

培育数字化集成城市系统： 以加拿大卡雷拉瓦尔公园为例

Fostering Urban Digital Integrated Systems: The Case of Carré Laval, Canada

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摘要

许多城市的政府部门应用数字技术来提高城市软硬件设施系统，以培育创业型社会，开创新型服务，提高市民生活质量，优化城市体验，提振地方经济。建设有传统基础设施的城市系统往往天然具有垄断性，而基于数据的数字平台可以促进多元利益相关方的参与。本文提出了混合型数字化集成城市系统的概念以及设计方法论，旨在将数字技术和实体设施融入到城市环境中。而后介绍了由麻省理工学院可感知城市实验室学生设计、笔者指导的设计项目，以加拿大拉瓦尔市卡雷拉瓦尔公园建设与改造项目为例，整合了数字技术并提出设计方案——6名学生在课程中每人提出一项设计方案，分别为“屏幕激活”“无限记忆”“论坛”“智能桌”“我的AR世界”和“饮食足迹”，这些设计能够促进公园改造项目建设进程中的公众参与。以人为本、因地制宜地进行方案设计可以促进数字技术与城市系统更好地融合，并增加城市对本地新兴利益相关方的吸引力，为他们营造新的城市体验。

关键词

城市环境；城市体验；公众参与；以人为本设计；数字化平台；教育；卡雷拉瓦尔公园

ABSTRACT

City governments are embracing digital technologies to improve hard and soft urban systems, so as to create and improve urban experiences, foster an entrepreneurial city, as well as devise novel services that can improve the livability of citizens and boost the local economy. Unlike traditional infrastructure and urban systems, which tend to be natural monopolies, data-driven digital platforms can engage multiple stakeholders simultaneously. This article, introducing the notion of hybrid urban digital integrated systems, proposes a methodology aims at the integration of digital and physical elements in urban environments. We based our discussion on the work developed by students at the Massachusetts Institute of Technology Senseable City Lab, which focused on the integration of the digital-technology-based solutions in Carré Laval of the city of Laval, Canada. As the result of the workshop, six projects have been developed by students, namely, "Activating Surface," "Infinite memories," "Fora," "iTable," "MinecARt," and "Foodprint." These designs aim at promoting civic engagement as intrinsic elements of the re-appropriation and redesign of this severely underutilized site. The human-centered designs rooted in specific context will help digital technologies embedded in the city and increase the attractiveness of the city to local and new stakeholders.

KEYWORDS

Urban Environment; Urban Experiences; Civic Engagement; Human-Centered Design; Digital Platforms; Education; Carré Laval

1 研究背景

许多城市都制订了诸如促进创新、扩大开放、加强协作、重视循证、提倡参与等发展目标^①，为实现相关目标，物联网（Internet of Things）和人工智能（Artificial Intelligence）等数字技术在其中发挥着重要作用。物联网是一个由相互联通的设备组成的系统：这些设备可以收集数据，将其接入互联网并进行分析，在某些情况下，可以改变基于物理实体的感应—动作循环的行为/反应^[1]。近年来，物联网技术通过其所串联的设备已在不知不觉中渗透到了人们的日常生活中。举例来说，人们随身携带的设备即包含各种传感器，持续不断且悄无声息地记录并上传了大量个人行踪信息。同时，建成环境中也分布着各种传感器，常见的有检测空气质量和噪声等环境因素的仪器。人工智能可以通过收集到的数据完成诸如视、听、说、学习和搜索等通常需要借助人类智慧才能完成的工作^[2]。因而一些城市已经开始探索利用物联网和人工智能技术的方法，更好地服务居民，改善其生活质量。比如，纽约新近颁布了《纽约市物联网战略》，墨尔本、哥本哈根和赫尔辛基等城市也实施了应用数据平台的战略^{[3]-[6]}。近几年，50多个国家正在制定或已发布人工智能战略。

城市中存在大量可用的数据，这的确可以为当地社区居民和游客开启探索新的生活与体验方式的可能性。即便如此，在数字技术的应用过程中仍需注重以人为本——因地制宜、考虑各利益相关方

的需求，避免造成城市中数字化元素与物理实体的割裂。践行这一城市发展路径需要规划师和政策制定者与当地利益相关方合作，在理解并接受新的方法的基础上，将数字技术集成到城市的实体社会环境中，可以取得意想不到的成果。新的方法论将为政府部门对公共空间的营造和决策提供新的见解，确保此类项目的成功，给政府及其公私合作方带来切实利益。

