the WEF to sponsor a single smart city project, the city agrees to

support the WEF's broader policy goals, some of which are depicted in Table II. The WEF, has stated that its Smart Cities Alliance program is a vector for it to influence governance policy at the local level:

> "Representing more than 200,000 cities and local governments, companies, start-ups, research institutions and non-profit organizations, the Alliance is leading numerous initiatives in more than 36 pioneer cities around the world focusing on smart city governance…" [22]

Clearly for the WEF, establishing a robust influence on local smart city related policies is a multi-fronted effort. In some cases, the WEF seeks to influence local policy through a targeted campaign such as the Global Cities Alliance, as shown in the above quotation. And in other cases, it seeks to inject policy that affects smart city technology through larger programs such as the C40 Cities Initiative. Regardless of what vector is chosen, the result is intended to affect the purchase and use of smart technologies. In 2006 Seattle signed onto the WEF's C40's initiative [22].

While The World Economic forum seeks to leverage smart city projects to support its agenda, the effort draws into sharper contrast the differences between organizations outside the city, and the taxpayers, who fund the city with compulsory tax revenue.

D. Obligation Based Value Propositions

Taxpayers have a unique relationship with the other stakeholders of a smart city public-private partnership, in that they are the only group required to participate through compulsory taxation. The city's participation and the private contractor's participation are voluntary and can even be ended whenever the agreements that underpin a smart city project allow. For example, the individual taxpayer cannot calculate the proportion of their taxes that would be used in a public-private partnership and withhold that from their property tax payments for any reason. Doing so would put the local government in a position of seizing the taxpayer's property such as their home and shutting down their businesses [24].

The relationship taxpayers have with their city illuminates a striking aspect of value propositions in the context of the smart city - the net financial benefit of a smart city project is a moot point for some stakeholders. In Seattle's case there are three concrete examples that illustrate this. Seattle contributed $400,000 to a new AI Incubator which works out to a one-time charge of about $0.53 (fifty-three cents) per taxpayer or less. In another instance, residents pay for local programs based on the value of their homes, which is described in Section IV below. In addition, legal analysis on public-private partnerships in Washington State, where Seattle is located, purposely exclude financial analysis of the various stakeholders [2]. Framing the concept of value proposition based on rote financial calculations, therefore, unnecessarily discard those stakeholders from analysis for whom the smart city project is most consequential.

While an analysis of value propositions based on realized benefits is challenging, assigning a value metric based on their *obligations and consequences* is more straightforward for all cases. Each stakeholder's obligations and consequences are generally spelled out in clear terms in contracts and agreements that communicate the smart city partnership. Table 5 in Section 6, below, illustrates how this concept might be applied.

TABLE II. WEF TARGETS AFFECT THE USE OF TECHNOLOGY AMONG OTHER PRODUCTS [23]

Consumption category	Consumption interventions	Emission reductions per consumption category between 2017 and 2030	Emission reductions per consumption category between 2017 and 2050
	• Reduce the number of new clothing items bought every year • Reduce supply chain waste	39% (Reducing the number of new clothing items alone accounts for 37%)	66% (Reducing the number of new clothing items alone accounts for 64%)
	• Dietary change: eat in line with health recommendations and lower meat and dairy consumption • Reduce household waste • Reduce supply chain waste	36% (Dietary change alone accounts for 27%)	60% (Dietary change alone accounts for 45%)
	• Reduce number of flights • Increase adoption of sustainable aviation fuel	26% (Reducing number of flights alone accounts for 18%)	55% (Reducing number of flights alone accounts for 31%)
	• Improve materials efficiency • Enhance building utilisation • Switch to lower carbon materials • Adopt low-carbon cement • Reuse building components	26% (Improving materials efficiency and enhance building utilisation together account for 18%)	44% (Improving materials efficiency and enhance building utilisation together account for 29%)
	• Reduce car ownership • Increase car lifespans • Increase material efficiency	28% (Reducing car ownership alone accounts for 24%)	39% (Reducing car ownership alone accounts for 31%)
	• Optimise lifetimes of IT equipment	18%	33%

