My Body My Data: A Case Study of South Korea's MyHealthWay and Its Transformation of the Health Information Exchange System to Reduce Data Fragmentation

A Research Paper Submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Devang Ray

Fall 2024

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Kathryn A. Neeley, Associate Professor of STS, Department of Engineering and Society

I. Introduction

The application of artificial intelligence (AI) in developing more advanced healthcare tools has become increasingly prevalent following the recent AI boom (Basu et al., 2020). Over recent years, medical researchers have found remarkable success leveraging limited, directly applicable techniques such as image classification (Rezaeikhonakdar, 2023). However, following these simpler successes, more complex applications, like patient diagnosis, using AI are being explored. As the scale of problems grows in complexity, the applied AI models require training with larger and more diverse datasets to maintain reasonable reliability (Al-Antari, 2023). In addition to performance, the size and robustness of datasets used to train AI models also determine how equitably the solution performs: which is a crucial aspect of any medical tool (Wen et al., 2022).

In the United States, patient data is naturally distributed between multiple actors in systems of health information exchange (HIE) responsible for storing and sharing health data amongst involved actors. However, limitations under laws like HIPAA prevent exchange of health information and incites data fragmentation, where a domain of data is isolated under multiple actors with little sharing. As a result of this data fragmentation, researchers struggle to aggregate medical datasets capable of representing the diversity and breadth of information required for large AI models (Basu et al., 2020; Cascella et al., 2023). Data fragmentation has been recognized as an emergent obstacle to advancing health care technologies elsewhere in the world. A handful of countries have begun exploring implementations of unifying platforms to aggregate individuals' data from multiple sources at the national level, with South Korea rolling out the most substantial product, MyHealthWay, in September 2023 (Ha et al., 2024). The

United States has BlueButton+, that aggregates a single patient's data but lacks infrastructure supporting data aggregation from research purposes (Ha et al., 2024).

Frank W. Geels introduces a method coined multilevel analysis, which divides actors into discrete levels and exposes interactions taking place between the levels. In addition, Claudia Schwarz-Plaschg developed a method for analyzing arguments between actors within a system, termed discourse analysis. Schwarz-Plaschg argues that the analogies used in discourse are key to identifying the goals of the responsible actor and expose how the system is impacted. This paper will leverage Geels' and Schwarz-Plaschg's frameworks to argue that the key to South Korea's success was the involvement of the government as a regime outsider, and the analogy of the "highway" as a means of persuasion and justification.

II. Problem Definition: The Unification of Systems of Medical Health Information Exchange Is Necessary to Reduce the Data Fragmentation Holding Medical AI Back

Artificial Intelligence (AI) has been a developing technology since the 1970s (Holdren et al., 2016). AI models use user information by encoding their data into numerical values and going through a process of prediction and regularization to identify patterns, and ultimately modify its own parameters to maximize the number of correct predictions (Rezaeikhonakdar, 2023). Throughout this process of prediction and regularization, any data fed to an AI model will become a permanent facet of the model, internalizing its representativeness as well as any biased patterns within the greater substance of the dataset (Wen et al., 2022). Common forms of stored bias are explored in a study of publicly available skin imaging datasets, where David Wen and a group of researchers found that the dataset vastly overrepresented patients from wealthier, Western countries. Wen concluded that the most dangerous consequence was how these biases will be internalized by AI models that will perpetuate the bias as they are applied, since the

hidden nature of AI decision-making obfuscates bias and makes it harder to identify issues before they are implemented in practice (Wen et al., 2022).

While AI has had "booms" and "winters" where it gained and lost interest (Holdren et al., 2016), it has experienced a significant and long-lasting boom after OpenAI's public release of ChatGPT. This is illustrated through Google Trends, where interest for the keyword "artificial intelligence" quadrupled in less than 5 months (Google Trends, 2024). Researchers Price and Cohen explore how AI has steadily made medical advancements and discussed how the drastic increase in interest established itself in the medical field with an explosion of research beginning with the simplest implementations of artificial intelligence on problems within the medical field. The first research focus was on image classification as it was a proven and direct application of AI capability on a simple medical problem. Soon imaging classification was verified to be robust and trustworthy for medical application, and the FDA approved image-based AI diagnosis software EyeDiagnosis (Price & Cohen, 2019). From here, researchers looked to expand capabilities to much more critical applications like diagnosis (Basu et al., 2020).

However, the size and complexity of an AI model directly relates to the size and robustness of the datasets required to train such models. Once again, as medical research expanded to explore how AI can help solve more complex problems, the required models had to become proportionally large and complicated (Basu et al., 2020). Furthermore, models also require larger and more robust datasets to ensure they perform equitably on any demographic of patient that requires healthcare (Wen et al., 2022). In the case of tools used in hospitals, it would be unacceptable for a tool to only work on a certain demographic, and prohibitively expensive to maintain and support multiple tools to cover the range of diverse patients. Obermeyer's analysis of an existing

artificially intelligent tool establishes the risks coupled with training models on datasets with data fragmentation.

