Innovation to Tackle Gender Inequality

A Back-to-basics Roadmap

Expert Paper for Expert Group Meeting related to the 67th Commission of the Status of Women (CSW67)

IT for Change

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1. Digital Innovation Ecosystems and Gender Injustice

As the UN Women Strategic Plan 2018-2021 acknowledges, digital innovation has the potential to be a critical "driver of change" for gender equality by expanding women's access to information and knowledge, essential public services, and opportunities for full participation in socio-economic life.[2]

What we know is that the benefits of technological innovation do not necessarily add up to gender-transformative social outcomes. The path dependency of technology reflects extant socio-economic conditions, even as the specific modalities of its development, appropriation, assimilation, and reconfiguration impact social structures.[3] This mutual shaping between the socio-political context and technological innovation comprises a complex ecosystem of norms and rules, discourses and practices. Innovation ecosystems are hence much more than a sum of the material artifacts representing the techno-social epoch. They represent a dynamic socio-political structure. Whether and how innovation ecosystems can contribute to a radical restructuring of the gender status quo concerns the specific organizing principles, institutional norms, and rules informing its architecture.

Digital technologies are General Purpose Technologies like electricity; pervasive, potent, and paradigmatic. They radically alter production systems and social organization. The gender scorecard on the digital paradigm (and its constituent technological artifacts in data, artificial intelligence, and platform innovations) reflects multi-level exclusions (in creation, access, use, benefits, and control), with far-reaching consequences for the socio-economic status of women, especially from marginal locations. The fact that women have disproportionately lesser access to the internet has a direct impact in the form of their ejection from essential public services.[4] Automation is poised to affect women disproportionately.[5] Pre-existing gendered and racialized discrimination in education and employment, and the unequal distribution of unpaid care work burdens make the pursuit of re-skilling for upward mobility in labor markets daunting for women, and consequently, the critical 'jobs of

[1] Expert paper for CSW 67. Priority theme: Innovation and technological change, and education in the digital age for achieving gender equality and the empowerment of all women and girls.
[2] UN Women. (2017). *Strategic Plan 2018-2021*. https://www.unwomen.org/en/executive-board/documents/strategic-plan-2018-2021
[3] For an illustration of the path dependency of the technological revolution in capitalist society, see Srnicek, N. (2017). *Platform capitalism*. John Wiley & Sons.
[4] Men are 21% more likely to be online than women globally, a proportion which rises to 52% in Least Developed Countries. See, Alliance for Affordable Internet. (2021). *The Costs of Exclusion: Economic Consequences of the Digital Gender Gap*. Web Foundation. https://webfoundation.org/docs/2021/10/CoE-Report-English.pdf
[5] Between 40 to 160 million women globally, across different industries, will lose their existing jobs to technology-induced displacement by 2030. See, Wajcman, J., Young, E., & Fitzmaurice, A. (2020). *The Digital Revolution: Implication for Gender Equality and Women's Rights 25 Years after Beijing*. UN Women. https://www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/Library/Publications/2020/The-digital-revolution-Implications-for-gender-equality-and-womens-rights-25-years-after-Beijing-en.pdf

tomorrow' that require advanced technical skills remain out of reach for them.[6] Further, trends also suggest that the future of work for the majority of women in the Global South is likely to be low-paid, low-status platform work, with high-skilled technology and data analytics jobs remaining a male prerogative.[7] Tech and science start-ups led by women are much less likely to receive funding than those headed by their male counterparts. In 2020, a report by Harvard Business Review estimated that just 2.3% of venture capital went to start-ups led by women.[8]

Women make up just 22% of workers in artificial intelligence (AI) worldwide. In cloud computing, women make up only 14% of the workforce; and in engineering, they are only 20%.[9] The field of frontier data and AI tech development is not only overwhelmingly male, but also overwhelmingly white, as the 2019 AI Now Report found, with little room for women of color, transwomen, and gender minorities.[10] Mainstream data science is anchored in institutional systems that have failed to acknowledge the intersecting forces of power, privilege, and oppression at work in the world. (See Box 1). The charmed world of AI ignores that "those who wield power are disproportionately elite, straight, white, able-bodied, cisgender men from the Global North".[11]

[6] UNESCO Science Report 2021, cited in: Merchant, N. (2021). *Only 22% women in AI jobs — The gender gap in science and technology, in numbers.* The Print. https://theprint.in/features/only-22-women-in-ai-jobs-the-gender-gap-in-science-and-technology-in-numbers/697917/

[7] International Labour Organization. (2021). *The role of digital labour platforms in transforming the world of work.* https://www.ilo.org/global/research/global-reports/weso/2021/WCMS_771749/lang--en/index.htm

[8] Bittner, A. & Lau, B. (2021). Women-Led Startups Received Just 2.3% of VC Funding in 2020. *Harvard Business Review.* https://hbr.org/2021/02/women-led-startups-received-just-2-3-of-vc-funding-in-2020.