IV. PUBLIC-PRIVATE PARTNERSHIPS CONNECT TAXATION TO INTELLECTUAL PROPERTY PORTFOLIOS

One of the recurring narratives of smart city projects is the notion of the value proposition realized by the taxpayer. Smart city literature available from Seattle reveals that value is often described in overgeneralized terms such as "increasing equity", and this appears to be the case for many of the more politically liberal cities within the United States [26]. A more concrete notion of monetary value, however, can be defined based on hard taxpayer payments if data about those payments are publicly available.

Research by the Tax Foundation provides data that establishes a reasonable data set that can be used for this purpose [27]. A subset of their data is reproduced here:

TABLE III. EFFECTIVE LOCAL TAXES PAID BY RESIDENTS OF CERTAIN CITIES, IN ADDITION TO FEDERAL INCOME TAXES [27].

State	Local Effective Tax Rate
New York	15.90%
California	13.50%
Washington	10.70%

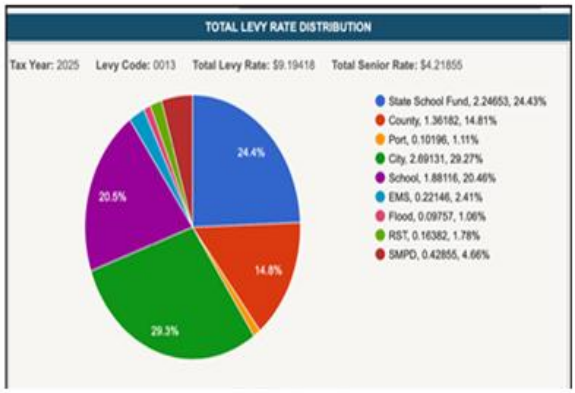

Figure 3. Allocation of homeowner taxes by government program [25].

In addition to effective local tax rates, which can help estimate the average expected tax burden of a city's population, a random selection of property taxes can provide more concrete data. A home in Seattle is presented as an example. Table III shows that the homeowner pays about $66,000/year in property taxes [25]. The use of this revenue paid by the homeowner of this Seattle home is also broken down by program. There are nine different government run programs supported by these taxes (Figure 3), and each program has the authority to create a smart city public-private partnership.

While lump sum property taxes such as these illustrate the overall investment residents currently make into their communities, incorporating them into an analysis framework for smart city projects can lead to misleading results. The literature revealed this can happen for a couple of notable reasons. First, the range of investment attributed to any single taxpayer varies widely. For example, Seattle contributed $400,000 to a new AI Incubator which works out to a one-time charge of about 53 cents per taxpayer. Second, in the legal context the use of monetary values is a moot point. For example, judges in Washington State, where Seattle is located, routinely exclude specific financial information when considering the constitutional aspects of a smart city project [2].

Deconstructing the types of taxes residents pay to fund a city is critical to understanding how public-private partnerships bridge the gap between taxation and intellectual property portfolios. The city itself, at least in the case of the United States, is formed by the residents who live in the area, and the resources a city can make available for smart city projects come ultimately from taxation, either past taxation or future. The power of a city to enter public-private partnerships is created under the authority of the city's charter, which the citizens of the city define during the formation of the city. While the city itself may be the initiator of a public-private partnership, it relies on various types of technologies that will be utilized or created as part of the project. The technologies, in turn, are covered by exclusive rights typically under the control of one of the contractors in the private sector. While the private individuals and companies have a right to profit from the intellectual properties they control, the public has an interest in maintaining basic city infrastructure and services, as well as improving the quality of life [28]. The public-private partnership serves to bridge the gap between private interests and public good within the smart city context.

Because of the tight association between It is helpful to regard the city as a "taxpayer funded startup" for smart city projects, and this is particularly evident when the city invests in actual new business incubators [21].

