数都上海 2035

Shanghai: The Global Digital Metropolis 2035

主编单位：上海市城市数字化转型应用促进中心

Editor-in-Chief: Shanghai Application and Promotion Center of City Digital Transformation

目录

引言

随着信息技术的不断发展，网络化、信息化、智能化深入经济社会、城市建设和治理的方方面面，城市数字化转型进入快车道。纽约、东京、伦敦等国际发达城市开始研究如何运用新一代信息技术来重新审视城市的本质、定位城市发展的目标、培育城市的功能、调整城市的结构、塑造城市的形象与特色，相继提出了发展“智慧城市”的战略举措，并针对一系列现代城市发展中的关键问题开展了创新性应用，城市数字化建设成为提升城市竞争力的重要手段，城市智能发展的新模式逐步孕育成型。

在数字化转型与建设的过程中，城市经历了1.0起步阶段、2.0成长阶段，目前已步入3.0深化阶段。1.0阶段主要实现IT技术集成，2.0阶段聚焦于技术应用部署，整体建设过程公众参与度低，成果难以真正用之于民。因此，在城市数字化转型3.0阶段，应以建设以人为本的智慧城市为目标，以“为民、便民、惠民”为导向，通过持续创新、协调融合，构建全社会共建共享的城市数字化新格局。

与世界其他国家相比，我国城市数字化建设有其独特背景，比如城市人口增长与承载能力不协调，资源与环境生态压力日渐增大；政府公共管理与公众需求之间存在不匹配，城市管理协同性、时效性有待提升；产业格局与经济发展不相适应，传统生产技术以及管理方法难以为继，等等。因此，如何利用数字技术提高人民幸福生活指数，提升经济发展能级，激发城市管理和创新活力，成为城市建设者与管理者亟待解决的关键问题。

在数字中国战略下，各城市的数字化转型正在如火如荼地进行。上海作为超大型城市目前面临着因人口规模、经济规模不断扩大而带来的诸多发展与治理难题，为解决超大城市复杂巨大系统的转型瓶颈，上海也已全面开启城市数字化转型推进工作。2021年1月4日，《关于全面推进上海城市数字化转型的意见》（以下简称《意见》）正式对外发布。《意见》提出，到2025年，上海全面推进城市数字化转型取得显著成效，国际数字之都建设形成基本框架；到2035年，成为具有世界影响力的国际数字之都。届时，数都上海将全面建成。

城市数字化转型是一个庞大的系统性工程，需要社会多元主体共同参与，以共建共治共享为基本理念。本白皮书旨在展现数都上海建设决心与以人为本的城市思考，为全社会共同参与上海城市数字化转型提供行动指南，进一步发挥上海作为国际先锋表率、国家标杆旗帜、区域协同引擎的示范作用。

本白皮书将深入解读上海全面推进城市数字化转型的重要意义、内涵目标、建设领域、行动原则，全方位勾勒上海未来的转型方向，明确重点任务，引领数都上海全面建设、加快推进。

数字上海，
让生活更美好。

愿景主旋律：开放创新、包容、安全、韧性和可持续

数字时代下，国际数字之都应是人类物理空间、精神空间、数字空间构成的三元空间理想集合体，应当融合上海6000年人类生活沉淀的人文精神、1000多年城市发展的建设特色以及国际化数字空间的特有属性。国际数字之都的愿景主旋律是对上海城市精神的集中体现，是2035年上海远景目标的数字化诠释。

数都上海的五个主题词

开放创新

作为改革开放的前沿国际化城市，上海将融合数字空间开源无界的特点，在开放合作、开放创新、开放共享的世界经济中抢占先机。

包容

秉承“海纳百川，兼容并蓄”的城市人文精神，上海将融合数字空间万物智联的特点，集聚众家之所长，提供平等和谐的城市生态。

安全

以数据安全、隐私安全、技术安全为核心原则，上海将融合数字空间的新安全手段，打造全球数字要素的重要流通枢纽。

韧性

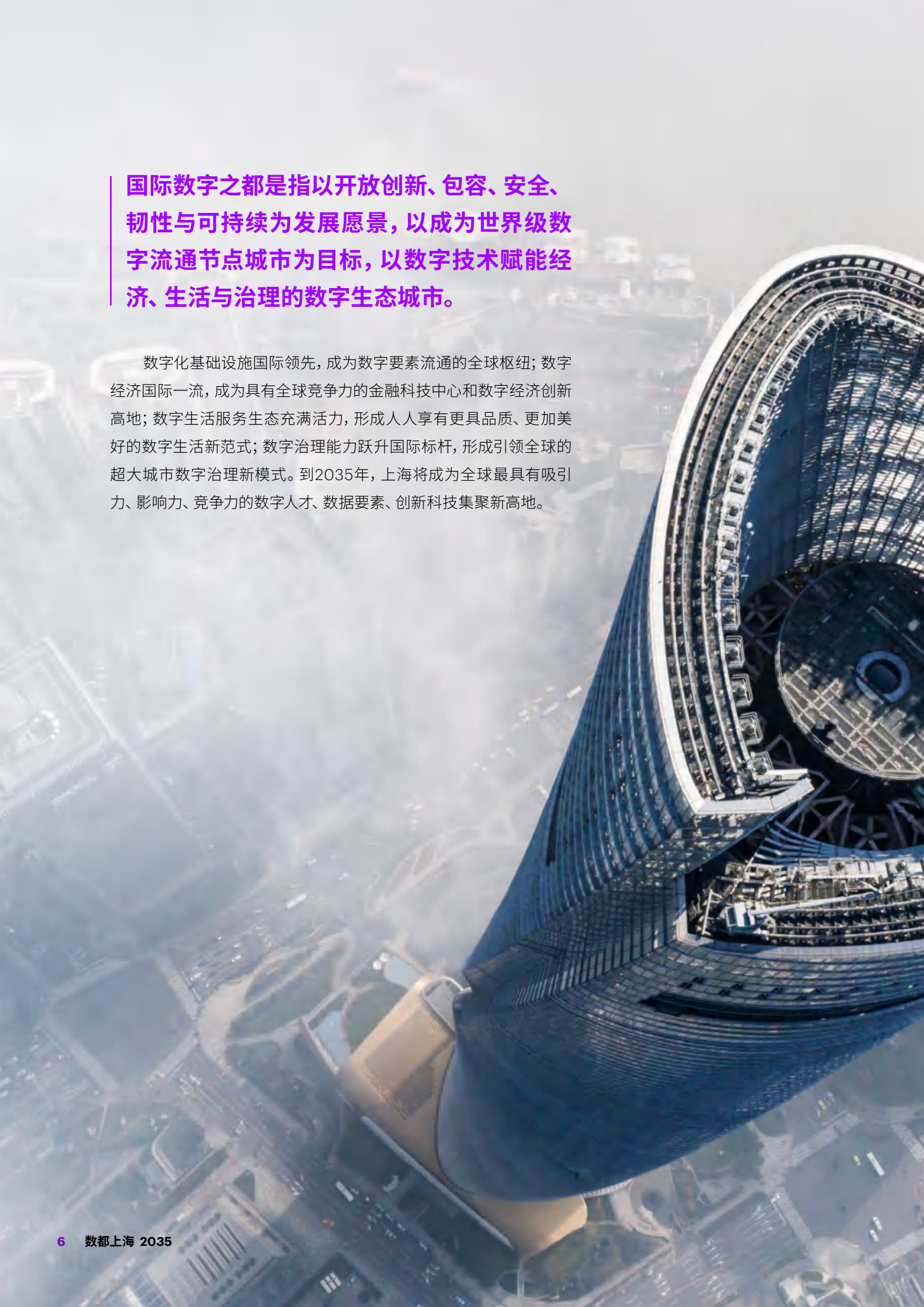
上海将发挥数字空间灵活多变、持续进化的属性，加快推动韧性城市建设，探索超大城市的高效治理解决方案。

可持续

以全面、协调、融合为原则，上海将以数字化助力实现城市经济、生态、生活及治理的可持续发展。

国际数字之都是指以开放创新、包容、安全、韧性与可持续为发展愿景，以成为世界级数字流通节点城市为目标，以数字技术赋能经济、生活与治理的数字生态城市。

数字化基础设施国际领先，成为数字要素流通的全球枢纽；数字经济国际一流，成为具有全球竞争力的金融科技中心和数字经济创新高地；数字生活服务生态充满活力，形成人人享有更具品质、更加美好的数字生活新范式；数字治理能力跃升国际标杆，形成引领全球的超大城市数字治理新模式。到2035年，上海将成为全球最具有吸引力、影响力、竞争力的数字人才、数据要素、创新科技集聚新高地。



应变求机：大变局中上海的挑战与机遇

上海此次提出“全面推进上海城市数字化转型”，是适应时代大趋势，符合国家总体战略、区域协同发展和城市自身可持续发展要求的重要战略。因此，要充分理解“数都上海”的内涵、明晰建设重点，应从时代、国家、区域、城市这四大层面上，剖析上海面临的挑战与机遇。

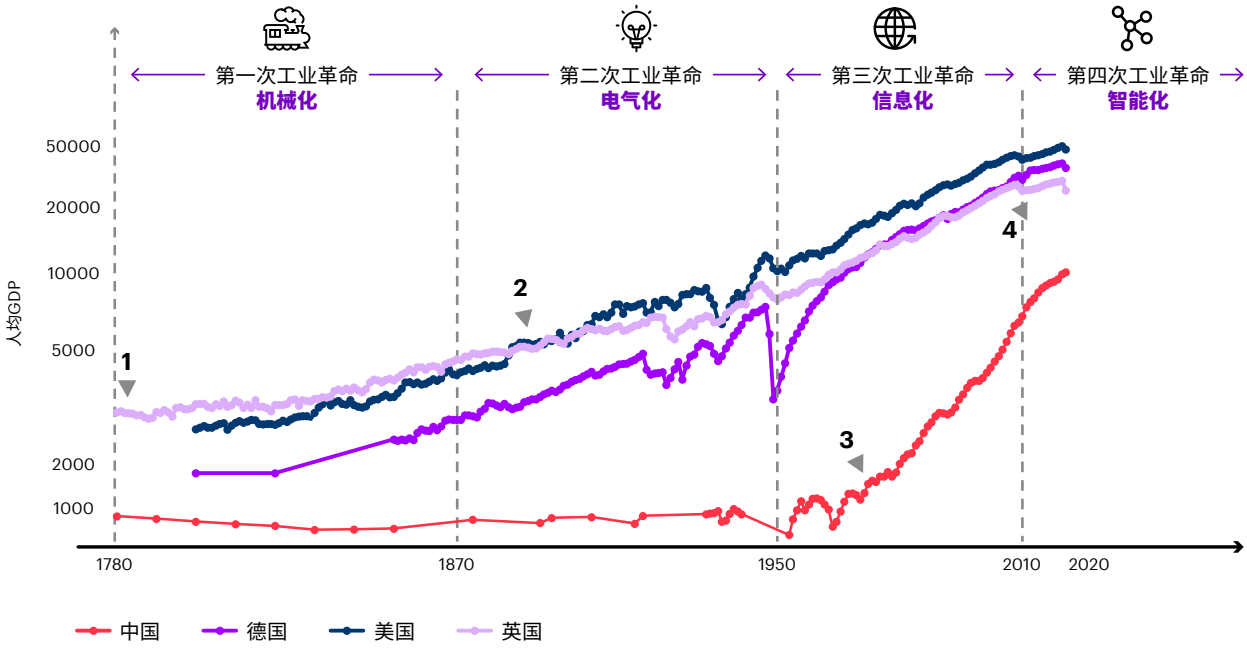
时代层面
以全球城市之担当，应对国际变局与危机

当今世界正经历百年未有之大变局，全球城市将作为重要角色带领人类命运共同体面对世界之变、时代之变、历史之变。值此变局，上海应以全球领先城市之姿态，成为城市发展进程的推动力量，引领人类文明时代进步。

以人工智能、脑科学、芯片技术为主导的第四次工业革命正带领人类社会由信息化向智能化演进，以中国为代表的东方文明正逐步在此次工业革命中占据优势，亚洲国家和城市加速崛起。

全球气候变暖趋势及极端气候事件让人类意识到社会生态的脆弱性，控碳减排成为社会发展的硬约束。国家与城市正在谋求合作并采取更加有力的政策和措施，以经济绿色复苏破解资源环境瓶颈，实现自身低碳转型。同时，**新冠疫情全球肆虐与反复的常态化趋势加速了全球数字化进程，**经济带疫重启、数字新业态、政府威信与全球治理将是国家与城市共同面临的普遍挑战。

图1: 第四次工业革命带领人类社会由信息化向智能化演进[1]



数据来源：世界银行，www.worldbank.org。

全球迈入城市时代，国际领先都市将通过构筑全球城市体系增强全球话语权与影响力。把握住第三次工业革命机遇，上海在过去30年飞速发展成为仅次于伦敦、纽约、东京、北京和巴黎的国际枢纽城市，并通过在第四次工业革命抢得的先机与疫情后的快速恢复，进一步增强“五大国际中心”功能。

未来，上海要以数据新要素引领智能制造与高端服务，以数字化技术赋能城市高质量发展，成为领导时代转型的全球标杆城市。

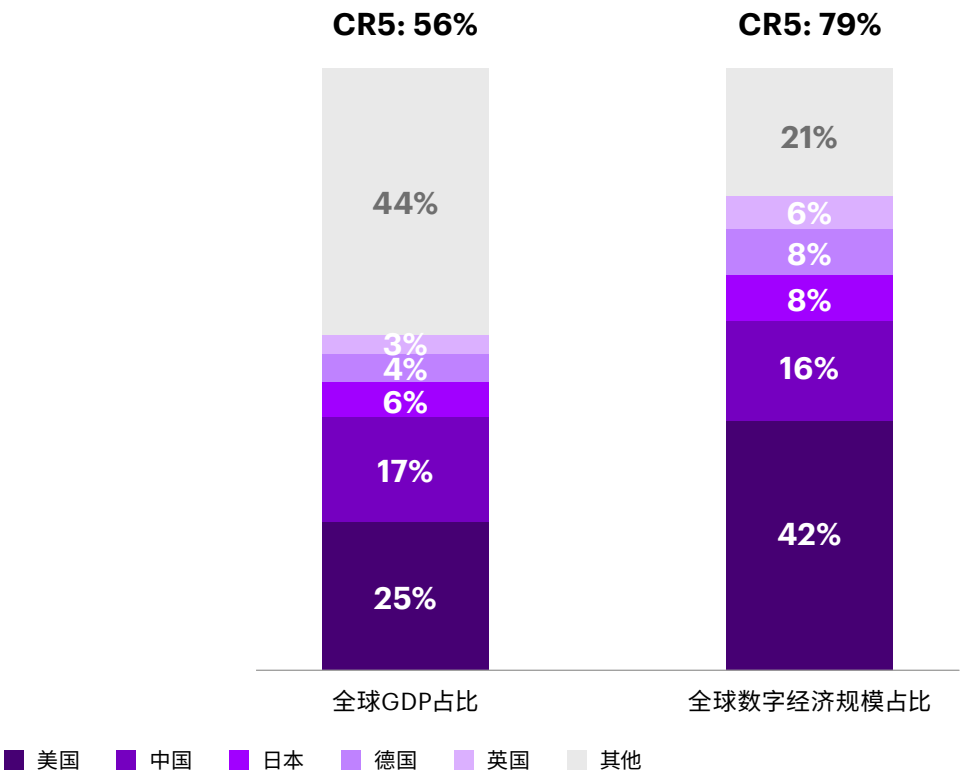
国家层面
以一线城市之开放，引领中国转型与腾飞

中国经济正由高速发展阶段转向高质量发展阶段，数字经济发展将成为城市经济转型的主力，承载并带动中国产业升级。面临经济转型，上海应承接国家战略方针，作为强力牵引全国发展的引擎，成为中国经济转型的标杆城市，分享全球化红利。

世界经济与国际贸易同时进入缓慢增长阶段，数字经济却逆势增长，在全球GDP中的占比从2005年的14.2%增长至2020年的43.7%，[2] **数字经济与数字贸易成为全球各主要经济体的新增长引擎。**另一方面，数字经济呈现出比传统产业更为明显的马太效应，成为全球经济竞争的主要战场（图2）。**中国具有发展数字经济的巨大优势，**庞大的人口基数与高数字化渗透率成为本土数字产业化的强大拉动力，世界第二大的第二、第三产业规模也为产业数字化提供了巨大的市场和增长空间。但是，**中国城市在数字经济上的发展极不均衡，**城市间在数字经济规模与渗透上的差距巨大，中国的数字经济发展仍有较大提升空间。

图2：数字经济与数字贸易成为全球各主要经济体的新增长引擎[3]

2020年全球分国家GDP占比与数字经济规模占比



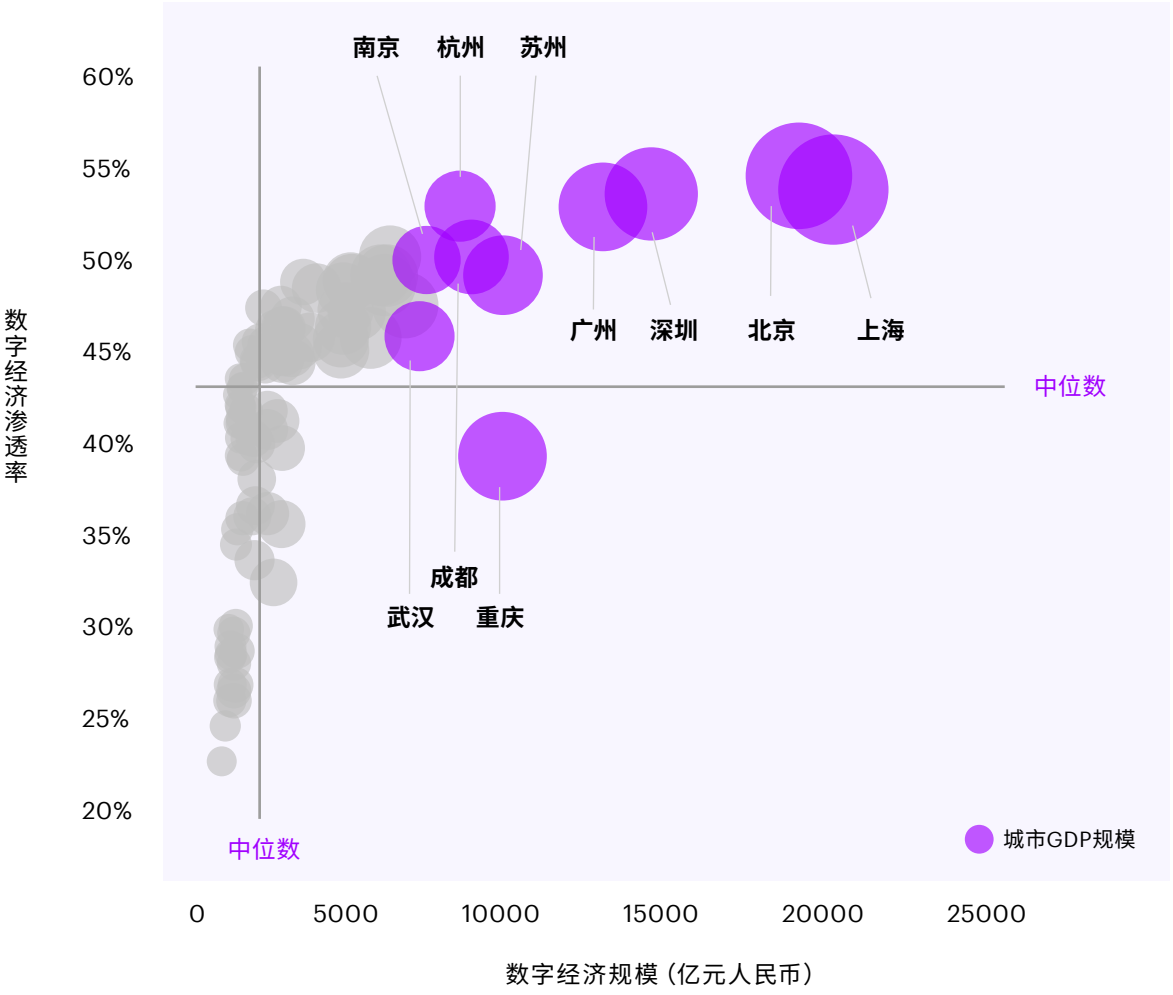
CR5: 排名前五的国家经济规模占比

数据来源：世界银行，《全球数字经济白皮书》——中国信息通信研究院，2021年8月。

40年改革开放之路，上海始终是排头兵、先行者，是牵引中国高速发展的重要引擎。一方面，上海数字经济规模全国第一，数字经济渗透率仅次于北京，成为全国数字经济领军城市（图3）。另一方面，上海依靠全球资源要素集聚与国家功能定位的先发优势，以浦东“引领区”为抓手，构建离岸金融体系，促进高水平改革开放，以数据交易中心为承载，积极推进数据生态、数据立法与数据开放。

上海将利用数字科技的禀赋优势成为中国双循环的战略链接，引领全国城市能级提升与国际化进程进一步可持续发展。

图3：中国各城市数字经济发展[4]



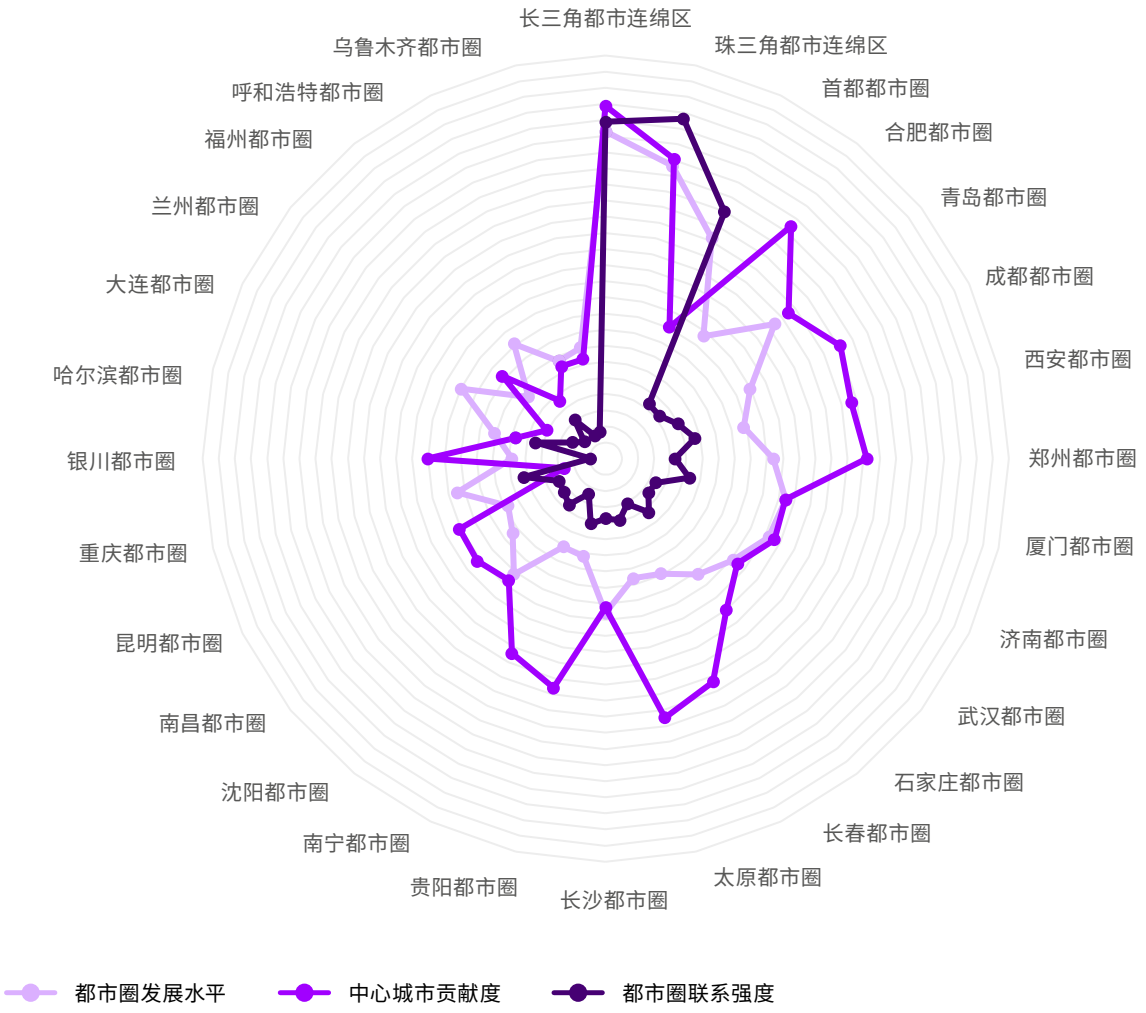
数据来源：埃森哲研究。

区域层面
以核心城市之辐射，带动区域一体化发展

实施长三角一体化发展战略，是引领全国高质量发展、完善我国改革开放空间布局、打造我国发展强劲活跃增长极的重大战略举措。上海作为长三角中心城市，要利用自身数字化要素禀赋，为长三角一体化发展中的产业升级、功能提升、技术创新等发挥积极的辐射和带动作用，撬动长三角区域优势，引领大都市圈共同繁荣。

