数字技术赋能中国服务业成长：作用机理与实施路径

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摘　要：数字技术作为数字赋能与数字经济发展的工具和载体，近年来同服务业密切融合，使得产业内出现工业互联网平台、新零售、在线教育等新业态新模式，促进中国服务业向提质扩容和转型升级的目标迈进，推动服务业成长，具体表现为产业规模不断扩大、产业结构优化升级、实现提质增效、增进民生福祉和自主创新能力不断增强这五个方面。目前我国服务业数字化仍存在数字化发展程度不够、发展水平参差不齐、要素支撑能力较弱、政府扶持力度有待增强等问题，未来应从完善基础设施和平台建设、强化要素支撑和加强政策制度体系建设等方面予以完善。

关键词：数字技术；服务业；转型升级

JEL 分类号：O11, O14

一、引言

全球新冠肺炎疫情持续蔓延，各国局势错综复杂，我国正处于百年未有之大变局，经济社会发展面临诸多挑战，尤其对于需要线下开展的经济活动造成了严重冲击，其影响正在逐渐显现出来。但随着科技进步带来的新一代数字技术的广泛应用，数字经济逆流而上，获得大幅增长（钟业喜、吴思雨，2022）。《中国数字经济发展白皮书（2021）》显示，2020年中国数字经济规模达到39.2万亿元，占GDP比重达到38.6%，保持9.7%的高位增长速度，成为稳定经济增长的关键动力。而这其中，数字技术是数字经济的核心要素，是数字经济价值创造的生产力基础，也是数字经济的引擎和运行的支撑（何玉长、刘泉林，2021）。数字技术是指以大数据、人工智能、区块链、共享经济为代表的数字新技术（陈晓红，2018），它作为一种技术要素参与产品生产过程，改造传统的生产制造技术，显著提升了生产率。数字技术还重塑了经济社会发展形态，通过与产业融合不断衍生新业态和新型商业模式，推动数字经济高速增长（胡优玄，2022）。“十三五”以来，我国服务业比重不断提升，生产性服务业加快向专业化方向发展，生活性服务业继续向高品质拓展。国家统计局数据显示，2021年，服务业增加值占国内生产总值比重为53.3%，对经济增长的贡献率为54.9%，拉动国内生产总值增长4.5个百分

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点，分别高出第二产业13.9、16.5和1.4个百分点，这足以说明我国已经迈入服务业为主的发展阶段，而数字经济从根本上改变了服务不可储存、不可贸易的性质（江小涓、罗立彬，2019），给服务业带来新的发展契机。基于当前发展环境和未来的技术演变趋势，厘清数字技术的内涵特征，分析数字技术赋能服务业成长的内在机理，探索促进数字技术与服务业融合发展的主要路径，具有重要的理论意义和实践价值。

二、数字技术赋能服务业成长：基本内涵与理论依据

（一）概念与特征

1.数字技术的演进

数字技术作为数字赋能与数字经济发展的工具和载体，成为转型时代产业发展供给侧改革的触发器、需求侧改革的探测器。时代的发展和变化促使数字技术在不断更新，20世纪90年代数字经济界定的焦点集中在互联网上，而当代，云计算、大数据、物联网、人工智能（AI）、虚拟现实、区块链、3D打印等数字技术同样成为与数字经济融合发展的核心驱动技术。随着数字技术与信息产业的深度融合，数字化浪潮正在席卷全球并深刻改变着人类社会的生产生活方式，以移动互联网、大数据、云计算为代表的新一代信息技术的出现，进一步加速了经济社会发展领域中数字技术、信息系统、智能基础设施的重构式创新发展。

2.数字技术的内涵与特征

人们普遍认为数字技术是从计算技术、微电子技术以及现代通信技术所构成的新技术群体发展而来的，它的实质就是要实现各种信息的鉴别、转换、储存、传播以及应用等功能。另一些学者则认为目前ICT的范畴是随着电子技术走向成熟而逐步缩小到传输数据、处理数据等方面，相当于广义上的数字技术。数字技术作为一种典型的通用目的技术，其技术—经济特征主要表现为渗透性、替代性以及协同性上。渗透性即数字技术能够直接或者间接地介入社会生产、分配等环节，通过与实体经济的深度融合，持续赋能社会经济，扩大经济增长空间。替代性指在全社会投资和消费中，数字技术资本以其稳定性和可靠性的优势，持续取代非数字技术资本促进经济增长的能力。协同性意味着数字技术能够促进大规模社会生产计划的制定，使网络化协作成为可能，并且随生产要素特征、规模、结构等因素的变化而产生不同的“化学反应”，从而体现出数字技术在生产率提高方面的重要性。

3.服务业成长的内涵

中共十九大报告提出了在全面建成小康社会基础上实现“两步走”的奋斗目标，到本世纪中叶实现富强民主文明和谐美丽的社会主义现代化强国目标。建设社会主义现代化强国必须依靠现代

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产业体系这一重要依托，服务业是现代产业体系的重要组成部分，是国民经济发展中的重要主体，是建设现代化强国的坚实基础。近年来，数字技术同服务业深度融合，使得产业内新业态不断出现，新模式不断被激发，新服务不断出现于竞争合作版图中，有效促进了中国服务业向提质扩容和转型升级的目标迈进。服务业的成长，不仅是总量的增长，更重要的是发展水平的提升。随着中国经济进入新常态，“十四五”时期是加快推进以创新驱动为主线的供给侧结构性改革的关键时期，也是服务业实现高质量发展的攻坚时期，从而把持续扩大产业规模、优化产业结构、实现提质增效、增进民生福祉、增强自主创新能力的发展历程称之为“服务业成长”。

4.数字技术下的服务新特性

在由“数字化”革命形成的服务型社会中，数字技术极大地改变了服务的特性。第一，数字化衍生的巨量信息服务，极大地改变了资讯和知识的传播、沟通方式，如网络搜索服务，为消费者提供了几乎无成本的信息服务。第二，服务生产过程被重组。在数字化的条件下，生产过程被分解成许多专业化环节，利用全球不同地点在人力资本、成本、市场、规模经济等方面的优势在全球各地生产，同时又通过信息技术将它们连成一个有机整体。第三，知识生产过程被重组。信息技术对知识编码使之标准化，再将以知识为基础的服务通过研发、设计、编程等方式将其分解为模块或者片段，并以网络为传播媒介进行分散和连接。第四，网络能远距离连接服务生产和消费，消费者能够在全球范国内选择合适的服务供应商，服务提供者也可以面向全球消费者提供服务。服务业因为数字化革命而获得了自我革新机会，正是因为服务业这样的数字化质变，服务创新才能成为经济增长的新引擎，服务型社会才得以加速构建。

（二）理论依据

1.服务业“成本病”假说

（1）数字技术可以通过间接赋能的方式推动服务业生产率的提升。间接赋能是指数字技术不直接改变服务生产、供给等基础活动所使用的生产工具，而是通过改变辅助活动所使用的工具及相关基础设施实现生产率的提升，比如不断改进的交通运输技术。数字技术在为人们带来便利与效率的同时也对社会经济产生了巨大影响。一方面，数字化技术能够减少人与设备之间的距离，从而降低了时间成本；另一方面，数字技术还能节省劳动力。以腾讯会议为例，使得相关服务活动无需人员物理空间位置移动就能远程开展。

（2）数字技术可以通过直接赋能的方式推动服务业生产率的提升。直接赋能就是数字技术在服务价值链这一基础活动中的直接运用，在创造完整服务价值的过程中达到生产率的提升，如数字技术和相关智能机器等的运用使得服务业内部分工加深甚至取代了大量工作岗位。加之数字技术融入传统服务业，使得服务无形性、异质性、产消同步性、不可储存性等传统特征得以转变，并重新

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界定服务企业的经营管理模式，帮助企业减少单位服务供给成本，提升生产效率。

2.信息不对称理论

（1）数字技术赋能可以有效降低需求侧获取信息的难度。数字技术帮助消费者快速搜集并处理其对商品和服务的需求数据，然后根据全链条下的追踪和对接来实现精准化的需求侧服务。通过对需求信息的精准聚合和对消费者行为的技术捕捉，基于社会数据资源的数字技术可以实现为需求方提供精准的个性化服务。

（2）数字技术赋能可以有效降低供给侧信息匹配的难度。数字化的推进正在增加信息的数量和可用性，数据作为关键要素在数字赋能过程中为供需双方提供了交互参与的可能性，供给主体通过数字技术大幅提高数据的收集、传输、存储、计算和快速处理能力，在化解信息不对称难题的同时，帮助生产者或供应商更好地了解消费者需求，从而提高其服务的效率和质量。

3.交易成本理论

（1）数字技术可以减少需求侧的交易成本。随着社会主要矛盾的转变，公众对商品和服务已不再满足于基本的需求，越来越向高质量和个性化目标看齐。所以，伴随着数字化智能技术的应用，平台的计算能力和算法迭代出新、日趋成熟，使得M2C模式可能成为普遍的产消方式，从而减少交易渠道和降低交易成本，为实现资源配置最大化创造良好的条件。

（2）数字技术可以减少供给侧的交易成本。在数据赋能的作用下，服务的提供时限被大大缩短，商品或服务被分解成若干个模块，通过特定的流程组装连接并交付给用户，使其在最短的时限内享有最优的商品或服务。而且，通过合理使用社会信息，数字技术不但能够迅速响应用户需求，而且能够通过消除商品交易中的机会主义和不确定性来控制产品制造成本。所以，数字技术因其能够利用大数据算法提供更精确、个性化的商品或服务，可以大大降低供给侧的交易成本。