TABLE IV. AN EXAMPLE OF PROPERTY TAXES PAID BY A SINGLE HOMEOWNER IN SEATTLE, WASHINGTON, USA [25].

Tax Information	2025	2024	2023	2022
Levy code	0013	0013	0013	0013
Status	Taxable	Taxable	Taxable	Taxable
Omit year	0000	0000	0000	0000
Land value	$2,938,000	$2,739,000	$2,739,000	$2,218,000
Improvement value	$4,181,000	$4,108,000	$4,929,000	$3,702,000
Charges				
Tax	$65,453.37	$61,983.90	$62,255.72	$52,270.05
Surface Water	$1,498.72	$1,372.46	$1,290.38	$1,219.00
Noxious Weed	$6.30	$6.30	$6.30	$5.41
Conservation	$13.03	$12.79	$12.47	$12.17
Total billed	$66,971.42	$63,375.45	$63,564.87	$53,506.63
Amount paid	$0.00	$63,375.45	$63,564.87	$53,506.63
Interest	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Penalty	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Balance	**$66,971.42**	**$0.00**	**$0.00**	**$0.00**

V. THE PRESENT SIMPLIFIED ANALYSIS FRAMEWORK

It is clear that any person using an analysis framework on smart city projects will need to account for many complex factors. This issue has been documented by other authors, who correctly point out that even deriving a basic notion of what "value" is for a smart city project is subjective. This is because different stakeholders, such as end-users and professionals, will arrive at different definitions of "added value" of the solution [29].

To make determinations of added value even more complicated, the impact of time, needs to be addressed. While measuring impact is a useful measure to derive for a municipal project, it is only possible to take a snapshot in time of impact [13]. This limitation can be compensated for, however, by analyzing the various contracts and controlling agreements of a public-private partnership to determine the obligations each stakeholder has. These agreements also account for controlling policies and regulation for the duration of the project. The snapshot dilemma is eliminated through this approach because the underlying agreements are applicable for the duration of the project.

A linear model based on the information presented above is now described. Taxpayers fund governments, which then allocate them to projects. The model is expressed as a cashflow diagram in Figure 5.

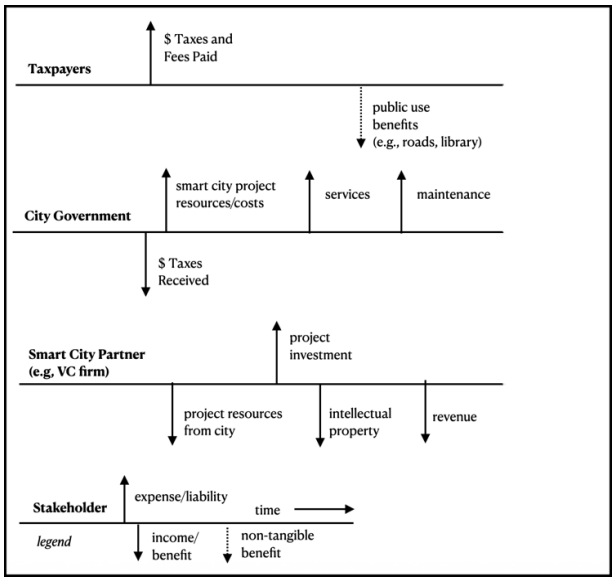

Figure 4. Costs and benefits to public-private partnerships can be understood as simple inputs and outputs.

VI. A New Framework

Other authors propose a template for characterizing the value proposition a smart city project provides the public from a technical, or systems perspective. The concept of a value chain typically defined in the business context is employed to capture the variety of ways that a project would presume to serve a public good [30]. Relying heavily on a systems approach to the exclusion of basic human needs and desires, however, risks alienating the population, or in a worst-case scenario treating the population as a "problem to be managed" [31].

