Executive Summary

In 2011, Seoul elected a new mayor who promised open government. Many of the city’s 10 million residents had grown impatient with the need to make a formal request to access public information, a requirement that impeded the development of smartphone applications that relied on updated data about city services such as public transit. To improve government transparency and encourage business growth, the Seoul Metropolitan Government opened two user-friendly online portals: Seoul Open Data Plaza and Seoul Information Communication Plaza. Through these sites, citizens have been able to access city statistics, internal approval documents, policy notes, and other public data freely and easily.

To implement the new platforms, Seoul’s city government retrained city staff and reworked government processes to create new data standards and review mechanisms. These reforms made the data platforms more effective and useful to city residents. Experts, journalists, and entrepreneurs have used public data for innovative research, reports, and smartphone applications that benefit all of Seoul.

Introduction

In December 2009, the most popular free application providing real-time bus arrival information for citizens in the Greater Seoul region suddenly stopped
providing information about certain areas. Developed by a high school student, Seoul Bus had become a go-to application for residents to track bus locations and arrival times using data provided by various government websites. Gyeonggi Province, however, blocked this application from collecting information, citing a legal issue with third-party usage and the dissemination of government-produced information (Kim 2009). Angry citizens flooded the Gyeonggi Province website with complaints about the application’s removal.

Citizen interest in accessing public information and data reached beyond bus arrival status. The Seoul Metropolitan Government (SMG) had received 3,500 to 5,000 requests for disclosure of information each year from 2008 to 2011 (SMG 2020b). The number of citizen requests for information received by the 25 district governments that constituted Seoul exceeded 40,000 in 2010 (SMG 2015b).

In 2011, Park Won Soon won the 2011 Seoul mayoral by-election on an “open government” platform that aimed to provide city government information to citizens in a transparent and timely manner and encourage citizen participation in the city’s decision-making processes (SMG 2014).

With the commitment from the leadership, SMG resolved to make city data and information “public goods” accessible on online portals, making an exception only for sensitive information subject to nondisclosure laws. SMG made the most of the data and administrative information readily available at the Seoul Open Data Plaza (SODP) and Seoul Information Communication Plaza (SICP) so that users could access them without a formal request or preapproval (figure 1). SODP was created to access databases, whereas SICP was created to access “unstructured data” like administrative information and policy reports.

SICP and SODP opened in 2012 through pilot operations as repositories for users looking for relevant, updated information about public services, projects, and policies in Seoul. SICP provided access to more than 20 million administrative SMG documents, such as internal requests, meeting information, construction project information, and policy research materials. On the SICP site, SMG posted links to 27 internal systems related to government functions that included work process management, an administrative portal, a finance portal, and a construction alert system (SMG 2016). SODP provided over 8,600 datasets with six types of data: files, sheets, charts, maps, links, and open application program interfaces (API). It also provided linked, open data. Data largely fell under 12 categories: health, general administration, culture and tourism, industry, welfare, environment, transportation, urban management, education, safety, safety and households, and housing and construction.

SMG first started focusing on public disclosure of information in the late 1990s to combat corruption and bribery that had arisen in the process of resolving civil complaints and requests. In 1999, a senior SMG official was caught accepting bribes from a private company to alter official paperwork about property administration

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1 As of August 12, 2020.
2 Interview with Sang Bum Kim, 22 May 2020.
In response, the SMG developed the Seoul Online Procedures Enhancement for Civil Applications (or Seoul OPEN System for short), through which citizens could file civil complaints online and also follow how their cases are progressing on a real-time basis. The objective of this system was to reduce private contacts between public officials and citizens in the process of settling a civil complaint.

Beyond the sheer volume of data released, Seoul’s new mechanism for open data and information shifted focus from “disclosing information that citizens requested” to “providing items to citizens before the request.” SMG made most data readily available on portals to enable users to search and browse for items of interest without first having to make requests and wait for approval.

To implement its new open data projects, SMG had to resolve complicated questions including what kinds of data and information to disclose, how to protect personal and sensitive information, how to make data more accessible and useable, and what standards and internal mechanisms to put in place for the more than 10,000 public servants involved in information production. To reform SICP and SODP, SMG reoriented internal culture and awareness, developed standardized formats for data, and established rigorous data monitoring and management practices to avoid leakage of confidential or personal information.