4.服务创新理论

（1）数字技术赋能服务型制造创新发展。数字技术使得制造业的连接、数据、算法与算力以及加工制造能力等显著提升，在制造企业服务化转型过程中，对用户的服务由以能力为核心扩展到以数据为核心，促进增值服务产品化，从而使得制造企业能够实现服务型制造活动的大规模供给，显著扩展了服务型制造的发展空间。

（2）数字技术赋能公共服务创新发展。随着信息技术的飞速发展，“互联网+”在公共管理和服务中发挥着越来越重要的作用。数字技术和公共服务领域的深度融合催生了电子政府、数字治理和智慧城市等新业态，这些新业态通过强化政府对突发状况的反应速度、加快流程的自动化进程和拓宽市民的反馈渠道来促进跨领域的信息共享、简化工作流程和推进部门协作，从而提高公共服务水平。

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三、数字技术赋能服务业成长的作用机理

（一）扩大规模

1.打破历史局限，加速规模扩张

从服务业领域来看，从新中国成立至改革开放初期，服务业主要聚集于商贸物资、运输服务等少数行业，规模小且实力弱，数字技术通过激发服务新模式，进一步拓展服务业领域。比如数字技术推动电子商务的兴起，电商“数智化”带动信息技术服务业和衍生服务业发展，2020年，全年电子商务服务业营业收入达5.45万亿元，较上年同期增长21.88%，其中，电商交易服务营业收入为1.15万亿元，增长36.33%；基础业务领域中的电子商务支付、电子商务配送、信息技术服务等业务营业收入逆势增长，总额为2.10万亿元，增速达16.73%；衍生服务领域业务营业收入持续增长，总额为2.21万亿元，增速达20.30%。[①]在数字经济渗透率方面，2020年，中国服务业数字经济渗透率为40.7%，相比2019年提高了2.9个百分点，其中信息传输、软件和信息技术服务业等新兴服务业近4年年均增长19.4%，[②]反映出我国服务业繁荣发展的良好态势，折射出中国经济的质量与成色。

2.消除时空制约，促进服务贸易

由于互联网和信息技术从本质上改变了传统服务业低效率和不可贸易的特性，强化了服务全球化发展的动力，显著加快了网络时代服务全球化的发展速度，服务贸易总量不断增加。2012年至今，我国服务贸易进出口保持了高速的发展态势，平均每年都以高于全球增长率3.1个百分点的速度递增。2022年上半年，我国服务进出口总额达到2.9万亿元，比上年同期增长21.6%，其中服务出口1.4万亿元，比上年同期增长24.6%。[③]数字技术的发展改变了传统的需要面对面式的跨境贸易模式，通过数字连接全球用户，既增强了服务的可贸易属性，又拓宽了服务贸易的产业创新边界，助力全球服务贸易发展。

（二）优化结构

1.数字技术推动传统服务业升级

由于要素之间的相互转换，服务业结构逐步向高级形态方向发展，典型表现为以批发零售业、运输业、仓储业为代表的传统服务业比重不断下降，而现代服务业占比持续提高。自2G及PC互联网广泛应用以来，信息通信技术方面的技术升级在需求端迅速普及，形成规模效应。4G、光纤、智能终端等广泛普及，大幅改变了服务信息获取的方式和速度。以5G为核心的信息网络融合了感知技术、云计算、虚拟现实、大数据、人工智能等数字基础技术，与服务垂直产业的高度融合将会进一步改善

① 资料来源：前瞻产业研究院，《2022—2027年中国电子商务行业市场前瞻与投资战略规划分析报告》。
② 资料来源：前瞻产业研究院，《2022—2027年中国数字经济行业市场前瞻与投资规划分析报告》。
③ 资料来源：商务部网站，http://mo.mofcom.gov.cn/article/tjsj/zwfengsu/202208/20220803339820.shtml。

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服务体验，并催生出全新的服务商业模式与产业形态，为服务市场提供新产品、新服务、新体验。以旅游业为例，数字技术通过催生出在线旅游和数字文旅等新业态，提升消费者个人体验，推动旅游产业结构升级。

2.数字技术推进服务业与制造业融合

首先，数字技术的应用带来的技术进步不断渗透到各个产业领域，实现产业内生产能力的提升，并且由于技术扩散会带来相应的竞争与合作，降低制造企业提供服务的技术门槛，从而突破服务业与制造业融合过程中的行业壁垒。其次，数字技术应用于前端环节，可以提高厂商的生产灵活性和市场应变能力，缩短产品生产周期，在后端环节降低信息搜寻与匹配成本，优化产品或服务的匹配速度与效率，从而促进两业融合。最后，数字化激发了潜在服务需求。通过数字信息技术知识和数据的免费、大范围共享，促进了公众认知水平和意识的提高，从而客观地激发出新的产品市场需求，消费边界的扩展会强化生产服务一体化需求，从而加速两业融合的步伐。

（三）提升效能

1.推动服务业效率变革

根据鲍莫尔—福克斯假说和发达国家从工业经济向服务经济转型的经验，由于传统服务业的产出效益通常低于制造业，在转型过程中的总体增长将明显放缓。中国进入服务经济时代虽然晚于发达国家，但是得益于数字技术的广泛应用，服务业的生产率得到了显著提高。因此在国民经济结构从工业型结构向服务型结构转换的进程中，中国整体经济增长并没有发生明显放缓，反而始终处于较快发展。数字技术的最大特点在于传播范围广和边际成本低，能够在消费、生产、分销等领域形成明显的规模经济，从而改变了服务的无形性、同步性、不可存储性和异质性，缓解了供需双方在价格、时间、空间等问题上的匹配难题。在决策部署方面，数字技术能够提升数据获取、处理、分析方面的效能与精确度，从而合理安排服务能力的时空布局，不仅可以提高交付和履行的速度和准确性，也减少了不必要的资源浪费，提高收益率。如餐饮企业基于大数据分析预测订单变化趋势，合理配置外卖和堂食餐饮资源，科学规划服务人员班次。在业务精简环节，数字技术可以集成各项资源，优化业务流程，在一定的技术条件下实现最优化配置。

2.推动服务业质量变革

首先，一方面平台化服务成为新潮，消费者评论在平台上汇聚并公开，压缩虚假信息传播渠道，缓解信息不对称问题，让服务透明化；另一方面，数字技术提高了行业标准化程度，克服服务内容的多变性，部分实现了质量管控。例如，《外卖信息描述》作为外卖行业的首个国家标准，规定了互联网平台外卖基本信息描述的术语、定义和要求，外卖信息披露更完整，倒逼商户积极地改善服务质量。比如国内许多主流服务平台的活跃用户已上亿，平台每日都会获取大量客观的服务评价，这

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些即时反馈将有助于促进市场净化，实现优胜劣汰。其次，通过大数据或C2B模式将消费者的需求准确地传递给商户，从而协助商家提供精细化服务和定制化服务。特别是利用数字技术和服务业的融合发展，使“服务”成为一种特殊商品，由劳动力密集转变为技术密集、知识密集，从而提高了服务附加值，促进高端服务行业的蓬勃发展。

（四）增进福祉

1.服务业数字化有利于吸纳就业

一方面，服务业数字化为企业创造新岗位，为人民增加新的就业机会。2021年，第三产业数字经济就业岗位占比高达60.2%，远高于第二产业的7.1%和第一产业的0.1%，其岗位薪资也高于第二产业和第一产业；[④]另一方面，服务业数字化创造了新型灵活就业模式，例如外卖骑手。餐饮业数字化依托互联网技术推动人才流动与人岗匹配，实现人才功能最大化，针对低频及非必要岗位推出灵活用工，在激发行业上下游间接就业的同时，给从业人员带来短期就业机会及兼职工作并获取相应收入来源。以网约配送员为例，2019~2021年，通过某平台实现营收的骑手数量从398.7万上升至527万，年均增长64.5万，约占全国城镇新增就业的5%，超过了快递行业同期20万人的年社会就业增量。[⑤]数字技术赋能餐饮从业者，缓解其在点单收银、加菜传菜、排班排岗过程中所面临的重负与精力损耗，有利于为餐饮业从业人员营造一个更加高效与智能的环境。新冠肺炎疫情下，零工经济催生的“人才共享”模式为周期性失业者提供短期就业机会，从而有效缓解各行业劳动力紧缺与劳动力闲置同时存在的困境。

2.服务业数字化助力公共服务的优质发展

2012年到2021年，我国网民规模已由5.6亿人发展至10.32亿人，互联网普及率达到73%，构建了全球规模最大的线上教育平台和全国统一的医保信息平台，远程医疗覆盖超过全国90%的县区。[⑥]网络扶贫行动为打赢脱贫攻坚战做出了贡献，数字乡村建设扎实开展，城乡居民共享数字化发展成果。一方面，多行业以数字技术为手段不断开发出新模式，比如医疗行业的互联网医疗、教育行业的在线教育以及护理行业的智慧养老，这些新模式秉持了公共服务在居民生活中的基础性作用，让不同地区的居民平等受益于优质公共资源，提高生活满意度和幸福感；另一方面，我国农业农村发展从增产到提质的转变需要技术创新的大力支持。随着数字化的发展，区块链、人工智能等新一代信息技术已成为乡村振兴实践的新动力，以农产品溯源为例，砀山梨、安吉白茶等地理标志产品利用区块链探索出独特的数字化路径，将种植、仓储、物流信息上链，不仅可以实现智能化生产管理，还