[9] UNESCO Science Report 2021, op.cit.

[10] S.M., Whittaker, M. and Crawford, K. (2019). *Discriminating Systems: Gender, Race and Power in AI*. AI Now Institute. Retrieved from https://ainowinstitute.org/discriminatingsystems.html

[11] D'Ignazio, C., & Klein, L. (2020). Introduction: Why Data Science Needs Feminism. In *Data Feminism*. Retrieved from https://data-feminism.mitpress.mit.edu/pub/frfa9szd

Box 1. How Gender-biased AI Systems Perpetuate Injustices of Recognition

Research by the Berkeley Haas Center for Equity, Gender and Leadership[12] has found that AI system development that fails to account for the social status differentiation produced by the intersectional operations of gender power could lead to a range of adverse impacts on the ground, including:

- lower quality of services for women and non-binary individuals – arising from AI tools for targeted welfare delivery trained on unrepresentative gender data
- unfair allocation of resources, information, and opportunities – owing to automated hiring and recruitment systems that discriminate against women candidates
- reinforcement of existing, harmful stereotypes and prejudices – made viral by algorithmic recommendation systems that perpetuate sexism on social media
- derogatory treatment of people from marginalized gender locations – based on inaccurate results of facial recognition tools, and
- even physical harm – caused by wrong clinical diagnosis of women's health conditions due to biased training data

The catastrophic fallouts for gender equality in the current digital paradigm underscore the urgent need to re-organize the principles, norms, and rules to reorient the institutional design scaffolding global to local innovation ecosystems. Situated primarily within a hyper-capitalist, corporate-led institutional framework, innovation ecosystems in digital technologies seem to be reinforcing socio-structural hierarchies, cementing patriarchal gender power and perpetuating global injustice. To move towards transformative outcomes that challenge and change the social gender order, this essay proposes the need to approach the system-disruptive force of digital technologies through a 'public innovation ecosystem' framework, suggesting what will need to be done in order to effect this shift.

[12] Smith, G., & Ishita. (2021, March 31). When good algorithms go sexist: Why and how to advance AI Gender Equity. *Stanford Social Innovation Review: Informing and Inspiring Leaders of Social Change*. https://ssir.org/articles/entry/when_good_algorithms_go_sexist_why_and_how_to_advance_ai_gender_equity

2. The Case for Public Digital Innovation – Why Free Market Innovation is not a Panacea for Gender Equality

Capitalist imaginaries of innovation are based on the premise of the 'free market' wherein fair competition is seen to reward inventions identified as most useful by consumers. Innovation is conceptualized as an individual pursuit by a talented few from which social development is believed to automatically follow, rather than as a collective pursuit to harness technological advancement for the common good.[13] The balancing of economic, socio-cultural, and environmental interests in the innovation process, in this view, is to be achieved through an 'added-on' ethical scaffolding. Gender equality and allied social responsibility imperatives are seen as external to the regular process of market-led innovation.[14]

The political economy of the global data and AI paradigm is built on the edifice of racial and gendered misrecognition and maldistribution. Contrary to early utopian visions of digitalization and its promise of an equitable economy founded on a collaborative knowledge commons, the arc of data and AI technologies has been shaped by, and continues to embolden, intellectual monopoly capitalism.[15] The pan-global expansion of the capitalist platform firm and its business model of ceaseless data extractivism has only reinforced a monolithic idea of innovation as a zero-sum game. At a societal level, this has led to grave consequences for gender equality (See Box 2).