An analysis framework that omits stakeholders or does not weigh the projects benefits against the stakeholders' individual obligations would blind an analyst to circumstances, writ-large, that could render the entire project useless to anyone. For example, a contractor who receives a grant to complete a smart city project has no obligation to demonstrate additional value to the taxpayers who indirectly funded the project. This creates an imbalance of responsibility where the taxpayer can be sanctioned for not paying taxes that support the project, while the grant recipient has no apparent consequence of failing other than a poor reputation and perhaps loss of future opportunities. This would be permitted in a scenario where the needs of the grant recipient were considered to the exclusion of the taxpayer's obligations to fund the project.

With that in mind, the simplified model above is now updated to incorporate the notion of stakeholder obligations to a public-private partnership. When incorporated into an analytical framework, assigning value based on obligations,

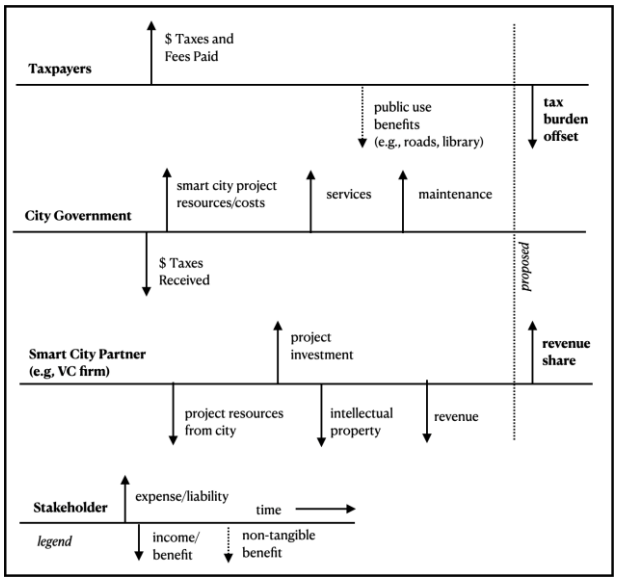

Figure 5. A revenue share that offsets tax burdens is one of many options.

or consequences, identifying an objective value proposition for each stakeholder is a straightforward exercise. Table V presents an example.

TABLE V. Project values change based on partnership structure.

Stakeholder	Project. Name	Value Proposition	Obligations	Value Metric
Taxpayers	Smart Sensors	none	Tax payments required.	0
City Government	"	publicity	Grants, loan guarantees, office space	20
Technology Provider	"	sales	provide smart sensors	50
Smart City Startup	"	patents	fund 20% of project costs	80
Taxpayers	Fiber infrastructure	Available service	Optionally subscribe to internet	80
City Government	"	Increased tax base	Grants, loan guarantees, office space	60
Technology Provider	"	sales	Install fiber	50
Smart City Startup	"	patents	fund 50% of project costs	20

In Table V, there are two projects and the same set of stakeholders for each project. In the first project "Smart Sensors" the project has no value to taxpayers because they are required to fund a technology through taxes that they will not make direct use of. The second project, "Fiber

infrastructure", provides taxpayers an optional Internet service on the city's new fiber optic network. The project takes on a high value to the taxpayers because their payments for the service are only made when they are using the service. The value metric for the Smart City Startup, however, is decreased dramatically, because it is accepting the obligation of funding 50% with no guarantee that citizens will subscribe to the service. There is some value, however, to the Startup because it can recover costs through patent revenue.

VII. Conclusion and Future Work

In this paper, we claim companies can leverage one city's smart city project to create intellectual property rights which empower them to collect revenue from other cities which, in turn, can impact local fiscal autonomy. We also claim that applying an obligation-based value metric to all stakeholders can help analysts to identify the overall effects of intellectual property assignment to a city's contractor. To demonstrate why and how this can be done, we pulled together a broad set of selected data and research from multiple disciplines that are in-scope for smart cities. Concrete examples are used to show how diverse topics intersect in the context of a public-private partnership, such as intellectual property rights, systems related topics, intergovernmental organizations, municipal governance, legal aspects, and even constitutional considerations. Simple flow diagrams are used to illustrate the application of a simple analysis framework that can capture the obligations and benefits each stakeholder is expected to receive in a smart city public-private partnership. We demonstrate that the objective information needed for such analysis can be extracted from the underlying agreements, laws, and policies that govern the public-private partnership. We then extended the analysis framework to include a mechanism by which the tax obligations of a city taxpayer could be offset by intellectual property revenue.