④ 资料来源：前瞻产业研究院，《2022—2027年中国数字经济行业市场前瞻与投资规划分析报告》。
⑤ 资料来源：美团，《2021企业社会责任报告》。
⑥ 资料来源：中国互联网络信息中心，《中国互联网络发展状况统计报告》。

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可以产生品牌溢价，提升经济效益。

3.服务业数字化有利于提升数字政府治理服务效能

2021年，全国一体化政务服务平台实名用户突破10亿，在大数据、云计算、人工智能等新一代数字技术与数字政府融合发展背景下，“掌上办”“指尖办”成为各地区政务服务标准配置，“一网通办”“跨省通办”得到了积极推进。数字抗疫加快数据互通共享步伐，健康码推广应用达到空前水平，安全稳定性能显著增强。以北京市为例，近年来将数字化思维融入政府治理全过程，通过大数据分析民生需求，对群众“急难愁盼”问题进行源头治理，有力推动了政府职能转变，提升了办事效率，让数字技术更好地服务人民、造福人民。随着数字政务建设的深入，服务领域也出现了变化，由“线下跑”转为“网上办”、由“分头办”转为“协同办”，政府的公共服务功能正由政府资源供应导向向民众需求导向转化，数字应用在促进民生服务、中小企业发展、自然灾害预警、应急管理等领域也更为有效，不断丰富和创新了政府管理方法。

（五）推动创新

1.创造新业态、新模式

一是共享经济。经济体系中存在大量未充分利用的资源，数字技术能够以更高的效率和更低廉的成本来整合这些资源。共享模式可以使经济系统的离散资源得以释放，比如民宿产业、顺风车、共享单车等。二是长尾市场。由于服务需求存在差异化、专业化、个性化的特征，小众、低频需求较多，特别是线下提供的某些服务，其成本往往需要通过相应的供给规模来补偿，而数字技术则能够拓展服务信息的传递范围，捕捉更广泛的中低频需求，进而迅速达到服务供给的最小经济规模，例如密室等产业的发展。三是跨界融合。通过各种业态的相互融合、企业内在价值链和外部产业链的差异化融合、跨行业的整合以及新技术与网络的精细化，形成了一种企业、商业以及产业的新型组合形态，比如电子竞技和互联网直播等。

2.推动服务贸易多样化发展

电子商务已经成为一种普遍的经济和社会现象，借助互联网技术，跨境电商平台在20世纪90年代末迅速兴起，以低成本高效率的连接优势，聚合跨国的信息资源和市场资源，促成全球化的数字市场和数字化的跨境贸易网络。跨境电商正在向下一代E贸易方式转变。跨境电商平台从信息匹配中介逐渐发展成为提供“贸易相关的物流、金融、信息、支付、结算、征信、财税等配套服务和通关、收汇、退税外贸综合服务”的数字贸易核心商业基础设施（王晓红等，2020）。对于电子书和版权音乐等传统服务贸易领域，国内供应商可以通过跨境电商平台提供差异化和多样化的服务产品，满足全球消费者的个性化需求，并催生出服务贸易领域的长尾效应，开拓新的国际市场。因此，跨境电商平台可以扩大服务贸易规模，细化服务贸易类型，促进服务贸易多样化发展。

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四、数字技术赋能产生的服务业新业态

（一）工业互联网平台

工业互联网是满足工业智能化发展需求的关键网络基础设施，具有低时延、高可靠、广覆盖等特点，是数字技术驱动下价值共创的新生态，是新一代信息通信技术与先进制造业深度融合形成的新兴业态与应用模式。工业互联网平台作为工业领域数字新经济的重要组成部分，以数字技术为主线，通过开放设计、生产、流通、消费及服务等环节，建立起基于云平台海量数据采集、聚合、分析服务体系，支撑制造资源泛在连接、弹性供给及高效配置等，为产业升级及经济高质量发展赋能（李燕，2019）。目前，我国已建成全球规模最大、产业链最完整、应用场景最多的工业互联网体系，基本具备建设世界一流工业互联网平台的基础条件。从顶层规划看，国家对工业互联网的重视程度不断提升。工业互联网平台促使工业生产方式向数字化、网络化和智能化转变，同时引发以智能制造和工业大数据为核心的商业模式革新，打造“制造+服务”价值共创新生态。

工业互联网平台主要解决工业设备、工业产品以及工业服务等相关问题，它以传感器和物联网为依托，基于传感器网络、射频识别（RFID）技术、机器学习算法和大数据技术等，通过运输云实现制造企业、第三方物流企业与用户三方信息共享，提高车辆往返的载货率，实现对冷链物流全程监控；通过采集厂房设备的生产情况、能耗情况、品质情况等实时数据信息，实现对厂房的实时监测；设备制造商通过物联网获取设备状态，实现远程监测及故障诊断，避免非计划性停机从而达到预测性维修、提供增值服务及备品备件销售等。

由此可见，工业互联网平台实质上属于集成式、智能化、融合型的生产性服务业，改变着数字经济时代产业发展模式和道路，突破了制造业和服务业之间的边界，拓展了传统企业边界。区别于传统工业经济“原材料→生产商→品牌商→分销渠道→门店零售→消费者”的企业价值链的增值过程，数字技术的发展引发了产业全新变革。首先，数字技术在销售手段、渠道和界面等方面进行了革新，使人员—货物—场地重新整合（如疫情时期线上带货等），相比较线下门店模式，线上模式采用了数字技术对用户进行准确描绘、利用数字内容运营构建与消费者之间的连续互动、利用AI算法发掘消费者潜在需求等。其次，以往传统QCD[⑦]的内涵为“标准品大批量长交期”，也就是制造商把批量标准商品放在销售场所，消费者仅能关注这些标准商品的质量及售价，现在则以与原供应链完全不同的信息流向为导向，利用社交或消费互联网助力逆向创导机制，形成一种新的价值增值流程，为制造商提供研发、生产、创新的按需生产服务，因此，新QCD的内涵已转变为“多品种小批量短交期”。

⑦ QCD内涵：Q质量，C成本，D交期。

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（二）新零售

“新零售”也是基于数字技术的商业模式创新，是企业运用人工智能、大数据等数字技术基于互联网对商品的各环节特别是流通与销售环节进行升级改造，并最终实现一体化智能管理与自主商业智能决策，借助智慧系统不断提升消费者体验。

我国零售业的布局和发展始终仿照西方零售业态进行，从以“货”为核心的购物中心、百货商场、超市、便利店和专卖店到以“场”为核心的大型折扣店和仓储式会员店等“一站式”商业综合体，无不追赶着国外零售业业态的脚步。进入21世纪后，随着科学技术水平的不断提高，人们的生活方式也发生巨大转变，越来越多的消费者开始关注产品的体验性。因此，“以顾客为中心”的理念应运而生。其中欧美很多国家都通过打造以“场”为核心的“消费圣殿”来输出消费工具和消费文化，例如麦当劳、肯德基、宜家和山姆会员店都深刻地改变着全球消费的格局，而目前“以人为中心”的新零售让中国零售业的发展走出追随的窠臼，在世界范围内开始显示出消费引领者应有的潜质。

新零售并不存在一种一成不变的形式，可能是一种线上、线下充分结合的渠道零售（O2O），也可能是一种统一连锁的体验式消费或服务业“零售+产业生态链”，这种零售模式脱离了以往主要依靠生产和渠道的运营模式，突破了传统零售业信息不对称限制，利用线上大数据销售现货，汇集现代物流来减少库存、降低成本，并将物联网和大数据相结合，在信息对称中精准销售，从而改善消费者服务体验，让消费者获得更多实惠。新零售正在从实体门店向数字化转型。在新零售环境下，零售行业需要进行一系列变革：第一，重构业态；第二，重塑用户关系；第三，构建生态圈；第四，创新商业模式。例如，一是零售企业在大数据及先进算法的辅助下，解决了业务活动在原材料供应、生产管理、产品存储及物流、市场营销、售后服务等方面存在的问题，做到去中心化及机器自主决策；二是取消了社交距离，利用人工智能等海量数字技术整合零售商业生态、全产业链及运营各个环节，并将其纳入到消费者社交网络中，让消费者在互动性科技的作用下共享生活中的点点滴滴，并在社交网络上裂变出口碑传播，突破了虚拟及现实之间的障碍，从而消除了社交距离；最后，借助图像识别、RFID、语音识别等技术支持，抓取消费者在线下身份特征、货架行为、面部表情等信息，在线上结合线下，加强个性化精准营销等功能。

（三）在线教育

在线教育（e-Learning），在网络上进行远程教育、在线学习等，泛指以网络为载体进行学习。在国外，在线教育已经有了相当长的历史，而我国在线教育起步较晚。20世纪80年代末90年代初兴起的开放课程（MOOC），为在线教育提供了广阔前景。2000年开始，作为新兴教育模式，在线教育能够融合世界范围内的优质教学资源，传统学校围墙已逐步被突破，摆脱时空限制的在线教育成为了一种全新教学场景。伴随着科技的进步，在人工智能的帮助下人们能够促进教与学的变革，加速大规

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模、个性化、高质量教育的实现。在线教育拓展出知识生产、聚合和扩散的新空间，其资源供给与服务供给方式也会随着信息技术的发展而越来越灵活、越来越公平、越来越有质量、越来越有个性，是面向未来教育改革的主要推动力量和依托。