近年来，包括麻省理工学院的可感知城市实验室（SCL）在内的许多实验室都在密切关注相关话题。SCL的目标是在城市建成环境中应用上述数字技术，预测其未来的需求和发展机遇，以求获得新的见解和独一无二的设计方案。如今，SCL已经能够通过应用大数据、人工智能和物联网等数字技术使事物间的联系更加紧密，也令居民更加理解自身所处的空间。

本文综合考虑城市—人—技术三个维度，提出一套应用数字技术的设计方法论，旨在创建一个“混合型数字化集成城市系统”——一个通过自然元素、技术和以人为本的设计理念相互联系的公共空间系统。近年来，SCL工作坊反复针对不同城市开展此类研究，最终形成了这套方法论，与各案例一并出版于《可感知城市指南》系列丛书^②中。

2 设计过程

在世界各地的不同城市中，物联网/人工智能技术的应用可能会造成一系列关于“适度”使用

的问题。法比奥·杜阿尔特和里卡多·阿尔瓦雷斯的研究结果表明运用数据驱动的新技术可以促进城市研究，但必须与城市及市民对其内在社会价值的判断相适应^[7]。了解一个地区的独特需求和发展目标绝非易事，因此混合型数字化集成城市系统的实施需要为公众参与预留出一定时间。此外，由于建设有传统基础设施的城市系统往往天然具有垄断性，因而也需要借助公众参与的力量才能打破传统观念，将动态数字技术加诸其上，并制定具体的实施策略。例如野心勃勃的、以公众参与为活动宗旨的“欧洲公民计划”，期望在其项目规划期内（2021~2027年），鼓励并促进公众在应对因科技造成的问题中的参与度^[8]。如果数字技术的使用不以人为本，不因地制宜，那么其实施效果可能也无法实现其预期价值。

基于此议题，笔者与SCL的同学们将上文中提出的方法论应用于加拿大拉瓦尔市的卡雷拉瓦尔公园，探究如何通过改造公园中的公共空间改善居民生活质量、促进创业，以及增加公园对当前和未来居民和游客的吸引力。具体而言，学生们首先进行

① 来自世界各地的多个城市均实施了应用数字技术的政策，例如韩国首尔市政府的智慧城市平台、冰岛的“建设更好的雷克雅未克市”计划、英国伦敦的数据平台，以及波兰卢布林的“绿色预算”计划，这些项目表现出了相对一致的发展目标。更多信息详见各项目官方网站。

② 完整成果可详见SCL官方网站。



1. “屏幕激活”装置情景图
2. “屏幕激活”装置为不同社会群体的聚集提供了场地。

1. Activating surface scenario
2. An installation inviting various social groups to stay together



3. “无限记忆”装置示意图
3. Infinite memories diagram

环境分析发现问题, 随后结合数字技术组织设计思路, 最终生成详尽的技术应用和设计方案, 创造出具有参与感的城市体验。

目前, 加拿大拉瓦尔市正在开展对大片市中心区域的改造工程, 将其建设成为知识经济的创新中心。“卡雷拉瓦尔公园项目”作为其中的一部分, 旨在重新利用位于旧采石场中40hm²的场地, 将这片利用率低下的区域转变为新建生物技术中心和城市商业区之间的纽带——一个集生活、工作、教育和休闲娱乐于一体的多功能开发区。

每项设计方案必须要解决在实体环境中应用数字技术时会出现的一些问题, 如技术架构开发只顾眼前临时的使用需求, 而缺乏应对未来多功能需求的弹性, 亦不具备采纳居民、社区团体和企业在实际应用时可能产生的出乎意料的想法的能力。设计过程中需要清晰透明地展示出信息的收集和使用方式, 以完善社会的共建共享并实现共同利益。为了满足上述要求, 设计方案基于笔者提出的方法论生成, 不仅能够整合数字技术及其生成的数据生态系统和建成环境, 而且具备应对未来变数的灵活性。上述方法论包含以下四个步骤:

1) “背景分析”是确定研究问题的基础。学生们通过定性和定量研究的方法, 尽可能了解场地特征、项目涉及的利益相关方以及需要解决的主要矛盾, 在考虑场地周边环境和城市发展目标后, 提出具有针对性的对策。