Obermeyer and their research team evaluated a model used to identify American patients that would benefit from more inclusive care. As shown in Figure 1, Obermeyer's case study found that Black patients had to be strictly sicker to be treated at the same level as a White patient without exception, meaning that White patients were disproportionately selected for superior care. Tools leveraging AI are a double-edged sword as they make life or death decisions while being trained on small and disconnected datasets. While they are likely to perform more consistently than any human worker, this also implies that the tool may consistently propagate learned biases without fail.

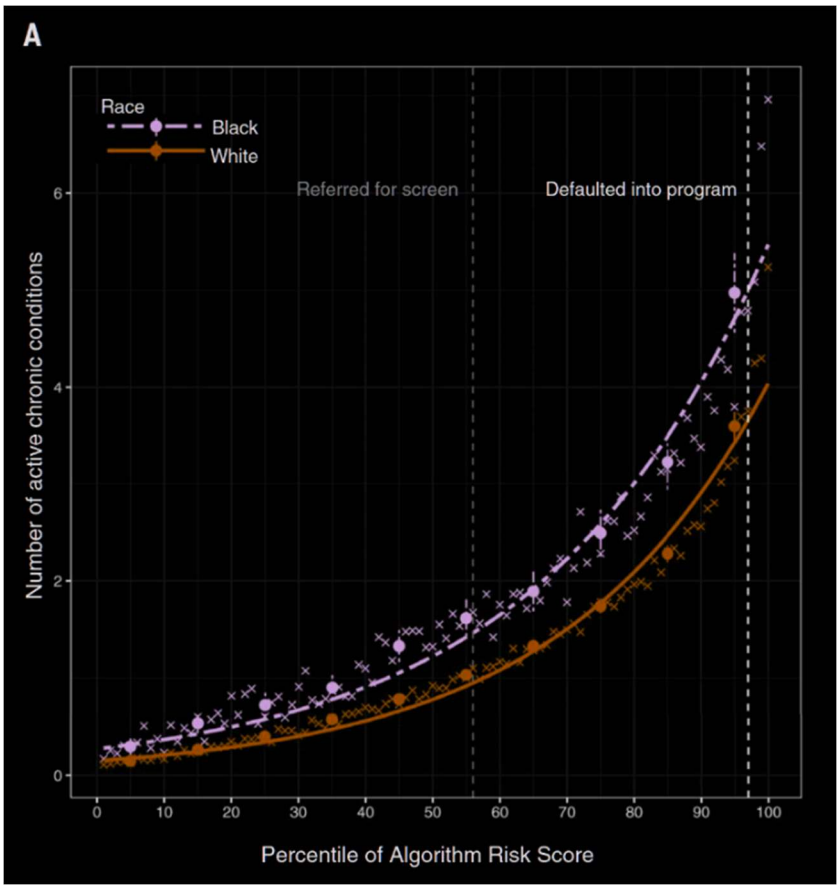

Figure 1. The Original Model's Assigned Risk Score compared between Black and White Patients. This graph illustrates the commercial model's bias by highlighting how much sicker a Black patient had to be evaluated prioritized at the same level as White patients in the same system (Obermeyer et al., 2019).

Highlighted in Figure 2, Obermeyer continued their evaluation by comparing the performance of the commercial model to an experimental model trained on a more robust form of the same dataset. Figure 2 shows that the commercial model had internalized bias causing it to overlook around 30% of qualifying Black patients, thereby refusing them critical care (Obermeyer et al., 2019). Far improved performance in the simulated model highlights how closely the analyzed model's unbalanced performance was dependent on the lower quality data it performed on. Without resolving the cause of poor data quality in medical training data, commercial models will consistently be at risk for prejudiced treatment.