我国在线教育发展可分为四大阶段。首先是多媒体教育时期，上世纪九十年代，具有多媒体特征的科技开始运用于教育教学过程中；其次是“互联网+”教育时期，1999年互联网成熟普及使得学习社区、教学视频等多种手段得到快速发展并在众多网校中上线运营；再次是“移动+”时期，伴随着2010年后移动互联网技术的逐步成熟，录播付费课程已经形成了稳定的商业模式；最后是“智能+”时期，从2013年到现在，基于“轻知识”的知识付费平台陆续兴起，智能化和个性化一起拉开了“智能+”时代的序幕。技术加速变革导致在线教育更迭周期缩短，再加上新冠肺炎疫情导致国内大、中、小学学生快速涌入各在线教育平台，移动互联网、大数据、人工智能等新一代数字技术促使停滞不前的线下教育快速实现线上化迁移，迎来了在线教育产业的黄金发展期。统计显示，各大在线教育App下载量在2020年春节达到高峰，注册用户数也随之增加，线上教育App产业日活跃用户由每天8700万人次增加到1.27亿人次。[⑧]

随着人工智能（AI）、元宇宙等尖端数字技术不断成熟与广泛应用，线上教学不但可以大范围模仿与取代线下教学，而且有望通过智慧化赋能的教学效果显著提高教学效率，从而真正达成“因材施教、有教无类”的教育理想。但目前我国高校在线教学仍存在诸多问题，如教学资源匮乏、信息化程度较低、师生互动不足等，如何解决这些问题成为当前研究的热点之一。如复旦大学管理学院引进的在线教育平台在真正意义上做到了教师可在管理平台上自由地创建和管理课程、进行在线课堂及作业、考试、问卷等，学生可根据教师制定的学习计划合理地安排学习时间与次序，进行高效学习，还能为管理者匹配提供海量可视化数据，对后续科学决策、规范管理、教学改进等工作提供大数据支撑。就MBA教育而言，美国已经出现了全在线的移动数字商学院。数字技术在人机互动中加强适应性学习，并通过线上动态提问与学生反馈来增强学习主动性与个性化，并把包括元宇宙、虚拟现实、机器学习、人工智能在内的前沿数字技术广泛地应用于教学之中，使得在线MBA课程内容与形式变得更加丰富，能给学生带来沉浸式的学习感受，促进学习效果并加强互动交流。

五、数字技术赋能服务业成长面临的挑战

我国服务业数字化已初见成效，正朝着做大做强的趋势迈进，但是也应清醒地认识到在此进程中还存在着数字化发展程度不够、发展水平参差不齐、要素支撑能力较弱、政府扶持力度有待增强等问题。这些问题对于数字技术赋能服务业成长构成了一定的制约。

[⑧] 资料来源：QuestMobile，《2020年中国移动互联网“战疫”专题报告》。

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（一）数字化发展程度不够，发展水平参差不齐

1.数字化生活服务用户覆盖率不高

2021年，我国服务业已具备向数字化转型的良好基础，网络购物及网络支付的用户规模分别达到8.12亿人及8.72亿人，然而海量网络用户的背后是生活服务覆盖率与活跃度尚处在初级阶段的局面。统计数据显示，2019年年末，我国移动互联网生活服务每日活跃用户量在1.5亿人左右，这就意味着每天只有16.6%的居民在使用数字化生活服务。与此同时，生活服务业数字化覆盖用户年龄层范围仍有待扩宽，如“千禧一代”（1984～2000年出生）占美团点评用户的比例高达71%，远远高于其占总人口的比例，35周岁以上群体无论从数字化生活服务注册量还是消费额度上看都与千禧一代有显著差异，数字化用户渗透还显乏力。[⑨]

2.细分行业数字化渗透程度不同

2020年中国数字经济规模达到39.2万亿元，占GDP比重为38.6%。三大产业中，生活服务数字化水平最高，数字经济比重达40.7%，高于全部经济（38.6%）、工业（21.0%）、农业（8.9%）。但就生活服务业内各个行业而言，其数字化水平仍存在较大差距，例如酒店业数字化率在35.2%左右，餐饮业数字化率在15.1%左右，家政业和养老服务业数字化率分别只有3.5%和不足1%。[⑩]生活服务业市场主体以中小企业和个体商户居多，存在规模小、布局散、实力不强的问题，数字化转型步伐缓慢。国际数据公司（IDC）调查数据显示，中国中小企业中79%的企业正处于数字化转型的初级阶段，且数字化应用主要集中在营销、服务和IT管理等领域，大多为单点效率提升，还没有完全形成统一的数字解决方案。在数字化应用过程中，除去技术障碍外，企业管理层观念落后、数字化人力资源供给不足、企业自身资金规模不大等也是延缓企业数字化的重要原因。

（二）要素支撑能力亟待提升

据统计，2021年数字化处在初步探索阶段的企业比例为79%，较2020年降低10个百分点，处在应用践行阶段的企业比例为12%，较2018年提高4个百分点，进入深度应用阶段的企业比例为9%，较2015年提高6个百分点。[⑪]尽管我国服务型企业在数字化转型方面已经有了积极的发展，但是绝大多数企业还处在数字化转型初级阶段，受限于各种要素资源，总体上呈现出来的数字化转型程度不高。

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⑨ 资料来源：中国互联网络信息中心，《中国网络购物行业市场前景及投资机会研究报告》。
⑩ 资料来源：中国信息通信研究院，《中国数字经济发展白皮书（2021）》。
⑪ 资料来源：中国电子技术标准化研究院，《中小企业数字化转型分析报告（2021）》。

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1.数字化转型资金不够

资金短缺是当前服务型企业数字化转型中普遍存在的一个难题。一方面，服务型企业规模小、竞争激烈，大部分资金用于维持日常经营，信息部门在向公司申请预算时，若是没有业务驱动、提高销售和降本增效作为落脚点，很难获批预算；另一方面，数字化升级是一条具有连贯性的链路，要求领导层、组织层、意识层、人才层的高度统一，但当前疫情对生产服务型企业的冲击较大，在执行或运营中由于担心不能覆盖试错成本或投入之后没有成效，容易耽误数字化建设的最佳时期。

2.数字化人才供给不足

根据调研统计数据，2022年，我国企业营收能力受疫情的影响较大，对于职员招收的要求更高，除了具备专业知识和基础性工作能力之外，综合素质是公司更注重的考量部分。由此，数字化人才在市场上出现供不应求的局面。数字化人才，并不简单地指熟练掌握相应ICT技能的人才，而是指在掌握专业能力的基础上，具备较高的信息素养和科学决策能力的复合型人才，能够将数字技术灵活应用于全工作场景中，通过发现数据、挖掘数据、管理数据等一系列操作后，提高企业的业务精细化管理水平和创新能力。以零售业为例，电子商务时代下，随着线上流量逐渐趋于饱和，单位获客成本和供应链成本均上升，企业利用大数据分析和人工智能等前沿数字技术，对产业全链条进行升级改造，通过将物流与线上服务和线下体验紧密结合的方式拉开“新零售时代”的序幕。但是行业内还处于初步阶段，选品、仓储、宣传、销售、物流等涉及企业运营的多个方面还不成熟，再加上疫情常态化导致各种生活用品、防疫物资的线上订单剧增，供应链管理压力不断加大，需要依赖专业的全媒体运营和数字物流管理等领域的数字化人才来助推公司发展。

（三）政府扶持力度有待增强

新冠疫情发生以来，服务业遭受较大冲击，各地政府不断出台相应政策举措推动产业有序恢复发展，纾困方案在各区域密集落地。国家发展改革委等部门在2022年2月发布的《关于促进服务业领域困难行业恢复发展的若干政策》中明确提出普惠性扶持纾困措施、针对性扶持纾困措施、精准实施疫情防控措施三方面共43项措施，进一步加快服务业市场主体纾困解难的节奏和步伐。但是，政府对政策的颁布与实施并未采取最大限度的全方位宣传，导致多数企业对政策知晓率不高，再加上部分优惠政策审批程序繁琐、门槛过高、持续时间较长，优惠政策的获取成本高且含金量低，企业总体上表现出经营预期不高、对政策信息熟悉度不高、受惠面不宽等现象。而且由于生活服务业具有点多、面广、行业门类多、企业多而杂等特点，无论中央还是地方政府在制定产业数字化政策的时候都很难综合考虑，缺乏具有实践意义的系统性的政策设计和具有针对性的实施建议，专项支持力度不够。

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六、数字技术赋能服务业成长的实施路径

（一）完善基础设施和平台建设

“新基建”是服务业数字化的基础。一是推进5G、数据中心等新型基础设施建设，为产业数字化奠定坚实的技术基础。加强数字科技的研究和开发，消除数据鸿沟，打破服务贸易的技术壁垒。攻克并掌握核心技术，主导全球产业链、供应链和价值链，从而占领服务贸易的制高点，重塑国际分工与贸易利益分配格局。二是引导、支持平台企业提供针对性强、使用便捷、成本合理的服务业数字化基础设施，并给予一定的税收优惠、财政补贴、政府购买服务等支持。加大对服务企业“上云”的扶持以及SaaS等系统在中小微企业的普及使用，强化中小微生活服务企业主动拥抱数字化的意愿。三是进一步完善我国服务行业开放平台建设，积极拓展我国服务业对外开放试点，进一步放宽国内服务行业市场准入条件，积极扩大优质服务进口数量，在满足国内需求的同时，倒逼地方服务业发展。四是推动重点行业、领域试点示范。如通过AR、VR、AI等数字技术对旅游景区进行数字化、智能化、沉浸式改造，提升景区的智慧化服务能力；加快推动无人车、服务机器人示范；加快即时配送系统和智慧餐饮整体方案落地等。