The framework and model presented aims to shift the narrative around smart city projects to account for the value proposition stakeholders receive, and to express that value proposition in terms of how consequential the project is to each one. The project documents, contracts, data, and other concrete information that memorializes the legal partnership can be utilized to objectively assess the obligations of each stakeholder, determine the value propositions, and assign a value metric based both.

A path to future work is also implied by the analytic framework and model presented. This approach is expected to scale to projects of any size, and in general the work will simply increase with the amount of information available about the project.

Using this framework to analyze real projects is suggested as a future project.

References

[1] T. S. Woodson, "Public private partnerships and emerging technologies: A look at nanomedicine for diseases of poverty, Research Policy," vol. 45, issue 7, 2016, pp. 1410-1418, ISSN 0048-7333, https://doi.org/10.1016/j.respol.2016.04.005.

[2] N. Beermann, "Legal Mechanisms of Public-Private Partnerships: Promoting Economic Development or Benefiting Corporate Welfare?," 23 SEATTLE U. L. REV. 175, 1999.

[3] Seattle University Law Review. (Online). https://digitalcommons.law.seattleu.edu/sulr/. [retrieved: December 2024].

[4] The City of Seattle Website. (Online). https://www.seattle.gov/. [retrieved: November 2024].

[5] King County, Washington, USA Website. (Online). https://kingcounty.gov/. [retrieved: November 2024].

[6] The American Journal of Comparative Law. (Online). https://academic.oup.com/ajcl. [retrieved: February 2025].

[7] Elsiver. (Online). https://elsevier.com. [retrieved: November 2024].

[8] Taylor and Francis Online. (Online). https://www.tandfonline.com/. [retrieved: January 2025].

[9] World Economic Forum. (Online). https://www.weforum.org . [retrieved: January 2025].

[10] US Census Bureau. (Online). https://www.census.gov. [retrieved: February 2025].

[11] P. Jacobsen, "Leveraging PPPs for Smart City Infrastructure," World Bank. [Online]. Available from https://www.gfdrr.org/sites/default/files/D3_CaseStudy16_PaulJacobson_PPP_Smart_cities.original.1531294896.pdf. [retrieved: February 2025].

[12] A. Voorwinden, "The privatised city: technology and public-private partnerships in the smart city," Law, Innovation and Technology, 13(2), pp. 439–463. https://doi.org/10.1080/17579961.2021.1977213.

[13] L. Berntzen, "Measuring the Impact of eGovernment Services," The Eighth International Conference on Digital Society (ICDS 2014) IARIA, March 2014, pp 54-58, ISSN 2307-3956, ISBN: 978-1-61208-324-7

[14] D. Custos and J Reitz, "Public-Private Partnerships," The American Journal of Comparative Law, vol. 58, Issue suppl_1, Supplement 2010, pp. 555–584, https://doi.org/10.5131/ajcl.2009.0037.

[15] M. Buso, M. Moretto, and D. Zormpas, "Excess returns in Public-Private Partnerships: Do governments pay too much?," Economic Modelling, vol. 102, 2021, 105586, ISSN 0264-9993, https://doi.org/10.1016/j.econmod.2021.105586.

[16] C. Kalleya, A. Purnomo, E. D. Madyatmadja, and Meiryani, M. Karmagatri, "Smart City Applications: A Patent Landscape Exploration," Procedia Computer Science, vol. 227, 2023, pp. 981-989, ISSN 1877-0509, https://doi.org/10.1016/j.procs.2023.10.607.