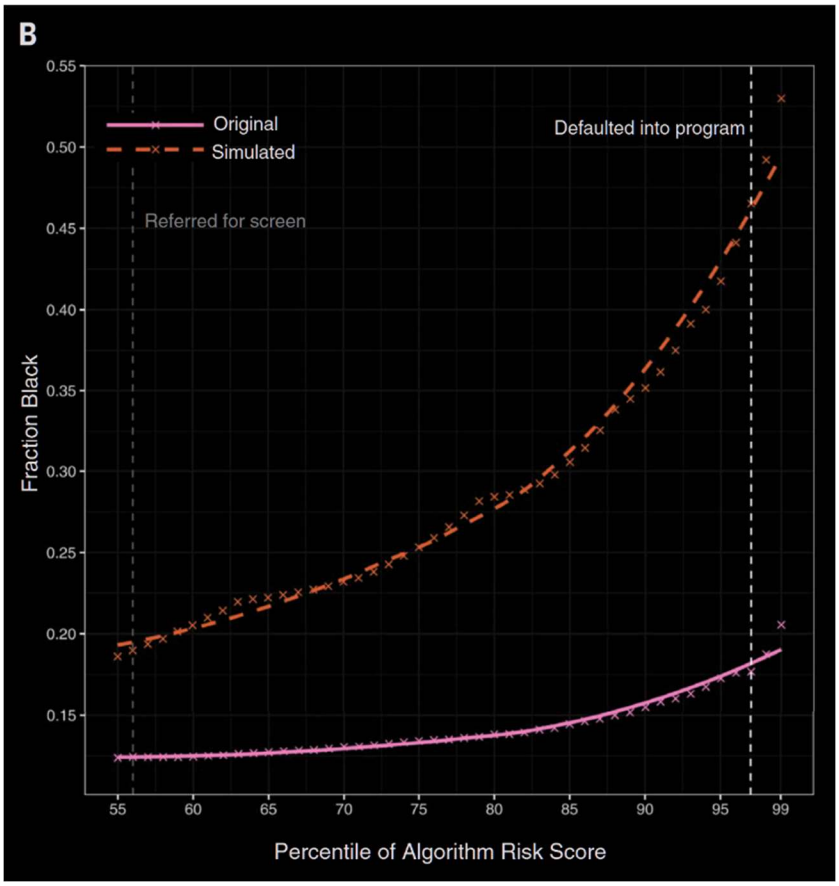

Figure 2. Comparing the Percentage of Black Patients Recommended for Care between the Commercial Model and an Experimental Model. This graph establishes how the model failed to meet an acceptable level of equitable care by internalizing biases from its trained data, and Obermeyer concluded that on average about the model was letting 30% of qualifying Black patients go untreated (Obermeyer et al., 2019).

Data fragmentation with health information in the United States is most attributed to HIPAA (Health Insurance Portability and Accountability Act), a federal law which holds multiple data privacy laws (Basu et al., 2020). In his article "Privacy Parts," Jeff Drummond, an expert consultant on HIPAA compliance, explores the history of how HIPAA has evolved since its enactment in 1996. Drummond concluded that while HIPPA started to help facilitate health information portability, opaque regulations were later packaged under HIPAA to simplify administrative load, but ultimately only made the system of health information exchange more inefficient (Drummond, 2006). Unclear and harsh punishments for non-compliance discouraged actors from exchanging health data, resulting in the data fragmentation obstructing medical research surrounding applications of artificial intelligence.

Data fragmentation is not only an issue within the United States. Countries like South Korea, Finland, Germany, and Japan have similar issues with facilitating the sharing of patient data for its citizens (Juhr et al., 2015). In response, these countries have started implementing unifying platforms aggregating individuals' data from multiple sources. South Korea has rolled out the most substantial product with a nation-wide platform, MyHealthWay, having been released in September 2023 (Ha et al., 2024). While the United States has previously attempted a similar program specifically for its veterans through the US Department of Veteran Affairs, the solution was not successful and extremely limited in scope (Ha et al., 2024).

There is a lack of discussion on how actors in the system of health information exchange (HIE) within countries like South Korea were capable of fostering aggregations of medical information in comparison to analogous systems in the United States. Identifying how actors at the niche, regime, and landscape levels fomented the system-wide transformation that introduced MyHealthWay will expose where corresponding American actors have failed, providing a

greater understanding how data fragmentation can be countered. Analyzing South Korea's sociotechnical HIE system through Frank W. Geels's lens of multilevel perspective while leveraging Claudia Schwarz-Plaschg's approach of discourse analysis to expose how regime outsiders enhanced the transformation's momentum within the system will provide a significant tool to overcoming the gap in knowledge this paper seeks to surmount.

III. Research Approach: A Multilevel and Discourse Analysis Will Reveal how MyHealthWay Is Successful and Can Guide Analogous Systems

The paper applies Geels' multilevel analysis of the systems of health information exchange (HIE) in South Korea and incorporates Schwarz-Plaschg's discourse analysis of how organizational actors within the system introduced and argued for system transformations. In "Transformations of Large Technical Systems: A Multilevel Analysis of the Dutch Highway System," Geels combines multilevel perspectives with insider-outsider dynamics to highlight processes of change within sociotechnical systems (Geels, 2007). Geels' approach is well-suited to large systems and effectively highlights political influences, which makes it especially fitting for analyzing a tightly regulated medical health exchange system that spans all South Korea. In "The Power of Analogies for Imagining and Governing Emerging Technologies," Claudia Schwarz-Plaschg discusses how the analogies used to describe technological development influence public perception, and consequently contributes to whether it is lauded or criticized (Schwarz-Plaschg, 2018). The political discussion around the implementation of MyHealthWay due to discourse around data privacy makes it a rich domain for discourse analysis.

The foundation of Geels's approach is the concept of the niche, regime, and the landscape: the three levels at which large systems are influenced. The niche level is where new technical artifacts separate from the system are created with potential to destabilize a system.

The assorted arrows at the niche level in Figure 3 below identify how tools have potential to destabilize if given the chance to gain greater support. The regime level is defined as the "ruleset or grammar" that influences a sociotechnical system and is defined by interactions between the system's "insider" institutional actors and "outsider" actors (Geels, 2007). Regime insiders refer to actors within the system who are motivated to maintain the momentum of the system with incremental innovation. Outsiders refers to dissenters who try to pressure the system to change (Geels, 2007). Discourse captured between organizational actors at the regime level will also be most relevant to a discourse analysis of the system, as they hold the "credibility and societal status" (Schwarz-Plaschg, 2018) required to develop analogies capable of shifting public opinion. Finally, the landscape level captures forces outside of the regime, like cultural actors that motivate regime outsiders. The long, wavy arrows at the landscape level in Figure 3 illustrate how its actors are independent of the system but can independently create windows of opportunity allowing for greater system-wide change.