（二）强化要素支撑

一是加强技术基础支撑。加强前瞻性基础研发，增加源头科技供给，积极扶持5G、云计算、边缘设计、大数据分析、区块链、人工智能等技术在服务行业落地运用，建立基于云端科技的低成本数字化解决方案供给能力，降低企业创新和转型发展的壁垒。二是要给予强有力的财税支持。一方面加大服务业供给侧数字化资金扶持，补助企业上“云”和购买数字化设备或者服务，增加数字化转型所需经费，准确破解中小企业经费不足的困境；另一方面完善税收优惠政策，针对在数字化转型过程中投入较多、转型程度较高、转型成效较好的先进企业，按技术先进型企业税率标准缴纳企业所得税。三是要加快数字化人才培养步伐。适时建立数字化人才培养政策机制、课程体系和学术条件，高校应立足市场需求加强数字化复合型人才培养，企业要积极与高校联合搭建“智改数转”实训平台，在实训基地建设和人才引培等方面做好进一步合作对接，为服务业转型升级提供人才支撑。

（三）加强政策制度体系建设

一是加快服务业数字化标准建设。各地政府应积极与龙头企业、行业协会、科研院所共同建设服务业数字化的行业标准和品牌标准，主动发挥行业引领作用，形成对行业数字化转型的路径指导，在完善财税、人才、电商、物流等产业配套的同时推进服务业上下游链条协同发展，加快相关新型基础设施建设和数字化服务能力提升，培育产业新生态。二是搭建数字化治理体系。坚持包容审慎的监管政策，顺应现代服务业数字化发展，建立企业数字化管理机制，正确处理政府部门与企业

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之间的合作关系，形成边界明晰、分工协同、平衡互动的治理结构。如正确把握数字经济时代竞争规律与实质，以消费者利益为出发点，权衡规模效应与竞争效应，合理地制定产业组织政策等。三是积极贯彻并推动数字服务贸易国际准则的制定。充分发挥我国在发展跨境电商、移动支付、电商服务等数字化前沿业务方面的经验优势，积极主动对接国际服务经贸新准则。同时，就网络消费者保障、劳工规范、数字商品征税、大数据流通安全和数字货币管理等领域开展广泛探讨与研究，倡导有利于我国的国际经贸合作新规则，进一步增强了中国对服务贸易新准则的话语权。

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Digital Technology Empowers China's Service Sector Growth: Mechanism and Implementation Path

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Abstract: *Digital technology is an instrument and vehicle for digital empowerment and the development of the digital economy. Digital applications in the service sector have spawned new business modes over recent years such as industrial internet platforms, new retail and online education, which have contributed to China's service sector growth and transition. With the help of digital technology, the service sector has maintained rapid growth, improved in terms of structure, quality and efficiency, increased public welfare, and enhanced indigenous innovation. In light of inadequate and uneven progress of digitalization and insufficient factor support and government incentives, we suggest that the government further advance digitalization development across the board, bolster factor support, and enhance policymaking.*

Keywords: *Digital technologies, service sector, transition and upgrade*
JEL Classification Code: O11, O14
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1. Introduction

The COVID-19 pandemic and complex geopolitical situations pose numerous challenges to China's socioeconomic development while the world faces changes unseen in a century. In particular, offline economic activity has suffered heavily with unfolding ramifications. Meanwhile, the digital economy has registered substantial growth thanks to the ubiquitous applications of new-generation digital technologies (Zhong and Wu, 2022). The *White Paper on China's Digital Economy Development (2021)* estimates China's digital economy to be worth 39.2 trillion yuan, or 38.6% of its GDP. With a rapid growth rate of 9.7%, China's digital economy has served as a vital force in stabilizing economic growth. Digital technology is a core productive force for the digital economy to operate and create value (Chen, 2018). As a technology factor, the digital technology contributes to production and significantly boosts productivity by upgrading traditional manufacturing technology. Digital technology has also reshaped socioeconomic development, and supercharged the digital economy by incubating a flurry of new business modes via industrial integration (Hu, 2022).

Since the 13th Five-Year Plan period (2016-2020), China's service sector has made up a growing share of the economy, producer services have developed towards professionalization, and life services have improved in terms of quality. According to data from the National Bureau of Statistics (NBS), China's service sector value added accounted for 53.3% of China's GDP in 2021 and contributed 54.9% - or

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4.5 percentage points - to economic growth, outpacing those of the secondary industry by 13.9, 16.5, and 1.4 percentage points, respectively. These figures suggest that China has entered a service-based development stage, and the digital economy has transformed the non-storable and non-tradable nature of services (Jiang and Luo, 2019), presenting a new opportunity for service sector development. It is of great theoretical and practical significance, therefore, to uncover the intrinsic characteristics of digital technology, discuss how it empowers service sector growth, and explore pathways for its applications in the service sector based on the current development environment and future trends of the technology revolution.

2. Digital Technology Empowers Service Sector Growth: Basic Implications and Theoretical Basis

2.1 Concepts and Characteristics

2.1.1 Evolution of digital technology

As an instrument and vehicle for digital empowerment and digital economy development, digital technology catalyzes supply-side reforms for industrial development in the era of economic transition and a trailblazer for demand-side reforms. With changing times, digital technology has undergone continuous renewals. In the 1990s, the internet comprised the backbone of the digital economy. Nowadays, cloud computing, big data, the internet of things (IoT), artificial intelligence (AI), virtual reality (VR), blockchain, 3D printing, and other digital technologies have emerged as key drivers for integrated digital economy development. With the integration of digital technology and the IT industry, the wave of digitalization has swept across the world and transformed people's ways of life and work. New-generation information technologies led by mobile internet, big data, and cloud computing have spurred the reconstructive innovations of digital applications, information systems, and smart infrastructure in social and economic spheres.

2.1.2 Implications and characteristics of digital technology

Digital technology is generally considered to have originated from a group of new technologies including computer, microelectronic, and modern communication technologies. In terms of functions, digital technology enables information identification, conversion, storage, communication, and applications. Other academics consider that with the sophistication of electronics, the scope of information and communication technologies (ICT) narrows down to such functions as data transmission and processing, i.e. digital technology in the broad sense.

Given the typical and general-purpose nature of digital technology, its technological and economic characteristics are manifested in penetrability, substitutability and synergy. Penetrability means that it may intervene in such links as production and distribution directly or indirectly and lead to continuous socioeconomic empowerment via integration with the real economy, thus broadening growth potentials. Substitutability means that digital technology capital can substitute other capital as a more stable and reliable engine of economic growth. Synergy means that it facilitates mass production via network-based coordination and generates different sorts of "chemical reactions" that change the characteristics, size , and structure of production factors, contributing to productivity improvement.

2.1.3 Implications of service sector growth

The Report to the 19th CPC National Congress called for a "two-step" goal to turn China into a prosperous, democratic, civilized, harmonious and beautiful modern socialist country by the middle of this century. In building a modern socialist strong country, we must rely on the modern industrial system, of which the service sector is a key component. The service sector is the mainstay of national

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economic development and the foundation for building a strong modern country. In recent years, deepening integration between digital technology and services has given rise to new business modes and services through competition and cooperation, galvanizing China's service sector growth and upgrade. As China's economy enters the new normal, the 14th Five-Year Plan period is a critical one for advancing innovation-driven supply-side structural reforms. It is also a critical period for the service sector to develop with higher quality. In this sense, we refer to "service sector growth" as one in which industrial expansion, structural improvement, and indigenous innovation lead to quality and efficiency gains and better quality of life.

2.1.4 New service sector characteristics under digital technology

Digital technology has transformed the nature of services in a service-based society. First, a myriad of information services derived from digitalization has changed the way information and knowledge communicate. Web search, for instance, is an information service provided to consumers at a low cost.

Another change is the way service is delivered. With digitalization, service production is divided into numerous specialized links spread across different parts of the world with advantageous human capital, cost, market access, and economies of scale. Meanwhile, those nodes of production are integrated into a holistic system using information technology.

Third, the process of knowledge production is reorganized. Knowledge is coded and standardized with information technology, and knowledge-based services are decomposed into modules or segments using R&D, design, and programming, which are dispersed and connected via network as the communication medium.

Fourth, the internet connects service producers and consumers across distances, allowing consumers to choose suitable service providers on a global scale and service providers to serve global consumers. Thanks to the digital revolution, the service sector has gained an opportunity for self-renewal, and service innovation has emerged as a new engine of economic growth, underpinning the service-based society.

2.2 Theoretical Basis

2.2.1 "Cost disease" hypothesis of the service sector

(1) Digital technology may induce productivity improvement in the service sector using indirect empowerment by changing the tools and infrastructure for ancillary activities without directly changing the means of production for service production and supply *per se*. One example of such indirect empowerment is constant improvements in transportation technology. Digital technology creates great conveniences and efficiency gains in our social and economic life. Digital technology reduces the cost of time by shortening the distance between people and equipment; it also conserves the labor force. Tencent Meeting, for instance, allows service activities to be carried out remotely without the physical movement of people.