[13] Pecis, L., & Berglund, K. (2021). Hidden in the limelight: A feminist engagement with innovation studies. *Organization*, 28(6), 993–1017. https://doi.org/10.1177/13505084211015380
[14] Blok, V., & Lemmens, P. (n.d.). The Emerging Concept of Responsible Innovation. *Three Reasons Why It Is Questionable and Calls for a Radical Transformation of the Concept of Innovation*. https://philpapers.org/archive/BLORIT-2.pdf
[15] Papadimitropoulos, E. (2019). *Beyond neoliberalism: Digitization, freedom and the Workplace.* ephemera. http://ephemerajournal.org/contribution/beyond-neoliberalism-digitization-freedom-and-workplace

Box 2. Big Tech Innovation Models

Today, global data and AI innovation ecosystems are controlled by large digital behemoths; corporations that operate on the logic of (data) extractivism. These systems profiteer through extreme exploitation by assetifying the bodies, labor, and lifeworlds of women. Take, for instance, the below instantiations:

- The rapidly expanding global femtech innovation market that is expected to grow to USD 60 billion by 2027 is pegged on the massive amounts of menstrual and reproductive data that it collects. With an eye on re-using this data, including for targeted advertising and market research, femtech app providers often exploit legal loopholes in the markets they operate. Branding their services as 'wellness advisories' to escape health services and medical devices regulation, and taking advantage of the lack of robust data protection regulation – especially in contexts in the Global South – they engage in illegal data collection and data-sharing practices.[16]
- The start-up ecosystem in AI innovation – predominantly in the Global North – relies on gendered and racialized labor in cross-border labor chains, exploiting women from the Global South for repetitive, low-paid jobs in data annotation and labelling gigs, that deskill[17] and dehumanize.[18]
- Mainstream precision agriculture solutions and ag-tech platform services developed by Big Tech, Big Agri, and asset management companies, are built on corporate visions of farm productivity that evacuate local pockets of capital accumulation in agricultural value chains, rendering local knowledge, skills, and agricultural practices irrelevant. They jeopardize women's role in farming, presenting new risks to household food sovereignty.[19]

[16] IT for Change. (2021, December). *Data Subjects in the Femtech Matrix: A feminist Political Analysis of the Global Menstruapps Market*. IT for Change. https://itforchange.net/node/2011
[17] Gregg, M., & Andrijasevic, R. (2019). Virtually absent: The gendered histories and economies of Digital labour. *Feminist Review*, 123(1), 1–7. https://doi.org/10.1177/0141778919878929
[18] Chami, N., & Kanchan, T. (2021, March 24). *A feminist social media future: How do we get there?* Bot Populi. https://botpopuli.net/a-feminist-social-media-future/
[19] Gurumurthy, A., Alemany, C., & Chami, N. (2019, June 21). *Gender equality in the Digital Economy: Emerging Issues*. DAWN. https://dawnnet.org/publication/gender-equality-in-the-digital-economy-emerging-issues/; IPES-Food, & ETC Group. (2021). A Long Food Movement: Transforming Food Systems by 2045. IPES-Food. https://www.ipes-food.org/_img/upload/files/LongFoodMovementEN.pdf

Increasing recognition of the socially deleterious nature of Big Tech-led digital innovation has seen a shift in the policy discourse, with calls for ethical and responsible technology.[20] More recently, the Action Coalition on Technology and Innovation for Gender Equality came out with a joint statement that calls for gender equality to be placed at the heart of the Global Digital Compact. In particular, the statement underscores the need for "inclusive innovation ecosystems", highlighting that: "Now is the time to embed accountability, gender equality, and non-discrimination in technology development, leverage data science for evidence-based solutions and systematize the use of gender impact assessments, to ensure technological advancements build trust and equally benefit women and girls in all their diversity."

The ethical turn in the trajectory of digital technologies needs unpacking. While inclusion and trust may be a critical part of the solution to remedy digital innovation gone wrong, the instrumentalization of trust by Big Tech – for instance, the technicalization and corporate mediation of 'community' ethics by social media giants controlling public discourse, and of inclusion, essentially as pink-washing tactics to monetize diversity (of data),[21] presents the paradox of leaving to the market the political task of guaranteeing equality and accountability. Platform companies are eager to embrace rainbow capitalism when LGBTQI identity politics can be gamed for the eyeball economy,[22] but blatantly disregard the investments needed in algorithmic content moderation to prevent sexist hate in low-resource languages/smaller markets.[23] Digital divides continue to remain wide open, especially in geographies where telecommunication companies do not expect a viable return on investments, locking women from marginal socio-economic locations in "an access trap".[24] The majority of ag-tech investments tend to be concentrated in segments of the agricultural value chain that are most profitable to corporate farming such as market linkages rather than marginal farmers' knowledge needs for food production.[25] AI applications in healthcare have brazenly ignored representativity (for sex, gender, race, and ethnicity) in data-based disease tracking and intervention during the pandemic.[26] Commercial actors in AI also tend to under-invest in the crucial work of good quality data collection and annotation, given that this is "time-consuming, invisible to track, and often done under