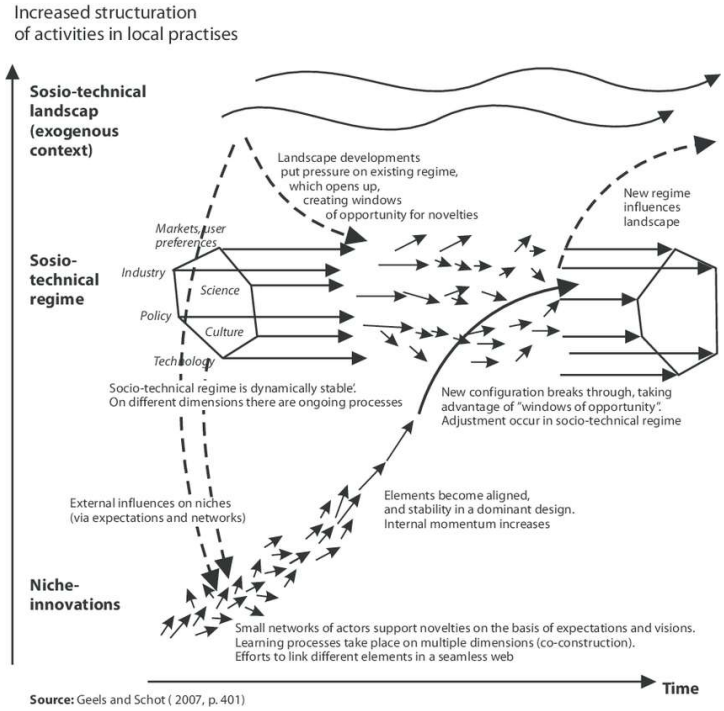

Figure 3. How System Transitions are Broken Down into Interactions between Actors at the Landscape, Regime, and Niche level for Sociotechnical Systems. The solid arrows identify actions within a given level, and the dotted arrows highlight interactions between the levels (Geels, 2007).

This research performs a case study analysis of an example of successful transformation in South Korea's medical data exchange system that culminated in the introduction of MyHealthWay, a platform that unifies patient data from all healthcare providers into a single source. Geels performed a "longitudinal case study of the Dutch highway system" to prove the efficacy of his approach in exposing how actors at the three levels interacted to enact system transformation. This paper will similarly apply Geels' framework on the case study of the implementation of MyHealthWay in South Korea, ensuring the research approach will be applied effectively. Furthermore, a discourse analysis has been done on the press releases released by the South Korean government introducing and explaining the implementation of MyHealthWay to its citizens. The South Korean government used controlled analogies to convince regime-insiders, in the form of privately owned hospitals and insurance companies, to cooperate with the transformation. Furthermore, since MyHealthWay was first released in September 2023 (Korean Ministry of Health and Welfare, 2021), this case study meshes well with the framework put forth by Schwarz-Plaschg.

Figure 4 below illustrates the steps taken in this paper's multilevel and discourse analysis. First, the HIE system in South Korea was identified as an already-established system that had transformed significantly. Then, technological developments at the niche level seeking to disrupt the HIE system are highlighted. Thirdly, South Korean governmental organizations were identified as system outsiders attempting to assert pressure and enact change, and their interactions were tracked to expose how they contributed to system transformation. These technological and organization actors have the potential to disrupt the system but would generally be unable to without further help. At this point, the analogies that the South Korean

government used to introduce MyHealthWay were analyzed to elucidate how they added pressure against system insiders and raised public approval. Then, coinciding landscape developments, like the COVID-19 pandemic, which created the windows of opportunity that were leveraged by system outsiders are pinpointed to create a robust explanation of how South Korea's HIE system transformed.

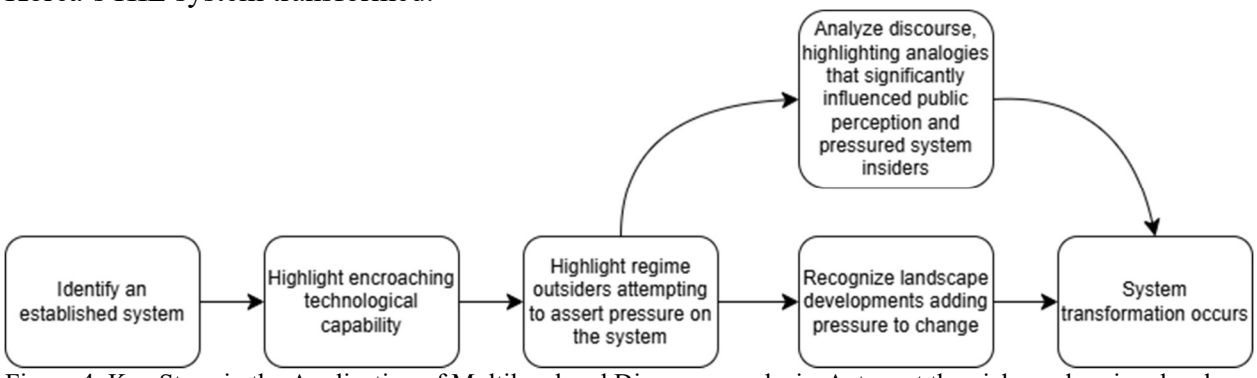

Figure 4. Key Steps in the Application of Multilevel and Discourse analysis. Actors at the niche and regime levels are constantly trying to enact change, but pressure from the landscape level is necessary to facilitate substantial transformation (Created by Author).