长三角是世界级六大城市群之一，也是我国综合实力最强的都市圈（图4）。但是，在高速度的经济增长下，长三角都市圈正面临产业同质化严重、经济增速放缓的严峻挑战。一方面，长三角区域内各城市间分工协作不足，同质化竞争问题突出，多元发展与协作机制有待建立。另一方面，长三角城市群公共服务与人口结构存在错配，优质资源共享程度与各类要素流动程度不足。

图4：中国都市圈综合实力评分[5]



数据来源：中国都市圈发展报告，中国新型城镇化研究院，2018。

为持续推动长三角一体化发展，中央及各级政府部门已先后在城市群布局、交通运输、生态绿色、信息化建设等方面出台多份重要政策文件，保障长三角一体化国家战略的落地。**交通、经济、人口、信息的要素流通，配合整体协调的同城化机制保障，是上海发挥核心城市功能，引领都市圈整体发展的有力抓手。**在交通辐射方面，上海高铁密度常年保持全国领先，并以“五大新城”作为链接江浙皖三省的节点枢纽，建成“轨道上的长三角”，联动省际公路、高速公路、世界级机场群和港口群，打造区域及国际级交通枢纽。在经济辐射方面，上海与周边外围城市企业互相投资规模达400亿元人民币，经济联系程度在中国都市圈中位居首位。在人口辐射方面，上海的都市圈中心与外围城市日均流动人次位居长三角城市圈首位。在信息辐射方面，上海拥有全国领先的新基建实力，打通区域内外知识流和信息流，实现地区信息“软联通”。在同城化机制方面，上海正领导推进长三角“一网通办”、产业链协同、生态区域共治、服务区域共享等创新发展机制。

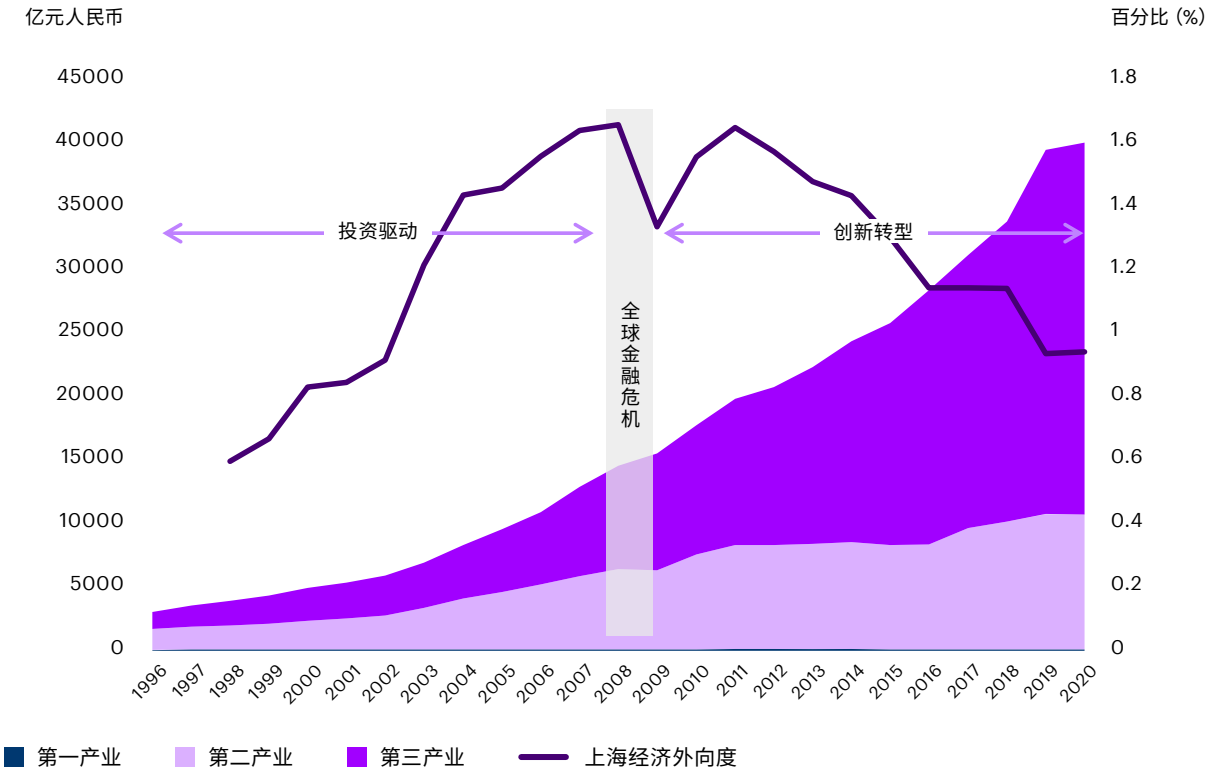
在新一轮的长三角发展战略规划中，上海将延续使命，利用创新空间平台效应、功能网络等数字化能力赋能长三角区域创新一体化以及全球资源配置功能的进一步提升。

城市层面
以人民城市之根本，带动城市整体性转变

伴随着经济飞速发展与人口增长，上海正面临城市有限资源和规模扩张间的矛盾，如何更有效的实现城市资源分配，创造美好生活是急需解决的问题。因此，上海的城市数字化转型应与上海多元、开放、包容、务实的海派文化以及“海纳百川，兼容并蓄”的城市精神相契合，围绕以人为本的中心思想，升级城市服务，打造活力经济，通过数字化方案解决城市治理难题，提升城市治理水平，增强人民幸福感、获得感。

在外部不稳定的大环境下，上海城市经济外向度回落，第三产业比重迅速提高所带来的产业结构性转变，是上海自身面临的重大挑战。上海开埠以来，依靠优越的地理区位以及其文化的高度包容、经济的繁荣多样和思想的自由开放等诸多优势，在短时间内一跃成为远东第一大都市。城市经济也经历了一段对外开放、高速发展的腾飞期。而在2008年金融危机之后，依靠投资和传统产业驱动的发展模式逐渐暴露脆弱性和不可持续性，**上海面临从投资驱动发展的旧动能向创新驱动发展的新动能转型（图5）。**在城市的可持续发展中，提升经济密度和做强核心功能，强化全球资源配置、科技创新策源、高端产业引领、开放枢纽门户等四大功能，依靠创新、新兴产业驱动的新动能，深化供给侧结构性改革，是上海经济可持续、城市能级提升的必由之路。

图5：上海历史GDP和经济外向度走向[6]

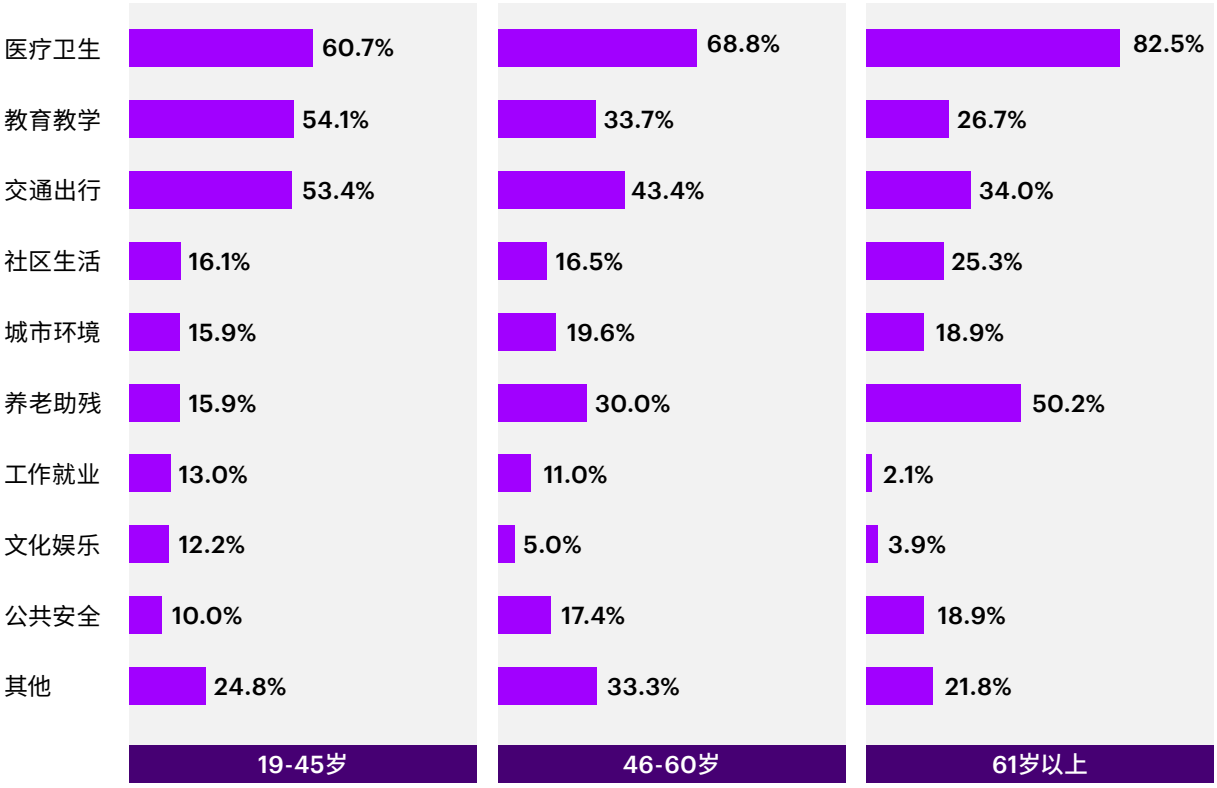


数据来源：上海市统计局，2020统计年鉴。

此外，**超大城市聚集特征带来的经济红利的背后，是在提高人民生活质量、提升城市治理水平过程中面临的愈发复杂和多样性的挑战。**作为中国主要人口流入地，上海人口不断扩张，已成为世界人口数量排名第三的城市[7]，其中外来人口的占比在过去20年从23%提升到了42%[8]。同时，上海也是中国最早进入老龄化与老龄化程度最高的城市。**上海城市公共资源尤其是医、教、养等基础公共资源表现出总体供应不足、区域分布不均的特点（图6）。**据调研显示，高水平医疗卫生服务不足、优质教育资源供需矛盾突出、交通资源分布不均是当前城市居民的核心痛点。受越发不稳定的国际形势与气候变化以及上海本身地理区位与功能定位等多重影响，**台风、洪涝、高温等自然灾害，新冠疫情流行等公共卫生事件，交通安全以及资源分布等问题将为韧性的城市治理带来挑战。**

城市密度与和谐宜居、充分竞争和社会公平、经济发展与生态文明、自由开放与有效监管，将是上海未来城市发展需要平衡的四大命题。上海要以数字化赋能公共服务新模式，突破城市资源的有限性及区域性，**以“以人为本”城市生活新场景提升居民幸福感，以数据驱动的城市“智理”保障城市韧性发展，以“政企民共建”的创新建设机制打造包容、公平与韧性的人民城市。**

图6：上海市民最期待进行数字化改造的领域[9]

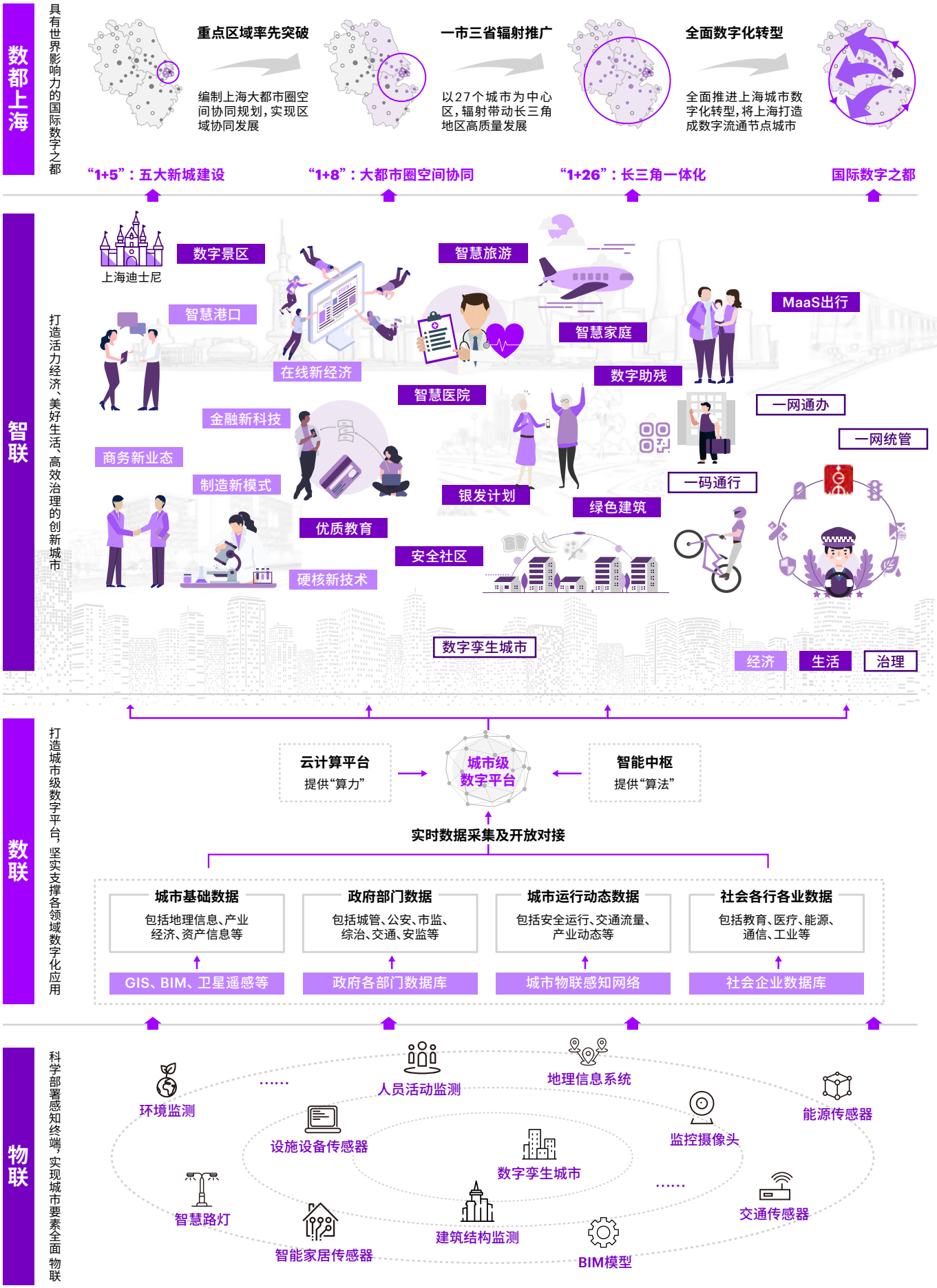


数据来源：埃森哲研究。

以数谋新：数都上海未来展望

数都上海不仅是基于数字空间的特性，对超大城市数字化所面临的共性问题做出引领表率，更是基于上海百年历史所沉淀下的城市特色，对上海城市精神的现代化诠释。建设数都上海的内涵包括数字经济、数字生活、数字治理、数字流通、数字保障五个方面。

图7: 数都上海未来展望


数都上海
具有世界影响力的国际数字之都
重点区域率先突破
编制上海大都市圈空间协同规划，实现区域协同发展
一市三省辐射推广
以27个城市为中心区，辐射带动长三角地区高质量发展
全面数字化转型
全面推进上海城市数字化转型，将上海打造成数字流通节点城市
“1+5”：五大新城建设
“1+8”：大都市圈空间协同
“1+26”：长三角一体化
国际数字之都
智联
打造活力经济、美好生活、高效治理的创新城市
上海迪士尼
数字景区
智慧港口
在线新经济
智慧旅游
智慧家庭
MaaS出行
数字助残
智慧医院
一网通办
一网统管
金融新科技
商务新业态
制造新模式
一码通行
银发计划
绿色建筑
优质教育
安全社区
硬核新技术
数字孪生城市
经济
生活
治理
数联
打造城市级数字平台，坚实支撑各领域数字化应用
云计算平台
提供“算力”
城市级数字平台
智能中枢
提供“算法”
实时数据采集及开放对接
城市基础数据
包括地理信息、产业经济、资产信息等
政府部门数据
包括城管、公安、市监、综治、交通、安监等
城市运行动态数据
包括安全运行、交通流量、产业动态等
社会各行各业数据
包括教育、医疗、能源、通信、工业等
GIS、BIM、卫星遥感等
政府各部门数据库
城市物联感知网络
社会企业数据库
物联
科学部署感知终端，实现城市要素全面物联
环境监测
人员活动监测
地理信息系统
能源传感器
设施设备传感器
监控摄像头
数字孪生城市
智慧路灯
交通传感器
智能家居传感器
建筑结构监测
BIM模型

建设“数都上海”，**不仅是基于数字空间的特性，对超大城市数字化所面临的共性问题做出引领表率，起到标杆作用，更是基于上海百年历史所沉淀下的城市特色，对上海城市精神的现代化诠释。建设“数都上海”的关键要义在于以技术为手段、以数字为驱动，焕新人民生活、创新产业经济、革新城市治理，提升城市发展能级；在宏观、中观、微观的挑战下，围绕分享全球红利，牵引区域乃至全国发展，树立全球标杆。**因此，建设“数都上海”的内涵包括数字经济、数字生活、数字治理、数字流通、数字保障五个方面。

数字经济

新旧动能转换，发挥禀赋优势，打造全球数字经济新高地

上海将通过新旧动能转换，实现经济发展形态高度多元化，平台经济、数字经济、绿色经济、夜间经济等多种创新经济形态共同发展。新生代互联网经济品牌崛起，线上线下经济无缝融合。发挥城市功能的禀赋优势，实现产业协作生态网络的成熟有序，产业之间高度集聚且互联互通，产业链及内部价值链高效协作。消费互联网与产业互联网双轮驱动数字贸易蓬勃发展，跨境电商、数字娱乐、在线教育、远程医疗等新兴业态层出不穷，为人民群众提供优质便捷的消费选择，为建设数字经济强国提供强大引擎。

数字生活

延续多元文化，平等包容便捷，打造人民美好生活新典范

上海将延续“海纳百川，兼容并蓄”的城市精神，同时顺应全球疫情防控常态化下人民的生活方式与消费方式向数字空间转移的转变，形成完善的社区公共空间和服务体系。人人可享数字化的创新品质生活，处处可及定制化的社会包容服务。坚持技术普众、以人为本的创新之路。数字服务与实体设施融洽无间，孪生市民建设计日程功，便捷服务数据分析算无遗策。形成人民生活无忧、出行无阻、社区无废、安全无虑的美好生活新典范。

数字治理

市民深度参与，城市韧性治理，打造全球城市智理新标杆

上海将成为市民深度参与、各主体协同共建的开放式治理城市，自学习自优化、防风险防事故的安全自主城市，全要素数字化精准映射、虚实融合互动的孪生式镜像无界城市，全范围部署物联设备、全方位感知城市体征的互联式泛在融合城市。从城市“治理”向城市“智理”的进化，现实与虚拟城市的边界溶解，既为广大市民提供安全安静、宜居宜业的工作生活环境，又为上海城市治理打破数字和物理的隐形鸿沟，更为全球展示高效的数字治理“上海”标杆。

数字保障

发挥市场活力，夯实数字技术，建立数字创新盛世新策源

上海将在技术上打造科技创新高地，强化企业创新主体地位，夯实数字技术基础与新基建建设。通过技术创新加速产业的蝶变升级与数字新产业的重大突破，引领数字技术赋能下产业转型、生活服务、管控治理的换道超车。建立灵活工作模式与创新机制。厚植具备数字化战略头脑、拥有数字化思维、推动数字化落地、实现数字化创新的新时代数字化人才沃土。发挥人民主体性，推动数字文化在多元人民结构的文化渗透。鼓励全民参与城市多元化的建设进程，建立“人民城市人民建”的数字共创文化，在人民的深度参与中真正落实“人民城市为人民”的建设初衷。

数字要素

秉承开放基因，安全合作共享，发挥数据资源要素新价值

上海未来既是数字经济对外合作开放高地，更是全球高端要素和优质资源集聚配置的新通道。因此要以数据为新的生产要素，以数据要素流通驱动资源高效配置，通过数据融合打破信息孤岛，通过数据开放激发创新活力。加强智能公共基础设施网络建设，作为智能城市运行基石。秉承网络数据安全至上，主动防御与被动防护相结合，软性机制与硬性设施相融合，形成安全互信的城市数字化发展环境。

定向扬帆：数都上海建设的八大领域

上海的城市数字化转型正面临全新的历史机遇，城市的内在需求与未来的发展战略也使得城市转型方向更为清晰，上海未来将聚焦活力经济、美好家园、数字包容、智慧交通、低碳环境、未来政府、现代设施以及创新生态八大领域进行整体转型，塑造引领未来发展的数字动能，树立全球标杆。