2) “用户交互分析”需涵盖所有使用者的操作和互动: 包括发生于物理空间中的人们获取数据

和使用设备时的本地用户交互; 以及在人们在城市中进行位移或使用由数字技术提供的服务时, 无形中产生的数字化的用户交互。此步骤反映出当人们身处于这个逐渐融合了数字技术的实体环境中的感受, 同时由于他们有意无意的行为促进了这一融合的发生, 这个步骤也对人们使用数字技术的动机进行分析。

3) “城市交互分析”旨在分析数字技术应用于微观到宏观的各级城市基础设施时的影响。项目必须要与周边环境相互连接并对其产生积极影响, 实现共赢。

4) “技术分析”聚焦于技术的应用和选择。这需要某种分析方法来选择传感器(用于数据采集)与执行器(用于产生实体—数字反馈或效果)。传感器和执行器或者服务于特定用途, 如针对预先设定的用途专门设计和放置; 或者不预先设定用途, 借助既有设备获取信息, 也许会收获意料之外的惊喜。“技术分析”步骤需要对城市系统中技术的应用进行反思, 充分理解数据处理和分析过程, 包括数据的所有者是谁; 如何控制、访问和维护数据; 数据的处理和分析过程是自动还是手动、其输入/输出内容分别是什么, 以及从原始数据得出输入/输出内容的具体步骤。

在2020年的“数字城市工作坊”中, 6位学生分别提出了一项设计方案, 并以设计概要的形式收录于《拉瓦尔可感知城市指南》^②。本节将从上述四个方面简要介绍每个方案。

“屏幕激活”方案(图1)由王冠一(音)设计, 旨在通过在公园内设置配以人工智能的与现实相交互的界面系统, 为游客提供类似社交体验的个性化运动和健康指导, 进而推广健康的生活方式。将增强现实技术应用于半透明的玻璃镜面, 生成教练员的全息影像, 督促用户开展运动(图2)。这些镜面遍布整个公园, 使用户获得个性化指导, 并且可以自由选择运动场地和项目, 可选项目包括瑜伽、有氧运动, 甚至越野滑雪等。此系统可以为单人或多人提供运动指导, 也可以为亲子或儿童提供服务。

“无限记忆”(图3)由祖宾·鲁斯托姆·瓦迪亚设计。人们常常在公园中建造纪念碑和纪念馆, 使其成为承载城市集体记忆的场所。本方案基于此传统, 旨在使不同社会群体对彼此的文化和准则的理解更为深入。具体而言, 首先对数字化的个人和集体记忆进行编码, 并将其储存在激光蚀刻的实体