The synthesis of Geels' multilevel perspective and Schwarz-Plaschg's discourse analysis is relevant to the wide-reaching and politically dependent system of health information exchange. The multilevel perspective provides tools to stratify a large system that would be overwhelming to analyze as a single unit. Dividing actors between niche, regime, and landscape levels organizes a complex system while also emphasizing the most important interactions by grouping similar actors together. Discourse analysis and its exposure of how analogies frame emerging technologies is highly relevant to a politicized system like health information exchange that must balance tensions between data privacy and data fragmentation. Schwarz-Plaschg's approach is further relevant to highlighting how analogies supported successful system transportation in South Korea, and how they can be applied to other systems.

IV. Results: Government Investment and Landscape Developments Due to the COVID Pandemic Are Crucial to Rectifying Data Fragmentation in HIE Systems

As discussed previously, South Korea's MyHealthWay platform is one of the first unifying health information exchange (HIE) systems implemented at the national level in 2023 (Korean Ministry of Health and Welfare, 2021). MyHealthWay falls under the goal of MyData – seeking to consolidate all forms of personal information into a single system managed by the individual (Ha et al., 2024). As a direct consequence of MyHealthWay, South Korea has developed a direct solution to data fragmentation by aggregating its citizens' data across the thousands of involved healthcare institutions into a unified platform. Geels' multilevel perspective and Schwarz-Plaschg's discourse analysis provide insight into how South Korea's system of health information exchange transformed to support this innovation and highlight key takeaways that may benefit analogous systems. This paper presents three primary features crucial to the transformation of the system of health information exchange: government investment as regime outsiders, a collective interest in protecting health as a landscape development, and the analogy of the highway to defend the transformation.

I. Government Investment with Support from Shifting Landscape Developments Enacted Change in Accordance with Geels' Model

The government's investment of authority and resources towards the transformation of the HIE system was crucial to its success. According to Geels' model in the HIE system, governmental organizations like the South Korean Ministry of Health and Welfare and the Korea Health Information Service began as system outsiders. Prior to the implementation of MyHealthWay in 2021, hospitals and insurance companies had the most authority over patient

data (Ha et al., 2024). Only 7% of the hospital market is produced through public hospitals, making private involvement in the South Korean health care industry significantly higher than the global average (Yeo et al., 2016). By making up 93% of the healthcare industry, the regime actors cemented themselves as a crucial facet of day-to-day life and ensured they had stability to maintain status quo. As the ruling government, these organizations had broad regulatory power, but without corresponding landscape developments there was no priority to exert greater pressure on regime insiders.

With the addition of niche technological evolution and supporting landscape development, organizations within the government were motivated to exert greater pressure. With the advent of "smart" technology products like the Fitbit, a technological niche was introduced to the HIE system. These actors provided a potential capability to generate data at an unprecedented granular level (Lee & Kim, 2024). While these technological actors are generally popular, they remain niche through Geels' framework as their capabilities in relation to health information exchange were generally unrealized long after they were introduced to consumers. However, due to a shifting paradigm towards individuals becoming more involved in their own health care, these personal wearables have gained momentum throughout the system.

As shown in Figure 5, this landscape change influenced development in the niche level and placed pressure at the regime level as well. Smart technology products grew in popularity as people became more conscious of their health, consequently building their momentum to influence the HIE system. As regime insiders in the hospitals and other data owning organizations were unable to manage this newer form of data, the stability of the established HIE system was threatened. Regime outsiders like the Ministry of Health and Welfare, the Korea Health Industry Development Institute, and the Korea Health Information Service were

motivated to exert greater pressure on the system to transform to meet the new requirements introduced from the niche level.