01

活力经济

占据经济发展新赛道，铸造经济发展强引擎

目标

延续上海改革开放先驱的优势长板，加速传统产业从数到质的转型的同时，打造创新驱动的上海“五型经济”，通过数字化实现经济的高质量发展。

背景

时代变局、国际贸易格局、都市圈发展、城市定位以及疫情对全球经济的影响，凝聚成了上海坚决从投资驱动向创新驱动转型的驱动力。上海要发挥城市长板优势，以城市“四大功能”为主要发力点，进一步提升经济密度与核心功能。当下是上海发展数字新动能的决胜时期，数字经济的马太效应决定了抢占高端机遇的窗口稍纵即逝。上海将着力发展新兴产业，持续推动产业升级，健全产业生态制度，全方位提升城市经济竞争力，提高城市能级，担任好在新发展格局中国内大循环的中心节点、国内国际双循环的战略链接。

案例介绍

上海张江打造人工智能岛。张江人工智能岛位于张江科学城中部核心区，占地面积6.6万平方米，地上总建筑面积10万平方米。园区是国内首个“5G+AI”全场景商用示范园区，拥有全国首套最齐全的园区内“5G+MEC+边缘云”设施搭载园区指挥中心。园区积极探索在医疗和城市管理等领域的人工智能技术应用，打造基于计算机视觉的智能可视化、智能前台以及服务机器人，同时充分将人工智能技术应用于张江科学城的数字化管理。

主要举措

1. **硬核新技术：**加快布局量子计算、量子通信、神经芯片、DNA存储等关键共性和前瞻引领技术。通过数字技术和通用软硬件的开源开放，创业应用等智能产品创新迭代，云计算、区块链、大数据及电信服务等信息服务高端化转型，夯实上海数字经济发展基础。
2. **在线新经济：**打响服务型经济品牌，聚焦数字文创、新零售、在线设计，提升在线新经济品牌影响力。打造在线新经济产业首选地和集成应用场，完善就业保障体系，优化健全制度环境，促进在线新经济企业集群集聚发展。鼓励线上线下场景融合，发展多种平台经济的流量型业态创新，提升规模链接能力和流量运营能级。

3. **制造新模式：**以智能示范工厂建设为抓手，建设数字孪生企业，增强数字化设计、智能化制造、精益化管理、个性化定制、网络化协同、服务化延伸能力，为企业增效。全面推进供应链、产业链数字化，增强工业大数据、知识图谱和智能算法的供给水平，精准感知运行态势，加速实现精准测链、补链、强链、固链，发挥“链主”枢纽作用，激发中小企业双创活力，促进“双链”数字化增智。聚焦三大先导产业、六大产业集群，加强龙头企业牵引，打造行业标杆平台，推动产业生态整体提升以及行业数字化的深度转型，实现平台生态增能。

4. **商务新业态：**传统企业稳妥探索发展新业态、新模式，打造上海新生代互联网经济品牌。提升贸易数字化和智能化管理能力，加强数字创新与传统行业融合发展，开发培育释放数字贸易潜能。新经济企业积极组建“城市未来场景实验室”，形成可复制、可推广的创新场景与商业模式。打造大型企业引领推广、中小企业广泛应用的融通发展模式，发挥大型企业牵头协调作用，推进中小企业数字化改造。发挥政府的引领保障作用，优化口岸服务，深化上海国际贸易单一窗口建设，推动长三角合作共建“服务专区”，增强区域辐射能力。打造口岸综合性大数据枢纽节点，深化口岸数据应用，建立智慧口岸服务体系。

5. **金融新科技：**拓展数字人民币应用场景，探索普适便捷的数字人民币支付方式。强化科技赋能与数据驱动，实现金融产品及服务、客户经营、风险防控、管理决策的全面数字化，为客户提供便捷、高质量、广覆盖的金融服务。建设开放合作的服务金融生态，建设产业数字金融服务平台，围绕客户生产生活场景，提供综合化、一站式的金融及非金融服务，运用数字科技等手段强化普惠金融服务，不断提升对小微、民企、三农等领域的服务能级。

02

美好家园

塑造人人幸福新城市，构建幸福人人新体验

目标

践行“人民城市人民建、人民城市为人民”的重要理念，围绕医、教、养、安全等核心生活需求，实现公共服务数字化应用广泛落地，建成美好数字家园。

背景

城市化的演进与超大城市的不断发展，越来越多的人口涌入超大城市，追求优越的物质条件和现代化的生活。如何解决众多人口在生活各方面的多元且升级的需求，以进一步提升城市的竞争力和人才吸引力，是上海作为超大型城市需要面对的长期且极其重要的复杂课题，数字化是解题的重要抓手。公共服务的数字化升级，是上海建设美好家园的首要基础，只有具备更高保障性的社区安全，更充足的医养供给，更平等的教育条件，更便捷的社区生活，才能更高水平满足居民群众对美好生活的向往。上海数字公共服务建设关系着上海城市数字化转型能否高质量落地，上海在数字公共服务建设上的实践探索，也将为其他城市提供有益参考和借鉴。

案例介绍

瑞金医院打造5G+健康医疗场景。瑞金医院充分发挥5G大带宽、低时延、广覆盖的特点，打造了5G+远程超声、5G+远程康复等场景，实现远程医疗体验。通过5G+远程超声机器人，可使医生操作远在千里之外的机械臂，实时进行超声扫描并给出诊断意见。瑞金医院和企业合作开发了“康复力道直播”模块，通过机器人实时力反馈技术、5G延时抖动预测与回滚技术实现康复治疗远程评定、康复远程训练的目的。在建设5G+急救体系方面，医院急诊室已无缝对接120指挥调度系统；车载远程会诊设备让救护人员获得专家指导，实现“上车即入院”新场景。

主要举措

6. **开源优质教育资源：**建设教育云服务平台，吸收海内外名师，推进名师讲堂网络化、教育资源在线化，助力建设“家门口的好学校”。打造对所有市民免费开放的高质量数字学习空间，通过VR、AR等新技术，提升学习资料的直观感和沉浸感，有效提升学习效率与效果。
7. **医疗资源提质增效：**精细化管理医疗需求，通过医疗全过程的覆盖提高市民健康管理的整体水平。利用DRG、AI医疗等新技术新机制，提高整体医疗能力。应用远程诊疗、线上复诊、智慧医院等数字化医疗场景，扩大各环节医疗资源的可获得性，加强地方、社区基础医疗的需求分担能力。
8. **安防应急智能强化：**加速以感知端为重点的智能安防建设，如智能安防调度平台建设，全面提高基础防控工作智能化、科技化、社会化和专业化水平，增强公共安全的应急处置能力。
9. **便民服务美好体验：**合理规划布设智慧早餐、智慧零售、智能末端配送、智能回收设施、智能书屋、健康驿站等，发挥“政企联动、市场为主”的建设运营模式优势，丰富社区市民的文化生活和消费场景，构建便捷幸福的新生活方式。

03

包容社会

建设和谐包容新社会，尽享公平普惠新生活

目标

弥合数字鸿沟，运用数字技术让城市各类主体都能够切实地享受到均衡、普惠的生活服务，保障弱势群体充分分享社会发展红利。

背景

在改革开放、创新转型方面的积极尝试，有效拉动了上海经济、社会福利、人民福祉，上海市民人均预期寿命已为全国最高。然而城市快速发展背后外来人口的增加、人口老龄化的加重，也让不同群体享受发展红利的差异日益扩大，在收入、教育、文娱等方面均有明显的不公平现象。为了消除差距，上海市将继续坚持普惠性、可得性、包容性的原则，推进全社会民生服务的均衡供给，帮助各类社会主体融入现代社会，享受数字福利。

案例介绍

上海市甘泉路街道针对老年人打造社区信息化管理平台。该平台定位社区中特殊老年群体开展精细化服务，以“动态数据”管理模式，除了对居民的人户关系、工作婚姻状态等基本信息进行采集外，还提供了3大类44种个性化标签，赋予特殊群体特定身份，在针对特定群体开展服务活动时通过多条件筛选，实现服务供给精准定位，解决老年群体在就医、助餐、出行等多维度需求。同时作为全市首批试点家庭照护床位的街镇，通过配送智能设施设备进入家庭，实现传统养老模式向数字化养老转型。

主要举措

10. **打造银发计划：**针对老人的生活痛点，融合社区服务、金融服务、远程医疗、智能监控等多方主体和技术服务，整体性地为老人提供适老化产品与服务改造。开展老年人群的数字化素养与技能培训，帮助老年人完成“自身的数字化转型”。
11. **推进数字助残：**加强惠残助残领域技术应用和成果转化，拓展线上助残服务领域，为残疾人基本生活、康复服务、教育就业提供全方位科技赋能。建立残疾人数据资源平台，强化信息整合、共享及应用，实现困难残疾人精准化识别全员额、残疾人工作精细化管理全领域、社会助残精确化实施全流程、政务服务“一网通办”全覆盖，让残疾人享受到科技进步带来的便利、快捷和高效。
12. **外来人员公平：**开展面向外来务工人员的数字化转型行动，围绕外来人员在沪基本需求，如就业、就医、营商、子女上学等，提供具有经济性的数字化工具，设计相关数字化服务。
13. **外籍人士包容：**针对在沪工作生活的外籍人士，上海也将进一步完善数字化产品和服务，将现有服务延伸推广，为外籍人士提供更便捷、可获得的数字化产品和服务。

04

智慧交通

打造立体交通新网络，建设国际化通都大邑

目标

增强城市综合交通能级，构建高质量综合交通体系，提升城市交通服务品质，满足人民更为便捷、安全、经济的交通出行需求，为城市经济发展提供高效、便利的“硬联通”。

背景

近年来，上海综合交通数字化转型取得一系列成效，但在综合交通领域依然面临一些瓶颈急需通过数字化手段寻求突破，如在海空枢纽等设施上对全球要素的资源配置能力仍需进一步提高，城市内交通出行基础设施资源依然供给不足且分配不均等。上海未来将坚持业务场景与技术深度融合的智慧交通发展理念，基于城市自身发展诉求进行整体性规划，为技术的升级、转型与应用确定方向，从而打造泛在、协同、智敏的新一代智慧交通设施体系，实现人畅其行、物畅其流。

案例介绍

上海奉贤新城打造智慧出行示范项目。抓住奉贤新城自动驾驶示范区的机遇，聚焦新一代数字基建、出行产业数字化趋势，对路网组织、无人公共交通调度、城市弹性功能空间/地下空间/管线进行突破性、前瞻性、可感知的高规格融合试点，以城市数字底座吸附智慧出行上下游产业，催化智慧出行产品化、产业化。以MaaS（出行即服务）为切入口，探索城市移动空间模板（多功能无人驾驶车辆）的灵活调度与配置，逐步重组城市功能的组成形式与空间形态，探索智慧出行与智慧能源融合产业机会，形成未来空间城市样板。

主要举措

14. **推动港航数字化升级：**运用数字化技术对港口、机场等基础设施进行升级改造，构建大数据分析与开发服务平台，通过智能化运营提升整体服务能力。打造世界级数字孪生智慧机场与智慧港口，提升上海国际海空枢纽的影响力与竞争力，强化国际航运中心地位。

15. **加快长三角交通一体化协同：**推进长三角区域交通信息的共建共治共享，加强跨区域智慧高速公路、水网、机场群数字化建设以及跨区域一网通、一卡通等服务体验建设，推动长三角交通一体化建设进程，提升区域互联互通水平。

16. **创新交通数字化服务：**加强时间与信息融合，推进线路精准化运营、实时到站预报全覆盖，实现城市内地面公交与轨道交通系统的可靠、高效运行。构建出行即服务（MaaS）平台，打造一站式出行体系，实现实时、全景、全链交通出行信息数据共享互通，建设融合地图服务、公交到站、智慧停车、一键叫车、无感充电等场景的统一服务平台，实现市民出行生活的优质普惠。

17. **打造全局动态交通管控：**建立数据驱动的智能化协同管控系统，探索人车路联网联控体系设计，加强安全应急管理决策能力建设，实现上海交通出行的精细化管理，提升交通品质与整体出行效率，增强交通安全性。

05

低碳环境

锚定零碳转型新目标，可持续高质量谋发展

目标

为全市居民提供绿色、宜居的自然生态环境，助力上海能源结构优化和经济高质量发展，共同应对气候危机，增强城市韧性，实现上海的低碳转型与可持续发展。

背景

承接我国“二氧化碳排放力争于2030年前达到峰值，努力争取2060年前实现碳中和”的双碳目标，上海率先出台时间表，提前五年实现碳达峰。近年来，上海在蓝天、碧水、净土保卫战和垃圾分类攻坚战上取得优异战果，城市生态环境质量明显改善。同时上海通过优化产业结构、推广新能源车、升级绿色建筑、发展绿色农业，推动了经济绿色高质量发展。然而，上海面临的经济发展与人口增长双重压力，与上海城市本身存在的碳排基数大、资源过度开发、PM2.5污染等城市环境问题，对上海未来的环境可持续发展带来了巨大挑战。

案例介绍

黄浦区打造中心城区虚拟电厂示范项目。依托“物联网通信”+“互联网聚合”，大规模汇聚城市建筑可调电力负荷资源，将零散资源盘活成“大数据+人工智能+智慧建筑”高质城市电力数字资产群，建立电力消费精细化管控模式，提高电力使用效率，达到智慧减碳效果。

北外滩街道打造智能垃圾厢房。在辖区内率先试点智能垃圾箱房，通过AI摄像头智能识别指定时间外的违规投放行为，并予以语音提示。此外，垃圾箱房内安装了红外测试仪、垃圾桶底部的电子秤、有害气体感应器和渗水装置等各类高科技设备，全方位了解垃圾箱房垃圾分类情况。

主要举措

18. **构建智慧能源体系：**运用数字化技术规划建设绿色能源基础设施，降低可再生能源发电成本，提高能源生产与流通效率。构建智慧能源社区等终端用能解决方案，提高能源利用效率。
19. **数字化赋能绿色建筑：**将绿色建筑3D模型、建筑材料碳排数据模拟以及智能平台等数字技术应用在建筑的规划、设计、施工、运营全生命周期，对建筑的各类碳排指标进行跟踪，支撑减排计划与政策制定，助力城市整体减排目标实现。
20. **提升废弃物处理效率：**通过数字化技术对垃圾进行智能化分类管理、垃圾处理流程精准化模拟等，以实现垃圾全生命周期的科学、智慧管理，最终提升废弃物处理效率与循环利用率。
21. **推进市民碳普惠计划：**倡导市民低碳行为，打造个人“碳积分”账户，对接碳交易市场、商业消费平台等，通过有效机制激励市民践行低碳生活。

06

未来治理

构建高效韧性新智理，强化以人为本之理念

目标

持续强化管理权责清晰，夯实数据信息安全，提升政务流程效率，通过政府的顶层监管与机制设计，整合、流通数据，释放数据资源价值，打造包容、和谐、普惠、共赢的社会共同体。

背景

本土、国际企业，国有、民营企业，本地、外来人口，传统、现代的城市产业，构成了上海城市在国际范围的包容性模式，也给上海政府提出了多样化、多相关方、高风险、低容错的严峻治理挑战。为了有效、高效、切实的服务好各方面社会群体，上海将继续提高对社会各主体的感知、监管能力，“车同轨，书同文，行同文”，上海应以数据要素为驱动，以统一机制为轨道，引导政、企、民多方神经元的沟通与协同，利用数字化技术构建协同、安全的城市神经网络。

案例介绍

浦东新区打造“政务智能办”，实现高频事项“零材料填报”。针对企业申报环节材料准备烦、难的问题，积极探索政务服务数字化转型，打造综合窗口“政务智能办”新模式。通过信息共享、智能审查，整合咨询、收件、初审环节为“一次办成”，帮助企业在咨询过程中通过问答即可形成准确、完备的申报材料，为企业提供“零材料填报”全新体验。一是窗口办事实现“三免”。实现“信息免提交”、“材料免填报”、“办事免跑动”。二是政务服务实现“四转”。理念转变、角色转变、功能转变及方式转变，让企业省心，政府放心。

主要举措

22. **一网统管：**以政府、市场和社会为治理主体，从聚焦城市运行和应急处置着手，持续向公共服务、公共管理、公共安全三大领域拓展与延伸，减少政府公共管理的横向协调及纵向整合成本，提高政府治理效率。借助数据全面感知社会事项及公众所需，为政府决策提供丰富的数据资源和重要的平台支撑，形成数字化城市“智理”新范式。

23. **一网通办：**以企业和群众为服务对象，整合社保、医保、公积金、税务、工商等数据，深化业务流程的重塑再造，聚集跨部门、跨层级、跨区域事项的高频需求，帮助市民解决“如何办好一件事”，塑造人性友好的城市数字化服务。全面深化数据治理，拓展公共服务领域，提升线上线下服务能级，使公民能够随时随地利用任何设备方便地获取政府服务、参与政府活动并与政府交流。推动长三角同城化机制的构建，拓展跨区域跨省通办事项，依托长三角数据共享交换平台，建立长三角数据供需对接机制，推动实现长三角公共数据“无差别”合作。

24. **一码通行：**打造市民“一码通行”服务，在交通出行、文化休闲等市民城市生活场景和场所中实现一码缴费、一码出行、一码游览，并与个人“碳账户”、信用账户等形成场景协同与追踪，实现数据的打通与对多类场景的赋能发展。进一步探索长三角“一码通行”服务，实现长三角城市间居民数字身份互认，逐步实现长三角区域公共服务的打通，为长三角区域内的居民提供跨城跨行业服务，成为长三角数字一体化的重要推手。

25. **镜像治理：**建立城市运行生命体征指标体系，纳入地理空间、生态环境、建筑结构、人车活动、能源状态等各类静态及动态数据，形成精准、实时的城市运行数字画像，打造镜像无界城市。推动城市级可信信息交换与协作网络与BIM、GIS、大数据、人工智能等技术融合，构建覆盖城市建设、社区、基础设施、交通系统的综合运行和智能管理大数据平台，实现城市情境全息感知，从全局视角整合、调度、优化城市资源，打破城市治理数字和物理的隐形鸿沟，提升城市运行的科学治理能力。

07

现代设施

筑造泛在互联新基座，保障坚实安全稳成长

目标

抓住新一代基础设施建设为城市转型升级带来的新机遇，打造万物互联、万物智联的数字新基座，成为连接现实世界与虚拟世界的关键桥梁，以提升新设施的国际竞争力，提升城市创新转型支撑能力。

背景

新型基础设施建设是城市数字化转型的重要支撑，是创新驱动发展的重要基石。上海围绕具有全球影响力的科技创新中心建设目标，不断加码网络基础设施、数据中心以及计算平台等重大基础设施布局，总体水平在国内保持领先。但是在5G网络市域全覆盖、物联网设施统一规划与建设、功能平台与数据平台建设、现代科学设施集群建设等方面依然存在待提升之处。未来上海将进一步聚焦城市功能提升与创新转型，通过统一规划指引推进建设“上海特色”的新型基础设施。

案例介绍

商汤科技正式启动人工智能计算中心。商汤科技人工智能计算中心（AIDC）是由商汤科技打造的一个开放、大规模、低碳、节能的先进计算基础设施，该项目于2020年7月开工建设，于2022年1月启动运营。

该项目位于上海临港，作为SenseCore商汤AI大装置计算基础设施的重要组成部分，AIDC一期工程的设计算力为每秒3740 Petaflops（1 Petaflops为每秒千万亿次浮点运算），是亚洲最大的超算中心之一。AIDC占地面积13万平方米，一期机柜数量5000 个。

主要举措

26. **加快新一代数字化基础设施建设：**加强5G通讯基站及网络建设，实现5G网络对上海市域全覆盖；推进云基础设施建设，合理布局边缘计算，为城市产业发展与转型提供算法与算力。
27. **构建城市数字化转型赋能底层新平台：**构建一批城市级服务平台，通过企业数据、行业数据、公共数据的整合，构建面向城市企业、个人用户的数据开放服务能力，进而赋能整体城市发展。推进人工智能、数字孪生平台等新平台建设，洞察城市用户、城市发展的痛点与需求，推动数字化转型场景的落地。
28. **打造科技创新战略平台与科学大设施集群：**围绕科学与产业前沿布局建设重大创新平台，争取国家支持布局新一轮重大科技基础设施，依据不同的设施属性给予不同的政策与财政支持，以大设施集群支持上海前沿科学发展与产业化。

29. **升级城市各类智能终端：**合理部署视频图像、传感监测等AIoT感知终端，推进智能储物柜、智能充电桩、“互联网+”医院设施等智能末端设施的建设，构建城市神经元网络系统，实现全市多领域数据信息的采集与管理。

30. **构建数字安全保障体系：**利用先进技术增强网络安全建设，确保网络安全攻击防得住、网络安全事件查得明、网络安全隐患除得尽。完善数据安全策略设计、标准流程设计等，营造安全的数据使用环境，实现数据的“可管、可控、可信”。增强安全核心技术能力研究，促进安全产业发展，增强城市数字安全保护力量。

08

创新生态

融合多方共赢新生态，打造城市创新新台阶

目标

建立城市各方创新转型主体的纽带，实现创新转型能力、资源的集约化与协同化，融合多方力量撬动城市整体转型，汇聚数都上海的蓬勃力量，实现城市数字化转型模式自我革新、不断发展。

背景

上海城市数字化转型已经进入深水区，然而在城市转型过程中存在多方合作机制尚不健全，创新主体协同不足，需求难以对接融合，点状场景建设矛盾突出，创新动能尚未完全激活等问题。实现协同与融合、利用市场化资源撬动城市整体转型是未来城市转型过程中最突出的诉求。未来上海将坚持以人为本的转型理念，以创新生态为纽带构建全民共建、共治、共享的新格局。

案例介绍

长宁区打造新微智谷科创基地。新微智谷作为长宁“虹桥智谷”国家双创基地的重要载体，集人工智能应用场景、智慧体验、零售、联合办公、创新孵化等功能为一体，以人工智能为导向，依托科协科技工作者和学会资源、微系统所专业技术优势和人才优势，打造数字化转型产业聚集区、科技成果转化基地，营造数字化人才发展的生态圈。

主要举措

31. **建立多元化城市创新生态网络：**立足上海城市数字化转型以及创新驱动发展目标、能力诉求及资源禀赋，规划设计创新生态网络的战略定位、运营模式以及实际承载功能，打造城市创新生态网络，实现创新资源与需求的供需对接，推出一批示范场景，激发市场创新活力，赋能企业数字化转型，促进科技创新企业孵化，增强数字人才引进与培养，带动数字经济发展。

32. **构建线上线下协同化承载设施：**构建线上生态平台实现协同创新服务集成，统一入口与数据，为城市数字化转型各主体提供无时间、空间限制的各种服务协调与调度。建设各类线下基础设施，与线上平台实现流量协同、服务协同，相互促进，实现资源、能力的效益最大化。

33. **配套城市生态网络运营保障机制：**建设一套由启动、推广到运营的全流程创新生态网络运作机制，通过体制机制建设激发生态网络主体内生动力，盘活各类转型创新资源。

34. **搭建科学全面有的放矢的评估模型：**为城市管理者提供有的放矢的衡量标准和评定依据，为城市建设者提供有指导意义的建设框架。结合上海的特色，秉持“规模与质量并重，全面与聚焦兼顾，投入与成效齐举，定量与定性结合”的原则，为未来实现数都上海的愿景蓝图，提供可衡量、可执行、全面性、高维度、有侧重的参考评估模型。此外，在建设数都上海的过程中，也应对上海整体的城市发展水平进行把控与追踪，保证数字化举措对以人为本的城市转型起到切实有效的提高效果。