玻璃标牌中。然后, 这些纪念标牌会被放置在互动装置“记忆之台”上, 以此保存拉瓦尔市居民的记忆。如需回放记忆, 可通过一系列分散放置的投影仪将其放映在水幕上。

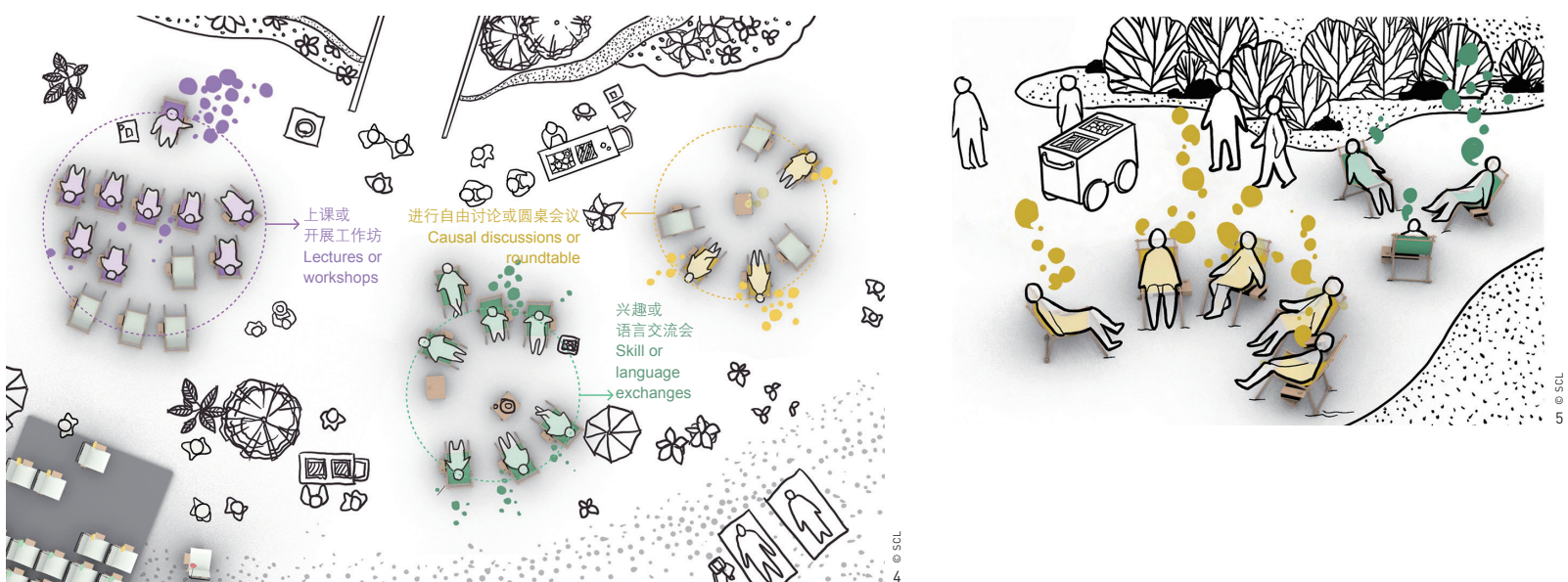
“论坛”(图4)由贾祎晨(音)设计, 旨在促进公园游客之间以工作或休闲为目的的社交。项目设计了一组结合了数字技术的座椅, 可以进行动态响应, 促进使用者之间的协作和交流(图5)。座椅上装有多种传感器, 若座椅彼此靠近就会相互识别, 同时座椅的不同的灯光模式有助于人们快速定位。这些座椅可以通过一款App同步灯光模式, 兴趣相投的人们可以在此App上互相约见, 并通过相同灯光模式的座椅相互识别。座椅的灯光还可以为人们互相交谈营造出有趣的氛围。

“智能桌”(图6)由黄子栋(音)设计, 期望通过公园中的服务设施促进人们的协作、创意和设计活动。在这个项目中, 通常只被用于迅速解决午餐的不起眼的公园餐桌将变身成为电子触控屏幕, 于公园自然环境中创造出一片具有极大生产潜力的空间。

“我的AR世界”(图7)由张子慧(音)设计, 探索了一种促进包括少数族裔在内的多个社会群体参与决策中的途径, 以此使将拉瓦尔市建设为一座包容且可持续的城市。此项目中, 运用增强现实技术和游戏机制创造了一种新型公众参与途径, 让市民和游客通过空间化的三维数据发表见解并相互讨论(图8): 通过智能手机, 按照自己的想法从大型三维模型库中选取新建筑或城市户外家具等元素, 将其组合起来绘制成草图, 以此进行公共干预。草图绘制完成后, 可以上传到特定平台进行分享并获取他人的评论。

“饮食足迹”(图9)由朱子源(音)设计, 旨在推广健康饮食, 同时维持并重新发现那些历史悠久的饮食传统。建议在公园中建造社交饮食空间——“智能”变形厨房, 由人工智能技术根据特定场合为用户推荐食谱, 同时用全息投影指导烹饪过程; 同时鼓励创新以及分享新食谱。公园中的厨房不仅可以给用户留下难忘的聚会记忆, 而且可以通过彼此分享食谱在用户间建立连接, 同时也可以通过数字化平台在用户与本地生产商间建立连接, 使其更易获取高质量的本地食材。

上述方案都不是闭门造车的结果, 而是通过贯穿整个学期的一系列工作坊和线上讨论^③, 与同学及拉瓦尔居民合作和沟通的最终成果。事实证明这些环节极大地促进了每个方案的形成, 尤其是体现在



通过批判与评价打磨自己的想法、改进方案的过程中。方案中的想法都可以成为促成不同利益相关方和拉瓦尔居民对话的机会。

3 讨论与评价

将数字技术应用于城市系统，为提供数据驱动的智能服务创造了条件，同时可以通过在设计逻辑中内置反馈回路，使得设计方案能够应对动态变化、适应多种功能需求。这样，数字技术的应用或许有助于改善现有的城市系统，并且在地方和区域尺度上促进创业生态系统的革新，如地方小店或许会开发出与社区间的新型沟通方式，又如一些大型企业或许会被新型城市环境吸引，来此测试其创新性的技术方案。