(2) Digital technology may boost service productivity via direct empowerment. Once applied in the basic activities of the service value chain, it will increase productivity while creating complete service values. For instance, digital technology and smart robotics have deepened the service sector division of work and even replaced human workforce. Integration of digital technology into traditional services has transformed characteristics of services such as intangibility, heterogeneity, simultaneous production, consumption, and non-storability, and redefined the business operation and management of service enterprises, making service supply less costly and more efficient.

2.2.2 Theory of information asymmetry

(1) Digital technology facilitates access to information by helping consumers search and analyze

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goods and services to match them with demand-side services throughout the value chain. By gathering demand information and capturing consumer behaviors, digital technology based on social data resources allows customized services to be supplied on both supply and demand sides.

(2) Digital technology boosts service sector productivity via direct empowerment, i.e. direct application of digital technology in the service value chain to raise productivity in creating complete service value. For instance, digital technology and smart machines have deepened the service sector internal division of labor and replaced numerous jobs. Digital applications in traditional services have transformed the traditional characteristics of services such as intangibility, heterogeneity, synchronous production and consumption, and unstorability. Digital applications redefine the operational and managerial modes of service enterprises and help reduce the unit cost of service supply and raise productivity.

2.2.3 Theory of transaction costs

(1) Digital technology may reduce demand-side transaction costss. In the current stage, China's principal social contradiction has evolved into one between the ever-growing material and cultural needs of the people and backward social production. That means consumers are no longer satisfied with basic goods and services and call for better quality, efficiency, and customization. With the applications of digital and smart technologies, service platforms have acquired increasing computing power. Against this backdrop, the manufacturer-to-consumer (M2C) mode may become a common mode of production and consumption to reduce the cost of transaction, and optimize resource allocation.

(2) Digital technology may reduce supply-side transaction costs. Data empowerment has shortened service delivery. Modularized goods and services are reassembled for delivery to users in a quality and efficient manner. By accessing social information appropriately, digital technology not only enables a swift response to user demands, but reduces manufacturing costs by eliminating opportunism and uncertainty in the transaction of goods. While matching supply with demand means cheaper transactions, digital technology leverages big data for a more accurate and individualized supply of goods and services.

2.2.4 Service innovation theory

(1) Digital technology empowers service-based manufacturing innovation and development, enhancing manufacturing connectivity, data, algorithm, computing power, and processing capabilities. With the support of new-generation digital technology, manufacturing enterprises are transitioning from service-centric to data-centric user services to enable service-based manufacturing on a mass scale.

(2) Digital technology empowers public service innovation and development. With the rapid development of information technology, Internet+ plays an increasingly significant role in public administration and services. Digital technology applications in public services have breathed life into new service modes like e-government, digital governance, and smart cities. Those service modes - as manifested in rapid emergency response, automation for expedited procedures, and broader channels for citizen feedback - have facilitated cross-sectoral information sharing, simplified administrative procedures and increased departmental coordination, resulting in better public services.

3. How Digital Technology Empowers Service Sector Growth

3.1 Service Sector Growth

3.1.1 Quantitative expansion beyond historical limitations

From the founding of the People's Republic of China in 1949 to the eve of reform and opening up in 1978, China's service sector had been focused on a few sectors such as trade, logistics, and transportation

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services, and dominated by small and fragmented operators. Digital technology has inspired new service modes and broadened the scope of services. One example is the rise of e-commerce, IT services and their derivatives. In 2020, China's e-commerce business revenue amounted to 5.45 trillion yuan, showing a 21.88% year-on-year increase. Moreover, the operating revenue of e-commerce transaction services reached 1.15 trillion yuan, up 36.33%; basic services such as e-commerce payment, delivery and IT services saw their operating revenues rise against the headwind and reach 2.10 trillion yuan, up 16.73%; derivative services also recorded growing operating revenues, which totaled 2.21 trillion yuan, up 20.30%.[1] The penetration of the digital economy in China's service sector stood at 40.7% in 2020, up 2.9 percentage points from 2019, and emerging services like information, software and IT services have recorded business revenue growth by 19.4% on an annual average for four straight years, reflecting China's service sector economic growth.[2]

3.1.2 Promoting trade in services beyond temporal and spatial limitations

The internet and information technology have transformed the inefficient and non-tradable nature of traditional services. As a result of thriving service globalization in the internet era, the volume of trade in services has increased consistently. Since 2012, China has registered rapid growth of trade in services, outpacing the global average by 3.1 percentage points. In the first half of 2022, China's imports and exports of services totaled 2.9 trillion yuan, up 21.6% from the previous year, with service exports at 1.4 trillion yuan, up 24.6%.[3] Digital technology has transformed the traditional face-to-face mode of cross-border trade and digitally connected global users. Not only have services become more tradable, the boundary of industrial innovation for trade in services has also widened, bringing global trade in services to a record high.

3.2 Structural Improvement

3.2.1 Digital technology as a driver of service sector upgrade

Convergence between factors of production has led to an increasing sophistication of China's service sector structure, as manifested in the rising share of modern services relative to the decline of traditional services led by wholesale and retail, transportation, and warehousing. Ever since 2G communication and PC internet became ubiquitous, ICT applications have swept across the demand side, creating economies of scale. Extensive applications of 4G, optical fiber and smart devices have made service information accessible at fingertips. A combination of sensing, cloud computing, virtual reality, big data, AI, and other digital technologies has led to 5G information network, which holds great promise for service experience to improve and for new service modes to emerge. Digital tourism, for instance, offers a boon to consumers for managing and virtually enjoying their travels, representing a structural upgrade of the tourism industry.

3.2.2 Service-manufacturing integration driven by digital technology

First, digital technology applications are permeating into various industrial sectors, causing a productivity-boosting effect. Technology diffusion will encourage competition and cooperation that drive down the technical threshold for service provision by manufacturing enterprises, thus overcoming barriers to the integration of services and manufacturing.

Second, digital technology applications at the front end allow firms to become nimbler and more

[1] Foresight Industry Research Institute, Report of Development Tendency and Investment Strategic Decisions Analysis on China Electronic Commerce Industry(2022-2027).

[2] Foresight Industry Research Institute, Analysis Report of Market Prospective & Investment Strategy Planning on China Digital Economy(2022-2027).

[3] Website of the Ministry of Commerce, http://mo.mofcom.gov.cn/article/tjsj/zwfengsu/202208/20220803339820.shtml.

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responsive to a changing market by shortening the production cycle. At the rear end, those applications make it cheaper and more efficient to search for information and match products or services. This helps promote service-manufacturing integration.

Lastly, digitalization unlocks potential demand for services. Free access to IT knowledge and data will increase public awareness and create demand for new products, and the extension of the consumption boundary will, in turn, make the case for service-manufacturing integration.

3.3 Efficiency Improvement

3.3.1 Transforming service efficiency

According to the Baumol-Fuchs (Baumol, 1967) hypothesis and the experience of developed countries transitioning from an industrial economy into a service-based one, traditional services tend to be less productive than manufacturing and grow at a much slower pace. Thanks to increasing service sector productivity, China's economy continued to grow rapidly amid the shift from an industrial to a service-based economy.

With its broad scope and modest marginal cost of application, digital technology gives rise to economies of scale in consumption, manufacturing, and distribution, transforming the intangible, synchronous, non-storable, and heterogeneous nature of services. As a result, matching supply with demand has become cheaper, less time-consuming, and spatially feasible. By making it more efficient and precise to acquire, process and analyze data, digital technology is conducive to the reasonable temporal and spatial allocation of service capabilities, which means faster and more accurate service delivery and less waste. Big data helps restaurants, for instance, analyze and forecast order trends to prepare for dine-in and delivery orders and plan for staff shifts. Digital technology also serves as a tool for firms to integrate resources and streamline business processes.

3.3.2 Step change in service sector equality

Platform apps allow consumers to read reviews left by others and post their own reviews about a service. In the current wave of platform-based services, consumers can read and post comments about a service on a mobile app. For the service sector, standardization enabled by digital technology helps overcome service variability and enforce quality control. The Online Food Delivery Information Description as China's first national standard for the online food delivery industry prescribes the terminologies, definitions, and requirements for the description of basic information about online food delivery services on internet platforms. Complete information disclosure drives merchants to offer better services. Mainstream service platforms with over 100 million users in China generate a wealth of user reviews daily, which help clean up the market by weeding out inferior service providers. Second, consumer demand is sent to merchants via big data or C2B (Customer to Business) for them to refine and customize their services. Once combined with digital technology, service becomes a unique commodity that is less labor-intensive and more knowledge-intensive. Thanks to higher value-added, high-end services have thrived.

3.4 Increasing Welfare

3.4.1 Service sector digitalization is conducive to job creation

Service digitalization is a new source of job creation. In 2021, the digital economy accounted for 60.2% of all jobs in the tertiary sector, which was far higher than the shares (7.1% and 0.1%) in the secondary and primary industries, respectively.[4] Not only are jobs created by service digitalization

[4] Foresight Industry Research Institute. *Analysis Report of Market Prospectie & Investment Strategy Planning on China Digital Economy(2022-2027).*

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more plentiful and better paid than in the secondary and primary industries, but those jobs are also more flexible. One example is food delivery drivers. Assisted by mobile internet, digitalization matches workers with jobs in the catering industry, allowing gig workers to earn incomes from low-frequency and non-essential positions. In 2019-2021, for instance, the number of food delivery drivers registered at an online delivery platform in China jumped from 3.987 million to 5.27 million, up 645,000 on an annual average basis, or 5% of China's national urban job growth, outpacing the annual growth of 200,000 jobs in the parcel delivery industry during the same period.[5] From order-taking to dish serving and payment, digital technology has made catering service less onerous and more efficient. Amid the COVID-19 pandemic, the gig economy has provided the cyclically unemployed with short-term jobs through "talent sharing" to ease labor shortage in various sectors.

