Laboratories and AI Applications: The Sites of Knowledge Production or Commodity Manufacture

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Abstract
In order to maintain the social stability, healthcare, has always been an issue that governments cannot ignore. Since Bismarck implemented the social health insurance model in Germany, modern nations around the world have consistently attempted to address the problem of the uneven distribution of medical resources through systems such as healthcare systems or health insurance. Taiwan is no exception to this trend. However, new challenges have arisen after the implementation of Taiwan's National Health Insurance (NHI) program. The availability of affordable and convenient healthcare, which has made it easy for the public to access diagnoses and treatment from physicians, has pushed Taiwanese society into an ultra-aging stage, widening the distribution gap of doctors between cities and regions. Artificial intelligence (AI) appears to be one of the potential solutions to address the aforementioned issues. However, without the imperative of COVID-19 prevention and public health governance, AI might not have necessarily evolved into a domain perceived as a 'new medicine,' valued by governments, practiced in hospitals, and embraced by the general public. This research aims to investigate the dispositif of AI applications in medicine in the society of Taiwan. This research finds that the development of the dispositif that revolves around AI applications in Taiwanese society parallels the process of 'Pasteurization' as argued by Bruno Latour in the context of French society.

Keywords: Artificial Intelligence in Medicine, Dispositif, Actor-Network Theory

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Introduction

In order to maintain the social stability, healthcare, has always been an issue that governments cannot ignore. Since Bismarck implemented the social health insurance model in Germany, modern nations around the world have consistently attempted to address the problem of the uneven distribution of medical resources through systems such as healthcare systems or health insurance. Taiwan is no exception to this trend. However, new challenges have arisen after the implementation of Taiwan's National Health Insurance (NHI) program. The availability of affordable and convenient healthcare, which has made it easy for the public to access diagnoses and treatment from physicians, has pushed Taiwanese society into an ultra-aging stage, widening the distribution gap of doctors between cities and regions. Nevertheless, compared to urban areas, rural regions in Taiwan are typically inhabited by elderly populations in need of long-term medical care (Legislative Yuan, Republic of China, 2022). However, according to reports from the Taiwan Medical Association (2020), physicians tend to concentrate in urban areas. Additionally, fewer and fewer doctors are willing to specialize in traditional medical fields such as internal medicine, surgery, obstetrics and gynecology, pediatrics, and emergency medicine. This trend can be attributed to the long working hours in outpatient clinics or surgical settings, coupled with limited reimbursement under the NHI system. Consequently, medical students are increasingly reluctant to pursue careers in these fields. Instead, they are turning to areas such as self-pay healthcare.

While the distribution of doctors remains uneven, during the COVID-19 pandemic, the government has found that the integration of 'big data, AI applications, and physicians' experiences' is an effective approach to prevent the spread of the epidemic. The information mentioned above will be transformed into 'effective information,' which is transformed as valuable substance for both the general public and healthcare personnel, once this information is input into algorithms to drive AI applications, even in the absence of an adequate number of doctors. This experience of containing COVID-19 is called ‘Taiwan model’(台灣模式) by the government of Taiwan (Ministry of Foreign Affairs Republic of China).

The Taiwan model for combating the pandemic by using communication technology not only gained international recognition through publishing the academic article by the minister of Health and Welfare, Chen Shih-Chung (2021), but also bolstered the Taiwanese citizens' confidence through the coverage in foreign media (石田, 2021; Hale,2022). However, as the Taiwan model continues to receive attention, more and more actors start to approach the vital technology of the model, that is, AI application. As the result, ‘the Taiwan model’ shifts from its original context. This phenomenon is possible to be observed through several interviews with the key figure in the technological pandemic prevention, namely the Minister Without Portfolio, Audrey Tang. As a software programmer with experience in combating viruses, she was interviewed by various types of media. Even on the topic of national security, she was invited to comment based on her experience in applying AI applications to prevent the pandemic (BBC,2022). This reveals the original meaning of AI applications has shifted to other social issues.