人们在日常生活中会生成大量数据，即人类活动和人机交互所产生的数字痕迹：音频和视频、手机信令数据、自动驾驶汽车激光雷达传感器收集的数据、环境数据，以及我们在机场、办公楼等公共场所使用洗手间或途经生物传感器时被收集到的人体相关数据等。利用这个庞大的数据集，数据科学家和设计师们借由人工智能技术揭示了许多此前从未被捕捉到的城市生活面貌，并将其作为那些可能改变我们在城市中理解、优化、设计甚至生活的技术应用基础。现在是时候将这些研究成果转化为创新的政策和规划方法了。

脱离了其所在的环境，在此基础上生成的解决

方案就有可能忽略用户需求以及城市的中长期目标。为了解决上述问题，笔者提出了一套方法论，旨在创建一个数据和技术本体框架——混合型数字化集成城市系统。

笔者坚信公众参与对于为市民和游客创造新体验、改善人们的生活质量以及增加城市吸引力至关重要。然而受新冠肺炎（COVID-19）疫情影响，项目进行过程中拉瓦尔市利益相关方的参与度受到了限制。因此，在项目的下一阶段，笔者将继续与拉瓦尔市合作，以系列工作坊的形式将这些想法带到当地社区，完成两项新增的研究内容，作为上述方法论的补充。公众参与在其中至关重要，

新增步骤如下：

1) 基于当地社区群体目前的需求、未来愿景，以及设计方案的反馈，分析并识别其共同目标和价值观。如能准确刻画出其目标和价值观，该步骤可以做到让所有利益相关方参与到方案的决策过程中，进而确保方案的有效实施。

2) 应用实例分析与目标和价值观分析密切相关，尤其应当关注卡雷拉瓦尔公园改造项目中涉及或影响的多个利益相关方可能采纳并从中受益的用例。将居民、用户和专家纳入应用实例分析，可以了解他们当前的需求和对未来的希冀，这对于因地制宜打造体验和解决方案至关重要。**LAF**

4. “论坛”平面图
5. “论坛”情景图
6. “智能桌”情景图

4. The plan of Fora
5. Fora scenario
6. iTable scenario

③ 本次工作坊受到新冠肺炎疫情的影响，所有与当地利益相关者的互动以及课堂讨论都在线上完成。





7. 对“我的AR世界”中项目进行评论
8. “我的AR世界”使用过程

7. Comment the work in MinecARft
8. Craft journey

- ① Similar goals tried to be achieved via implementing strategies of digital technologies in various cities, including Seoul Metropolitan Government smart city platform in South Korea, “Better Reykjavik” in Iceland, London Datastore, and the Green Budget strategy in Lublin, Poland. For more information, please search the official website of each project.



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1 Research Background

Government of some cities set goals towards being more innovative, open, collaborative, evidence-based, and participatory^①. In this context, the use of digital technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI) is instrumental. IoT is a system of interconnected devices that collect data, connect to the Internet, generate analytics, and (in some circumstances) alter behavior/

responses of physical elements based sensing-action loops^[1]. In recent years, IoT devices have become an almost undetectable and invisible feature of our daily lives. For example, devices people carried contain a variety of sensors that silently and continuously record and transmit enormous amounts of data about one's whereabouts. At the same time, the built environment is now blanketed with a variety of sensors, e.g., to detect environmental parameters such as air quality and noise. AI is

the ability of software systems to rely on the collected data to perform tasks that would typically require human intelligence, such as vision, voice, language, knowledge, and search^[2]. Governments have begun to look into methods to use IoT and AI in public policies to serve residents better and improve quality of life. For example, lately the Mayor's Office of the Chief Technology Officer is implementing *New York City Internet of Things Strategy*, or other cities like Melbourne, Copenhagen and Helsinki also have implemented strategies of using digital technology^{[3]-[6]}. In recent years, more than 50 nations have released or are in the process of developing AI strategies.

The availability of large amounts of data does make cities an ideal test ground to generate new possibilities of uses and experiences for their local communities and visitors alike. Yet, the adoption process of data-based technologies needs to take into account the local context and the needs of different stakeholders in a human-centered way, avoiding just becoming a digital layer glued on top of a pre-existing physical context. This human-centered approach to urban technologies demands an effort from planners and policymakers in collaborating with local stakeholders, understanding and implementing technologies to envision some unexpected findings. The adoption of such integrating digital technologies with the physical and social context would be critical to creating new insights to fuel place-making and decision-making in the public sector context, ensuring the success of such projects, and thus providing practical benefits for city governments together with public and private partners!