3.4.2 Service digitalization galvanizes high-quality public services

From 2012 to 2021, internet users in China increased from 560 million to 1.032 billion. With an internet penetration of 73%, China has built the world's largest online education platform and a national medical insurance information platform. Telemedicine is accessible in over 90% of counties and districts across China.[6] The initiative to connect impoverished areas to the internet has helped win the battle against poverty. China has made solid progress in building a digital countryside to share the benefits of digital development among both urban and rural residents. From telemedicine to online education and smart elderly care, digital technology allows residents across regions to access satisfactory public services. For China's agriculture and countryside to improve quality instead of simply expanding output, the role of innovation is pivotal. Amid digitalization, new-generation information technologies such as blockchain and AI provide a new impetus for countryside vitalization. Take traceability in agriculture for instance, for geographical indication products such as Dangshan Pear and Anji White Tea, their planting, warehousing, and logistical information is uploaded via the internet for intelligent production and management. Such traceability also brings brand value premium and economic benefits.

3.4.3 Service digitalization boosts government efficiency

In 2021, China's national government service platform registered over one billion real-name users. Big data, cloud computing, and AI applications have supercharged e-government, which allows citizens to apply for government services of different departments and even provinces at their fingertips without the hassle of visiting separate offices. Digital tools such as the "health code" have been instrumental in curbing the spread of COVID-19. With the help of big data, Beijing municipal government, for instance, has identified the most pressing issues of public concern for targeted and efficient response. Public services are increasingly driven by public demand rather than limited by the availability of government resources. The government has found digital applications innovative and efficient tools for a wide range of areas such as public services, the development of small and medium-sized enterprises (SMEs), early warning of natural disasters, and emergency response management.

3.5 Digital Technology for Innovation

3.5.1 Digital technology is a catalyst for new business modes

Sharing economy: In an economic system, it is common for resources to be underutilized. With digital technology, idle resources can be put to effective use at a low cost. Examples include bed and breakfast-inns, ridesharing and bike-sharing services.

Long tail market: Without economies of scale, it would be costly to meet the demand for customized

[5] Meituan. *Corporate Social Responsibility Report*.
[6] CNNIC. *Statistical Report on Internet Development in China*.

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and low-frequency services, especially those delivered face-to-face. By broadening access to service information and capturing low-frequency service demand, digital technology will minimize the threshold of the economic scale, allowing niche services such as escape rooms to thrive.

Cross-sector integration: Integration between business modes, between corporate internal and external value chains and between sectors, as well as the sophistication of modern technologies and networks, has led to new business modes such as e-sports and online video streaming.

3.5.2 Trade in services towards diversification

E-commerce has become a way of life. Since the 1990s, cross-border e-commerce platforms have become popular amid increasing internet penetration. Global digital markets and cross-border trade networks have brought together the information and market resources of countries in a cost-efficient manner. Cross-border e-commerce is evolving towards next-generation e-trade. From information intermediaries, cross-border e-commerce platforms have developed into a core commercial infrastructure offering everything from trade-related logistics, financial services, information, payment, settlement, credit reference, taxation and other ancillary services to customs clearance, forex collection and tax refund services (Wang *et al*., 2020). For traditional service trade such as e-books and copyrighted music, domestic suppliers may satisfy individualized global consumer demand by providing a diverse range of differentiated goods and services and engender a long-tail effect in service trade to foray into new international markets. Hence, cross-border e-commerce platforms may expand service trade and promote service trade diversification by offering more types of service trade.

4. New Service Modes Emerging from Digital Technology Empowerment

4.1 Industrial Internet Platforms

The industrial internet is a critical network infrastructure for smart industries with low latency, high reliability, and wide coverage. It opens up a new ecosystem of digital technology for value co-creation and is a vehicle for applying new-generation ICTs in advanced manufacturing. As a key component of the digital new economy, industrial internet platforms empower industrial upgrade and high-quality economic development by supporting ubiquitous connectivity, elastic supply, and efficient allocation of manufacturing resources, enabling mass data collection, integration and analysis based on cloud platforms for design, production, distribution, consumption, and service (Li, 2019). With the world's largest industrial internet systems and the most numerous use cases, China is poised to develop world-class industrial internet platforms. In terms of top-down planning, the Chinese government has increasingly prioritized industrial internet. The industrial transition towards digital, network-based, and smart features has breathed innovation into business modes, engendering a new ecosystem of service-based manufacturing for value co-creation.

By connecting industrial equipment, products and services, industrial internet platforms allow information to be shared among manufacturers, third-party logistics companies, and users. As an industrial internet platform, the transportation cloud, for instance, helps increase vehicle load rate and monitor cold chain logistics. This is achieved by a combination of IoT-connected sensors, RFID, machine learning, and big data. Location-based services enable the real-time monitoring of equipment, production, energy consumption, and quality. By accessing equipment status via IoT, equipment manufacturers may perform predictive maintenance and avoid unscheduled shutdowns through remote monitoring and fault diagnosis. Such platforms also allow them to provide value-added services and sell spare parts and components.

Industrial internet platforms are a vehicle for integrated and intelligent producer services. In the digital economy era, they have transformed the pattern of industrial development, blurring the boundary between manufacturing and services. In the conventional industrial economy, contract manufacturers

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receive raw materials and produce goods for brand owners, which then sell branded products to consumers via a labyrinth of distribution channels and retail outlets. This business model has been transformed by digital technology. Digital innovations in marketing, sales channels and interfaces have reorganized the sales force, merchandise, and sales venue, as manifested in the rise of online streaming sales during the COVID-19 pandemic.

Compared with brick-and-mortar stores, the online sales mode creates precise customer profiles using digital technology, interacts with customers continuously through digital content, and taps potential consumer demands based on AI algorithms. The traditional QCD[7] approach are characterized by the mass manufacturing of standardized items with a long delivery cycle, which are stored at the sales venues and offer consumers not much more information than quality and price. With the advent of social media and consumer internet, however, the flow of information is reversed and a new value addition process takes hold, in which manufacturers receive R&D, production, innovation, and other demand-based services, giving rise to a new QCD approach featuring small-batch manufacturing of numerous products with a short delivery cycle.

4.2 New Retail

The phrase "new retail" is a kind of business mode innovation based on digital technologies. With AI, big data and other digital technologies, enterprises upgrade various processes of the product lifecycle towards integrated smart management and autonomous business decision-making for a better consumer experience.

China's retail industry has followed the footsteps of Western business modes from goods-centric shopping centers, department stores, supermarkets, convenience stores, and brand franchises to "one-stop" shopping complexes like venue-centric discount stores and warehouse outlets. Amid technological advancement and changing lifestyles after the dawn of the 21st century, consumer experience began to receive ever-greater attention, giving rise to the "customer first" concept. In Europe and North America, countries have built venue-centric "palaces of consumption" to export consumerism. McDonald's, KFC, IKEA, and Sam's Club, to name but a few, have transformed the pattern of global consumption. In the current "people-centric" new retail business mode, China's retail industry is blazing its trail and evolving from a follower to a leader of global consumption trends.

New retail takes varied forms, ranging from the convergence of online and offline channel sales (O2O) to integrated experiential consumption or a "retail plus industrial ecosystem" mode of services. Unlike the traditional business model, the new retail business mode is less reliant on manufacturing channels and breaks free from the limitations of information asymmetry that besets traditional retailers. With the help of big data and IoT, online sales of spot goods along with modern logistics have reduced inventories and costs, and targeted marketing has contributed to enhancing consumer experience and welfare.

Amid the transition from brick-and-mortar stores to digitalization, the retail industry needs to embrace sweeping changes by adopting innovative business modes, reshaping customer relations, and creating business ecosystems. For instance, retailers have employed big data and advanced algorithms to address problems concerning the supply of raw materials, production management, product storage and logistics, marketing, and after-sales services, thereby achieving decentralization and autonomous decision-making. Moreover, AI and digital applications have linked consumer social media to the retail business ecosystem, industrial chain, and business operations. By sharing every facet of their life, consumers spread the word of mouth beyond the boundary between cyberspace and the real world. Image recognition, radiofrequency identification (RFID) and voice recognition technologies help capture consumer identities, shelf behaviors and facial expressions for targeted marketing.

[7] QCD: Q for quality, C for cost, D for delivery.

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4.3 Online Education

When it comes to e-learning or online education, China is a late starter. Massive Open Online Courses (MOOCs), which emerged in the early 1990s, opened a broad horizon for online education. Since 2000, online education began to integrate quality educational resources globally free from the boundary between conventional schools. Technological advancement - not least AI - means new possibilities for teaching and learning, making it possible for personalized education to be offered to the masses and with high quality. With the rise of virtual space for knowledge creation, consolidation and diffusion, the supply of educational resources and services is poised to become more flexible, fairer, better, and personalized, underpinning future educational reforms.