**Delivery Challenges**

**Coordination and Engagement**

**Reorienting Internal Organizational Culture**

Staff responsible for implementing this initiative did not immediately accept the new procedures or adapt their work accordingly. There was great discomfort among the SMG staff with the idea of releasing open data and administrative information (SMG 2014) and several concerns about the implications of the new approach. One such concern was that publishing the raw data could cause misinterpretation and undermine confidence in the reliability of public information (SMG 2014). In one media interview, Dr. Jong Sung Hwang, the former chief information officer of the Seoul Metropolitan Government who led the project at the initiation stage, recalled, “Internally, there were views that statistical information such as the Seoul Survey should not be disclosed. We interpreted this material using the estimating equation formulated based on the raw data. However, if people start interpreting and understanding the survey results in their own way, there would be confusion” (Jeong 2012).

**Project Design**

**Task Sequencing**

Sequencing appropriate tasks for data standardization and quality management posed a challenge for SODP (box 1). SMG produced and located original data within multiple internal operational systems such as internal administrative systems and webpages. Preexisting internal systems used for routine administrative work produced tremendous amounts of data that complicated sequencing tasks for data standardization and quality management.

Ho Jin Kwak, deputy director of the Big Data Division, framed the issue around data governance, (the management of consistent policies from data production to utilization). “There is a question of whether to standardize the operational system and the information system at the same time or conversely standardize the information system first and then expand the process to the operational system,” he said. The former would mean changing the mechanism of internal operational systems, such as administrative portals, to store data with a certain degree of coherence. The latter would involve standardizing data after they were received from their sources while incrementally changing the operational system. The former seemed more efficient because it would enable pursuing a consistent policy from the data production stage to disclosure stage. In other words, it might be more logical to standardize the internal operational system first and then manage data quality while it was being produced.

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4 Interview with Sang Bum Kim, 22 May 2020.

5 Interview with Jong Sung Hwang, 28 April 2020.

6 Interview with Ho Jin Kwak on August 10, 2020.

7 Interview with Ho Jin Kwak, 22 June 2020.

8 Interview with Ho Jin Kwak, 22 June 2020.
Although simultaneous standardization of the operational system and information system might more effectively maintain data consistency, it could be time-consuming, costly, and risky. “Operational systems are where key database are stored, so changing formats and names of the data entails making adjustments to the applications systems that would be affected by changes in the original data,” Kwak said. “You also need to find errors incurred by the change and correct them. It not only takes a long time to make these changes, but also the project needs human resources and budget.” Such an overhaul would create logistical challenges because SMG internal operational systems were used by over 10,000 staff members in their daily work.

**Tracing the Implementation Process**

To establish a functioning and sustainable open data portal, SMG first had to reorient internal organizational culture and address concerns over potential risks of open data. For the SODP, data standardization processes had to be sequenced carefully because of the complexity of preexisting internal data management systems.

**SODP: A Two-Track Approach to Data Standardization and Quality Management**

Rather than sequence reforms one after another, SMG worked on two tracks at once. The city government both pursued timely short-term standardization of data received from individual departments and initiated a long-term plan to standardize internal operational systems. The data standardization and other quality management work took place just before public disclosure of the data without making major changes to internal operational systems. Simultaneously, the Information System Division provided feedback to different operational systems on improvements for data management efficiency. In this way, more data could be released to the public on time without prolonging the project timeline or raising costs. Kwak added that the long-term process of standardizing operational systems required sustained commitment. “Standardizing operational system takes a long time, and it is slow,” he said. “so it is difficult to quickly notice the change. However, changes have been made continuously over the past decade.”

Before standardizing data, the SMG first identified public demand for data by analyzing over 220,000 Twitter mentions about SMG’s public information posted from November 2011 to January 2012 (SMG 2013a). Data were classified under 135 groups belonging to nine large categories: transportation; urban management; culture and tourism; health; welfare; industry and economy; safety; general administration; and environment (SMG 2013a). The result showed high demand for information on general administration, especially related to budget and policy. Environment, urban management, health, and transportation were also popular categories. The social media analysis guided prioritization of data standardization and error correction.