[17] P. Silal, A. Jha, and D. Saha, "Managing E-Government Development for Reducing Corruption via Effective Policymaking: Emerical Evidences from Cross-Country Analysis," The Thirteenth International Conference on Digital Society (ICDS 2019) IARIA, February 2019, pp 1-7, ISSN 2307-3956, ISBN: 978-1-61208-685-9.

[18] R. M. Schomaker, "Conceptualizing Corruption in Public Private Partnerships," Public Organiz Rev 20, pp. 807–820, 2020. https://doi.org/10.1007/s11115-020-00473-6.

[19] M. Scutella, C. Plewa, and C. Reaiche, "Customizing eGovernment Support Services: A Value Co-Creation Perspective," The Fourteenth International Conference on Digital Society (ICDS 2020) IARIA, November 2020, pp 30-33, ISSN 2307-3956, ISBN: 978-1-61208-760-3.

[20] T. Cellucci and J. Grove, "Leveraging Public-Private Partnership Models and the Free Market System to Increase the Speed-of-Execution of High-Impact Solutions throughout State and Local Governments," US Homeland Security Science and Technology. [Online]. Available from: https://www.dhs.gov/xlibrary/assets/st-leveraging-partnerships-for-state-and-local-governments-August2011.pdf. [retrieved: February 2025].

[21] Seattle AI Incubator Announcement. [Online] https://harrell.seattle.gov/2025/03/27/mayor-bruce-harrell-and-city-of-seattle-launch-groundbreaking-ai-incubator-to-propel-the-next-generation-of-ai-entrepreneurs/. [retrieved: March 2025].

[22] World Economic Forum. (Online). https://www.weforum.org/impact/smart-cities-governance-alliance/ [retrieved: February 2025].

[23] WEF C40 Cities, ARUP, and University of Leeds, “The Future of Urban Consumption In a 1.5°C World,” World Economic Forum. (Online). https://www.c40.org/wp-content/uploads/2023/04/2270_C40_CBE_MainReport_250719.original-compressed-1-2.pdf [retrieved: March 2020].

[24] King County Tax Foreclosures. (Online) https://kingcounty.gov/en/dept/executive-services/buildings-property/treasury-operations/tax-foreclosures [retrieved: February 2025].

[25] King County Parcel Viewer. (Online) https://gismaps.kingcounty.gov/parcelviewer2/. [retrieved: February 2025].

[26] Columbia Telecommunications Corporation, “A Plan For Facilitating Equitable Access to Wireless Broadband Services in Seattle,” City of Seattle. [Online]. Available from https://www.seattle.gov/documents/departments/broadband/facilitatingequitableaccesstowirelessbroadbandservicesinseattlectcreport2017.pdf. [retrieved: June 2017].

[27] Y. Erica, J. Walczak, “State and Local Tax Burdens, Calendar Year 2022,” Tax Foundation. (Online) https://taxfoundation.org/data/all/state/tax-burden-by-state-2022/ [retrieved: June 2024].

[28] T. Szewc and S. Rubisz, “Intellectual Property Issues in Managing a Smart City,” Scientific Papers of Silesian University of Technology – Organization and Management Series, iss. 168, Available at SSRN: https://ssrn.com/abstract=4351515 or http://dx.doi.org/10.2139/ssrn.4351515.

[29] M. Hartog and B. Mulder, “Preconditions for the Structural Deployment of (Digital) Technology for Healthcare in a Participatory Society: Validation of methodological and practical challenges,” The Twelfth International Conference on Digital Society (ICDS 2018) IARIA, March 2018, pp 14-16, ISSN 2307-3956, ISBN: 978-1-61208-615-6.

[30] C. Pfister, S. Haller, and E. Klein, “Towards a Smart City Blueprint Template,” The Thirteenth International Conference on Digital Society (ICDS 2019) IARIA, Februaryt 2019, pp 30-36, ISSN 2307-3956, ISBN: 978-1-61208-685-9.

[31] G. Halegoua, “Smart Cities,” Chapter 4; MIT Press: Cambridge, MA, USA, 2020.