行远自迩：数都上海建设的行动原则

数都上海在多个主要领域的转型建设中，应当是齐头并进，多点开花，互相协同，互惠互利，全面拉通的。同时，又由于上海的精巧、密集、高能等特性，应当在转型的过程中，谨慎务实，以绣花的精神去落地建设转型。数都上海的建设可总结为三大原则。

多方协同，合作共赢

实现上下贯通、政企协同、多方联动，促进产学研合作，共创政企合作、市场投入为主的合作运营机制，形成社会公众共同参与的模式。在建设过程中，始终保持“城市是主场，企业是主体，市民是主人”的建设机制，充分践行“人民城市人民建，人民城市为人民”的重要理念。

避虚向实，长期价值

面向未来长期发展，城市整体转型要贯彻以人为本的根本原则，运用新一代数字技术，助力数字化城市建设的“避虚向实”，推动政府精准施策，精确满足社会需求，避免重复投资、重复建设，以社会长期价值为导向，规划切实有效、长期有益的建设路径。

以点带面，撬动全局

对症下药，以点、线、面的推进节奏，撬动上海整体性转型的胜利。在**点 – 重点场景深耕：**在楼宇、企业、社区、单部门、单设施等局部重点领域，聚焦场景应用，在最具备价值提升空间，最能解决人民切实痛点的场景，运用成熟的技术在聚焦领域深耕试点，实现单体机构或设施的高水平提升；**线 – 关联领域协同：**在街道、工业区、公共区域、跨城市、多设施等强相关重点领域，强调多场景的关联应用，通过各要素在领域间的流通与迭代，进一步提升场景自身的能力水平，同时建立起跨领域的服务体系，解决复杂、跨域的需求场景，提供一体化、一站式的人民服务，带动区域整体性的提升；**面 – 全球品牌影响：**在跨国家、跨文化等高维相关领域，打通宏观壁垒，在整体大数据感知的基础上，达到宏观上全球要素的配置调控，微观上全面落地的智慧决策能力，塑造上海城市数字化转型的国际品牌，打造对全球城市发展的国际影响力。

结语

随着全球城市化发展进程的加快，全球城市在经济、生活与治理方面将面临全新的、更严峻的挑战。与自然共处、与多元文化共存、与新经济共赢，是新城市阶段的新愿景。城市的数字化与国际化将是达成这一愿景的重要抓手，上海将在顺应城市本身特色的基础上，抓住百年大变局和数字技术革命下的历史性机遇，构建“开放创新、包容、安全、韧性和可持续”的数都上海，不断改善人民生活，提高城市能级，增强国家综合实力，为全球城市提供标杆借鉴，为全人类命运共同体作出中国贡献。

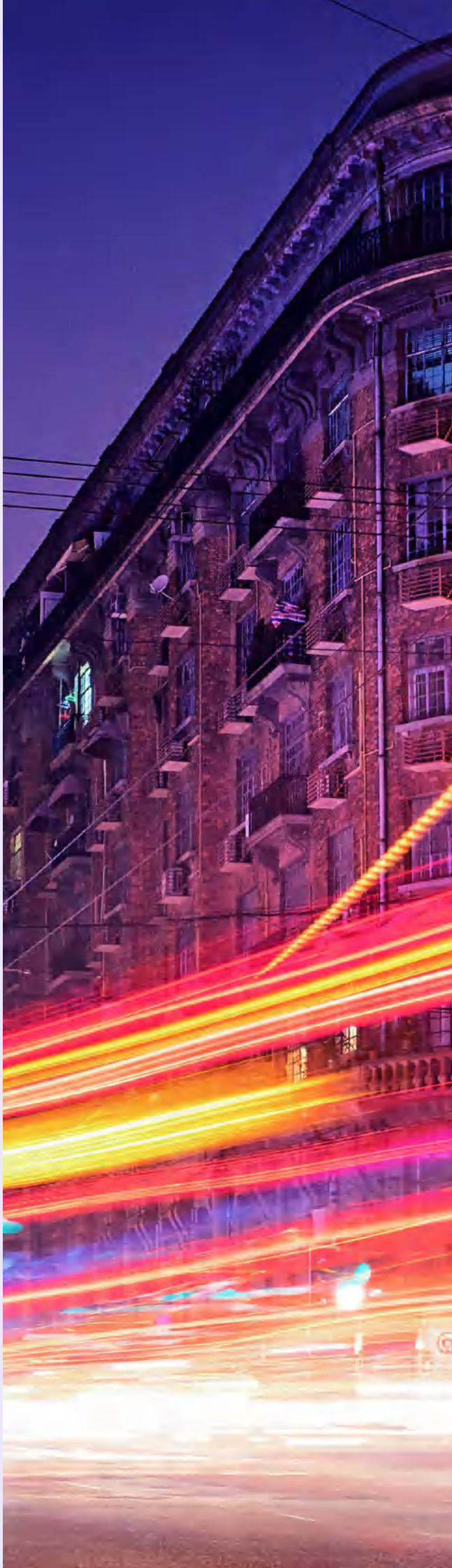
附录

城市数字化转型评价指标体系

概览

为帮助城市准确衡量和反应数字化转型建设的目标、进度和发展水平，帮助城市管理者了解城市数字化转型的优势及短板，及时调整规划方向，需形成一套与城市数字化转型思路与规划相适应的评价指标体系。

因此，在前期研究的基础上，特制定《城市数字化转型评价指标体系》（以下简称“指标体系”）。该指标体系主要是基于城市数字化发展理念，统筹考虑城市数字化水平、综合竞争力、绿色低碳、人文科技等方面的因素综合而成，为进一步提升城市竞争力、促进城市数字化转型提供有益参考。



一、设计原则

城市数字化转型评价指标体系不是指标的简单堆积和随意组合，而是根据设计原则而建立并能反映一个城市数字化转型进展和水平的关键指标集合。这些设计原则是通过参考国际指标体系、国际与国家标准等实践总结出的带有规律性的共同约定。设计评价指标体系时，依据这些原则可以提高评价的科学性和有效性。

因此，为了建立一个可行、可持续发展的城市数字化转型评价指标体系，在设计城市数字化转型评价指标体系时遵循以下原则。

规模与质量并重

指标体系在关注城市数字化转型的投入和建设规模的同时，应关注发展质量，致力于考核和评价城市数字化转型给市民、企业、政府机构及其他相关主体带来的实际效用。

全面与聚焦兼顾

指标设计时应统筹兼顾城市数字化转型的各方各面，做到体系完备。同时重点聚焦城市数字化转型的关键领域，有效监督城市数字化转型目标实现。

投入与成效齐举

评价指标应关注城市数字化转型全过程，从资源投入、项目进展、发展成效、长期影响等角度进行全方面考核，监督城市数字化转型中各项工作的有效落实，保障项目建设质量，提升城市数字化建设效益。

定量与定性结合

城市数字化转型评价应当由定性指标和定量指标结合构成。通过定量指标确定清晰明确的量化标准，以更加直观、准确地评估考核对象的实际工作情况，减少主观性。同时结合定性指标，全面考核城市数字化转型工作。通过定量为主、定性为辅的评价方式，充分反映城市数字化的建设水平。

二、设计目标

对于没有目标的航船，所有的风都是逆向。城市数字化转型评价指标体系应有明确的设计目标。该目标既要充分贴合城市整体数字化转型战略，又要具备可落地性与可持续性。通过设立清晰、可行的目标，指标体系设计可与数字化转型建设紧密挂钩，实现理想的指导与评价作用。因此，指标体系的详细设计围绕以下目标进一步展开：

提升资源配置效率

指标体系旨在为资源配置决策提供科学依据，客观反映城市建设成效，明确城市建设重点方向，从而引导各级政府稳定有序地推动资源配给，即在资源投入一定的情况下，通过配置资源使产出最大，或在产出一定的情况下，配置资源使投入最小，从而实现资源配置经济效益及效率的最大化。同时引导市场对资源的自由配置，借助合理的指标体系减少政府对资源配置的直接干预，更好地发挥市场对资源配置的决定性作用。

提升资源投入效能

指标体系旨在将最大化资源投入效益，提升资源投入效能。通过科学评定城市数字化转型过程中各个环节的资源投入与产出价值，避免盲目投入、重复投入引起的资源浪费，使投资真正源于需求，面向应用，创造价值。

提升资源集聚密度

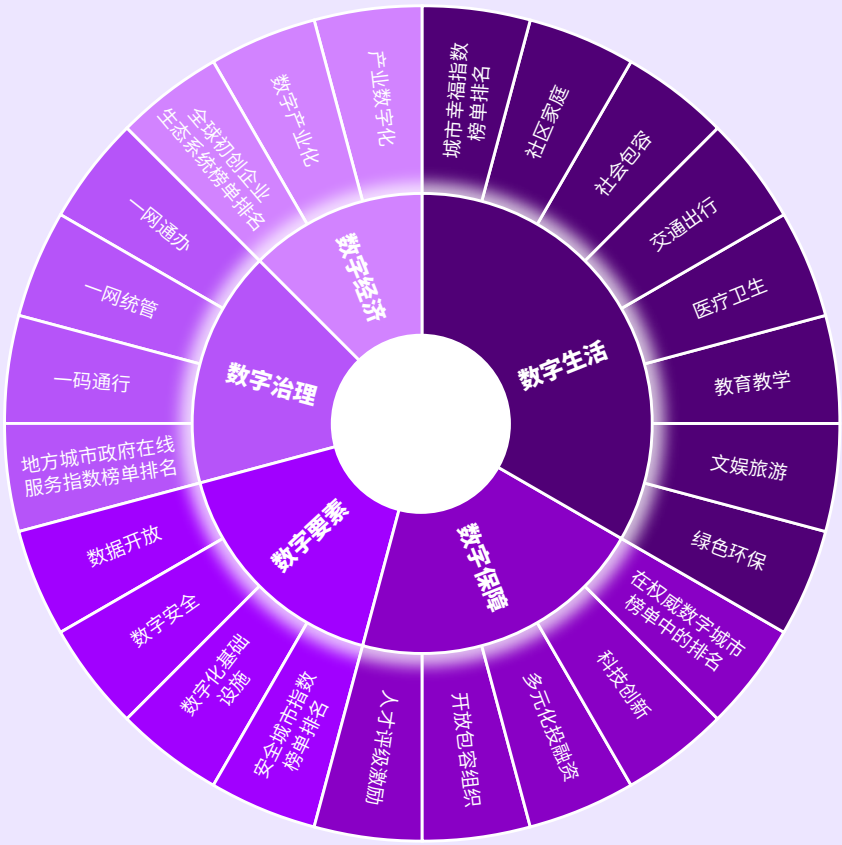
指标体系旨在提升资源要素的多样性和城市主体的多元性。通过全面的城市数字化转型指标分析，引导资源要素向关键领域流动，促进人才、资金、技术、信息等各类要素的有机集聚。并且通过统一的考核指标规范各部门和机构行为，拉动各类主体共同监督城市数字化成效，汇聚多元主体联合参与城市数字化建设，提高城市活力。

三、指标体系

本指标体系承接《数都上海2035》，从数字经济、数字生活、数字治理、数字要素、数字保障五个维度展开城市数字化转型评价指标设计，共涵盖二级指标19项，三级指标123项，并根据衡量维度的不同，将三级指标分为了投入类、成效类、影响类指标。

投入类指标衡量数字化转型建设中所投入的资源，包含资源的数量、质量和投入及时性，以及培训发展、保障机制等能力建设的开展。成效类指标衡量数字化转型建设的最终成效，包括经济发展、生活水平、治理能力、基础设施覆盖、城市数字化能力的全面提升。影响类指标衡量数字化转型的长期影响，例如城市数字化转型相关方的满意度、在国际权威榜单中的排名相关指标等。

指标体系图



备注：

1、本“指标体系”将根据不同历史发展阶段的实际需求进行动态调整。
2、本“指标体系”所说的“城市”特指城市化区域。
3、本“指标体系”所说的城市市民一般指城市常住人口。

数字经济

数字经济是指以数据资源作为关键生产要素，以数字化技术作为效率提升和经济结构优化的重要推动力的一系列经济活动。指标体系根据产业数字化和数字产业化的建设及发展情况，评价数字经济的发展成效。主要包括25个三级指标。

二级指标	三级指标	衡量维度
产业数字化	传统行业数字化从业人员占比	投入
	开展数字化业务的传统行业企业占比	成效
	产业数字化年发明专利申请总量	成效
	产业数字化科技成果转化率	成效
	已应用新技术的传统行业企业的比例	成效
	工业互联网产业占比	成效
	工业互联网平台智能化应用	成效
	上云企业比例	成效
	企业数字化资源管理的比例	成效
	企业数字化生产管理的比例	成效
	智能工厂比例	成效
	智慧银行建设情况	成效
	智能船舶数量	成效
	能源互联网覆盖率	成效
	医药生产数字车间比例	成效
	药品新零售比例	成效
	无人农业生产基地比例	成效

二级指标	三级指标	衡量维度
数字产业化	数字经济研发支出	投入
	数字经济占GDP比重	成效
	数字经济从业人员占比	投入
	数字经济发明专利	成效
	数字经济固定资产投资额占比	投入
	数字经济国际化情况	成效
	数字经济独角兽企业占比	成效
全球初创企业生态系统榜单排名		影响

数字生活

数字生活是指利用数字化技术来提升市民生活体验与幸福感。指标体系根据绿色环保、文娱旅游、教育教学、医疗卫生、社会包容、社区家庭等关键场景的数字化程度与市民生活幸福指数，评价数字生活的发展成效。主要包括35个三级指标。

二级指标	三级指标	衡量维度
绿色环保	新能源汽车比例	成效
	重点用能单位在线监测率	投入
	建筑物数字化节能比例	成效
	城市环境质量自动监控情况	投入
文娱旅游	线上场馆比例	成效
	数字景区比例	成效
	线上娱乐活动比例	成效
	数字酒店数量	成效
教育教学	智慧教室覆盖率	投入
	智慧校园覆盖率	成效
	教师数字化技能培训	投入
	网络学习空间覆盖率	成效
医疗卫生	电子病历普及率	成效
	市民电子健康档案联网共享比例	成效
	一站式数字医疗服务医院比例	成效
	在线问诊率	成效

二级指标	三级指标	衡量维度
交通出行	共享交通使用率	成效
	公共交通来车信息实时预报率	成效
	公共交通乘车电子支付使用率	成效
	搭载自动驾驶功能的车辆占比	成效
	智慧停车位比例	成效
	一站式交通出行	成效
社会包容	残疾人/女性数字化产业中的就业比例	成效
	特殊人群数字应用服务人均使用数量	成效
	60岁以上老人智能机覆盖率	成效
	互联网特殊人群无障碍访问情况	成效
	长者数字活动人均次数	投入
	智能健康养老服务社区比例	成效
社区家庭	智慧物业覆盖率	成效
	“社区云”覆盖率	成效
	智慧菜场覆盖率	成效
	智慧超市覆盖率	成效
	数字商圈数量	成效
	智慧社区服务覆盖率	成效
城市幸福指数榜单排名		影响

数字治理

数字治理是指在数字化技术的支撑下，政府机构日常办公、信息收集与发布、公共管理等事务在电子平台上进行的行政管理形式。指标体系结合城市政务服务和城市运行的管理现状，抓住“一网通办”、“一网统管”、“一码通行”三大关键推动力，评价数字治理的发展成效。主要包括20个三级指标。

二级指标	三级指标	衡量维度
一网通办	一网通办“政民互动”情况	成效
	一网通办政务服务覆盖率	投入
	一网通办政府部门覆盖率	投入
	政务服务线上办理比例	成效
	一网通办可靠性	成效
	一网通办“一件事一次办”场景开发数量	投入
	一网通办“一件事一次办”场景开发成效	成效
	一网通办线上办理事项结项平均时长	成效
	一网通办满意度	影响
	一网通办无障碍访问等级	成效
一网统管	一网统管应用场景开发数量	投入
	一网统管使用满意度	影响
	企业电子档案覆盖度	成效
	数字化城管情况	成效
	公共安全视频图像支撑服务社会管理情况	成效
	紧急状态预警	成效
	城市交通运行发布及管理	成效
一码通行	“一码通行”应用场景数量	成效
	“一码通行”使用人数	成效
地方城市政府在线服务指数榜单排名		影响

数字要素

数字要素是指将数据作为新的生产要素，形成数字资产，以充分挖掘与沉淀数据价值。指标体系从数字化基础设施、数据开放、数据安全等关键维度出发，评价数字要素的发展成效。主要包括21个三级指标。

二级指标	三级指标	衡量维度
数据开放	信息资源部门间共享率	成效
	跨部门数据融合	成效
	公共信息资源社会开放率	成效
数字安全	智慧城市数字化安全保障机制	投入
	政府系统安全标准认证率	成效
	政府系统安全运营情况	成效
	失泄密事件（案件）数量	成效
	网络安全演习活动得分	成效
	网络安全演习活动覆盖率	成效
	市民反诈骗意识	成效
数字化基础设施	公共区域wifi覆盖率	成效
	5G信号覆盖率	成效
	Ipv6普及率	成效
	家庭网络能力	成效
	政府大数据中心建设情况	投入
	政府政务系统上云比例	成效
	数字孪生城市建设情况	投入
	数字孪生城市覆盖面积占比	成效
	城市赋能平台接入率	成效
	城市赋能平台使用率	成效
安全城市指数榜单排名		影响

数字保障

数字保障是指在城市基础运营的过程中利用数字化手段提供的坚实保障，以支撑城市数字化转型的可持续发展。指标体系根据人才评级激励、开放包容组织、多元化投融资、科技创新等关键维度，评价数字保障的发展水平。主要包括22个三级指标。

二级指标	三级指标	衡量维度
人才评级激励	企业数字化培训开展情况	投入
	政府员工数字化水平	投入
	数字相关专业教育情况	投入
	数字化相关专业院士级科学家数量	投入
	市民在城市数字化转型建设的参与度	成效
	市民在数字化扫盲培训中的参与度	投入
开放包容组织	企业在城市数字化转型建设中参与度	成效
	CIO或CDO制度企业占比	成效
	政府组织数字化转型活动的企业参与度	投入
	智慧城市组织机制	投入
	智慧城市保障机制	投入
	智慧城市战略规划	投入
	智慧城市战略执行	成效
多元化投融资	政府引导基金数量及规模	投入
	创业风险投资机构数量及资金管理规模	投入
	城市数字化转型政府支出占比	投入
科技创新	前沿基础技术研发中心数量	投入
	前沿基础技术发明专利申请数量	成效
	关键技术科技成果转化率	成效
	关键技术研发中心数量	投入
	关键技术产业固定资产投资额占比	投入
在权威数字城市榜单中的排名		影响

参考资料

1 世界银行，www.worldbank.org

2 《全球数字经济白皮书》——中国信息通信研究院，2021年8月

3 世界银行，《全球数字经济白皮书》，中国信息通信研究院，2021年8月

4 埃森哲研究，2021年

5 《中国都市圈发展报告》，中国新型城镇化研究院，2018年

6 《统计年鉴》，上海市统计局，2020年

7 联合国经济和社会事务部，《世界城市化展望2018年修订版》，2018年

8 上海第七次全国人口普查，2021年

9 《上海数字化全场景图谱专项报告》，埃森哲研究，2021年

Contents

Introduction

The ever-evolving information technology has implanted networking, informatization and intelligentization into all aspects of economy and society, including the construction and governance of cities, where digital transformation has ushered in a new stage. Leading cities such as New York, Tokyo, London have begun using a new generation of information technology to examine the essence of a city, define its development goal, identify its functionality, adjust its structure, and shape its image and features. One after another, they launched strategic measures for building Smart Cities, with innovative applications implemented aiming at a series of key issues in the development of modern cities. Digital transformation has become an important means to enhance the competitiveness of a city, while a new model of intelligent city development has begun to take shape.

In the process of digital transformation and construction, a city usually goes through the initial stage 1.0 and the growth stage 2.0 before reaching the deepening stage 3.0. Stage 1.0 mainly tackles the integration of IT technologies, and Stage 2.0 focuses on the deployment of technology applications. Both stages involve few residents in the overall construction process, so it is difficult for the people to benefit from the outcome. Therefore, in Stage 3.0 of digital city transformation, the goal is to build a people-oriented intelligent city for the purpose of "serving the people, facilitating the people, and benefiting the people," where a new pattern will be co-built and shared by the whole society through ongoing innovation, coordination and integration.

Compared with other countries, China's digital city transformation has its own unique context, including but not limited to: 1) The unsynchronized population growth and carrying capacity, with the environment and resources increasingly challenged day by day; 2) A mismatch between the government's public management and the general public's demand, calling for improvement in the synergy and timeliness of city governance; and 3) The industrial pattern incompatible with the economic development orientation, where conventional production technologies and management methods proven unsustainable. Therefore, it has become a key issue for the city planners and managers to leverage digital technology so as to improve people's wellness, upgrade economic development, and vitalize urban management and innovation.

Under the national strategy of digital China development, digital transformation is in full swing across Chinese cities. As a megacity, Shanghai is facing many development and governance dilemmas due to the ever-growing population size and economic scale. In order to break off from the transformation bottleneck of the complex giant system in megacities, Shanghai has been pushing its digital city construction plan in all aspects. The municipal government of Shanghai released the digital transformation plan for both the 14th Five-Year Plan (2021-2025) period and 2035 period, with the aim to transform Shanghai into a global digital metropolis by 2035. According to the plan, Shanghai will achieve remarkable results in comprehensively promoting its digital transformation by 2025, with a basic framework set up for the construction of a global digital metropolis, which will then turn the city into an international digital megacity with global influence by 2035. By then, the construction of a global digital metropolis will be completed.

The digital transformation of a city is a huge systematic project, which requires the participation of multiple social entities in line with the basic notion of co-construction, co-governance and sharing. This white paper aims to demonstrate Shanghai's determination to build a people-oriented digital city. It is an action guide for the whole Shanghai to take part in its digital transformation. Thereby, Shanghai, as a metropolitan city, will take the responsibility of the era, and give full play to its role as a national benchmark, a regional synergy engine and an international pioneer in this regard.

The white paper interprets Shanghai's promotion of its digital transformation in an all-round way, including the significance, connotations, goals, fields under construction, and action principles, draws a blueprint of the city's transformation, and identifies key tasks. All this aims at guiding and accelerating the overall construction procedures towards a digital Shanghai.

Digital Shanghai.
Let's meet!

Visions: Opening-up & Innovation, Inclusiveness, Safety, Resilience and Sustainability

A global digital metropolis should be an ideal mixture of three dimensions, namely the physical, spiritual and digital domains. Therefore, Digital Shanghai should integrate the humanistic spirit of Shanghai's civilization of 6,000 years, the features of the city's urban construction of more than 1,000 years, and the unique attributes to a boundaryless digital space digital space. The visions of a global digital metropolis fully embody Shanghai's urban spirit, and are the digital interpretation of Shanghai's long-range objectives through the year 2035.

Five key words of the visions

Opening-up & Innovation

As metropolis at the forefront of reform and opening up, Shanghai will integrate the characteristics of openness and boundarylessness of digital space to get a head start in the world economy featuring open cooperation, open innovation and open sharing.

Inclusiveness

Just as the sea embraces every stream, Shanghai is an "inclusive and all-embracing" city, where intelligent internet of things (intelligent IoT) will prevail in the digital space, which, together with other state-of-the-art technologies, promise an equal and harmonious urban ecology.