Next, the team had to ascertain which data were available. The team surveyed more than 400 SMG systems to determine the subject, source, nature, redundancy, and availability of data sets (SMG 2014). The survey allowed the team to identify 60 data sets adequate for public

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9 Interview with Ho Jin Kwak, 10 August 2020.
10 Interview with Ho Jin Kwak, 10 August 2020.
11 Interview with Ho Jin Kwak, 10 and 28 August 2020.

**BOX 1. THE IMPORTANCE OF DATA STANDARDIZATION AND QUALITY MANAGEMENT**

Data standardization and quality management are necessary steps for establishing an open data platform in situations in which the integrity and usability of data are concerned. “Data can create synergy when integrated and linked for cross-reference and further analysis,” Hyuk Jin Park, former director of the Information System Division, explained. For the data to be integrated and more useful, information with shared attributes such as a personal name should use related fields. Standardization requires metadata (“data about data”) to provide context and to link related data. If “John Doe” existed under the data field “Name” in one dataset and also under the field “Full Name” in a different dataset, for example, the metadata should show the commonalities between both fields to enable the user to recognize that both entries refer to the same person.

disclosure, which expanded to 150 after including items of high demand and usability (SMG 2014).

Ho Jin Kwak described the development of standards for internal data classification as a difficult but necessary process to better determine which data could be shared with citizens. The work was arduous and required continuous effort, carried out periodically without a set end date.

After receiving data from departments, the Information System Division improved data quality through monitoring, error correction, and standardization of formats and codes according to informal internal guidelines. The staff spent time, for example, reconciling datasets in which personal names were listed in a single column or divided into two columns for first and last names. Because nonstatic data like population counts changed over time, data quality management was a continuous process (see appendix). Sung Woo Leem, former director of the Information System Division, recalled that the team took actions to correct data errors on an ad hoc basis when errors were found, and it was a repetitive and routine process. Overall, the day-to-day process of error correction required prompt action and ongoing communication between departments.

**SICP: Training SMG Staff**

During pilot tests from August 2012 to October 2013, the SMG disclosed 6,117 administrative data sets on the SICP including meeting minutes, internal reports on high-profile projects, white papers on key initiatives, and any information eligible for proactive disclosure (SMG 2015b). Upon the SICP’s official launch in October 2013, internal reports and approval documents of senior SMG officials (at the level of director-general or higher) were automatically collected and disclosed on the SICP in PDF format (SMG 2015b).

Despite the phased approach to project implementation, SMG staff continued to classify documents for nondisclosure. After the SICP launched in October 2013, cases of “information nondisclosure” increased to about one-third of total document production, while the cases of proactive disclosure declined to 62 percent in December 2013 (SMG 2014).

To address SMG staff confusion about the changes to information disclosure, the Information Disclosure Policy Division established by the mayor in September 2012 organized semiannual training sessions for each department. Previously, SMG had lacked an office dedicated to information management, which had been generally handled by the General Affairs Division before then. The new division’s work included information disclosure, record management, and preparation for the opening of the Seoul Metropolitan Archives, which took place in 2019.

“Disclosing information while protecting information subject to nondisclosure can’t be achieved with technological solutions only,” said Woo Sung Kim, former manager of the Information Disclosure Policy Division. “When each staff member produces documents with an awareness that they would be disclosed and protects information for nondisclosure, information disclosure can be achieved effectively. With this idea, we promoted training.”

SMG staff training sessions typically lasted about four days. The training sessions could not accommodate all 15,000 SMG staff, so staff members who received training shared the training information and materials with their colleagues when they returned to work. Key staff in charge of information disclosure in each department received training first, but soon the training expanded to cover more of the staff. The bureau also provided extra training by request and organized separate visiting sessions for offices located outside the city hall.

Subjects covered by the training included the importance of open information, the information disclosure process, previous cases in which disclosure of sensitive information was monitored by the Information Disclosure Policy Division, and ways to avoid such accidental disclosure. Woo Sung Kim noted that the quality of information disclosed ultimately depended on SMG staff’s understanding how to produce administrative work documents in standardizable form.

A strong commitment to the open data and information agenda from the leadership helped resolve uncertainties felt by the staff in the early stage of implementation. “In fact, the will of the management is very important,” said Jeong Ah Song, former senior manager of the Information Disclosure Policy Division.