[20] United Nations. (n.d.). *Global Digital Compact | Office of the secretary-general's Envoy on Technology.* United Nations. https://www.un.org/techenvoy/global-digital-compact
[21] E-commerce platforms such as Walmart-owned Flipkart and Amazon have announced dedicated programs for women entrepreneur development but with limited concrete outcomes in terms of gains in sales or customer base for women participants.
[22] Moawad, N. (n.d.). *Everybody, Offline. We need to Talk*. IT for Change. https://projects.itforchange.net/e-vaw/wp-content/uploads/2017/12/Opinion-piece-1.pdf
[23] Chami, N., & Kanchan, T. (2021). *A Feminist Social Media Future: How Do We Get There?* Bot Populi. https://botpopuli.net/a-feminist-social-media-future/
[24] Antonia, A., & Tuffley, D. (2014). The Gender Digital Divide in Developing Countries. *Future Internet*, 6 (4). https://www.researchgate.net/publication/267626150_The_Gender_Digital_Divide_in_Developing_Countries
[25] World Bank. (2021). *Ag-Tech in India: Investment Landscape Report 2021.* https://olc.worldbank.org/system/files/ThinkAg%20AgTech%20Report%202021%20Presentation%20Final.pdf
[26] D'Ignazio, C., & F. Klein, L. (2020). Seven intersectional feminist principles for equitable and actionable COVID-19 data. *Big Data & Society*, 7(2). https://doi.org/10.1177/2053951720942544

(investor) pressures to move fast due to margins".[27] The lack of accountability in the Global South is heightened since policy frameworks for data and AI governance are still very nascent. In the health sector for instance, the focus tends to be narrowly limited to algorithmic model building, relying on (often poor quality) legacy data from electronic health data records and aggregate digital biomarkers from mobile and other ICT devices, effectively resulting in an imperfect and distorted representation of sex/gender dimensions.

The contradictions of making corporatized innovation systems in the digital space gender-responsive, accountable, and transformative, implore a deeper questioning and rethink.

They point to the need for a new lens that centers the openness and scrutability – the essential public nature – of innovation. Public innovation may be defined as "innovative solutions serving a public purpose that require the use of public means", where public means are understood as government actions and the use of instruments of the State.[28] The case for public innovation comes from the recognition that the State is the "ultimate risk taker in society" and in a position to invest in foundational infrastructural areas – with huge initial outlays and limited guarantee of return on investments – where the market is not prepared to go.

The institutional modality to roll out public innovation will need to catalyze the respective roles of the public, private, and community sectors, creating a system of checks and balances rooted in a systemic vision, operationalized through norms and principles in the law and actionized by appropriate mechanisms enforcing rights, duties, obligations, and liabilities. For instance, failures of data or AI systems that cause harms will need to be pegged on those liable, with corresponding penalties, just as public consultations and independent assessments will need to be mandated prior to rollout of technological systems in the public sector.

Public innovation ecosystems can be undermined by the erosion of public value and public control.[29] Therefore, such ecosystems need to be based on democratic institutional processes to decide the social appropriateness of innovation, ensuring the fair and equitable distribution of benefits. Since data and AI innovations have become essential infrastructure underpinning many sectors of economic, social, and political life, the case for public digital innovation as the meta-framework guiding the pursuit of digital technologies for gender equality is very strong.