Safety

Data safety, privacy safety, technique safety as the core principle will be followed in the course of building Shanghai into a vital circulation hub with global digital elements, by leveraging new safety and security methods in digital space.

Resilience

Given the flexible and continuous evolution of digital space, Shanghai will accelerate its pace to become resilient, and explore efficient solutions for governing such a megacity.

Sustainability

Aided by digitalization, Shanghai will sustain its economic and ecological development, and improve its livelihood and governance in a comprehensive, coordinated and inclusive manner.

A global digital metropolis refers to a digital eco-city which is open, inclusive, safe, resilient and sustainable, strives to become a world-class digital hub, and digitally empowers its economy, society and governance.

By 2035, Shanghai will become the most attractive, influential and competitive city in the world in terms of digital talents, digital elements and innovation business clusters. By then, it will possess the world's leading digital infrastructure and become a global hub for the circulation of digital elements; it will have a world-class digital economy and become a globally competitive Fintech center and a digital economy innovation bridgehead; its digital community ecosystem will be full of vitality, creating a new digital life paradigm to serve a better and quality life for all; its digital governance capabilities will align to international benchmarks, forming a new model for megacities around the globe.

Challenges and Opportunities for Shanghai in an Era of Uncertainty

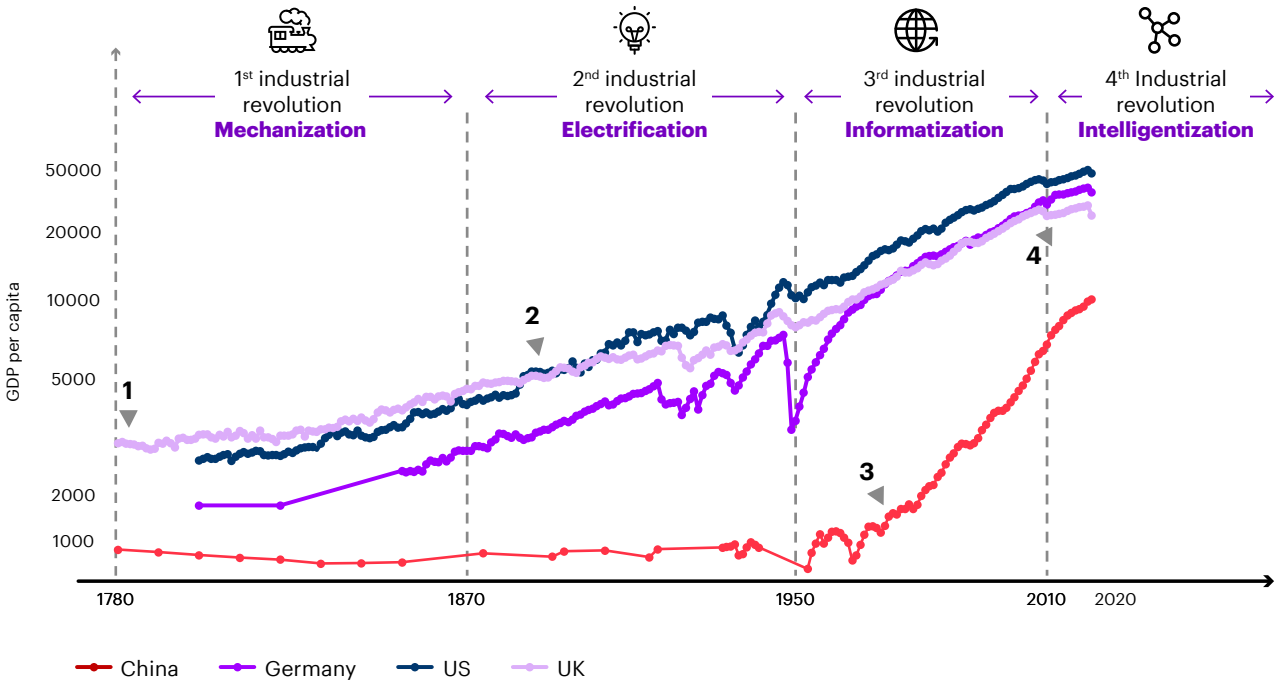
Shanghai's digital transformation plan is an Important strategy aligned to the trend of the era, which meets China's overall strategy and the requirements for sustainable municipal development and coordinated regional development. Therefore, it is necessary to thoroughly understand the connotation and key points of Digital Shanghai. The challenges and opportunities facing Shanghai should be analyzed at four levels: the context, the country, the region and the city.

The Context Level
Shanghai Responds to Worldwide Changes and Crisis as a Global City

The world today is undergoing profound changes unseen in a century. Cities around the world will play an important role in leading mankind to confront changes of the world, of the era and even in history. As one of the cities, Shanghai is to play a leading role and be a driver for the evolution of city development and a pioneer for the progression of human civilization.

The fourth industrial revolution, dominated by artificial intelligence, brain science and chip technology, is leading the evolution of human society from informatization to intelligentization. The oriental civilization, represented primarily by China, is gradually gaining an edge in this industrial revolution, where Asian cities and countries are getting rejuvenated. **The global warming and extreme climate events have made mankind aware of the fragility of social ecology, while carbon control and emission reduction have become a hard constraint on social development.** Cities and countries are seeking cooperation and adopting more powerful policies and measures to break the bottleneck of resources and environment with green economic recovery, so that they can achieve low-carbon transformation. At the same time, **the raging and recurring pandemic, which is normalized across the globe, has accelerated the process of global digitalization.** Common challenges facing countries and cities will include the restart of the economy amid COVID-19, new digital business formats, government credibility and global governance.

Figure 1: The Fourth industrial revolution leads the evolution of human society from informatization to intelligentization [1]



Source: World Bank, www.worldbank.org.

As the world has entered the urban era, leading cities will enhance their global voice and influence by constructing a global urban system. Riding on the wave of the third industrial revolution, Shanghai has evolved into an international hub next to London, New York, Tokyo, Beijing and Paris in the past three decades. Shanghai's rapid recovery from the pandemic attributes to its seizing the opportunities of the fourth industrial revolution, which reinforced its role as the "global center of economy, finance, trade, shipping, and scientific innovation."

In the future, Shanghai will lead intelligent manufacturing and high-end services with new data elements and empower its high-quality urban development with digital technology to become a global benchmark city leading the transformation of the era.

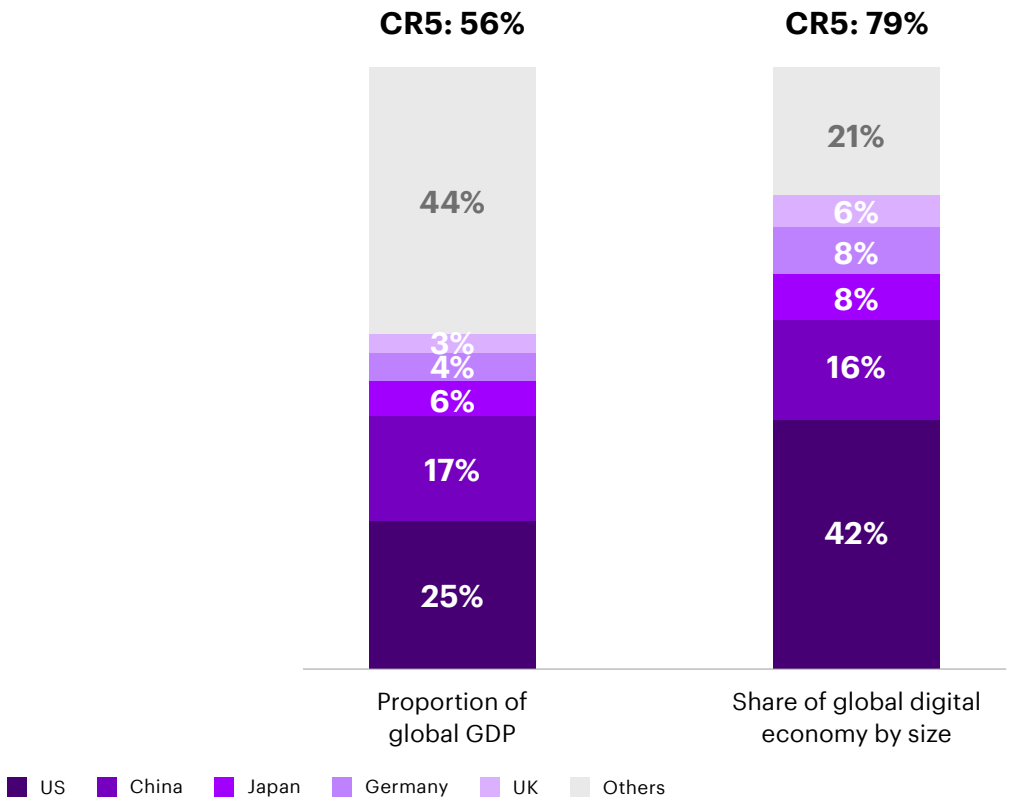
The Country Level
Shanghai Leads China's Transformation and Take-off as an Open First-tier City

China's economy is shifting from high speed to high quality growth. Digital economy will become the main force of economic transformation, carrying and driving China's industrial upgrading. In the face of economic restructuring, Shanghai should, in accordance with the national strategy and policy, act as a robust engine for national development, and set a benchmark for China's economic transformation.

The world economy and international trade have both slackened. In contrast, digital economy keeps thriving, accounting for 43.7% of global GDP in 2020 compared to the 14.2% in 2005 [2]. **Digital economy and digital trade have become new growth engines of major economies worldwide.** On the other hand, by exhibiting a Matthew effect more perceivable than traditional industries do, digital economy has become the main battlefield for the economic competition globally (see Figure 2). **China has a huge advantage in developing its digital economy.** Its large population base and high digital penetration rate constitute a strong driving force for local digital industrialization. China's secondary and tertiary industries, which also rank the second largest in the world by size, also provide a huge market with great potential for industrial digitalization.

Figure 2: Digital economy and digital trade as new growth engines for major economies worldwide [3]

The proportion of global GDP by country and the share of digital economy by size in 2020



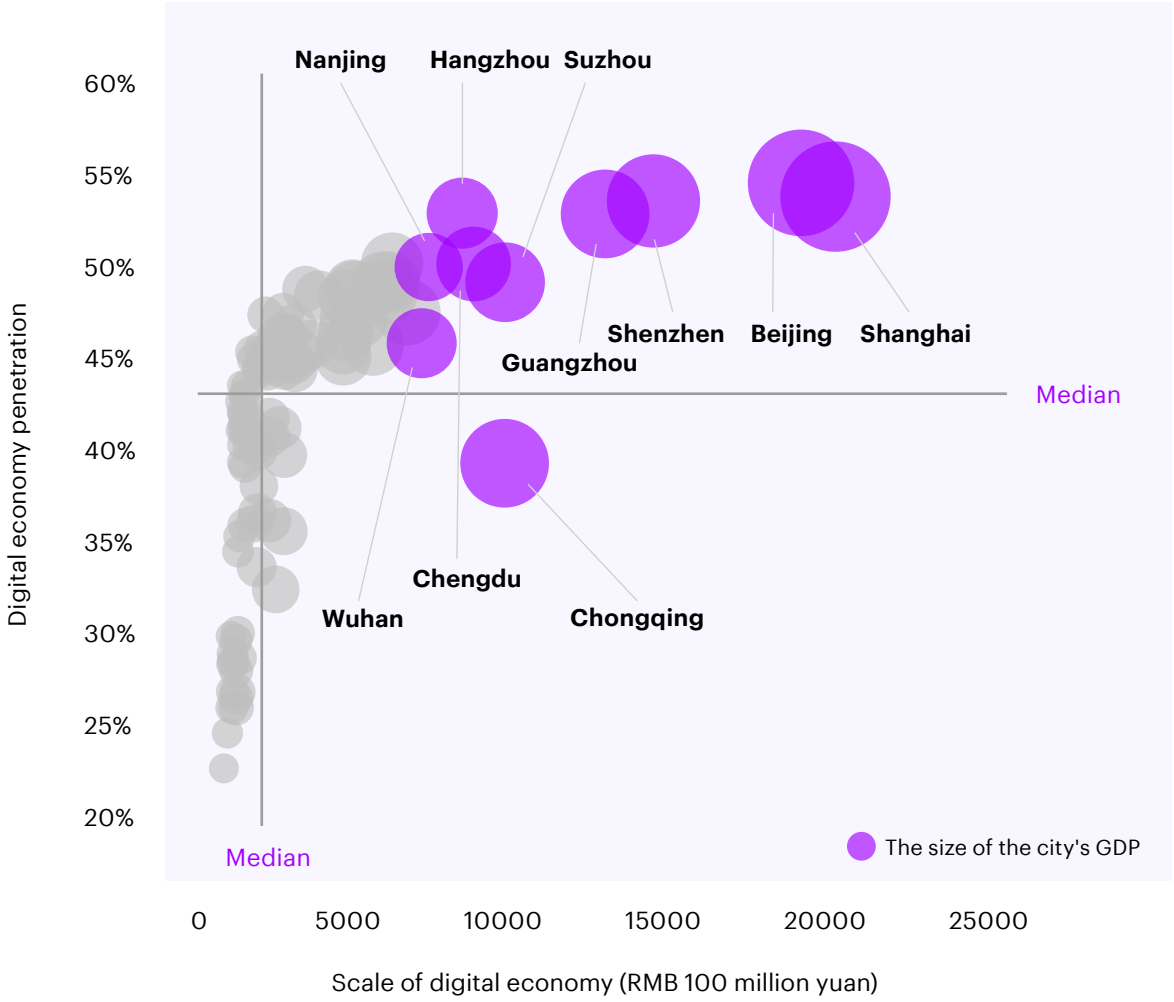
CR5: GDP share of top 5 countries

Source: World Bank; CAICT, White Paper on Global Digital Economy, Aug. 2021.

In recall of the 40 years of reform and opening up, Shanghai has always been a vanguard and pioneer, being an essential engine driving China's rapid development. On the one hand, Shanghai has the largest digital economy in the country, and its digital economy penetration rate is second to Beijing, making it a leading city in China's digital economy (see Figure 3). On the other hand, relying on its first-mover advantage of agglomerating global resource factors and state-level positioning of functions, Shanghai starts from Pudong District's "pioneer zone" to build an offshore financial system for higher-level reform and opening up, and actively advances data ecology, data legislation and data openness backed by its ground as the data trading center.

Shanghai will leverage its digital endowment to become a strategic node of China's dual circulation strategy, leading the further sustainable development of the cities' influence and internationalization process across China.

Figure 3: Development of digital economy across Chinese cities [4]



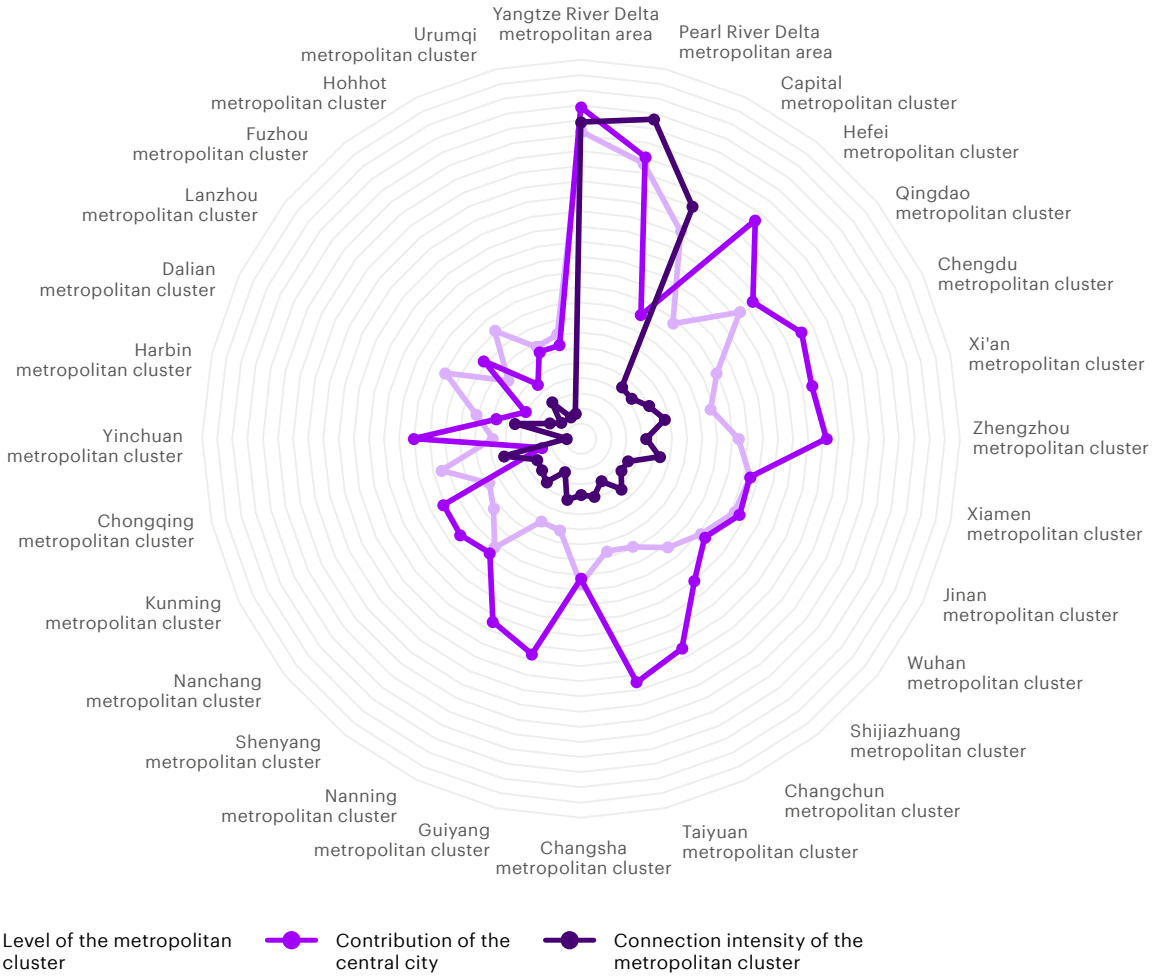
Source: Accenture research.

The Regional Level
Shanghai Leads the Regional Integrated Development through Radiation to Surrounding Areas

A major strategy of China is to develop the Yangtze River Delta as a whole, in the hope that the region can lead the whole country along the journey of high-quality development. In the process, China will improve its economic layout and nurture growth engines. As a leader in the delta, Shanghai enjoys unique digital endowment and will contribute to the industrial upgrading, functional elevation and technology innovation of the delta, promoting common prosperity of this metropolitan area.

The Yangtze River Delta is one of the six world-class urban agglomerations and China's No.1 metropolitan cluster by overall strength (see Figure 4). However, given the high-speed economic growth, the cluster today is severely challenged by industrial homogeneity and the deceleration of economic growth. On the one hand, insufficient division of labor and collaboration among cities in the Yangtze River Delta results in the homogeneous competition dilemma, which calls for establishment of pluralistic development and cooperation mechanisms. On the other hand, the mismatch between public services and demographic structure across the urban agglomerations of the region leads to a situation where quality resources are less shared and the mobility of factors is unsatisfactory.

Figure 4: Overall strength scoring of China's metropolitan clusters [5]



Source: The China Metropolitan Area Development Report, Institute for China Sustainable Urbanization, 2018.

Both central and local governments have successively laid out plans for urban agglomerations in the Yangtze River Delta, and introduced a number of key policies to ensure the integrated development of the delta. **The circulating factors of transportation, economy, population and information, together with the guaranteed mechanism for the coordinated overall urban integration, constitute an effective starting point for Shanghai to play its functions as the core city to lead the overall development of the metropolitan cluster.** In terms of traffic radiation, Shanghai's high-speed railway density of runs has maintained a leading position in the country all year round. With the "five new satellite cities" acting as the node hubs linking the three provinces of Jiangsu, Zhejiang and Anhui, the "Yangtze River Delta on the track" has been set up, linking inter-provincial highways, expressways, airports and ports to create regional and international transportation hubs. Mutual investment between Shanghai and peripheral cities has reached RMB 40 billion yuan, ranking the Delta first among Chinese metropolitan clusters by economic connectivity. In terms of population radiation, Shanghai also ranks first in the Yangtze River Delta for average daily number of migrants between the center and the peripheral cities. In terms of information radiation, Shanghai is endowed with the country's leading new infrastructure capabilities to channel the flow of knowledge and information inside and outside the region for "soft connectivity" of regional information. As for urban integration, Shanghai is taking the lead in promoting innovative development mechanisms in the Delta, such as "all-in-one service," production chain coordination, co-governance of ecological regions, and sharing of service regions.

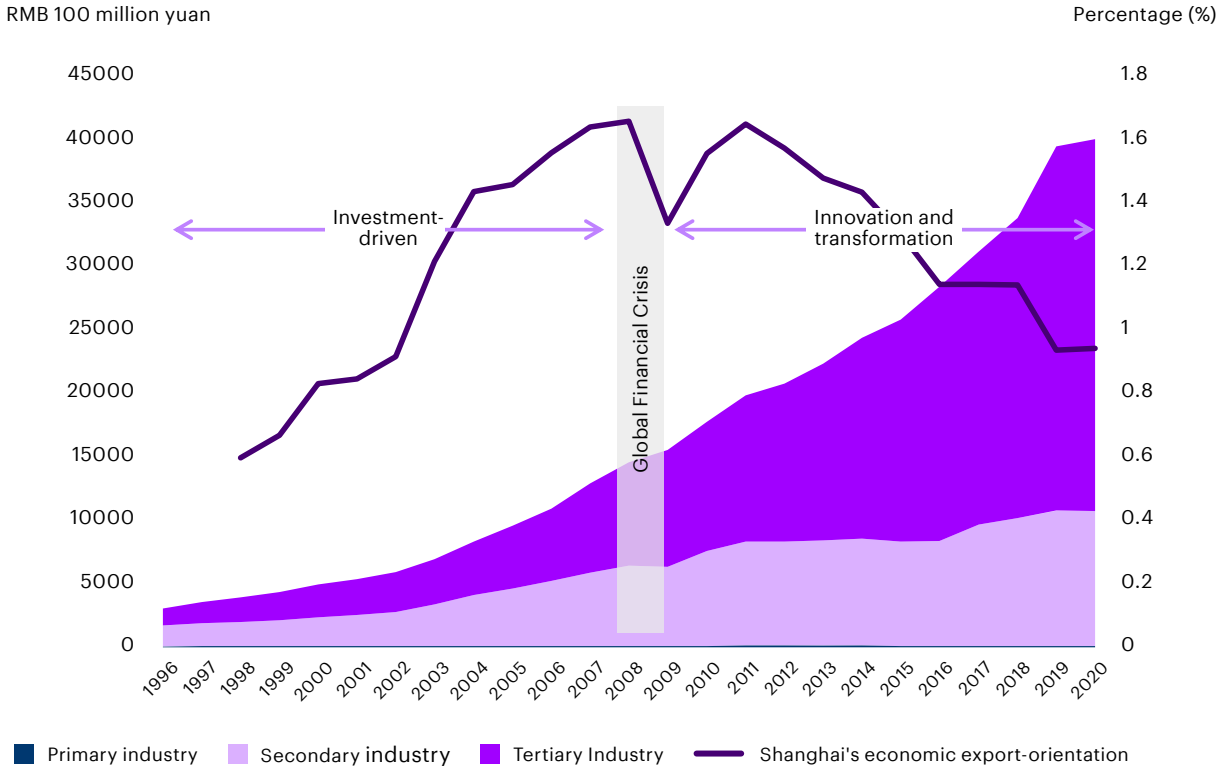
In the new round of strategic planning for the development of the Yangtze River Delta, Shanghai will continue its mission by utilizing digital capabilities such as the innovation space and platform and functional network to empower the Delta region in innovation integration and enhancement of its function of global resource allocation.