Over the last few years, many research labs have been focusing on these topics. Among which, the Massachusetts Institute of Technology (MIT) Senseable City Lab (SCL) aims to anticipate the needs and opportunities that will further exist in our cities as they incorporate these digital technologies into

the built environment, aiming to deliver new research insights and unique design solutions. SCL has established and encoded the role of Big Data, AI and IoT in enhancing our connected world and helping us understand more about the spaces we inhabit.

This article presents a digital-technology-based methodology in the urban-personal-technological dimension that aims at creating a “hybrid urban digital integrated system,” meaning a system of interconnected public spaces that blends nature and technology with a human-centered design. This methodology is the result of an iterative path defined during the previous experiences of the workshop, in the past years, where different cities have been examined. Results are disseminated and published in *The Senseable City Guide* series^②, which showcase research outcomes from cities across the world.

2 Design Process

Experience from cities worldwide demonstrates that applying digital technologies may present a series of challenges for their proper use and implementation. Duarte and Álvarez examined how data-driven approaches can foster urban studies but must be balanced with a critical view of the inherent social values of cities and their citizens^[7]. It is not obvious to understand the needs and goals of a specific context, and as a result, the hybrid urban digital integrated system’s implementation is not always immediate. Traditional infrastructure and urban systems, which tend to be natural monopolies; building upon the challenge of creating a strategic plan for integrating technology-related dynamics with a pre-existing

physical environment, the significance of civic engagement becomes crucial. One example is the Europe for Citizens program, where civic engagement is at the center, with several opportunities planned among the goals of the following programming period 2021 ~ 2027, as an ambitious plan to increase and boost civic engagement in addressing science and technology challenges^[8]. Adopting new technologies may not deliver the promised value if services are not designed with a human-centered approach, tailored for the specific context of application.

Based on this topic, focusing on how innovative public spaces in Carré Laval, in the city of Laval, Canada, can improve the quality of life, foster entrepreneurship, and increase their attractiveness to current and future residents and visitors to the area. SCL students conducted and presented background research, identified relevant questions, developed project ideas which focus on the integration of digital-technology-based solutions evolving them to a detailed set of technology and design scenarios to create engaging urban experiences, evaluating our methodology.

The City of Laval, in Canada, is currently in the process of transforming a large section of the city center to become an innovation center for the knowledge economy. As part of this effort, the city announced the “Carré Laval project.” The project seeks to repurpose a 40-hectare site located in an old quarry and turn it into a nexus between the new Biotechnology center and the commercial area of the city. The project envisions creating a mixed-use development with living, working, educational and leisure facilities in an area of the city that is today severely underutilized.

Design solutions for a new site must deal with some challenges emerging in the choice and implementation of digital technologies in a physical context, where it is easy to fall into the trap of developing a technology architecture specifically designed for ad hoc applications

for the present, rather than one which focuses on exploring future multi-functionality and openness to unexpected ideas which might emerge from the technology appropriation by residents, community groups, and businesses. The design process needs to be transparent in how information is gathered and used in this way, they become socially co-constructed and shared, as well as a common recognized good. To help in the design process, the students applied the methodological scenario proposed by the authors, under which the integration of digital technologies, their generated data ecosystem and the built environment are cohesively and strategically designed and allow for future flexibility. The framework presented here is broken down into four components:

1) Context definition is the basis for identifying the problem to be addressed. Through qualitative and quantitative research methods, students seek to understand the site characteristics, stakeholders involved, primary challenges to solve, and to identify a couple of possible solutions, specific to the context and the goals stated by the city.

2) Personal interaction covers all actions and interactions that involve users. It includes, for example, the local personal interaction in the physical world, as actions needed by people getting the data and interacting with a device; digital personal interaction, as invisible actions people made moving around the city or using services by digital technologies. This component seeks to reflect how people feel part of and responsible for the process at hand, as well as their motivations.

3) Urban interaction aims to consider all aspects of interaction with the urban systems, from micro to macro scale of the multiple infrastructural implications. Projects must aim to create an impact and generate a mutual relationship and benefit with the context.