When the Japanese media reported on how the uniqueness of Audrey's personal background made her qualified for technological pandemic prevention tasks, the Vice President of Taiwan, Chen Chien-Jen shared the article through social media and referred to what she has done as ‘a model for AI application in pandemic prevention’ (see Figure 1).

This study is curious about the interactions among different social actors. Applying the concept of Bruno Latour, this research aims to investigate the main research question: whether there is any assemblage being formed by actors of the society in Taiwan?

Figure 1: The Vice President praised Audrey Tang as not only the life and soul of the national pandemic prevention team but also the founder of the model for AI applications in pandemic prevention on his Facebook account.

Research Method

Via archaeological analysis of modern medical history, this research focuses on Latour's significant study, which demonstrated how Louis Pasteur's experiments with bacteria became objects of interest for various actors in 19th-century French society. Latour (1993), through his investigation of Pasteur as the chemist conducting experiments in the laboratory, showcased how the theory of bacteria became intertwined with the name PASTEUR, diffusing throughout the whole society in France. Latour's study illustrated how the notion of 'science' was constructed through the translation of various actors in French society. After being translated by different actors in their respective fields, the idea of 'science' gradually transformed into a form of belief rather than merely a way to practice empirically. To illustrate how the notion of science became the belief of French citizens, Latour argued three stages of dispositif among 'bacteria-chemist-laboratory-public health-medicine.' To apply Latour's concept, this research visualizes his arguments (see Figure2).

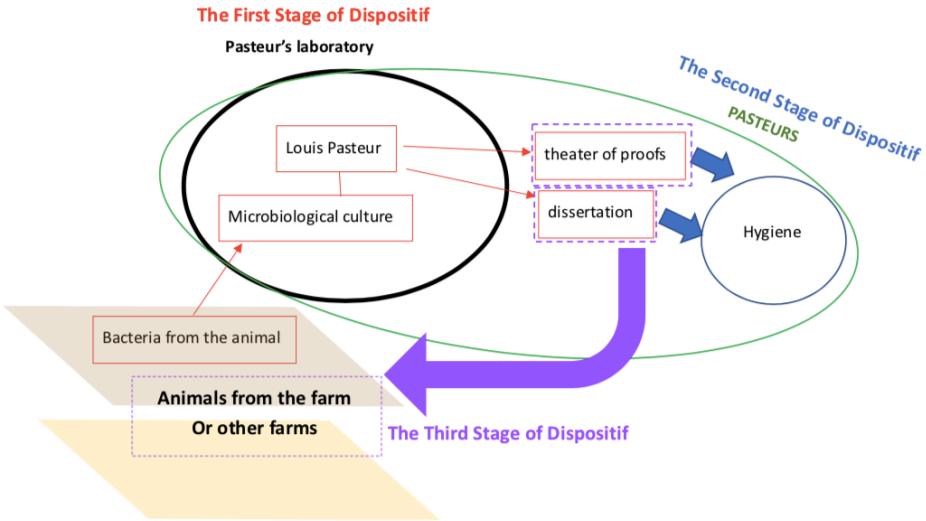

Figure 2: Three Stages of Dispositif, The Landscape of The Pasteurization of France

Drawing upon Latour's logic, this research finds that there is an assemblage between AI applications, AI operators and Big data, which is translated by actors as the pride of Taiwan. The curiosity that arises from this finding is, as the AI application, initially used to assist certain actors such as the government, public health experts, physicians, and citizens, in controlling the pandemic, gradually deviates from its original purpose, what does the assemblage constructed by these actors revolving around AI applications mean?

In the context of technological pandemic prevention, the government of Taiwan has begun to promote a new plan for economic development, namely the Big Health Industry plan. Therefore, this study takes the Big Health Industry as a case of observation (see Figure3). Following Latour's approach, this study investigates how actors translate AI applications into their own fields when AI applications interact with corresponding fields.