The City Level
Shanghai will Undergo Holistic Transformation as a City of the People

With the rapid economic development and population growth, Shanghai is facing the contradiction of limited resources vs. an expanding scale, and an urgent problem to be solved is how to allocate urban resources more effectively towards a better life. Therefore, Shanghai's digital city transformation should be in line with Shanghai-style culture – diversity, opening-up, inclusiveness and pragmatism – and the city's "all-embracing" spirit and people-oriented mindset. Its efforts include upgrading public service, creating a dynamic economy, tackling urban governance problems through digital solutions, improving city governance, and enhancing people's sense of happiness and gain.

External uncertainties render Shanghai's economy less outward, and the city is facing a major challenge – the structural transformation resulting from the rapid increase in the proportion of the tertiary industry. Since its re-debut as a port upon reform and opening-up, Shanghai has evolved into the largest city in the Far East in a short period of time, owing to its superior geographical location, highly inclusive culture, prosperous and diverse economy, tolerance for free opinions and many other merits. Accordingly, the city enjoyed a period of rapid development. However, after the financial crisis in 2008, the investment-driven traditional development model showed signs of vulnerability and unsustainability, **so it needed to turn from the old to the new (Figure 5).** The only way for Shanghai to sustain its development is to increase the economic density and strengthen the core functions, especially the four major functions of global resource allocation, scientific and technological innovation origination, high-end industry leadership, and open hub portals, relying on the new engine fueled by innovation and emerging industries to deepen the supply-side structural reform.

Figure 5: Shanghai's historical GDP and export-orientation curve [6]

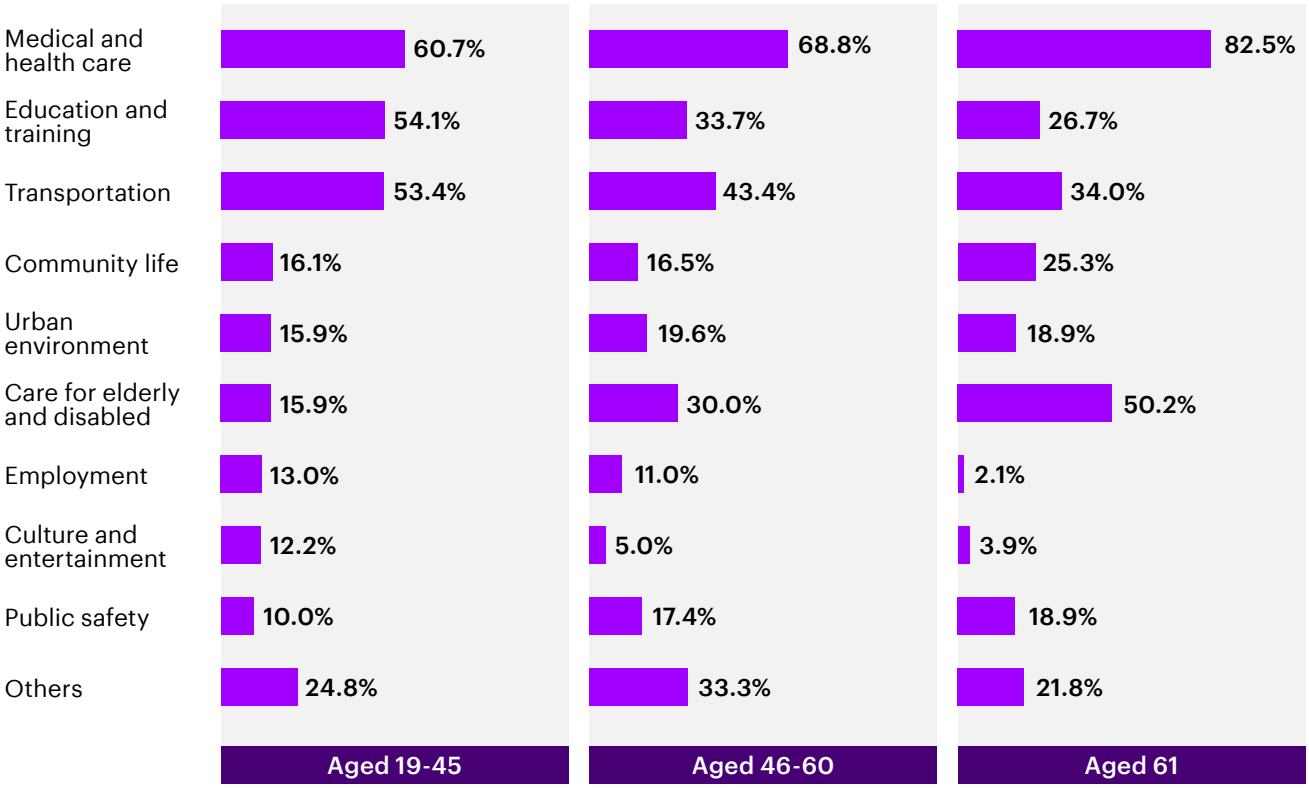


Source: Shanghai Municipal Bureau of Statistics, Statistical Yearbook 2020.

Besides the benefits from agglomeration around the megacity of Shanghai, the mission of improving the quality of people's lives and the level of city governance is becoming ever more complex and diverse. As one of China's main destinations of immigrants, Shanghai sees its population rising ceaselessly, becoming the world's third largest city by population size [7]. The proportion of immigrants has increased to 42% from 23% [8] in the past two decades. Also, Shanghai is the first city in China to suffer the aging problem and the one with the highest proportion of aging people. **Shanghai's public resources, especially underlying public resources such as medical care, education, and nursing facilities, indicate streaks of insufficient supply and uneven regional distribution (see Figure 6).** According to the survey, the core pain points currently stinging residents include inadequate high-level medical and health services, prominent supply-demand imbalance in quality educational resources, and unevenly distributed transportation resources. Affected by the increasingly complex and volatile environments, coupled with other factors arising from Shanghai's geographical location and functional positioning, including but not limited to **natural disasters such as typhoons, floods and high temperatures, public health emergencies such as the COVID-19 pandemic, traffic safety, and resource distribution, Shanghai still have a long way to go before succeeding in resilient governance.**

Shanghai needs to strike a balance in its future city development, respectively between population density, harmony, and livability, between sufficient competition and social equity, between economic development and ecological civilization, and between freedom and opening-up and effective regulation. The four major issues require Shanghai to digitally empower its public service model to shake off the shackles of limited and regional urban resources, **make residents happier with a new people-oriented urban life scenario, ensure ity resilience with data-driven "intelligent" governance, and cast an inclusive, fair and resilient city of and for the people via an innovative construction mechanism and synergy between the government, businesses and citizens.**

Figure 6: The fields that Shanghai residents expect most to undergo digital transformation [9]

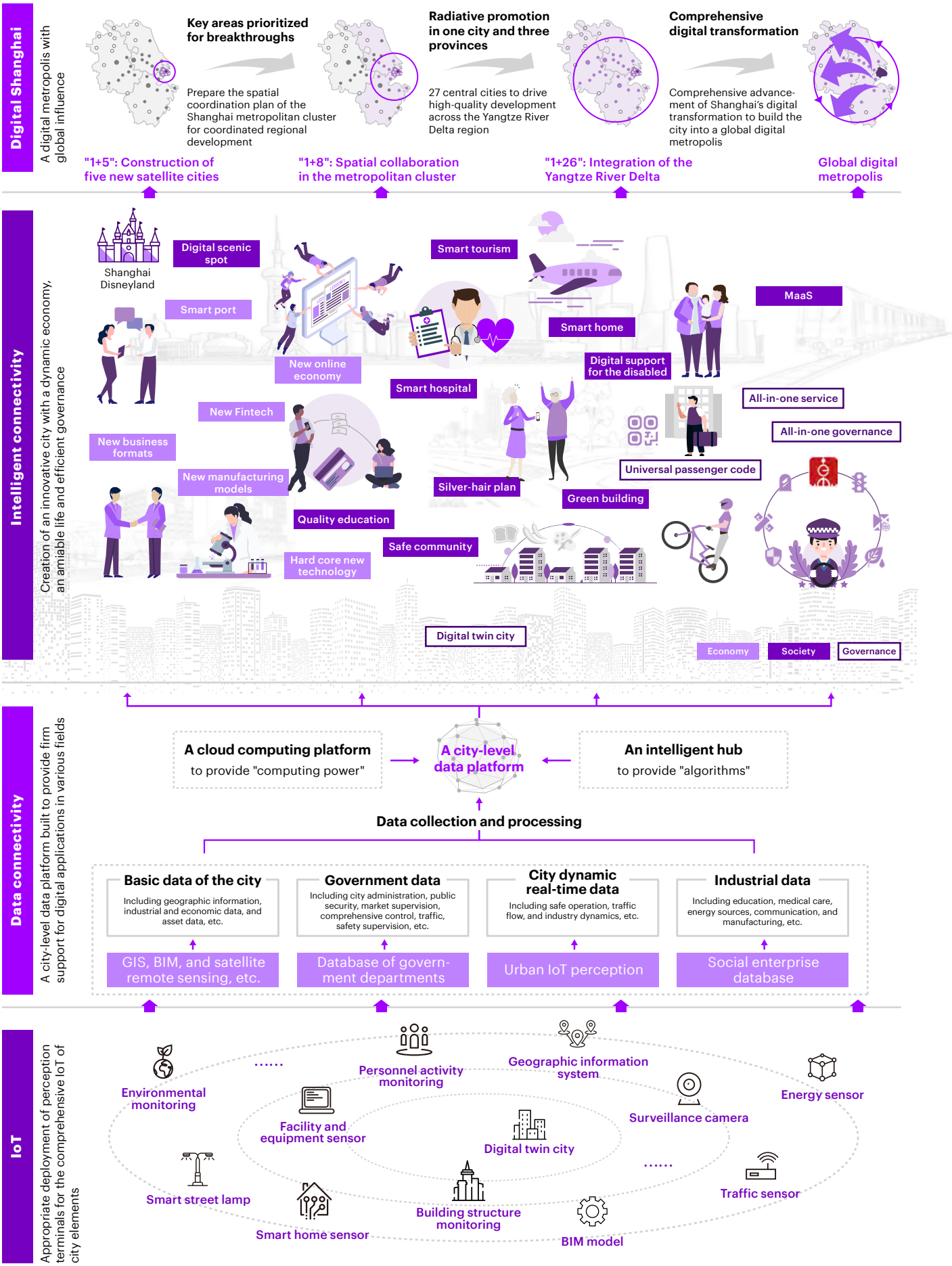


Source: Accenture research.

Digital-enabled Innovation: Outlook of Digital Shanghai

Transforming Shanghai into a global digital metropolis shall not only digitalize its space, but also set an example for megacities to address their common problems. What's more, Digital Shanghai shall reflect its historical characteristics, which derive in over 100 years. The connotation of building Digital Shanghai includes five aspects, respectively digital economy, digital society, digital governance, digital elements, and digital enablement.

Figure 7: Outlook of Digital Shanghai



Transforming Shanghai into a global digital metropolis shall not only digitalize its space, but also set an example for megacities to address their common problems. What's more, Digital Shanghai shall reflect its historical characteristics, which derive in over 100 years. The key to building Digital Shanghai is to use technology as a means and digital as the drive to rejuvenate people's lives, innovate industrial economy, renovate city governance, and upgrade urban development. In the face of challenges at macro-, meso- and micro-scales, Shanghai should set a benchmark for the world in promoting globalization and leading regional and national development. Therefore, the connotation of building Digital Shanghai includes five aspects, respectively digital economy, digital society, digital governance, digital elements, and digital enablement.

Digital Economy

Shifting to a New Engine, Giving Full Play to Endowed Advantages, and Creating a New Global Bridgehead for Digital Economy

Shanghai will create a highly diversified economic development pattern by gearing up to a new engine from the old one, allowing the co-development of various innovative economic forms, such as platform economy, digital economy, green economy, and night-time economy. The rise of a new generation of Internet economy brands has nurtured the seamlessly integrated online and offline economies. The endowed advantages of urban functions can be fully mobilized, and a well-established and orderly global ecosystem of industrial collaboration will take shape, with highly agglomerated and interconnected industries featuring efficient cooperation between production chains and internal value chains. The two-wheel drive of the consumer internet and the industrial internet will boost digital trade, with new formats emerging in an endless stream, such as cross-border e-commerce, digital entertainment, online education, and telemedicine, delivering quality and convenient consumption options to the general public and providing a powerful engine for building a strong digital economy.

Digital Society

Continuing Multiculturalism, Equality, Inclusiveness and Convenience to Create a New Model for People's Happy Life

Likening itself to the sea that embraces every stream, Shanghai is a city that is inclusive and all-embracing, it will carry on this spirit in adapting to the trend of people shifting their consumption to digital space amid the pandemic, so that everyone can live a quality digital and innovative life and have easy access to custom and inclusive social services. The path to innovation shall be technology-inclusive and people-oriented. Digital services and physical facilities will operate in perfect harmony, with the completion of the digital twin citizen project well in sight, and convenient service data analytics precisely reckoned. A new model for happy life will then come into being, where people can enjoy seamless daily life services, barrier-free travel, waste-free community, and absolute safety.

Digital Governance

In-depth Citizen Participation and Resilient City Governance to Create a New Benchmark for Intelligent Urban Governance

Shanghai will become an open-governance city with in-depth participation of citizens and co-construction of all parties concerned, a safety-autonomous city with self-learning and self-optimization for risk and accident prevention and control, a twin-mirror boundless city with accurate digital mapping of all elements for integrated virtual and real existences to interact, and an interconnected city with ubiquitous IoT devices to perceive its operations in all directions. The evolution from urban governance to intelligent urban governance dissolves the boundary between the real and virtual city, which not only makes the working and living environment safe, peaceful, livable, and amiable for the general public, but also bridges the invisible chasm between digital and physical urban governance of the city. Moreover, Shanghai will be viewed as an emerging benchmark for efficient digital governance.

Digital Elements

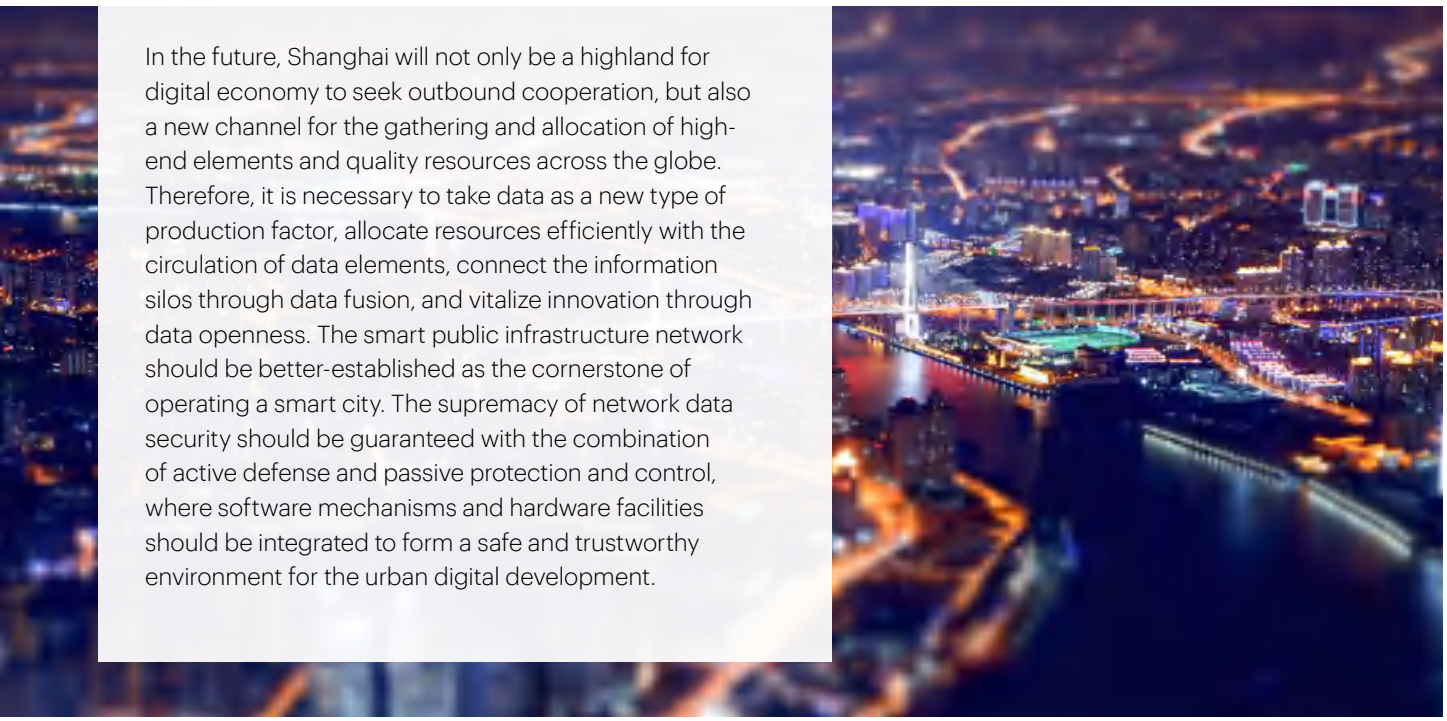
Carrying on the Gene of opening-up and moderation for both global and local cooperation and sharing, and Giving Play to the New Value of Data Elements

In the future, Shanghai will not only be a highland for digital economy to seek outbound cooperation, but also a new channel for the gathering and allocation of high-end elements and quality resources across the globe. Therefore, it is necessary to take data as a new type of production factor, allocate resources efficiently with the circulation of data elements, connect the information silos through data fusion, and vitalize innovation through data openness. The smart public infrastructure network should be better-established as the cornerstone of operating a smart city. The supremacy of network data security should be guaranteed with the combination of active defense and passive protection and control, where software mechanisms and hardware facilities should be integrated to form a safe and trustworthy environment for the urban digital development.

Digital Enablement

Market Vitality Unleashed and Digital Technology Advanced to Enter the New Era of Digital Innovation

Shanghai will build itself into an innovation forefront in terms of science and technology, strengthening the role of enterprises as the primary innovator, and consolidating the foundation and new infrastructure of digital technology. Through technological innovation, there will be an acceleration in the transformation and upgrading of industries, with major breakthroughs made in industrial restructuring, living services and city management. Flexible working patterns and innovation mechanisms will be set up to nurture a fertile ground for digital talents in the new era who are entitled to digital strategy, digital thinking, digital implementation, and digital innovation. The citizens will be mobilized as the main player to promote the penetration of digital culture in the multicultural population structure. All citizens are encouraged to take part in the process of urban diversification so that a digital co-creation culture that "the people's city is to be built by the people" can take root, and the original mission of building "the people's city for the people" will be genuinely fulfilled with the people fully engaged.



Sail to the Defined Destination: Eight Major Fields of Digital Shanghai

Shanghai's digital transformation is facing brand-new historical opportunities. In view of the city's organic demand and future development strategy, the transformation aims at comprehensive restructuring in eight fields: vibrant economy, amiable community, inclusive society, smart transportation, sustainable space, future governance, modern facilities, and innovative ecosystem, so as to turn Shanghai into a digital engine to lead the future development and establish a global benchmark.

01

Vibrant Economy

Seize Opportunities in the Emerging Digital Trends and Create a Strong Engine for Economic Growth

Objective

To accelerate the transformation of conventional industries from quantity to quality growth, and create an innovation-driven "economy of five orientations" (innovation, service, opening-up, headquarters, and flux) in Shanghai, through carrying on Shanghai's advantages as a pioneer in reform and digitalization.

Background

Given the changes of the era, the pattern of international trade, the development of metropolitan clusters, the positioning of the city, and the impact of the pandemic on the global economy, Shanghai is determined to resolutely transform from an investment-driven growth model to one that relies on innovation. The city will give full play to its advantages and its "four major functions" to further enhance its economic density and core functionality. This period is decisive for Shanghai to develop its new digital engine. The Matthew effect in digital economy prescribes a fleeting window to seize high-end opportunities. Shanghai will focus on the development of emerging industries, Continue to promote industrial upgrading, improve industrial ecological systems, enhance the city's overall economic competitiveness, and upgrade the city's energy level, so as to perform its duty as the central node of the domestic circulation and the strategic link between the dual (domestic and international) circulation in the new development pattern.

Case

The Zhangjiang AI Island is built in Shanghai. Located in the central core area of Zhangjiang Hi-Tech Park, the island covers an area of 66,000 square meters, with a total above-ground construction area of 100,000 square meters. It is the first "5G+AI" full-scenario commercialized demonstration park in China and boasts of the country's first and most complete set of "5G+MEC+edge cloud" facilities to carry the command center. The park is charged with a mission to explore the application of AI technology in the fields of medical care and urban management, and build intelligent visualization, intelligent front office and service robots based on computer vision. In addition, AI technology is to be fully applied to digital management across Zhangjiang Hi-Tech Park.

Key actions

1. **Frontier technologies:** Accelerate the development and deployment of critical, generic and frontier technologies, including but not limited to quantum computing, quantum communication, neural chip, and DNA storage. Consolidate the foundation of Shanghai's digital economy development through openness of technologies and generic software and hardware, the iteration of intelligent products for innovative applications, the upgrading of information services backed by cloud computing, blockchain, big data and telecommunication services.

2. **Internet economy:** Popularize the brand of service-oriented economy, with a focus on digital arts and culture, new retail, and online design to expand the influence of internet economy brands. Create the preferred location and integrated application field for the internet economy industry, improve the employment and assurance mechanism, optimize the institutional environment, and promote the agglomeration and clustering of entities. Encourage the integration of online and offline scenarios, develop flux-based business format innovations across multiple platforms, and improve link capability of scale and flux operation levels.

3. **Manufacturing models upgrading:** Take the intelligent demonstration factories as the starting point, build digital twin companies, and enhance the capabilities of digital design, intelligent manufacturing, lean management, personalized customization, network collaboration, and service extension, so as to increase the efficiency of enterprises. Promote the digitization of the supply chain and industry chain, enhance the supply end of industrial big data, knowledge maps and intelligent algorithms, accurately evaluate the operation status, accelerate the process of accurate chain measurement and revamp to make a strong and solid chain playing as the hub "chain master," and stimulate the vitality of SMEs for mass entrepreneurship and innovation, propelling digital intelligence enablement across supply chain and industry chain. Also, focus on three pioneer industries and six major industrial clusters, strengthen the traction of leading enterprises, build industry-wide benchmarking platforms, and promote the overall improvement of the industrial ecosystem and the in-depth transformation of the industrial digitalization, achieving ecological enhancement across platforms.