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12 Interview with Ho Jin Kwak, 12 May 2020.
13 Interview with Sung Woo Leem, 27 May 2020.
14 Interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
15 Interview with Woo Sung Kim, 27 August 2020.
16 Interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
17 Interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
18 Interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
19 Interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
Disclosure Policy Division. The mayor prioritized the disclosure of information as much as possible, and his firm beliefs helped change the way in which the project was perceived by the staff internally.

**SICP: Establishing a Strong Monitoring System**

To avoid accidental disclosure of sensitive or private information while maximizing information disclosure, SMG built a multilayered monitoring system that relied on both technical and human resources. The whole administrative disclosure mechanism consisted of three layers. First, an internal administrative information system automatically collected administrative documents such as internal approval request documents, budgetary information, and research and statistical information. Next, a document disclosure system filtered and masked personal information or any other patterned information such as national identification number or passport numbers. Finally, the SICP enabled citizens to access the final filtered information (SMG 2016).

These systems were useful for filtering patterned information but still risked unintended disclosure of information, despite the rigorous training of producers of administrative documents. The Information Disclosure Policy Division maintained internal data on the kinds of topics that were vulnerable to unintended information leakage and manually monitored over 1,000 high-risk cases among the 10,000 administrative documents produced daily.

In addition, SMG asked the software company Hancom, Inc., to develop a special masking function for a word processing software to enable SMG staff to flag sensitive information. The masked information was viewable by internal staff only and filtered by the document disclosure system when uploaded to SICP. The function was unique to the SMG, despite widespread usage of the word processing software among public institutions throughout the Republic of Korea.

The function also enabled SMG to disclose more administrative documents by allowing a selective filtering of information in documents before making them available to citizens.

**SICP: Enhancing Accessibility to Information**

As the amount of information available on SICP increased rapidly, it became challenging to improve the accessibility of information and provide the information that users were seeking. The Information Disclosure Policy Division regularly performed analysis to determine which types of information were most popular and which keywords were most searched. The team used the results of this research to redesign the database search function to show the relevant information that was most searched on the main page of the SICP. Additionally, instead of showing a single administrative document, the team showed the list of related administrative documents on the same page in order to provide the context of the specific administrative information. The team also increased traffic from search engines such as Google and the Korean search engine NAVER through search engine optimization.

**Outcomes**

**Seoul Open Data Plaza (SODP)**

SODP first opened in May 2012 for pilot operation with the disclosure of 918 internal raw data sets on transportation, environment, urban management, health, and housing (SMG 2015b). For the first time, citizens could access, process, and use raw government data through a single portal for their own purposes instead of receiving data already processed by the city (SMG 2015b).

The amount of data available on SODP continued to grow and by October 2019 had reached 5,400 items (SMG 2019). The number of users increased from 2.3 million in 2016 to 9.3 million as of October 2019 (SMG 2019). Using SMG’s data, new applications have been developed that help citizens use the services more efficiently, particularly those relating to public transportation. One of the most popular examples is the Smarter Subway application.

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20 Interview with Young Sam Zoh, 26 May 2020; interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
21 Interview with Young Sam Zoh, 26 May 2020; interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
22 Korean software widely used by the government and within the public sector in Korea.
23 Interview with Young Sam Zoh, 26 May 2020; interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
24 Interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
25 Interview with Jeong Ah Song and Woo Sung Kim, 12 June 2020.
26 Interview with Young Sam Zoh, 26 May 2020
27 Interview with Young Sam Zoh, 26 May 2020
28 Interview with Jeong Ah Song and Woo Sung Kim on June 12, 2020.
which helps users find the quickest subway route using real-time subway arrivals in open API format.

Furthermore, the data available on SODP provided useful resources for researchers aimed at improving public services in Seoul. Seoul Digital Foundation recently developed a model to predict how many public bicycles Seoul needed for each station to resolve a mismatch between supply and demand with the popular service (Park and Kim 2019). The prediction model was developed for the Seoul Bike management application using the bike rental database from the Seoul Facilities Corporation (which manages Seoul Bike), combined with other data such as weather databases and information on the bike rental stations available on SODP, such as each station's identification code, location, and the number of available bike racks.