4) Technology definition focuses on the use and choice of technology. It requires an

② For more information about the study, please visit the official website of SCL.

analytical approach to find and choose sensors (as tools to capture the data) and actuators (physical–digital tools that create feedback or effect). Sensors and actuators can be purpose-built, located for a predefined use or specifically designed and placed to collect data; or opportunistic, open to not-defined benefits embedded in existing devices. The technology definition needs reflection on urban systems and technologies to be able to understand how the data is processed and analyzed, and other features such as what is automated/manual, who owns the data, how it is controlled, how it is accessed and maintained, what the inputs/ outputs are, and how data measures them.

As a result of the 2020 edition of the “Digital City Workshop” six projects have been developed (one for each student), within the course of one academic semester. The projects reported as design briefs were included as book chapters of the *Senseable City Guide to Laval*^②. Each project is shortly introduced in this section, framed around the four components.

“Activating Surface” (Fig. 1), proposed by Guanyi Wang, aims at promoting a healthy

lifestyle using a system of AI agents and mixed reality interfaces designed to provide personal exercise and health guidance to park visitors as social experiences. Augmented Reality (AR) technologies are fused with translucent glass mirrors to create a holographic trainer that helps the user to get physically active (Fig. 2). The mirrors are to be placed throughout the park, allowing the user to get personalized coaching and to select from a variety of spots where to perform a variety of exercises, from yoga, cardio, to cross country skiing. The system provides guidance both for individuals and groups; and includes activities designed for families and children.

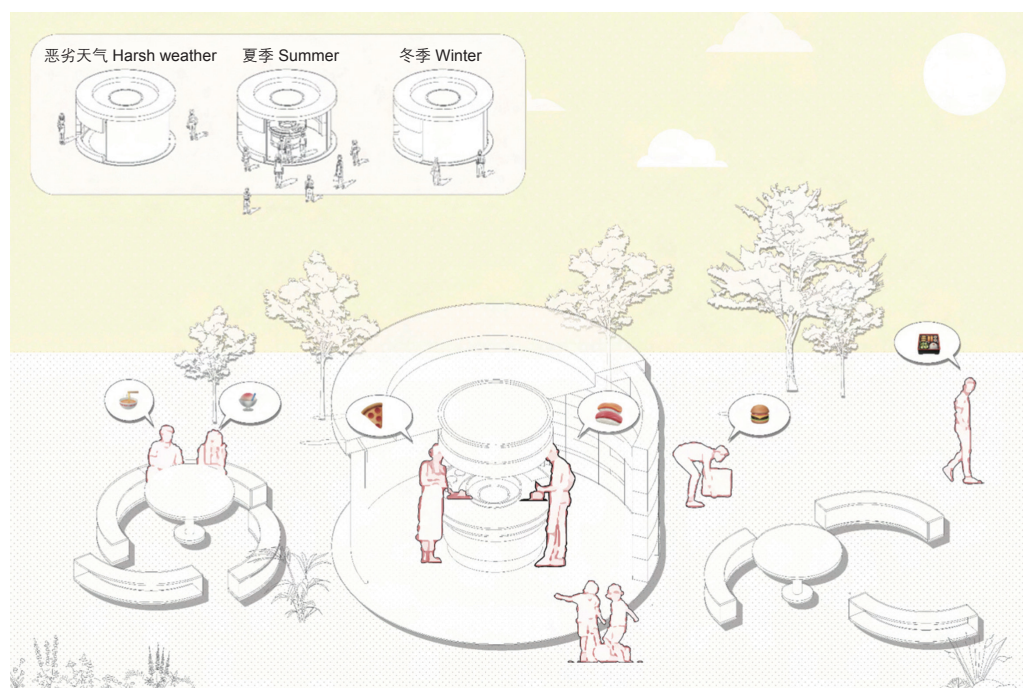
“Infinite memories” (Fig. 3), proposed by Zubin Rustom Wadia, builds on the long tradition of parks as locus of collective memories for the city, with their monuments and memorials, and aims at fostering greater understanding of cultures and norms between the diverse communities. The project proposes encoding personal and collective digital memories into physical tokens made of laser-etched glass. The tokens are then deposited on

“Podium of Memories,” an interactive structure that holds memories for the people of Laval city. In order to replay the memories, the system leverages a collection of distributed projectors and pressurized water to be used as screens.

“Fora” (Fig. 4), proposed by Yichen Jia, explores how to promote social interaction among visitors of the park, both for work and leisure. It envisions a collection of digitally-enhanced chairs that can respond dynamically to facilitate collaboration and exchange of ideas (Fig. 5). The chairs come equipped with a variety of sensors that monitor when chairs are located in proximity, they can also display different patterns of light for easy location. The chairs are capable of synchronizing their behavior with an app, which people with the same interests can set up meetings by the chairs that can also illuminate behavior to create a playful environment for people to meet and talk.