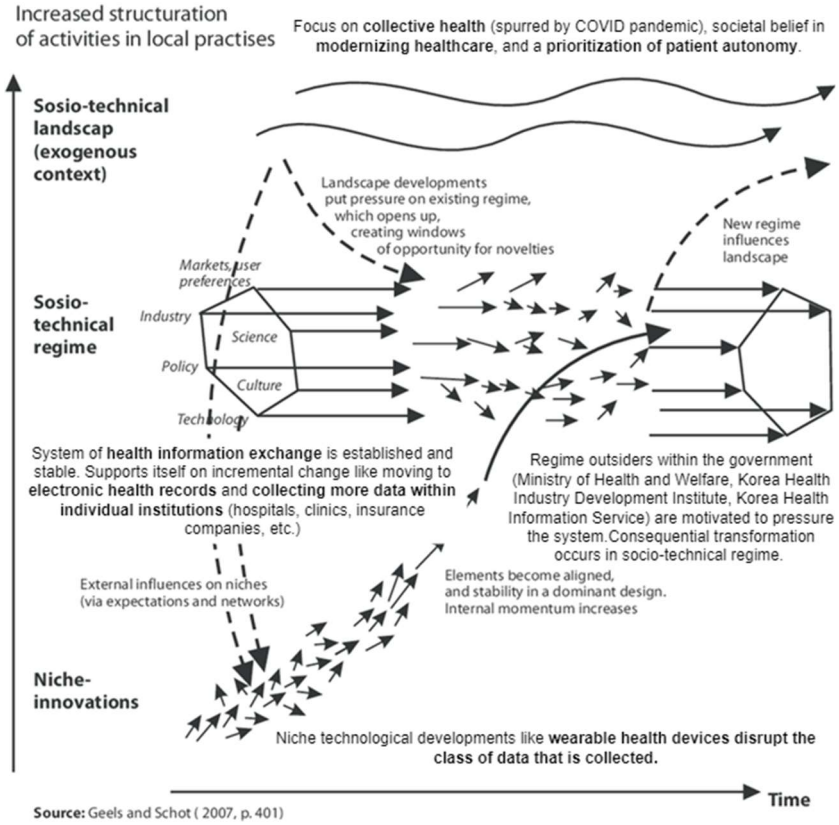

Figure 5. How the South Korean Health Information Exchange System Changed Through the Lens of Geels' Multilevel Analysis. Landscape changes in prioritization of a data-centric health system, patient autonomy, and collective health coincided with niche technological developments in wearable health devices and regime outsider's organizational actors in the South Korean government to enact system-wide change (Edited by Author, Adapted from (Geels, 2007)).

However, the rapid investment of government actors was crucial to influencing the HIE system to transform. In July 2020, the Korean Ministry of Science and ICT released an overarching plan termed the Korean New Deal aiming to position the country as a leader in AI development. This deal included commitment to invest in the country's capability to collect, share, and apply data towards the application of artificial intelligence and created the Presidential Committee on the 4th Industrial Revolution to collect strategies on accomplishing this goal (Gicheol, 2020; Jung, 2021). Finally in March 2021, amendments to three data protection laws (the Personal Information Protection Act, the Credit Information Act, and the Information and

Communications Network Act) were introduced with the specific goal of expanding data available to research and the flexibility with which private companies may use pseudonymized patient data (Jung, 2021). The speed and intensity in which the South Korean government moved forward exemplifies the government's investment into fomenting system change and was key to overcoming the stability of the established HIE regime.

II. Prioritization of Collective Health Spurred by the COVID Pandemic Is Key in Transforming Data Protection

As mentioned before, the goals of the Korean New Deal were published in July 2020, but its announcement was released in a press released labelled "The Digital New Deal Is to Lead Digital Transition in the World After COVID-19" (Gicheol, 2020). The COVID pandemic was a pivotal exogenous event in the South Korean HIE system. In the name of safety, emergency government policies allowed the collection of data ranging from credit card usage to surveillance camera footage in the name of contact tracing (Jung, 2021). This began a pattern of citizens entrusting more intimate data in the hands of the government as a tradeoff for enhanced collective health.

However, the most considerable influence of landscape development prioritizing collective health is in how it emboldened the regime to transform limitations on how data is used within the system. As the government took on more responsibility over personal data during the pandemic, they proved the benefits of sacrificing data privacy in the name of collective health. Through Geels' lens, regime changes resulting in system-transformation ultimately continue to influence the landscape level. Applying this model to South Korea, as the regime changed to reduce data privacy to reduce the impact of COVID, this transformation in turn influenced the landscape by

motivating Korean society to accept reductions in their data protections and to trust data in the hands of their government.

The Personal Information Protection Act (PIPA) is considered to implement one of the strictest data protections in the world with a stringent requirement for individual consent throughout every step ("South Korea's PIPA," n.d.). As it was implemented, PIPA applied to any owner of personal data, ranging from a third-party organization to a public agency, and protected the processes of collection, generation, storage, processing, and destruction. As discussed previously, PIPA was modified in the Data 3 Act to allow public data to be used without requiring consent given that data was pseudonymized, replacing personal information with placeholders (Jung, 2021). This modification is an example of the major sacrifices in terms of data protection that took place in the transformation to the HIE system, with a fair number of opponents among patient organizations. However, the opponents were minority regime outsiders and lacked support to exert meaningful influence. The impact of Korea's response to the COVID pandemic, and its impact on its own system of health information exchange cannot be overstated.

III. The Constructive and Persuasive Role of the Analogy of the "Highway" Argues for the Implementation of System-Wide Change

The third element fundamental to the transformation to the health information exchange system in South Korea is how regime outsiders employed the analogy of the "highway" to pressure the system to transform. This analogy plays a multifaceted role in positioning the unification of the HIE system in a favorable light, and denotes a purposeful choice made by the actors responsible for maintaining the transitions' momentum through the system. While the product allowing citizens to view their own data in one place was marketed as MyHealthWay, the overarching policy of aggregating data was explicitly described as a "Health Data Highway" (Korean Ministry of Health and Welfare, 2021) in a public press release. As Schwarz-Plaschg

wrote, “discourse creates versions of reality – it is constructive – and it stresses the strategic role of rhetoric in defending one version over other – it is argumentative and hence aims to persuade” (Schwarz-Plaschg, 2018). This section discusses how the analogy of the highway constructs the purpose and the limitations of the system and seeks to persuade its audience to buy into a promise of security.