Combining public data with private company data revealed useful information about public service management. SMG and Korea Telecom combined city government data such as public transportation usage and the number of registered residents with building databases using telecommunication signals. In the end, they were able to calculate a de facto population of Seoul, which included both registered residents and temporary visitors. When the result first came out in March 2018, the de facto population was 11.5 million, 1.38 million higher than Seoul’s registered population of 10.1 million as of December 2017 (Lee 2018; SMG 2020a; SMG and Korea Telecom 2018).

Even after all these reforms, the SODP system still had room for improvement. According to A Study on Policies to Revitalize the Public Big Data in Seoul (Choi and Yun 2018), more than 92 percent of data (as of August 2018) were serviced in open API format, which had high usability in the private sector. The study, however, found that only 9.1 percent of the total data were regularly updated each month and only 6.7 percent were updated in real time. Of total data downloads, nearly all (99.2 percent) were concentrated in transportation (73.9 percent) and environment (25.3 percent), with little data usage in other categories (Choi and Yun 2018). The study therefore suggested generating new public data that would most likely get high usage, such as energy, finance, and the internet of things (Choi and Yun 2018).

Establishing the SODP had the effect of enhancing data literacy among SMG staff, which Lim called “an unexpected benefit of the project.” Improved staff understanding of data allowed the staff to better use data for city administration. The staff analyzed patterns of car accidents in the city, for example, and developed policy responses such as identifying locations to set up speed bumps to reduce child car accidents and installing facilities around markets and parks to increase pedestrian safety (SMG 2015a).

Sharing his experience of using SODP, Bong Choi, senior research fellow at the Seoul Institute, mentioned that data available on SODP also can be found on other public portals. “Many times, I can obtain the same data through the Korean Statistical Information Service or Microdata Integrated Service,” Choi said. “There are not many raw data exclusively on Seoul City. ... However, the benefits of the SODP is that I can find detailed information on some national statistics, such as enterprise information or gross regional domestic product. Also, some data (for example on Seoul Bike) can be only obtained through SODP.” Choi’s experience suggests that the availability of unique data on the portal made it useful.

**Seoul Information Communication Plaza (SICP)**

After the SICP opened, the information disclosure rate improved (figure 2). The average information disclosure rate was 73.4 percent in 2013, but this increased to 96 percent in 2019. About 58,000 cases were set for nondisclosure every month in 2015, but this figure declined to 7,800 in 2019, showing that much more administrative information is available to citizens (SICP 2020).

The number of visitors also increased from 82,000 in 2013 to over 3.5 million in 2018, which means that on average, 12,000 visitors found Seoul’s administrative information through SICP per day (Yim 2018). According to user behavior analysis carried out through Google Analytics, around 68 percent of users visited the SICP through search engines such as Naver, Daum, and Google (Yim 2018).

The SICP has been functioning as an information repository to “information intermediaries” such as

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29 Interview with Sung Woo Leem, 12 May 2020.
30 Both statistical portals are run by Statistics Korea, a central government organization for statistics.
31 Interview with Bong Choi, 26 May 2020.
journalists and academics and has been able to curate vast amount of Seoul’s information. For citizens, it is not easy to digest SMG’s meeting minutes, internal approval documents, or policy notes without having a full understanding of the context behind those documents. Journalists, researchers, and other interested information consumers could thus play this intermediary role by translating the complexity of SMG’s information, delivering key messages, and thereby improving SMG’s communication with citizens.

Won Yul Lee, a journalist from the Korea Herald Business, explained how the SICP has made his work easier and more efficient. “Seoul [city government] is a large organization, and sometimes it takes time to even identify the SMG staff member who is in charge of an item that I would like to cover,” Lee said. “However, SICP provides useful information for understanding what the key focus of the SMG’s work is, as well as the departments and staff who are leading that work. I usually check administrative documents with the title "A Plan on..." when they are open for the public and look for information that citizens may be interested in knowing. I also think this helps avoid making calls or requesting interviews.”

Zinim Jeong, director of the Center for Freedom of Information (a civil society organization for information disclosure), said that she often used SICP when looking for information about certain policies and decisions made by SMG’s Information Disclosure Review Committee. She particularly noted the ease of finding information on SICP by searching keywords on Google, which provides a list of relevant documents on a certain topic of interest.

On the other hand, she said, a couple of hurdles for more active usage still exist. First, users have to look through a long search result in order to find the information they are seeking. “I think too much information is the same as too little information, to a certain extent,” Jeong explained.