4. **New business formats:** Steadily explore and develop new business formats and new models to build new digital brands for traditional businesses. Improve the digital and intelligent trade management capabilities, strengthen the integrated development of digital innovation and conventional industries, and breed and unleash the potential of digital trade. Set up "future urban digital scene laboratories" to form innovative scenarios and business models that can be replicated and publicized. Deploy an integrated development model of large enterprises leading the development and SMEs widely applying, give play to the leading and coordinating role of large enterprises while advancing the digital transformation of SMEs. Optimize port services, integrate Shanghai into the single window system for international trade, and promote cooperation across the Yangtze River Delta in building a "dedicated zone of services" to increase its influence. Set up a comprehensive big data hub at the port to better apply port data and establish an intelligent port service system.

5. **Fintech:** Expand the application scenarios of the e-CNY and explore universal and convenient payment methods accordingly. Be more technology-enabled and data-driven in approach to the comprehensive digitalization of financial products and services, customer operation, risk prevention and control, and decision-making, providing clients with convenient, quality, and broad-based financial services. Build an open and cooperative financial service ecosystem and an industrial digital financial service platform, provide comprehensive, one-stop financial and non-financial services centered on the production and life scenarios of clients, and apply digital technology and other means to strengthen inclusive financial services, constantly upgrading the services provided for small and micro businesses, private enterprises, and agriculture, rural areas, and farmers.

02

Amiable Community

Creating a Digital Community with Joyful Experience for Every Citizen

Objective

To concretize the vital notion of "the people's city that is built by the people and for the people," centering on core living needs such as health, education, nursing, and safety, and launching digital applications for public services on a broad base so as to build an amiable digital community.

Background

With the evolution of urbanization and the outspread of megacities, more and more people are flocking into megacities in pursuit of superior material and modern lifestyles. How to solve the diverse and upgrading needs of a large population in all aspects of daily life so as make the city more competitive and talent-attractive? This is a long-term complex issue with extreme importance that Shanghai needs to face. Digitalization is the key to the solutions. The underlying basis for building Shanghai into an amiable community lies in upgrading of digital public services. Residents' yearning for a better life can only be satisfied with more community safety, more adequate medical and nursing care, more equal education, and more convenient community life. The construction of Shanghai's digital public services is a decisive factor for the high-quality completion of Shanghai's digital transformation. Shanghai's practices and experiments in bettering its digital public services will provide useful references for other cities.

Case

Ruijin Hospital develops 5G+ health care scenes. By employing 5G, which is characterized by large bandwidth, low delay and wide coverage, Ruijin Hospital has set up scenes, such as 5G-based remote ultrasound and rehabilitation, for people to experience telemedicine. Through the 5G+ remote robotic ultrasound system, doctors can operate the mechanical arm thousands of miles away for ultrasonic scanning in real time and then give out diagnostic information. Ruijin has cooperated with enterprises to develop the "Rehabilitation Force Live Broadcast" module for long-distance evaluation and training of rehabilitation through robotic real-time force feedback, 5G delayed jitter prediction and rollback technologies. Its 5G+ first-aid system is seamlessly connected to the urban 120 command and dispatch system; and its vehicle-mounted consultation equipment enables ambulance personnel to remotely get guidance from experts, realizing a new scenario of "hospital admission upon boarding an ambulance", or simply “admission upon boarding”.

Key actions

6. **Open-source, high-quality educational resources:** Build a cloud-based platform for education to attract famous lecturers at home and abroad, with their lectures put on the internet together with other online education resources, helping to build "a good school at the doorstep". Create a high-quality digital learning space free to all citizens, and produce more intuitive and immersive learning materials through VR, AR and other new technologies to improve learning efficiency and effectiveness.

7. **Medical resources with higher quality and efficiency:** Medical needs will be under lean management, improving the overall public health management by covering the entire medical process. Utilize new technologies and mechanisms such as DRG and AI medical treatment to improve the overall medical capabilities. Use digital medical scenarios such as telemedicine, online follow-up consultation and smart hospitals to extend the availability of medical resources in each process and strengthen the demand-sharing capacity of local and community-based grassroots medical care.

8. **Security and contingency management strengthened with intelligence:** Accelerate the construction of intelligent security infrastructure, especially the perception end, such as the setting of an intelligent security scheduling platform, comprehensively improve the intelligence, technology, socialization and professionalization of basic prevention and control work, and enhance the emergency responsiveness in respect of public safety.

9. **Good experience of convenience services:** Rationally plan and deploy smart breakfast, smart retail, smart terminal distribution, smart recycling facilities, smart bookstores, and health stations, etc., and give full play to the advantages of the construction and operation model featuring "market-oriented government-enterprise connectivity" to enrich community residents' cultural life and consumption scenarios and develop a convenient and happy new way of life.

03

Inclusive Society

Building a More Harmonious and Inclusive Society for Everyone to Enjoy a Fair and Easy Life

Objective

To bridge the digital divide and enable all types of urban entities to enjoy balanced and inclusive daily life services by using digital technology, as well as to ensure that vulnerable groups fully benefit from social development.

Background

Active attempts in reform and opening-up, innovation and transformation have effectively boosted Shanghai's economy, social welfare, and people's well-being. The average life expectancy of Shanghai residents already ranks first in the country. However, aside of the rapid urban development, the increase in the number of migrants and the aggravation of the aging population have also widened the gap between different groups in access to development benefits, generating inequities in income, education, cultural life, and entertainment. In order to eliminate the inequities, Shanghai will, adhering to the principle of inclusiveness, availability and tolerance, promote the balanced supply of livelihood services in the whole society, and help various social entities get engaged into modern society and enjoy digital welfare.

Case

Shanghai's Ganquan Road Community has built a community information management platform for the elderly. The platform targets special elderly groups in the community to deliver refined services with a "dynamic data" management model, which not only collects basic information such as residents' personal relations and work and marriage status, but also provides 44 personalized labels in 3 categories and assign special IDs to the groups. Before offering them services, the government officials will screen them by multiple conditions for the purpose of customizing services, in other words, the city will provide medical, meal, mobility and other services precisely for the elders in need. To pilot the family care beds, the Ganquan Road Community distributes smart devices into households, thus changing from traditional to digital old-age care models.

Key actions

10. **A silver-hair plan:** Solve the daily life pain points of the elderly by integrating community services, financial services, telemedicine, intelligent monitoring and other multi-subject and technical services, providing the elderly with holistic aging-appropriate transformation of products and services. Launch digital literacy and skills training for the elderly as a way to help them complete their own digital transformation.

11. **Better digital support for the disabled:** Enhance the application and commercialization of technologies in benefiting and supporting the disabled, extend the online services in this regard for comprehensive technological enablement in the substance, rehabilitation, education, and employment of the disabled. Build a data resource platform for the disabled, catalyzing the integration, sharing and application of information for accurate identification of all people with disabilities, refined management of disabled people's work in all fields, precise and full-process social assistance for the disabled, and full-coverage all-in-one government services, so that people with disabilities can enjoy the convenience, speed and efficiency brought about by technological progress.

12. **Fairness for immigrants:** Deepen digital transformation actions to immigrant workers, provide economical digital tools, and design related digital services for their basic needs in Shanghai, such as employment, medical treatment, business operation, and children's schooling.

13. **Inclusion of foreigners:** Improve digital products and services for foreigners working and living in Shanghai, with existing services extended to provide foreigners with more convenient and accessible digital products and services.

04

Smart Transportation
Enhancing the Three-dimensional Transportation Network to Build a Regional and International Traffic Hub

Objective

To enhance the city's overall transportation capacity, build a high-quality comprehensive transportation system, and improve the quality of urban transportation services to meet the people's demand for more convenient, safe, and economical transportation, providing facility connectivity for economic development.

Background

In the past few years, a series of achievements have been made in the digital transformation of Shanghai's transportation, but there remain some bottlenecks in this field, calling for urgent breakthroughs via digital means. For example, lower capability in resource allocation of global factors across facilities such as maritime and air hubs, and insufficient and imbalanced transportation infrastructure resources. In the future, Shanghai will adhere to the smart transportation philosophy of in-depth integration of business scenarios and technologies, carry out overall planning based on its own urban development appeals, and determine the orientation of its technological upgrading, transformation and application so as to create a new generation of smart transportation facility system that is ubiquitous, collaborative, intelligent and acute in support of smooth flow of passengers and goods.

Case

Shanghai Fengxian Xincheng launches a smart mobility demonstration project in its Autonomous Driving Demonstration Zone. Fengxian follows the trend of a new generation of digital infrastructure and the digitalization of the travel industry, and makes breakthroughs in forward-looking, perceivable high-caliber integration piloting in road networking, unmanned public transportation scheduling, and flexible urban functional space/underground space/pipeline. The upstream and downstream industries of smart travel are attached to a city digital platform, catalyzing the commercialization and industrialization of smart travel technologies. Taking MaaS (Mobility as a Service) as the entry point, Fengxian explores the flexible scheduling and configuration of urban mobility space templates (multi-functional unmanned vehicles), gradually reorganizes the composition and spatial form of urban functionality, and seeks industrial opportunities for integrated smart travel and smart energy to form a future space city model.

Key actions

14. **Promoting digital upgrade of air and sea ports:** Apply digital technology to upgrade and renovate infrastructure such as seaports and airports, building a platform for big data analysis and development service, and improving overall service capabilities through intelligent operations. A world-class digital twin smart airport and seaport will be created to enhance Shanghai's international influence and competitiveness as a global transportation hub, reiterating its status as an international shipping center.

15. **Accelerating coordination across the Yangtze River Delta for integrated transportation:** Advance the co-construction, co-governance and sharing of traffic information in the region, strengthen the construction of cross-regional smart highways, smart water networks, and smart airport clusters, as well as cross-regional connected transport network, Smart Card, and other service experience, promoting the transportation integration of the Delta for higher-level regional interconnection.

16. **Innovative digital transportation services:** Better integrate time and information, and pursue precise operation with a full coverage of real-time arrival forecasts, thus ensuring the reliable and efficient operation of ground bus and rail transit systems in the city. Build a Mobility-as-a-Service (MaaS) platform to create a one-stop mobility system for data sharing and interoperability targeted at real-time, panoramic, full-chain traffic and travel information, and set up a unified service platform integrating map services, bus arrival forecasts, smart parking, call a ride, non-inductive charge, and other scenarios for quality and inclusive travel of citizens.

17. **Realizing overall dynamic traffic management and control:** Establish an intelligent, collaborative and data-driven management and control system, explore the design of a joint control network system covering travelers, vehicles and roads, and intensify the decision-making capacity building for safety and emergency management, thus putting Shanghai's traffic and travel in refined management for improved traffic quality and safety, and enhanced overall travel efficiency.

05

Sustainable Space

Anchoring the New Goal of Carbon-neutral Transition for Sustainable Quality Development

Objective

To provide a green and livable natural ecology for the city's residents, help optimize Shanghai's energy structure for quality economic development, jointly address the climate crisis and enhance urban resilience to achieve low-carbon transformation and sustainable development in Shanghai.

Background

To undertake China's carbon peaking and neutrality goals, namely to peak carbon emissions by 2030 and to achieve carbon neutrality by 2060 Shanghai took the lead in posting a timetable for carbon peaking five years ahead of national schedule. In recent years, the city has achieved excellent results in the battle to defend the blue sky, clear water, and pure land as well as in the garbage classification campaign, with the urban ecological environment significantly improved. At the same time, Shanghai has promoted green and quality economic development by industrial restructuring, clean-energy vehicles replacement, green architecture upgrade, and green agriculture development. However, in terms of environmental sustainability, Shanghai faces enormous challenges from the dual pressures of economic development and population growth. It also encounters inherent urban environmental problems, such as large carbon emission base, over-exploitation of resources, and PM2.5 pollution.

Case

Huangpu District builds a demonstration project of virtual power plant in central city. Based on the "Internet of Things Communication"+"Internet Aggregation", Huangpu pools the adjustable power loads of urban buildings within its district, then turns such scattered resources into a high-quality urban power digital asset using "Big Data+Artificial Intelligence+Smart Building". The smart and refined energy control can improve the efficiency of power utilization and achieve carbon emission reduction.

The North Bund Community sets up intelligent garbage huts. The North Bund Community takes the lead in piloting the intelligent garbage huts in its jurisdiction, which give out voice prompts upon identifying through the AI camera any delivery of garbage outside the specified time. Armed with infrared tester, electronic scale at the bottom of the trash can, harmful gas sensor and water seepage device, the high-tech huts are able to well detect the garbage and its categorized accuracy.

Key actions

18. **Building an intelligent energy system:** Use digital technology to plan and build green energy infrastructure, reduce the cost of renewable energy power generation, and improve the efficiency of energy production and circulation. Work out end-use energy solutions such as smart energy communities to improve energy efficiency.

19. **Empowering green buildings with digital:** Apply digital technologies such as 3D modeling of green buildings, carbon emission data simulation of building materials, and intelligent platforms to the entire life cycle of the building, namely planning, design, construction, and operation, track all kinds of carbon emission indicators of the building, and support emission reduction plans and policy making, contributing to the city's overall emission reduction goals.

20. **Improving the efficiency of waste disposal:** Use digital technology for intelligent waste classification and management, accurate simulation of waste disposal process, etc., manage the waste life cycle in a scientific and intelligent manner to ultimately increase the efficiency and recycling rate of waste disposal.

21. **Promoting the carbon inclusive plan for citizens:** Advocate citizens to adopt low-carbon behaviors, creating personal carbon credit accounts connected to carbon trading markets and commercial consumption platforms, etc., and encourage citizens to practice a low-carbon lifestyle through effective mechanisms.

06

Future Governance

Transforming to Intellectual Governance for High Efficiency and Resilience, Strengthening the People-Oriented Concept

Objective

To continue clarifying division of responsibilities, strengthening data and information security, and improving the efficiency of government processes. Integrate and circulate data and release the value of data resources through the government's top-level supervision and mechanism design, creating a tolerant, harmonious, inclusive and win-win social community.

Background

Local and international enterprises, state-owned and private enterprises, native people and immigrants, and traditional and modern urban industries..., the mixture of which constitutes an inclusive nature for Shanghai and poses a grave challenge for the municipal government to govern such a diverse, multi-stakeholder city, which is actually a high-risk and low fault-tolerant job. In order to effectively, efficiently and practically serve various social groups, Shanghai will continue to build capacity in the perception and supervision of various social entities. With uniform standards established, Shanghai should be driven by data elements and guided by a unified mechanism to guide the communication and collaboration between neurons of the government, businesses, and citizens, employing digital technology to build a coordinated and safe urban neural network.

Case

Pudong launches an "Intelligent Government Affairs Office" to "nullify submission of information" for frequently-sought-after affairs. Shanghai's Pudong New Area pilots a new mode of serving enterprises, called Intelligent Government Affairs Office, to address the tiring and annoying submission of various data for examination and approval. By applying digital technology, Pudong integrates consultation, material reception and initial review into one process through information sharing and smart examination, that is, the Office collects accurate and complete data through questions and answers during consultation, so that enterprises can have a brand-new experience of "zero data submission", as evidenced in three exemptions: at the government office window, enterprises will be exempted from 1) submitting information; 2) filling out information; and 3) frequently visiting the window; and four transitions: transition of mindset, role, function and style. This is an effort to reassure both the government and the enterprises.

Key actions

22. **All-in-one governance:** Take the government, market, and society as the main objects of governance, start from urban operation and emergency response, and continue to extend to the three major areas of public service, public management, and public safety, and improve the horizontal coordination and vertical integration in the government's public management to increase efficiency and reduce cost. Employ the data to comprehensively perceive social issues and the needs of the public, and provide rich data resources and essential platform support for government decision-making, thus forming a new paradigm of "intelligent governance" for digital cities.

23. **All-in-one service:** Provide services targeted to businesses and residents, integrate data on social security, medical insurance, provident fund, taxation, industry and commerce and other areas, deepen the remodeling and reengineering of business processes, and gather high-frequency demand calls for cross-department, cross-level and cross-regional matters, relieve citizens from troublesome handling procedures and shape humanistic urban digital services. Comprehensively deepen data governance, expand the field of public services, and work on capacity building for online and offline services, so that citizens can easily access government services, participate in government activities, and communicate with the government using any device anytime, anywhere. A mechanism will be built to boost the Yangtze River Delta's urban integration, allowing cross-regional and cross-provincial affair handling; The Yangtze River Delta data sharing and exchange platform will serve as a carrier for the data supply and demand docking mechanism to facilitate the "undifferentiated" public data cooperation across the Yangtze River Delta.

24. **Universal passenger code:** Build service of "the universal passenger code", which entitle the citizens to use one code to pay, travel, sightsee in all urban living scenes. Synergize with personnel carbon credit accounts, credit accounts to create more application scenarios. Further trials in the "universal passenger code" service in the Yangtze River Delta will be conducted for the mutual recognition of digital identities among residents in the Yangtze River Delta to connect public services across the region, providing cross-city and cross-industry services for residents in the region, acting as an important promoter of digital integration in the Yangtze River Delta.

25. **Virtual City:** Establish an index system of vital signs of urban operation that incorporates various static and dynamic data such as geographic space, ecological environment, building structure, human and vehicle activities, and energy status, etc., to form a precise real-time digital portrait of urban operation, and create a digital twin city. Promote the integration of city-level trusted information exchange and collaboration networks with BIM, GIS, big data, AI and other technologies, build a big data platform for comprehensive operation and intelligent management covering urban construction, communities, infrastructure and transportation systems, and realize holographic perception of urban scenarios to integrate, dispatch and optimize urban resources from a holistic view, break the invisible gap between digital and physical urban governance, and improve the scientific governance capability of urban operation.

07

Modern Facilities

Upgrading Infrastructure for Ubiquitous Connectivity to Ensure Solid, Safe and Stable Growth

Objective

To seize new opportunities for transformation and upgrading of cities brought by the new generation of infrastructure construction, build a new digital infrastructure for the intelligent interconnection of all things, and become a key bridge connecting the real and virtual worlds so as to enhance the international competitiveness of new facilities and provide better support for city's innovation and transformation.

Background

The construction of new infrastructure is an important support for the digital city transformation and an essential cornerstone of innovation-driven development. To build a scientific and technological innovation center with global influence, Shanghai has been stepping up investment in the layout of major infrastructure such as network facilities, data centers and computing platforms, the overall level of which has been leading in China. However, there are still areas to be improved in terms of full 5G coverage across the city, unified planning, and construction of IoT, construction of functional platforms and data platforms, and cluster construction of modern scientific facilities. In the future, Shanghai will further improve its urban functions, innovate, and transform, and build new "Shanghai-style" infrastructure under the uniform guidance.

Case

SenseTime Technology commences its Artificial Intelligence Computing Center. SenseTime's Artificial Intelligence Computing Center (AIDC) is an open, large-scale, low-carbon and energy-saving advanced computing infrastructure, which started construction in July 2020 and was put into operation in January 2022.

Located in Shanghai's Lin-gang Special Area, the AIDC is an important part of SenseTime's SenseCore AI computing infrastructure. The designed computing power of AIDC Phase I is 3,740 petaflops (a petaflop is one thousand trillion, or one quadrillion, operations per second), and upon completion, AIDC is expected to become one of Asia's largest AIDCs. AIDC covers an area of 130,000 square meters and there are 5,000 cabinets for Phase I.

Key actions

26. **Accelerating the construction of a new generation of digital infrastructure:** Strengthen the construction of 5G communication base stations and cables for the full 5G coverage in Shanghai. Promote the construction of cloud infrastructure, the development of urban big data centers, and the rational deployment of edge computing, and provide algorithms and computing power for the development and transformation of the city's industries.

27. **Building new underlying platforms for the empowerment of city digital transformation:** Construct a batch of city-level service platforms, and build open data service capabilities for corporate and individual users through the integration of corporate data, industrial data and public data, thereby empowering the overall development of the city. Foster the construction of AI platforms, digital twin platforms and other new platforms to gain insights into the pain points and needs of urban users and urban development so as to facilitate the implementation of digital transformation scenarios.

28. **Creating a strategic platform for scientific and technological innovation and a cluster of large-sized scientific facilities:** Build a major innovation platform centered on the layout of scientific and industrial frontiers, strive for state support to deploy a new round of major scientific and technological infrastructure, provide different policy and financial support according to the attributes of respective facilities, and support the development and industrialization of cutting-edge science in Shanghai by relying on the cluster of large-sized facilities.

29. **Upgrading all kinds of smart terminals in the city:** Appropriately deploy AIoT sensing terminals such as video imaging and sensor monitoring, promote the construction of smart terminals and facilities such as smart lockers, smart charging piles, and Internet-connected hospitals, and connect urban neuron networks into a system for the collection and management of the city's multi-field data and information.

30. **Building a digital security assurance system:** Enhance cyber security by using advanced technologies to ensure that cyberattacks can be prevented, cyber security incidents can be identified, and cyber security hazards can be eliminated. Improve data security policy design and standard process design, etc., to create a safe data use environment with "manageable, controllable and trustworthy" data. Strengthen the research on core security technology capabilities, urge the development of the security industry, and enhance the city digital security protection forces.

08

Innovative ecosystem

Innovating a Win-win Ecosystem to Step Up to a New Era of Collaboration

Objective

To create a bond between the main parties of innovation and transformation in the city to channel the intensification and collaboration of capabilities and resources need in the process, combine multiple forces to leverage the overall transformation of the city, and drive the city's digital transformation model towards self-innovation and ongoing development.

Background

Shanghai's digital transformation has entered a deep-water area. However, problems keep rising constantly, including but not limited to the immature multi-party cooperation mechanism, the insufficient coordination between innovators, the mismatched supply and demand, the contradictions in the construction of dotted scenarios, and the yet-to-be-activated innovation momentum. Synergy and integration for leveraging market-oriented resources to drive the overall transformation of the city will be the No.1 appeal in the process of digital transformation in the future, and Shanghai will follow the people-oriented transformation principle, relying on the innovation-oriented ecosystem to build a new pattern featuring co-construction, co-governance and sharing by everyone.

Case

Changning unveils Simic AI Valley—a technology innovation base. As a key carrier of Changning's Hongqiao Intelligent Valley—a state base for entrepreneurship and innovation, Simic Valley integrates AI applications, intelligent scenarios, smart experience, retail, co-working space, and startup incubation, etc. Based on its advantages (two institutes under the Chinese Academy of Sciences are based here, the microsystem and information technology institute and the Shanghai Institute of Ceramics) in developing the AI sector, the Simic Valley aims to become a hub of digital transformations, a commercial & exhibition facility, and an ecosphere for digital talents.

Key actions

31. **Establishing a diversified urban innovation ecosystem:** Plan and design the strategic positioning, operation model and actual functionality of its innovation-oriented ecosystem based on its urban digital transformation and development goals, capability appeals, and resource endowments, creating the ecosystem to match the supply and demand in innovation resources. Vitalize the market for innovation, enable enterprises to transit to digital, promote the incubation of technological innovators, and ameliorate the introduction and training of digital talents, thus contributing to the growth of Shanghai's digital economy.

32. **Building facilities for online and offline collaboration:** Build an online platform for the integration of collaborative innovation services, unify access and data and providing all players engaged in urban digital transformation with service coordination and scheduling without time or space constraints. Build various types of offline infrastructure to collaborate with the online platform regarding the flux and services, and maximize the benefits of resources and capabilities through mutual promotion.