Figure 3: Big Health Industry

Finding & Discussion

This study presents two primary findings. Firstly, it identifies the emergence of a dispositif in Taiwanese society, a process is termed as 'AIrization' in this study (see Figure4). AIrization refers to the sanctification and simplification of AI applications into a belief system, which occurs through three stages of dispositif. Secondly, the study focuses on the translation of AI applications within hospitals that support the Big Health Industry plans. This study found that relevant hospitals' explanations to the public about the role of AI diagnosis (which is a type of AI application) are oversimplified. This simplification process is reminiscent of Latour's argument that 'Pasteur's bacterial experiment' was simplified through the theater of proof and became a concept that spread to public health and other fields under the name PASTEUR. This phenomenon reflects the transition from the first-stage dispositif to the second-stage dispositif.

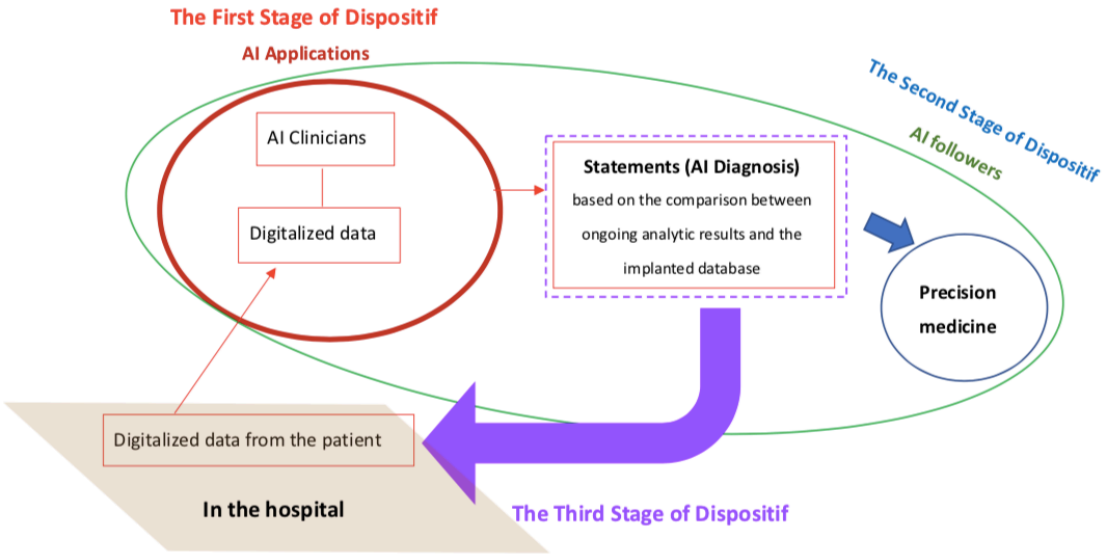

Figure 4: The Forging Dispositif, The AIrization of Taiwan

Conclusion

This study concludes that although AI medical care is still in its very early stages, if actors continuously diffusing the notion of AI by oversimplifying it, the dispositif between first-stage and second-stage will be more stable. Once these two stages are firmly built, they will become the base of the third-stage of the dispositif. In other words, the oversimplified information will be further translated. At this stage the public will ignore the importance to criticize the oversimplified meaning of AI. It implies that AI applications would be regarded as a panacea by the public. The public will naturally accept the logic that once the digitalized data is input into the AI application, the disease will automatically be cured. However, what is overlooked is that these discourses are just interpreted language used by different actors to translate AI applications into their own domains.

The next stage of this research will involve conducting interviews with AI application operators (i.e., clinicians) in urban and regional hospitals. By gathering insights from clinicians who actually operate AI applications in various regions, this research will provide further validation for the current arguments made in this study. The following questions can serve as avenues for the further development in this research. What are the actual changes that AI applications are bringing to the field of medical care? Do AI applications especially AI diagnosis applications gradually become a means of regional hospitals to solve the problem of a shortage of doctors? Or, in order to attract the public to accept AI applications, the way the hospital explains the concept of AI diagnosis to the public has gradually transformed the practices of AI diagnosis into a new type of fast and convenient commodity.

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