The clearest and superficial aspects of a highway that come to mind are its relation to accelerating the flow of traffic, and conversely how congestion and bottlenecks relate to severe limiting of the highway’s capabilities. As described in Table 1 below, both aspects tie into how regime outsiders desire to portray the implementation of MyHealthWay: the unification of the system of health information exchange will accelerate the flow of information as a highway enhances the flow of traffic, and the capabilities of the system will be hindered by overregulation in the same way a highway is made futile through congestion. By labelling the transformation as an information highway, the regime outsiders ensure that any public arguments must be fought through the framework they created, providing them a “home advantage” in how their audience will approach the subject. This analogy does the work of convincing South Korean citizens of the capabilities the regime outsiders wish to highlight: the efficiency and ease of use that will be of most personal use. In addition, the implication of a “traffic jam” within the information highway is a powerful motivator that forces regime insiders to involve themselves in the process. As discussed before, the regime insiders within Korea’s system of health information exchange are majority privately owned health data owners like hospitals and insurance companies. Through the reality the originators of the highway analogy built, these regime insiders are depicted as the causes for onerous traffic within the system: the bottlenecks and congestion that any metropolitan population would instinctually loathe, and the only way regime insiders can avoid

more pressure from society for blocking the implementation of the information highway is to actively become involved. The analogy does constructive work to depict the system's unification in a better light while also damaging the authority potential opponents to ultimately boost the momentum of the transformation within their system.

Category	**Target**	**Analogy**
System	Unified System of Health Information Exchange	Highway
Purpose	Flow of Information	Flow of Traffic
Limitations	Lack of participance from regime insiders	Bottlenecks and Congestion
Promise	The system is secure and non-invasive. It purely transports data securely	Highways have a singular purpose, just for transportation

Table 1. Exploring the "Highway" analogy and its connection to the System of Health Information Exchange. Organizational actors within the South Korean government carefully chose to compare the proposed transformation to a highway due to its implications for purpose of the implementation, and its capability to weaken opposing arguments on the security risks it may produce (Created by Author).

The most significant role of the "highway" analogy within the system of HIE is to shield against counterarguments for how the transformation may jeopardize the data protections of Korean citizens. While the landscape event of the COVID-19 pandemic did make citizens more amenable to sacrificing their protections in the name of collective health as discussed in the previous section, patient representatives still voiced their fears of the encroachment of their rights (Jung, 2021). However, highways are singularly designed to support transportation. In the same way that there are limited opportunities to stop on a highway, comparing a unified HIE system to an "information highway" implies that the sole purpose of the transformation is to move data and assuages fears that data may be stored for other uses. The analogy allows its

creators to promise their audience that data protections will be upheld by limiting data storage to reduce chances of cyberattacks, and that the transformation would never collect personal data to violate one's privacy. Through a singular, well designed analogy, that governmental actors working as the regime outsiders through Geels' multilevel lens, were capable of greatly enhancing the momentum of the transformation they wished to enact by ensuring it is viewed favorably in society, forcing regime insiders to participate, and limiting key counterarguments before they can be levelled.

V. Conclusion

With the recent development of AI-based medical tools, systems of health information exchange (HIE) have struggled to evolve to allow robust training by overcoming the obstacle of data fragmentation propagated by data owners being separated without means of safely sharing information. However, South Korea has one of the first nation-wide unifications of its HIE system. The results of a multi-level analysis leveraging discourse analysis at the regime level found that this success is most attributed to the government's position as regime outsiders willing to invest in building momentum, societal prioritization of collective health at the sacrifice of data protections stemming from the landscape development of the COVID pandemic, and the regime outsiders' purposeful comparison of the unification to an information "highway" building system momentum. Analogous systems in the United States should use this as inspiration of how to enact similar transformations by recognizing how they can harness the most successful strategies from the case study of MyHealthWay. Advocating for serious investment from governmental actors, fostering a societal appreciation for social health, and leveraging the metaphor of a highway in describing their uniform platforms are proven to be effective.

This paper drew its conclusions through an analysis of South Korea's transition to support data unification through MyHealthWay because it was the most substantial system transition that was also implemented at a significant scale. While MyHealthWay has been in its implementation phase since 2021, it was only launched to the public in September 2023. With only a little over a year, this paper's research was done on short-term studies and was unable to capture insights that may arise from a longer period of analysis. Furthermore, while the most important press releases from the South Korean government were released with official English translations, the discourse analysis conducted was ultimately dependent on language translation software when attempting to analyze non-government sources. This limited the depth at which discourse analysis as the translation software is unable to capture intricacies in the language used by actors at the regime level, obscuring some analogies leveraged within arguments. However, the findings of this research ultimately remain significant as a significant body of research was still collected to develop the results. The proximity of this research to the introduction of MyHealthWay means that a substantial number of journals released reviews of how the transformation was implemented, which was well leveraged through multi-level analysis. Furthermore, government press releases detailing the process of introduction MyHealthWay were meaningful contributions to exposing how its comparison to the "highway" produced more momentum within the HIE system.