Second, the information is sometimes subject to partial closure, and it is difficult to find important information. “In many cases,” Jeong said, “the administrative documents are open, but the attachments are subject to nondisclosure. The key information is mostly in the attachments, so from a user’s perspective, it doesn’t feel like the information was really disclosed.”

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32 Interview with Young Sam Zoh, 26 May 2020.
33 Interview with Young Sam Zoh, 26 May 2020.
34 Interview with Won Yul Lee, 24 August 2020.
36 Interview with Zinim Jeong, August 24, 2020.
37 Interview with Zinim Jeong, August 24, 2020.
38 Interview with Zinim Jeong, August 24, 2020.
Lessons Learned

Establishing an Open Data System Is a Cyclical, Iterative Process Rather Than a Linear Series of Steps

Opening the city’s data first required standardization and the existence of a quality management process to ensure data integrity and produce powerful synergy when combined with different datasets. Open data, however, did not entail a linear process of public data disclosure. It requires multifaceted processes of communicating with different departments, standardizing data according to international guidelines, correcting errors, and updating data over time.

While standardizing data from the production stage by adjusting internal operational systems sounded more efficient, sudden changes in the existing working mechanisms carried risks, costs, and the potential for staff confusion and disruption.

“Looking back, the early work of open data tended to focus on disclosing what we already have,” Lim said, “but I came to think it is actually a cycle, so we examine exiting data, standardize and manage their quality, and share and receive feedback. If needed, we also need to consider creating new data by repeating this process.”

Persuading Staff and Reorienting Institutional Culture Is the First Step

The idea of open information sharing was unwelcome initially. When the SICP first launched, SMG staff were reluctant to classify information for disclosure. The staff working on SICP, however, believed that the SMG staff had an essential role to play in information disclosure, as they produced and dealt with data in their everyday work. “We cannot exclude them from this,” said Young Sam Zoh, chief archivist of the Seoul Metropolitan Archives and former director of the Information Disclosure Policy Division. “We cannot establish a system without persuading them.”

The Information Disclosure Policy Division consequently provided multiple training sessions tailored and targeted to all grades of staff to help them understand the importance of information sharing and to familiarize them with the information disclosure system. Frequent communication of updated guidelines and real use cases are also expected to help staff learn how to work with confidence in compliance with data protocols.

Create a Multilayered Monitoring System to Ensuring Safe, Long-Term Operation

“Accidents can happen because information disclosure is done by humans,” said Zoh. Many times, administrative SMG documents have been found to contain private or sensitive information not appropriate for public disclosure. Unfortunately, there may be mistakes that cannot be filtered out by the automated masking system. To prevent information leakage, certain categories of documents were monitored each morning by the staff in the Information Disclosure Division. Implementing special software for masking sensitive information enabled all document producers within SMG to monitor their own data disclosure more effectively.

39 Interview with Sung Woo Leem, 12 May 2020.
40 Interview with Young Sam Zoh, 26 May 2020.
41 Interview with Young Sam Zoh, 26 May 2020.
References


Appendix: The Process of Data Quality Management

Quality Diagnostic Plan

- Selecting and surveying items for diagnosis
  - Identify items
  - Collect and analyze output

- Determining Quality Diagnostic Methods
  - Determine diagnostic methods according to the characteristics of systems

- Preparing diagnostics
  - Collect methods for approaching systems and files offered for diagnostics
  - Collect profiling data

Quality Measurement and Result Analysis

- Identifying items for profiling and types of profiling
  - Identify profiling types and columns for diagnostics

- Data profiling
  - Register in data quality management system

- Analyzing results of data profiling
  - Analyze results of different types of data profiling and possible errors

- Producing quality diagnostic report
  - Identify possible errors according to data analysis

Quality Improvement Activities

- Reporting results
  - Send quality diagnostic report to staff in charge and review

- Detecting errors and requesting correction
  - Find out if the data have real errors
  - Provide support to staff for data quality improvement

- Improving data quality and monitoring
  - Run a rediagnosis for the data quality improvement

- Identifying complementary measures
  - Diagnose data quality and identify issues and supplementary measures

- Improving the process
  - Establish complementary measures for data quality management to internalize the whole process

Source: SMG 2013b, 26.
Note: Translated by the author.