Delivering Digital Drugs

5 Episodes of Digitization

Digital Economy
Transforming Business and Society

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Follow the digital Drug

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Digital Drugs: noun, pl.,

drugs that are dependent on and substantially constituted by multiple digital representations and connections, and whose use and effectiveness is strongly mediated through digital means. [1]

Medicines and Drugs are hybrids, part active molecule, part delivery system, part packaging and instructions, and embodying a set of protocols of use and work practices.

They are also becoming in part digital – they are digitalizing [2]. Their agency as artefacts (their material agency, in particular their therapeutic potential) draws on digitised data and is applied through digitalised protocols.

From the supply chain, through clinical work and patients' bodies, to post-use data repositories and in structures of regulation, to follow a drug is to tell a story of material artefacts (devices, objects, cells and organs), and of chemical actions in biological milieu. But it is also a story of digital materiality and digital agency.

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As a hybrid digital artefact a drug is constituted within, and an expression of, multiple digital representations and inter-connections. *From in-silico* science during drug discovery, and in testing procedures of randomised control trials, a drug is embodies digital data.

And the digital sedimentations continue once a drug becomes a licensed product and moves to manufacture and use.

The people and groups who work with and use drugs (e.g. each and every one of us) are drawn in to the digital sphere and shape and adopt new practices of medicines use, individually and system wide

In this way digitalization implies new and novel architectures of value creation, realization and capture – new business models.

These are expressed in reconfigurations of the socio-technical and economic context of medicines within healthcare; as value propositions, as products and services, as therapeutic agents, as the locus of innovation, and as new forms of regulation.

Clinical Practices

Supply Chain

Patients and their bodies

Regulation

Pharmacovigilance
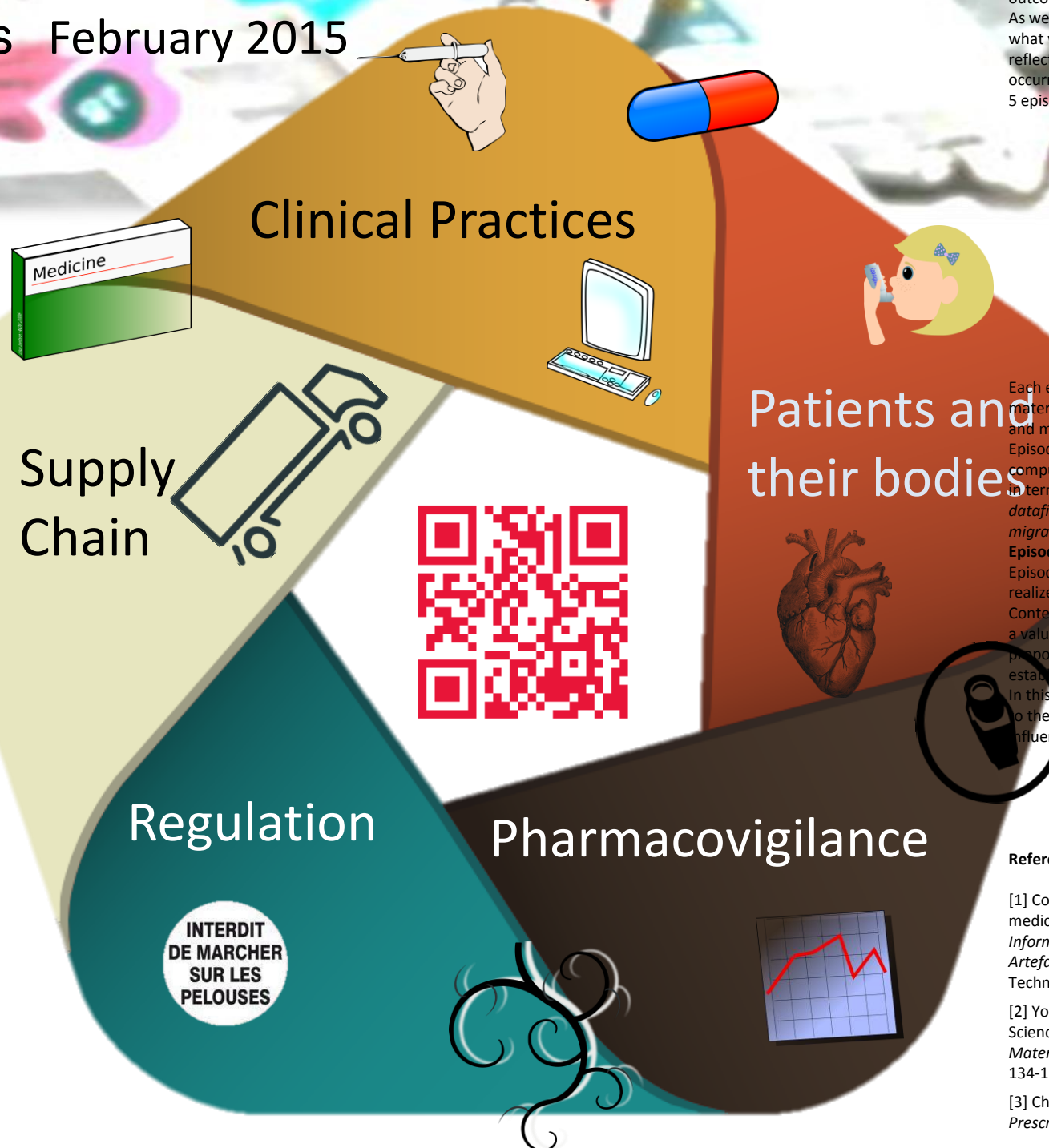
Following Drugs:
A primary aim of the **Delivering Digital Drugs** project is to reveal the multiple and interconnected locations and transitions by which drugs become digital. The research method is to 'follow the drug', and by so doing to map the processes of digitalization and the transitions that cumulate a drug's digital materiality. Our interest is the drug as (digital) artefact and in the context of its use.
So we start from the factory where a product is made, and follow it into the clinic, into and out of bodies, and onwards as some consequence or outcome.
As we follow a drug we see digitalization occurring in different settings – what we term '**episodes of digitalization**'. The word episode is chosen to reflect that drugs become digital cumulatively through multiple transitions occurring in different places and times.
5 episodes are under study:

Anti counterfeiting – incl. use of medicines unique serial numbers, 2D bar codes and other safety/integrity features
Hospital prescribing and administration – incl. clinical decision support, personalised/precision medicine, hospital formularies, …
Patient centred and co-consumption of medicines - patients as active participants in their medicines; incl. devices and reminder/adherence systems
Pharmacovigilance – incl. surveillance systems that combine patient data, active reporting, social networks, research studies
Research Data Services – cumulation of data (Big Data) for secondary use, research, management and commissioning

Each episode reflects a new entanglement in the relationship between material and virtual aspects, and between medicinal product/artefact (drug) and medicinal practice (medicine).
Episodes of digitalization, for example a hospital doctor prescribing using a computer, or a secure bar code to prevent counterfeiting, can be described in terms of: *digitization* (data that moves from analog to digital form), *datafication* (cumulation of data and its multiple repurposing), and *migration* (agency moving to the digital).
Episodes, Value and Business models
Episodes are situations in which a drugs therapeutic value is generated, realized and captured through digital means.
Contemporary literature proposes the business model as a way of expressing a value architecture, e.g. as the business logic of a specific firm, the value proposition it makes to a market, and the mobilization of resources and establishment of processes that this requires. [3]
In this work we apply the concept not to the firm *per se*, but to the drug and to the value architecture that it embodies and which is significantly influenced by digitalization.

References

[1] Cornford, T and Lichtner V. (2014) 'Digital Drugs: An anatomy of new medicines' in Doolin, B., Lamprou, E., Mitev, N., McLeod, L. (Eds.) *Information Systems and Global Assemblages: (Re)Configuring Actors, Artefacts, Organizations*, IFIP Advances in Information and Communication Technology, Vol. 446. 2014, XII, 247 p. 15 illus.

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[3] Christensen, C.M. Grossman, J.H. and Hwang, J (2009) *The Innovator's Prescription: A Disruptive Solution for Health Care*. McGraw Hill, New York

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