[27] Sambasivan, N., Kapania, S., Highfill, H., Akrong, D., Paritish, P., & Aroyo, L. (2021). "Everyone wants to do the model work, not the data work": Data Cascades in High-Stakes AI. In *CHI '21: Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery. https://dl.acm.org/doi/10.1145/3411764.3445518

[28] Bourgon, J. (n.d.). Re-Thinking Public Innovation, Beyond Innovation in Government. *Dubai Policy Review*. https://dubaipolicyreview.ae/re-thinking-public-innovation-beyond-innovation-in-government/

[29] Meijer, A., & Thaens, M. (2021). The Dark Side of Public Innovation. *Public Performance & Management Review*, 44:1, 136-154, DOI: 10.1080/15309576.2020.1782954

3. Designing Public Digital Innovation for Gender Equality – A Techno-institutional Blueprint

Public digital innovation for gender equality may be seen as a techno-institutional ecosystem that enables public agencies, private sector organizations, and community groups/people's organizations to co-shape innovation trajectories towards an egalitarian, economically just, and participatory digital paradigm; in other words, a techno-social order conducive to the project of feminist transformation and attentive to the democratic and distributive deficit of the digital paradigm.

The technological components of this ecosystem comprise the foundational digital infrastructure that needs to be provisioned through public financing models, in order to make them universally accessible and affordable, particularly to women from marginal socio-economic locations, for their effective and full participation in socio-economic and political life. In addition to connectivity infrastructure, the state should invest in:

1) Technical protocols that – as the building blocks for innovation – protect and preserve the public trust necessary for the participation of small/less powerful actors in the economy and society. For instance, public digital payments interface and public data exchange protocols are foundational to catalyze diverse platform ecosystems, without private gatekeeping and monopolistic market capture.

2) Platform, data, and AI public goods necessary for social equity and inclusion, especially in sectors and domains tied to basic human development dimensions impacting gender equality.

These technological investments can bring dividends only if vibrant stakeholder communities can be orchestrated around these infrastructures, involving public agencies, private sector, and civil society actors keeping their differentiated roles and responsibilities in mind. Specifically, institutional framework development needs to pay attention to the following aspects:

(a) Appropriate incentives for decentralized digital innovation:

The narrative of move-fast-break-things, spectacularized by venture capital-backed models in digital innovation has eclipsed not only the essential and legitimate place of public value in innovation discourses, but also the unique techno-material potential for decentralized innovation and democratic participation afforded by the digital paradigm. Data, for example is a social resource, originating in the commons of societal interactions. Yet, de facto rules of data governance privilege trade secrets and patents that allow algorithms and AI to be locked up, effectively thwarting the very entry of smaller, women-run enterprises into the space of innovation. The internet itself is a unique artifact of collective, human enterprise emerging in and through public innovation ecosystems.

To catalyze creative digital innovations to further gender equality, policies, must therefore incentivize innovation that brings power to the edges – that includes local public agencies that provide services to women, small enterprises, and social and solidarity economy (SSE) organizations. For example, infrastructural, technical, and financial support is vital for women's producer and artisanal organizations to prepare their individual members to step into domestic and global e-commerce markets. Collaborative platform models involving local governments and social enterprises are paramount to displace monopoly digital labor platforms (in transport, delivery or urban services), and underwrite the costs that individual women in domestic work, local tourism, beauty and wellness services, or urban transport cannot afford to bear to create or participate in digitally-backed livelihood systems.

(b) Rules to prevent capture of value propositions in digital innovation ecosystems:

Rules of participation are as important as incentives for participation in designing robust institutional frameworks for public digital innovation ecosystems. For example, while the public delivery of health services can potentially be revolutionized through quantum jumps in efficiency and responsiveness that data systems usher in, this depends on the exact nature of guarantees for harm prevention and privacy violation, as well as of benefit distribution and patient controls in such arrangements. Who will control the AI that is built from women's reproductive health data? Will the local health clinic have access to the processed datasets? Can local women's self-help groups demand access to aggregate raw data? Can patients demand explanations about the accuracy of AI-based diagnostics? These are crucial questions that, at a macro-level, translate into – What are the terms on which the private sector can participate in innovation ecosystems? How will Big Tech corporations be governed for market fairness and accountability? What are the claims that communities have in relation to their data? What international and national rule-based systems are needed to account for the disproportionate and illegitimate power of digital corporations? And so on.

Digital and data infrastructure for public systems that cater to the poorest women and girls do run the risk of being captured by powerful market players. Further, the absence of legal protection and data-aware social behavior can bring new risks at a societal level. Activists in the UK have pointed to the risks of UK's National Health Service relying on US data analytics company, Palantir, known for its ties to the security, defense, and intelligence sectors, to manage the data of millions of patients. To prevent the value propositions of public digital innovation ecosystems from being captured or subjected to public risk, and to protect and promote public value and public trust, institutional frameworks – access-and-use conditions for innovation pools, as well as public oversight and scrutiny are non-negotiable. Given that the risks of exclusion and harms in techno-innovation systems are necessarily

gendered, encoding gender perspectives for public value creation and distribution in the law and policy is non-negotiable for democratizing the potential and prospects of digital innovations.