33. **Establishing operation assurance mechanisms:** Build a wholistic mechanism of ecosystem operation from initiation through promotion to operation, motivate the endogenous power of the ecosystem players through mechanisms and processes, and revitalize the various transformation and innovation resources.

34. **Building a scientific and comprehensive evaluation model:** Provide city administrators with targeted measurement standards and evaluation basis, and city builders with a meaningful construction framework. The characteristics of Shanghai will be incorporated in adherence to the principle of "emphasizing both scale and quality, drawing the whole picture with spotlights, stressing on ROI, and combining quantitative and qualitative factors" to generate a measurable, executable, and comprehensive reference and evaluation model with high dimensions and focuses, so that blueprint and vision of Digital Shanghai will one day come true. In addition, in the process of building a digital Shanghai, the overall urban development progress would be controlled and tracked in general to ensure that digital initiatives effectively and practically facilitate the people-oriented digital transformation.

A Long Journey Begins with a Single Step: Action Principles of Digital Shanghai

In the transformation to Digital Shanghai, the multiple key fields should go hand in hand, cooperating with and benefiting from each other while being fully interconnected. At the same time, given Shanghai's characteristics, such as being exquisite, dense, and energy-intensive, the process of transformation should be prudent and pragmatic, as if it were a piece of embroidery. The construction of Digital Shanghai can be summarized into three principles.

Seeking multi-party collaboration and win-win cooperation

Pursue top-down and bottom-up integration, government-enterprise coordination, and multi-party collective action, promote IAR cooperation, create a cooperative operation mechanism based on government-enterprise cooperation and market orientation, and form a model of public participation. In the construction process, the construction mechanism should be maintained with "the city being the playground, the enterprises being players, and the citizens being masters," fully materializing the philosophy of "the people's city built by and for the people."

Pursuing long-term value and prevent it from being distracted from its intended purpose.

Oriented to the future for long-term development, the city must internalize the fundamental people-oriented principle through its overall transformation, using a new generation of digital technology to assist the digitalization and "stop it from being distracted from its intended purpose," urging the government to implement precise policies to accurately meet the needs of society, avoiding duplicate investment and construction, and taking the long-term value of society as the guide to plan an effective construction path that is long-term beneficial.

Applying local experience to the whole city

Shanghai should pay attention to case-specific diagnosis and leverage the big picture of its overall transformation by drawing upon the experience gained on key points and making it universal after piloting partial. **Point – Focused on key scenarios:** Focusing on scenario applications in key local sites, such as buildings, enterprises, communities, single departments, and single facilities, and using well-established technologies in the focused areas, as well as in the scenarios that have the biggest potential for value improvement and can best address people's pragmatic pain points so that much improvement can be delivered to individual departments or facilities. **Partial – synergy of the correlated fields:** In strongly correlated key fields such as communities, industrial parks, public areas, and cross-city or multi-facility scenarios, etc., emphasize the multi-scenario correlated applications, and further enhance the ability of the scenarios themselves through the circulation and iteration of various elements between the fields concerned, and meanwhile establishing a cross-domain service system to handle complex and cross-domain demand scenarios, providing integrated, one-stop services for the people and driving the region to upgrade as an integrity; **Universal – Global brand influence:** Break through macro-barriers in cross-country, cross-cultural and other fields related to higher levels; On the basis of overall big data perception, Shanghai shall achieve macro-level allocation and regulation of global factors, and micro-level full-fledged intelligent decision-making capacity building, thus shaping Shanghai's urban digital transformation into an international brand with an international influence on the development of cities worldwide.

Conclusion

With the acceleration of global urbanization, cities across the globe will encounter harsher emerging challenges in terms of economy, society and governance. A new vision of the coming urban stage consists of the coexistence with nature and multiculturalism, and a win-win scenario with the new economy. A digitalized international city is surely able to turn this vision into reality. Shanghai has its own characteristics. By seizing the historical opportunity of digital revolution, Shanghai will transform into a digital city characterized by opening-up, inclusiveness, safety, resilience and sustainability. It will improve the livelihood of its people, promote its development and contribute to the overall strength of the country. In the great change unseen in a century, Shanghai will set itself as a benchmark for other cities, and play its role in the promotion of a community with a shared future for mankind.

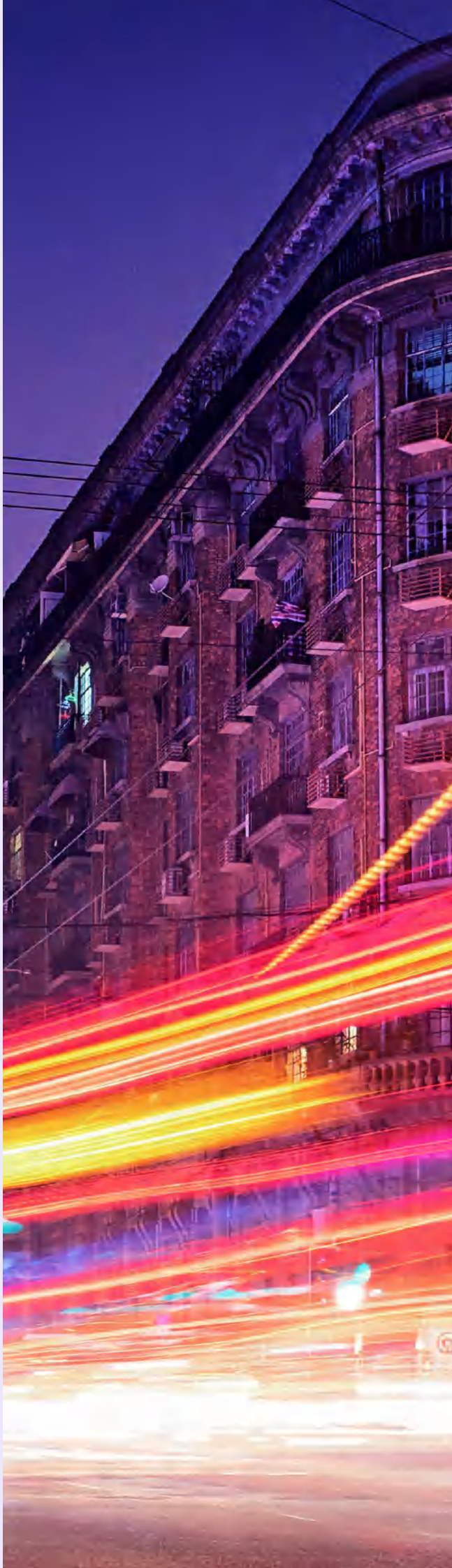
Appendix

Evaluation Framework

Overview

In order to help city administrators accurately measure and reflect the objective, progress and development of digital transformation of a city, it is necessary to develop a set of evaluation indicators compatible with the city's digital transformation guidelines and plans, which will enable them to learn about the advantages and disadvantages of digital transformation, and then adjust or redirect their planning.

Therefore, based on the philosophy of urban digital development, composed of the city's digitalization level, comprehensive competitiveness, greening and low-carbon presence, humanistic science and technology and other factors concerned, the System of Evaluation Indicators for Digital Urban Transformation (hereinafter referred to as the "SEI") is formulated. . SEI is aiming to serve as a useful reference for further enhancing the competitiveness of a city, and promoting its digital transformation.



1. Design Principles of the SEI

Reflecting the progress and level of a city's digital transformation, SEI is a collection of key indicators established according to design principles rather than a simple accumulation of random indicators. The design principles are common conventions of regularity concluded with reference to international index systems, national and international standards, and other practices. When followed in designing the SEI, these principles can make the indicators more sound and effective.

Therefore, to build a viable and sustainable SEI, the principles adhered to in the SEI design are as follows:

Equal emphasis on scale and quality

The SEI should highlight not only the investment and construction scale of digital urban transformation, but also the quality of development, aiming to assess and evaluate the practical effects of digital urban transformation on citizens, enterprises, government agencies and other relevant entities.

Integration and focus

In the design of indicators, all aspects of the city's digital transformation should be taken into consideration to set up a complete system. Also, there should be a focus on the key areas in the transformation to effectively supervise the fulfillment of the transformation goals.

Input aligned to effect

The evaluation indicators should cover the entire process of digital urban transformation for comprehensive appraisal in respect of resource input, project progress, development effect and long-term implications, and can be used to supervise the enforcement of various tasks in the transformation, ensure the project construction quality, and strive for higher benefits of a digital city.

A combination of quantitative and qualitative indicators

The SEI shall consist of qualitative and quantitative indicators. Clear and definite quantitative standards are identified upon quantitative indicators to assess the actual work of the target under evaluation in a more intuitive and accurate manner with less subjectivity, which will then be combined with qualitative indicators to draw a big picture of the digital urban transformation efforts. The evaluation system, based on quantitative methods and using qualitative methods as a supplementary, can fully reflect the level of urban digitalization.

2. Design Goals of the SEI

For a Vessel without a destination, any direction is a headwind. The SEI should have clear design goals, which not only go seamlessly in line with the overall digital transformation strategy of a city but also are implementable and sustainable. Once clear and feasible goals are identified, the SEI design will be closely linked to digital transformation efforts, both as a guide and as an assessment. Therefore, the detailed design of the SEI will revolve around the following goals:

Improve the resource allocation efficiency

The SEI aims to provide a scientific basis for resource allocation decisions, objectively reflect the effectiveness of urban construction, and clarify the key directions of urban construction, so as to guide the governments at all levels to promote resource allocation in a stable and orderly manner. Namely, in the case of a certain resource input, the output is maximized by allocating resources, or in the case of a certain output, resources are allocated to minimize the input, so as to maximize the benefit of resource allocation. At the same time, guidelines should be given to the market on free resource allocation, with a proper SEI introduced to reduce the government's direct intervention in resource allocation, giving a better play to the decisive role of the market in resource allocation.

Improve the resource input efficiency

The SEI aims to maximize the resource input efficiency and effectiveness. By scientifically assessing the resource input and output value of each section in the process of digital urban transformation, we can avoid the squander of resources resulting from blind or duplicate investment, so that investment become truly demand-commanded and application-oriented to create value.

Increase the density of resource agglomeration

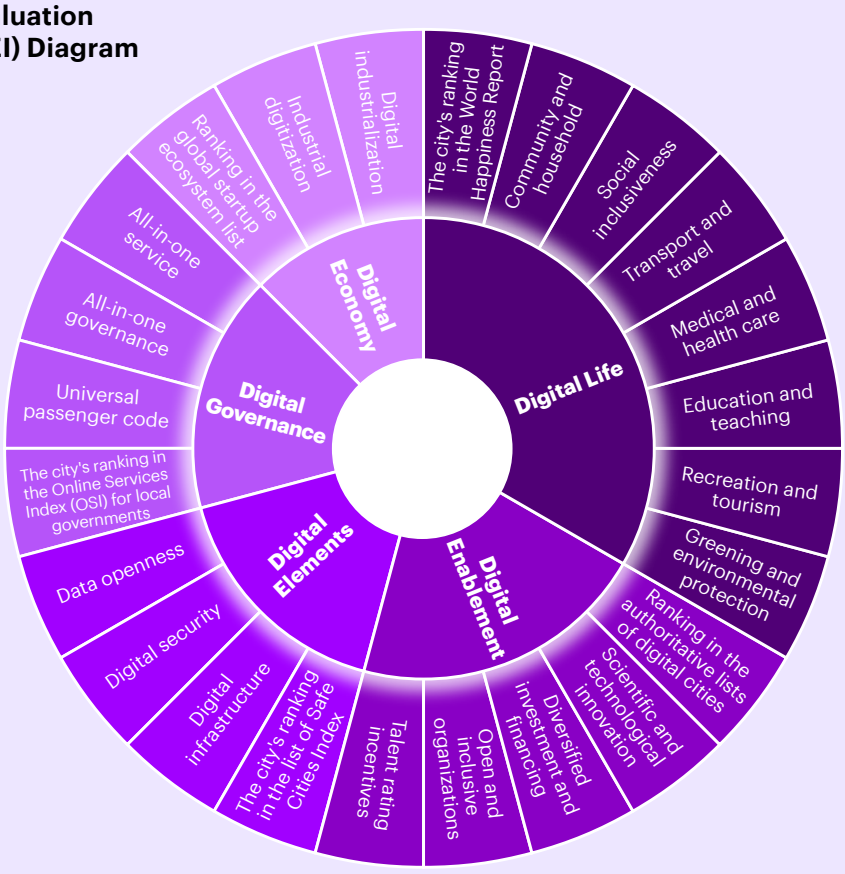
SEI aims to increase the diversity of resource elements and urban entities. Comprehensive analysis of the indicators for digital urban transformation serves to navigate the flow of resource elements toward key areas and promote the organic aggregation of talents, capital, technology, information, and other elements. In addition, with uniform assessment indicators in place, the conduct of all the departments and institutions concerned will be regulated. Various entities will be urged to jointly supervise the effectiveness of urban digitalization, creating a synergy of multi-party co-construction for a digital city with vitality.

3. General Description of the Evaluation Indicators

Based on Shanghai: The Global Digital Metropolis 2035, the SEI is designed to cover five dimensions, namely digital economy, digital society, digital governance, digital elements, and digital enablement, which are subdivided into 19 secondary indicators and 123 tertiary indicators. All indicators in the hierarchy are categorized into input, effect, and impact indicators according to their different dimensions of measurement.

Input indicators measure the resources invested in the digital transformation efforts, including the quantity, quality and timeliness of resources, as well as the progress in capacity building, such as the development of training and guaranteed mechanisms. Effect indicators measure the final effectiveness of the digital transformation efforts, including economic development, living standards, governance capabilities, infrastructure coverage, and the city's overall enhancement of digital capabilities. Impact indicators measure the long-term implications of digital transformation, such as the satisfaction of stakeholders throughout the transformation, and indicators related to the city's ranking in authoritative international lists, etc.

System of Evaluation Indicators (SEI) Diagram



Note:

1. The SEI will be dynamically adjusted according to the actual needs of different historical development stages.
2. The "city" mentioned in the SEI refers specifically to the urbanized area.
3. The "residents" or "urban residents" mentioned in the SEI generally refer to the permanent residents of the city.

Digital economy

The digital economy refers to a series of economic activities that use data resources as key production factors and digital technology as an important engine for efficiency improvement and economic structure optimization. The SEI evaluates the effectiveness of digital economy based on the construction and development progress of industrial digitization and digital industrialization, mainly incorporating 25 tertiary indicators.

Secondary indicator	Tertiary indicator	Measurement dimension
Industrial digitalization	Proportion of digital practitioners in conventional industries	Input
	Proportion of enterprises carrying out digital operations in conventional industries	Effect
	Total number of invention patent applications for industrial digitalization	Effect
	Rate of commercialized scientific and technological achievements in industrial digitalization	Effect
	Proportion of enterprises already applying new technologies in conventional industries	Effect
	Proportion of industries in the Industrial Internet	Effect
	Intelligent applications of the Industrial Internet platform	Effect
	Proportion of enterprises pursuing cloud services	Effect
	Proportion of enterprises adopting digital resource management	Effect
	Proportion of enterprises adopting digital production management	Effect
	Proportion of smart factories	Effect
	Construction of smart banks	Effect
	Number of smart ships	Effect
	Energy internet coverage	Effect
	Proportion of digital workshops for pharmaceutical production	Effect
	Proportion of new retail sales of medicines	Effect
	Proportion of unmanned agricultural production bases	Effect

Secondary indicator	Tertiary indicator	Measurement dimension
digital industrialization	R&D expenditure in digital economy	Input
	Share of digital economy in GDP	Effect
	Proportion of practitioners in digital economy	Input
	Invention patents in digital economy	Effect
	Proportion of fixed asset investment in digital economy	Input
	Internationalization of digital economy	Effect
	Proportion of digital economy unicorn companies	Effect
Ranking in the global startup ecosystem list		Impact

Digital society

Digital society refers to the use of digital technology to enhance life experience and happiness of residents. The indicator evaluates the effectiveness of digital society based on 1) the degree of digitalization of key scenarios such as greening and environmental protection, recreation and tourism, education and teaching, medical care, social inclusiveness, community and household; and 2) the happiness indicators for residents. It mainly incorporates 35 tertiary indicators.

Secondary indicator	Tertiary indicator	Measurement dimension
Greening and environmental protection	Proportion of new-energy vehicles	Effect
	Rate of key energy consumers subject to online monitoring	Input
	Proportion of digitally-enabled energy conservation in buildings	Effect
	Automatic monitoring of urban environmental quality	Input
Recreation and tourism	Proportion of online venues	Effect
	Proportion of digital scenic spots	Effect
	Proportion of online recreational activities	Effect
	Number of digital hotels	Effect
Education and teaching	Smarter classroom coverage	Input
	Smart campus coverage	Effect
	Digital skills training for teachers	Input
	Cyber learning space coverage	Effect
Health care and hygiene	Electronic medical record penetration	Effect
	Proportion of citizens' electronic health records available for online sharing	Effect
	Proportion of hospitals offering one-stop digital medical services	Effect
	Online consultation rate	Effect

Secondary indicator	Tertiary indicator	Measurement dimension
Transport and travel	Shared transport usage	Effect
	Real-time bus arrival forecasting rate	Effect
	E-payment usage for public transport	Effect
	Proportion of vehicles with built-in autonomous driving functions	Effect
	Proportion of smart parking spaces	Effect
	One-stop transport and travel	Effect
Social inclusiveness	Employment rate of women and people with disabilities in the digital industry	Effect
	Per capita usage of digital application services for special groups	Effect
	Smartphone coverage among people aged 60+	Effect
	Accessibility to the internet for special groups	Effect
	Per capita times of attending the SuiShenXue app usage training program for the elderly	Input
	Proportion of communities offering smart and healthy elderly care services	Effect
Community and household	Smart property coverage	Effect
	"Community Cloud" coverage	Effect
	Smart wet market coverage	Effect
	Smart supermarket coverage	Effect
	Number of digital business districts	Effect
	Smart community service coverage	Effect
The city's ranking in the World Happiness Report		Impact

Digital Governance

Digital governance refers to the administration pattern in which the daily office affairs, information collection and disclosure, public management and other procedures of government agencies are carried out on electronic platforms backed by digital technology. The SEI takes into consideration the management status of urban government services and urban operations and focuses on the three key engines of "all-in-one service", "all-in-one governance" and "universal passenger code" to evaluate the progress in digital governance. It consists of 20 tertiary indicators.

Secondary indicator	Tertiary indicator	Measurement dimension
All-in-one service	Government-resident interaction	Effect
	Government service coverage	Input
	Government department coverage	Input
	Proportion of government services handled online	Effect
	Reliability	Effect
	Number of scenarios developed for "one issue solved at one time"	Input
	Effect of scenarios developed for "one issue solvedat one time"	Effect
	Average time to complete online transactions	Effect
	User satisfaction	Impact
	Level of accessibility to all-in-one service	Effect
All-in-one governance	Number of application scenarios developed for all-in-one governance	Input
	User satisfaction	Impact
	Coverage of electronic corporate archives	Effect
	Digital city administration	Effect
	Situation of social management supported and enabled by public safety video images	Effect
	State-of-emergency early warning	Effect
	Disclosure and management of urban traffic operations	Effect
All-in-one code	Number of application scenarios for the Shanghai QR Code	Effect
	Number of users of the Shanghai QR Code	Effect
The city's ranking in the Online Services Index (OSI) for local governments		Impact

Digital Elements

Digital elements refer to the data deemed as new production factors generating digital assets to fully exploit and accumulate the value of data. The SEI evaluates the effect of digital elements in key aspects, such as digital infrastructure, data openness and data security. It consists of 21 tertiary indicators.

Secondary indicator	Tertiary indicator	Measurement dimension
Data openness	Rate of information resources shared across government departments	Effect
	Cross-departmental data fusion	Effect
	Accessibility to public information resources	Effect
Digital security	Guaranteed mechanism for the digital security of a smart city	Input
	Certification rate of the security standards for the government systems	Effect
	Safe operation of government systems	Effect
	Number of confidentiality breaches/leakage incidents (cases)	Effect
	Cybersecurity maneuver score	Effect
	Cybersecurity maneuver coverage	Effect
	Anti-fraud awareness of residents	Effect
Digital infrastructure	WiFi coverage in public areas	Effect
	5G signal coverage	Effect
	IPv6 penetration	Effect
	Home network capacity	Effect
	Construction of the government big data center	Input
	Proportion of the cloud government systems	Effect
	Construction of the digital twin city	Input
	Proportion of the area covered by the digital twin city	Effect
	Access rate to city empowerment platform	Effect
	Utilization of the city empowerment platform	Effect
The city's ranking in the list of Safe Cities Index		Impact

Digital Enablement

Digital Enablement refers to the solid backup force provided via digital means in the process of basic urban operation to support the sustainability of digital urban transformation. The SEI evaluates the maturity of digital enablement based on key dimensions such as talent rating incentives, open and inclusive organizations, diversified investment and financing, and scientific and technological innovation. It consists of 22 tertiary indicators.

Secondary indicator	Tertiary indicator	Measurement dimension
Talent rating incentives	Presence of corporate digital training	Input
	Digital competency of government employees	Input
	Digital-related professional education	Input
	Number of academician-level scientists in digitalization-related majors in Shanghai	Input
	Residents' engagement in the digital urban transformation	Effect
	Residents' engagement in the digital literacy campaign	Input
Open and inclusive organizations	Corporate engagement in the digital urban transformation	Effect
	Proportion of companies with a CIO or CDO system	Effect
	Corporate engagement in government-organized digital transformation activities	Input
	Smart city organizational mechanisms	Input
	Smart city Guaranteed mechanisms	Input
	Smart city strategic planning	Input
	Smart city strategic implementation	Effect
Diversified investment and financing	Number and scale of government guide funds	Input
	Number and fund management scale of VCs	Input
	Proportion of government expenditure on digital urban transformation	Input
Scientific and technological innovation	Number of R&D centers for frontier basic technologies	Input
	Number of invention patent applications for frontier basic technologies	Effect
	Commercialization rate of key technologies	Effect
	Number of R&D centers for key technologies	Input
	Proportion of fixed asset investment in key technology industries	Input
Ranking in the authoritative lists of digital cities		Impact

References

1 World Bank, www.worldbank.org

2 CAICT, White Paper on Global Digital Economy, Aug. 2021

3 World Bank; CAICT, White Paper on Global Digital Economy, Aug. 2021

4 Accenture research, 2021

5 The China Metropolitan Area Development Report, Institute for China Sustainable Urbanization, 2018

6 The Statistical Yearbook, Shanghai Municipal Bureau of Statistics, 2020

7 United Nations Department of Economic and Social Affairs World Urbanization Prospects: The 2018 Revision, 2018

8 The Seventh National Population Census，statistics of Shanghai, 2021

9 The Special Report on Shanghai's Digital Full-Scenario Atlas, Accenture Research, 2021

联合编撰

埃森哲 (中国) 有限公司
上海浦东发展银行股份有限公司

鸣谢 (按照姓名字母顺序)

宾晖、蒋晓云、孙捷、吴昊楠、徐亚敏、姚旭、诸大建

Co-editors

Accenture (China) Co., Ltd.
Shanghai Pudong Development Bank Co., Ltd. (SPD Bank)

Acknowledgement

(in alphabetical order of names)

Alex Jie Sun, Dajian Zhu, Haonan Wu, Hui Bin,
Xiaoyun Jiang, Xu Yao, Yamin Xu