“iTable” (Fig. 6), proposed by Zidong Huang, envisions using the park furniture to promote collaboration, ideation and design activities. In this project, an inconspicuous park table where a person may have a quick lunch can be transformed into a large e-ink touch surface display, to create a creative and productive spot enmeshed within the natural environments provided by the park.

“MinecARft” (Fig. 7), proposed by Zihui Zhang, explores how to engage a diverse pool of citizens, including minorities, into providing feedback and new ideas for the development of Laval city into an inclusive and sustainable city. It makes use of AR and gamification to give citizens and visitors a new collaborative tool to propose and discuss ideas using spatialized 3D



9. “饮食足迹”装置情景图
9. Foodprint scenario

③ This edition of the workshop has been affected by the COVID-19 pandemic, so all interactions with local stakeholders and the class discussions happened online.

data (Fig. 8). They can use their smartphones to suggest public interventions using an AR interface that allows them to sketch ideas combining elements from a large catalog of 3D models such as new buildings and urban furniture. After sketching, the idea can be shared on a platform that supports getting comments from other users.

“Foodprint” (Fig. 9), proposed by Ziyuan (Zoey) Zhu, aims at promoting healthy eating habits while supporting and re-discovering long-established food traditions. It proposes to create social foodspaces in the park with “smart” shape-shifting kitchens powered by AI technology that suggests recipes tailored to specific occasions while holographic projections guide the cooking; as well as supporting creation and sharing of new recipes. The kitchens are immersed in the park for memorable gatherings but also they are interconnected among each other for sharing recipes, and talking with local producers via a digital platform that increases accessibility to high-quality local ingredients.

Each proposal is an exploration performed not in a silo, but rather in collaboration and consultation both with their peers as well as with people from the city of Laval, through a series of workshops and discussions conducted online throughout the semester^③. These proved to be invaluable for this work, and were immensely helpful for our students in fleshing out their ideas and receiving critical feedback for their improvement. All these ideas are seen as opportunities to provoke conversation among different stakeholders and the general population in Laval.

3 Discussion and Review

Digital technologies embedded in our cities provide the possibility of creating data-driven intelligence and services, as well as dynamic, multi-purpose functions with feedback loops built into their design logic. These technological

tools might improve existing urban systems and foster innovation in the entrepreneurial ecosystem at local and regional scales—from the local shop that might devise new ways to interact with the community to large corporations attracted to such an urban environment prone to test creative technological solutions.

We disperse a huge amount of data in our daily activities, as digital traces of human activities and interactions: audio and video, mobile phone communication data, lidar sensor data from autonomous vehicles, environmental data, and human-related biological data when we use restrooms or pass through biometric sensors at airports, office buildings, and other locations, etc. Taking advantage of these troves of data, data scientists and designers have been using AI technologies to reveal aspects of city life that have never been captured before, as well as to lay the foundation of technologies that could change the way we understand, optimize, design, and ultimately live in cities. Now it is time to translate such findings into innovative policy and planning approaches.

It is the low integration with the context generates the risk of developing solutions that do not focus on the needs of people and the medium- and long-term goals of the city. To address this problem, we strongly believe in developing a methodology that aims at creating a data and technology ontology framework—hybrid urban digital integrated systems.

We firmly believe that civic engagement is critical to creating new experiences for citizens and visitors to cities, improving their quality of life and increasing their attractiveness as a magnet. Such work has been impaired by the COVID-19 pandemic, which limited civic engagement level of Laval stakeholders in this project. In the next phase of the collaboration with the city, we will be bringing these ideas to the local community in a series of workshops. Specifically, their role can now become critical

in investigating two additional components that add to the methodological steps just presented:

1) Definition of purposes and values as shared by the local communities based on their current needs, their vision for the future, and their reaction to the proposed projects. If well delineated, this process ensures an effective implementation that can engage all stakeholders.

2) Use cases and applications are related to the definition of the purposes and values, and focus on the possible use cases that the multiple stakeholders involved or impacted by the transformation of Carré Laval could adopt (who will use it and benefit from it). Involving inhabitants, users and experts in defining use cases and applications, for their current needs as well as their aspirations, can be crucial to creating experiences and solutions rooted in their specific context. **LAF**

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