(c) Digital rights as the basis for meaningful participation in digital society and its innovations:

The digital epoch places new demands on well-agreed normative and ethical principles under-girding the law. Rights in the digital society have been re-interpreted by legal-juridical systems world over, to correspond to the lived reality. For example, the pervasive datafication of our existence has led to new thresholds for the right to privacy, the right to free expression and information, the right to public participation, the right to freedom from online violence, right to access and be represented (or not) in data, the right not to be exposed to data harms, the right to benefit from the value of data, and more. A growing body of scholarship points to how each of these rights needs to be contextualized in gendered terms – in the unique socio-political antecedents that render women less powerful in the digital society and more disenfranchised in the enjoyment of all these freedoms. For instance, in so far as the scourge of online violence against women remains unabated and unchecked, women's participation in and benefits from the digital technological paradigm is bound to be heavily compromised.

Public digital innovation ecosystems for gender equality need to be imbued with a socially informed and gender aspirational vision. This is more than about bringing gender into code. It is certainly not akin to market-led ideas of trust, diversity, and non-discrimination – values coopted and subverted for profit motives in the digital sector. It is a vision that bestows rights – and can respond boldly and unequivocally to the corporatization of innovation discourses, the material power wielded by a few actors in the digitalizing economy and society, the urgent need for alternative feminist imaginaries of human enterprise and autonomy and the imperative for the creation and democratization of public and social value as the summum bonum of innovation.

4. Recommendations

In order to enable the flourishing of public digital innovation ecosystems for gender equality that further the SDGs in context-appropriate ways, we need concerted action from multilateral agencies, nation-states, the private sector, and indeed, from a constantly vigilant and proactive civil society. The value-based moorings of policies have been discussed in some detail in the previous section. The specific directions below need to be read along with the overarching conceptual reflections on techno-institutional frameworks discussed in Section 3.

4.1. Multilateral Agencies

Commitment to public digital innovation for gender equality at multilateral level

- The path to gender transformation in digital society hinges on public digital innovation. Such an approach needs to be based on a rights-based global digital constitutionalism that promotes an egalitarian, just, and participatory digital society capable of creating public and social value for furthering gender equality.
- The Global Digital Compact (GDC) should unequivocally embrace a human rights-, gender equality-, and development justice-oriented approach to the governance of the internet and global digital public goods. It must recognize the need for digital sovereignty of peoples and nations as an essential ingredient to democratize the opportunity to create and benefit from digital innovation.
- The GDC must envision clear commitments through the Official Development Assistance route for the financing of digital innovation ecosystems and institution development in the Global South, particularly LDCs, to strengthen gender equality outcomes, including in public services, local livelihoods, and women's public participation.

Gender Equality Work Program in the UN TFM

- The UN Technology Facilitation Mechanism (TFM) should be channeled effectively to enable synergistic resource support and agile institutional coordination between UN agencies and national governments for a gender strategy development on digital public goods, and to test, pilot and refine technical solutions that leverage these digital public goods. The creation of a new global work program similar to 'STI for the SDGs' will be productive in this regard.
- The principles and policies guiding these initiatives should privilege the idea of public digital innovation, and the gender-aware accountabilities to rein in the harms and unleash the gains of digital technologies.

4.2. States

STI policies for feminist transformation

- National STI policies need to move beyond focusing narrowly on cosmetic corrections to the all-powerful workings of digital corporations, shifting the onus towards the establishment of public digital innovation ecosystems rooted in feminist visions.
- Protocols for gender-aspirational design must guide the development of all digital public goods /infrastructure such as high-speed connectivity, public data pools and machine-readable data sets, public cloud infrastructure and public platform marketplaces.
- Technical infrastructural strategies must be accompanied by a range of creative institutional modalities to galvanize women's participation in local innovation and learning systems and enterprise development. For instance, social investment accelerators that subsidize digital innovation strategies of women's MSMEs and women's collectives/cooperative federations are crucial.
- Public-community partnerships between local government agencies and women's organizations are important ways by which to break away from the one-size-fits-all, dominant platform model that stifles local economic and institutional autonomy. MatchImpulsa from the city of Barcelona is one such initiative that describes itself as a transversally feminist hub of programs for the digital platformization of the SSE and Collaborative Economy.