VI. Reference List

Al-Antari, M. A. (2023). Artificial intelligence for medical diagnostics—Existing and future AI technology! *Diagnostics*, 13(4), 688. https://doi.org/10.3390/diagnostics13040688

Basu, K., Sinha, R., Ong, A., & Basu, T. (2020). Artificial intelligence: How is it changing medical sciences and its future? *Indian Journal of Dermatology*, 65(5), 365–370. https://doi.org/10.4103/ijd.IJD_421_20

Cascella, M., Montomoli, J., Bellini, V., Vittori, A., Biancuzzi, H., Dal Mas, F., & Bignami, E. G. (2023). Crossing the AI chasm in neurocritical care. *Computers* (2073-431X), 12(4), 83. https://doi.org/10.3390/computers12040083

Drummond, J. (2006). Privacy parts. *American Interest*, 2(2), 92–99. Political Science Complete.

Gicheol, J. (2020, July 20). The digital new deal is to lead digital transition in the world after COVID-19. Ministry of Science and ICT. [Government report].

Ha, T., Kang, S., Yeo, N. Y., Kim, T.-H., Kim, W. J., Yi, B.-K., Jang, J.-W., & Park, S. W. (2024). Status of MyHealthWay and suggestions for widespread implementation, emphasizing the utilization and practical use of personal medical data. *Healthcare Informatics Research*, 30(2), 103–112. https://doi.org/10.4258/hir.2024.30.2.103

Holdren, J., Bruce, A., Felten, E., Garris, M., & Lyons, T. (2016). Preparing for the future of artificial intelligence (pp. 1–25). Executive Office of the President. [Government report]. https://www.cra.org/ccc/wp-content/uploads/sites/2/2016/11/NSTC_preparing_for_the_future_of_ai.pdf

Juhr, M., Haux, R., Suzuki, T., & Takabayashi, K. (2015). Overview of recent trans-institutional health network projects in Japan and Germany. *Journal of Medical Systems*, 39(5), 50. https://doi.org/10.1007/s10916-015-0234-2

Jung, J. (2021, September 24). South Korea's MyHealthWay: A "digital highway" of personal health records, but to where? [Blog post]. BMJ Group. https://blogs.bmj.com/bmj/2021/09/24/south-koreas-my-healthway-a-digital-highway-of-personal-health-records-but-to-where/

Korean Ministry of Health and Welfare. (2021). Press release: The launch of the MyHealthWay (a digital highway). Korean Ministry of Health and Welfare. [Press release]. https://www.mohw.go.kr/react/al/sal0301vw.jsp?PAR_MENU_ID=04&MENU_ID=0403&CONT_SEQ=363763

Lee, N. K., & Kim, J. S. (2024). Status and trends of the digital healthcare industry. *Healthcare Informatics Research*, 30(3), 172–183. https://doi.org/10.4258/hir.2024.30.3.172

Obermeyer, Z., Powers, B., Vogeli, C., & Mullainathan, S. (2019). Dissecting racial bias in an algorithm used to manage the health of populations. *Science*, 366(6464), 447–453. https://doi.org/10.1126/science.aax2342

Price, W. N., & Cohen, I. G. (2019). Privacy in the age of medical big data. *Nature Medicine*, 25(1), 37–43. https://doi.org/10.1038/s41591-018-0272-7

Rezaeikhonakdar, D. (2023). AI chatbots and challenges of HIPAA compliance for AI developers and vendors. *Journal of Law, Medicine & Ethics*, 51(4), 988–995. https://doi.org/10.1017/jme.2024.15

Schwarz-Plaschg, C. (2018). The power of analogies for imagining and governing emerging technologies. *NanoEthics*, 12(2), 139–153. https://doi.org/10.1007/s11569-018-0315-z

Thales Group. South Korea's PIPA. Thales Group. [Company website]. Retrieved October 29, 2024, from https://cpl.thalesgroup.com/compliance/apac/south-koreas-pipa#:~:text=One%20of%20the%20strictest%20data,of%20Credit%20Information%20Act2)

Wen, D., Khan, S. M., Ji Xu, A., Ibrahim, H., Smith, L., Caballero, J., Zepeda, L., de Blas Perez, C., Denniston, A. K., Liu, X., & Matin, R. N. (2022). Characteristics of publicly available skin cancer image datasets: A systematic review. *The Lancet Digital Health*, 4(1), e64–e74. https://doi.org/10.1016/S2589-7500(21)00252-1

Yeo, Y. H., Lee, K.-H., & Kim, H. J. (2016). Closure of a local public hospital in Korea: Focusing on the organizational life cycle. *Journal of Healthcare Leadership*, 8(1), 95–105. https://doi.org/10.2147/JHL.S113070