Online education in China has experienced four stages of development. In the 1990s, multimedia began to be applied in classroom teaching. With increasing internet penetration since 1999, online learning communities and teaching videos became popular, spurring the emergence of online schools. After 2010, the sophistication of mobile internet led to a stable business model of paid video courses. From 2013 onwards, knowledge payment platforms have mushroomed with smart features to meet personalized demand for knowledge. Rapid technological change has shortened the iteration cycle of online education. During the COVID-19 pandemic, college, middle school, and primary school students rushed to online education platforms. This shift from offline to online education has been induced by the application of new-generation digital technologies such as mobile internet, big data and AI, unveiling a golden era for the online education industry. According to statistics, mobile education app downloads in China peaked during the Spring Festival of 2020, along with registered users. Daily active users of online education apps jumped from 87 million to 127 million during the same period.[8]

Not only is online education capable of emulating and replacing offline education with the sophistication and extensive application of AI, metaverse, and other cutting-edge digital technologies, but it also holds great promise for efficient and personalized education to unlock the full potentials of all students. There is still room to beef up educational resources, adopt modern technology, and increase teacher-student interactions for China's online education at the postsecondary level. Challenges in those areas have received a great deal of attention from academics. Fudan University School of Management, for instance, has introduced an online education platform with the functions of course creation and management, virtual classroom, homework, exam, and questionnaires. It allows students to study efficiently according to schedule and provides administrators with an ocean of visualized data to support decision-making, management, and teaching improvement. As far as MBA education is concerned, online business schools are on the rise across the United States. Digital technology keeps students involved through adaptive learning, online questions, and student feedback. Extensive application of metaverse, virtual reality, machine learning, AI, and other cutting-edge digital technologies has enriched MBA learning experience with more interaction and better results.

5. Challenges to Digitally Empowered Service Sector Growth

Despite its considerable progress, China's service sector digitalization has yet to overcome challenges such as inadequate and uneven levels of development and insufficient factor support and government incentives.

5.1 Insufficient Digitalization and Uneven Levels of Development

5.1.1 Modest user coverage of digital life services

In 2021, China's online shopping and payment users reached 812 million and 872 million,

[8] QuestMobile. *2020 China Mobile Internet War Epidemic Report*.

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respectively; however, the coverage and vibrancy of life services remained modest. By the end of 2019, the daily active users of China's mobile life services stood at around 150 million, which means that only 16.6% of households accessed these services daily. Moreover, digital life services have yet to cover broader age groups. Young people born between 1984 and 2000 made up 71% of users of Meituan, one of China's largest online shopping apps for services; this is significantly higher than their percentage in the total population. Those aged above 35 years trail far behind millennials in terms of digital life service registrations and consumption; the growth of digital users in this age group is tepid.[9]

5.1.2 Level of digitalization various across sectors

In 2020, China's digital economy reached 39.2 trillion yuan, accounting for 38.6% of GDP. Among the primary, secondary and tertiary industries, digital life services boast the highest share of digital economy at 40.7%, which is higher than those of the overall economy (38.6%), industry (21.0%) and agriculture (8.9%). Sector-wise, however, significant gaps remain. While the hospitality and catering sectors have digitalization rates of around 35.2% and 15.1%, respectively, this figure is only about 3.5% for home services and less than 1% for elderly care.[10] The life services market is dominated by small and medium-sized enterprises (SMEs) and individual merchants that are scattered, uncompetitive and slow in the digital transition. According to the China Electronic Standardization Institute (CESI), 79% of China's SMEs are in the preliminary stage of digital transition, and most digital applications are related to marketing, service, and IT management for sporadic efficiency improvements without integrated digital solutions. Aside from technology barriers, corporate digitalization has been slowed by obsolete management concepts, a shortage of digital talent, and insufficient corporate funding.

5.2 Digitalization Requires More Factors of Production

In 2021, 79% of Chinese enterprises forayed into digitalization, down 10 percentage points from 2020, 12% actually applied digital technology, up from 4 percentage points from 2018, and 9% intensively applied digital technology, up 6 percentage points from 2015.[11] Despite this positive trend, most Chinese service enterprises remain in the early stage of digital transition. Due to limited resources, their overall level of digitalization remains modest.

5.2.1 Lack of funding for digital transition

For service-based enterprises, funding shortage is a common challenge to their digital transition. Most service-based enterprises are small, cash-strapped and face fierce competition. Their IT departments find it hard to make the case for digital spending to drive business, promote sales, cut costs, and boost efficiency. Moreover, the digital upgrade is a coherent chain that requires a high degree of consistency at the management, organizational, awareness and talent levels. During the ongoing COVID-19 pandemic, producer service enterprises have suffered significantly and they hesitate to invest in digitalization for fear of not being able to cover the cost of trial and error; as a result, they have missed an excellent opportunity for digitalization.

5.2.2 Shortage of digital professionals

In 2022, Chinese companies saw a steep fall in their business revenue and became more demanding for the overall competence of job applicants and not just their professional knowledge and basic skills. In this context, digital professionals are in short supply in the job market. In addition to information and communications technology (ICT) skills, digital professionals should apply digital technology fitfully

[9] CNNIC. *Research Report on Market Prospect and Investment Opportunity of China's Online Shopping Industry*.
[10] For instance, credit score can be calculated according to many factors related to personal financial history.
[11] CAICT. *China Digital Economy Development White Paper (2021)*.

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in various business scenarios and contribute to managerial improvement and innovation. Take the retail sector for instance, as online traffic becomes saturated and customer acquisition and supply chain costs increase, enterprises employ big data analysis, artificial intelligence, and other cutting-edge digital technologies to upgrade supply chains, unveiling a "new retail era" by combining online services with offline experience via logistics. New retail, still in its nascent stage, has yet to develop more experience in various aspects of business operation ranging from product selection to warehousing, public communication, sales, and logistics. Given the surge in online orders for daily necessities and COVID-19 protection materials, retailers have to rely on professional multi-channel media operation, and digital logistics management professionals to cope with growing supply chain management pressures.

5.3 Government Support Needs to Strengthen

China's local governments have enacted a string of policies to shore up service sector growth since the eruption of the COVID-19 pandemic. In the Policies on Recovering the Development of Struggling Service Sectors issued in February 2022, the National Development and Reform Commission (NDRC) identified 43 initiatives to support struggling service businesses and contain the spread of COVID-19. Yet the policy initiatives were not fully publicized and made known to businesses. Moreover, it is prohibitively complex, protracted and demanding to apply for some policy preferences that are of modest value. Most businesses expect little from and are poorly informed about those policies. The broad scope of businesses involved also makes it hard for central and local governments to take everything into account. Meaningful and systematic policy design and targeted suggestions for implementation are absent, and targeted support is insufficient.

6. Implementation Path for Digital Technology to Empower Service Sector Growth

6.1 Improving Infrastructure and Platform Development

As the groundwork for service sector digitalization, "new infrastructure" should focus on the following priorities:

(1) Advancing infrastructure development such as 5G and data centers to support industrial digitalization. Digital technology R&D should be enabled to remove technology barriers to trade in services and reshape the international division of labor and distribution of trade interests.

(2) Tax preferences, fiscal subsidies and government procurement of services should be extended to encourage platform enterprises to provide targeted and convenient service digitalization infrastructure at reasonable costs. Incentives should be given to help service businesses access cloud services and increase the penetration of Software as a Service (SaaS) systems among SMEs and micro businesses.

(3) Open platforms for China's service sectors should be improved, expanding pilot programs for the service sector, relaxing service sector market access, and importing more services of superior quality to meet domestic demand, and encouraging local services to emulate.

(4) Pilot programs should be implemented in key sectors. Tourist attractions, for instance, may adopt augmented reality (AR), virtual reality (VR), and artificial intelligence (AI) for digital and immersive experiences. Progress should be made in deploying autonomous vehicles and service robots as demonstration programs, as well as just-in-time distribution systems and smart catering solutions.

6.2 Increasing the Factors of Production

(1) Greater support should be extended to forward-looking underlying technologies. Service sectors should be encouraged to deploy 5G, cloud computing, edge design, big data analysis, blockchain, and artificial intelligence. Low-cost digital solutions based on cloud technology should be adopted to lower the barriers to innovation and development.

(2) Digitalization calls for vigorous financial and fiscal support. Service enterprises, especially

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cash-strapped SMEs, should be given greater financial support to access cloud computing and purchase digital equipment or services and be better funded for digital transition. Tax breaks should be offered to companies that spearhead the digital transition.

(3) Policy mechanisms, curriculums, and academic conditions should be timely established for the cultivation of professionals. Universities should produce versatile digital professionals. Local governments should attract and retain digital professionals essential to developing local industries. Enterprises should join hands with universities for intellectual support to digital transition.

6.3 Enhancing Policymaking

(1) Speeding up service sector digitalization. Local governments should work with leading enterprises, industry associations, and research institutions to develop industry standards for service sector digitalization. They should guide service sector digitalization, improve fiscal, talent, e-commerce, and logistics policies, coordinate upstream and downstream services development, expedite new infrastructure development, enhance digital services, and foster new business models.

(2) Creating a digital governance system. Inclusive and prudent regulatory policies should be implemented to facilitate modern service sector digitalization. The government should create an administrative mechanism for corporate digitalization, work properly with enterprises, and form a coordinated and interactive governance structure with a clear boundary of responsibilities. According to the laws of competition in the digital era, the government should work out a reasonable industrial organizational policy that serves consumer interests and promotes economies of scale without stifling competition.

(3) Proactively implementing international norms on digital services and taking an active part in their formulation. We should give full play to our national experiences and strengths in cross-border e-commerce, mobile payment, e-commerce services, and other frontier digital businesses, and go along with international service trade standards. Meanwhile, we should extensively discuss and research such issues as online consumer protection, labor rights, taxation of digital goods, data security, and digital currency management. We should advocate favorable international trade rules and have our say in setting new service trade standards.

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