Digital and sectoral policies harmonized for gender equality gains in public systems

- Digitalization and datafication of public systems and public services infrastructure in sectors such as education and health need be developed through public consultation and rule-of-law-based systems.
- Data commons and AI solutions can enhance the efficiency and effectiveness of public services, enabling data-supported decision-making at the edges. For example, the Government of India, in partnership with UNICEF is piloting a digitalized birth registration system that is tied to the country's citizen identification number in select locations in the state of Uttar Pradesh. This system is intended to enable real-time tracking of sex ratio in high-risk districts for targeted interventions that challenge son preference and sex-selective abortions.[30]

[30] Interview with Piush Antony, Social Policy Specialist, UNICEF India, September 2022.

Promotion of women as creators in digital innovation ecosystems

- Governments must make concerted efforts to close the digital skills gap. As the 2019 UNESCO Report on Closing Gender Divides in Digital Skills Through Education highlights, ICT skills training needs to be embedded in formal education systems.[31]
- Incentivizing local innovation hubs can give the much needed fillip to women's participation in the technology sector, enabling them to pursue their aspirations while negotiating with the constraints of patriarchy.
- Quotas and hiring targets in the private sector should also be set and enforced by state agencies as part of the governance of market innovation systems in order to ensure effective participation of women in techno-design and development.

4.3. Private Sector

Human Rights Due Diligence

- Technology companies must respect data governance laws and data rights of citizens in all jurisdictions, committing to the highest ethical standards to eliminate harm and maximize social benefits of technological innovation.
- Corporate policies for techno-design and deployment need to be based on an explicit commitment to gender equality principles. Companies can adopt benchmarks from the guidance and advisories of the UN OHCHR's B-Tech project – which provides a useful framework to address human rights risks in business models, human rights due diligence and end-use; accountability and remedy; and investment choices.[32]

New digital enterprise models based on feminist values

- Alternative platform ecosystems that reject the extractivist, mainstream model provide a new pathway for women's organizations, collectives, and cooperatives to leverage the network-data advantage for economic empowerment. The SEWA Cooperative Federation is building platform marketplaces for the member nodes, supporting the latter with ethical intermediation with consumers and backbone technological capacities.[33] In the Global North, the platform cooperativism movement is beginning to respond to the growing crisis of social

[31] UNESCO. (2019). *I'd blush if I could: closing gender divides in digital skills through education.* https://unesdoc.unesco.org/ark:/48223/pf0000367416.page=1
[32] Business and Human Rights Resource Centre. (2021). *OHCHR B-Tech Project releases guidance on implementing the UN Guiding Principles with respect to technology*. https://www.business-humanrights.org/en/latest-news/foundational-papers-from-the-united-nations-ohchr-b-tech-project-on-implementing-the-guiding-principles-on-business-and-human-rights/
[33] Scholz, T. (2018). *"We Are Poor but So Many": Self-Employed Women's Association of India and the Team of the Platform Co-op Development Kit Co-Design Two Projects*. Platform Cooperativism Consortium. https://platform.coopersystem.com.br/blog/we-are-poor-but-we-are-many/

care, building and strengthening care cooperatives. Equal Care Coop is a social care platform cooperative in the UK, owned jointly by care workers and those seeking care, which seeks to build a localized, care work marketplace that is centered on worker autonomy, dignity, and guarantee of minimal wages.[34]

4.4. Civil society

Vigilance and coordinated action for safeguarding gender justice in digital innovation ecosystems

- The role of a diverse civil society – that includes members of the tech community, women producers' organizations and enterprises, women technologists and 'maker' communities, intermediaries working to promote gender inclusion in local economies, activist-scholars and digital rights groups working on the digital economy and society issues, etc. – in furthering gender justice in digital innovation ecosystems cannot be overemphasized. Given the complexity and increasing social embedding of digital technologies, civil society actors need to forge concerted action to ensure that emerging digital innovation ecosystems preserve and promote women's human rights – from global to local levels and across various sectors and issues.

[34] Equal Care Coop. https://www.equalcare.coop/