



Resiliency through Financial Management Information System Innovations in the Impact of the CoViD-19 Pandemic

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Abstract

As the global community deals with the financial and economic effects of the CoViD-19 Pandemic, many nations struggle as they allocate funds, monitor their economy, and enact policies preventing further socioeconomic decline. This study aims to identify and understand the instances when these systems in the Philippines and South Korea were used amidst a global pandemic by enabling resiliency and understanding the application of innovation and technologies in these solutions. This study made use of a literature review to review qualitative articles, journals, research, whitepapers, and quantitative data to provide an insight into the objectives that made use of convenient sampling to choose the systems/countries/instances to be chosen. After reviewing 2 instances and scenarios, it was found that both systems; a digital Budget and Accounting System from South Korea and a National Retail and Payment System (a part of PhilPaSS), performed exceptionally on what they were intended to do. While South Korea's d-Bas/d-BRAIN allowed for effective asset and budget management, the Philippines' PhilPaSS allowed an effective decision support system to its respective government institutions or organizations. Conclusively, combining what the two systems were able to achieve and their functional model provides a good insight into how these FMIS systems will truly enable Global financial resiliency and financial information integration.

Keywords: *Information Systems, Financial Management Information System (FMIS), Accounting System, Financial Resiliency, CoViD-19*

1. Introduction

Before the Corona Virus Disease-2019 (Covid-19) pandemic took us to embrace the new normal in an ever-changing world that has taken the lives of many in our nations and impacted our lives, the world was under growing rapid Globalization, as described in an article by Lund et.al (2019), which made supply chain and trade interconnected that provided harmony for companies, businesses, organizations, and governments to expand further in Economic Prosperity. The world has seen the great economic prosperity that recovered from the 2008 Financial Crises that shocked many investors. While optimistic that markets are returning better than before the 2008 crisis, the ever-growing fears once again that one might see the economic crises hit once more. Rising Inflation and Consumer costs bundled by rising interest rates bothered investors that we might be seeing a Market Crash once again as described in an article by the FX Empire Editorial Board (2013). While the United States is only one market, the financial implications made by the interconnected trade and globalization made these risks ever more important that it not only affects one country but the whole world due to factors such as an interconnected Supply Chain Network (SCN) and interconnected Financial Institutions utilizing the Global Trade and Investments.

As predicted by FX Empire Editorial Board (2018) and many news outlets such as The Wall Street Journal, their fears came into reality when the 2020 Stock Market Crash occurred. However, unlike what these articles have predicted, we saw the stock crash being caused not by interest rates or the Yield Curve but an Epidemic in Wuhan China that eventually turned into a pandemic, published by a public press release of the World Health Organization (2020). Based on the work of Amadeo, K. (2020), investors were to scramble to companies resilient to the pandemic such as Microsoft, Google, Amazon, Moderna, Pfizer, and Johnson and Johnson to name a few. These companies however are essential in nature to the new normal working and studying behaviors we all know and went to adapt in our home quarantines back in 2020.

Many Organizations, Businesses, and Governments tackle the need to adapt to a changing socio-economic landscape that created an ever-growing need for FMIS innovations to effectively manage assets and funds became more fundamental in the growing demands of its shareholders, constituents, partners, and



customers. Reviewing the impact, the scenarios, and the responses of such government institutions will enable knowledge to further improve global mitigation efforts from future global economic threats such as a global pandemic.

2. Objectives

The objectives of this study are to identify the effective criteria and factors of Financial Information Management Systems (FMIS) in relation to how two countries: South Korea and the Philippines applied those effective criteria based on the factors and impacts brought by the CoViD-19 pandemic in mitigating the adverse effects of its economic impact.

3. Materials and Methods

This study will make use of a literature review as its research methodology to be able to provide a timely and relevant resource that will draw insights to provide an overview of the research objectives being investigated (Fink, 2020). A Narrative Approach will be used in this literature that will identify patterns and trends across the same or other literature to identify gaps, identify scenarios, and identify possible inconsistencies that would allow the establishment of context for a comprehensive, critical, and objective analysis of the research problems and objectives (Baker, 2016).

The primary literature used includes the use of qualitative and quantitative figures and data based on international and local governments, and organizations chosen such as legitimate News Articles, Journals, past, and other researches or literary review related to the topic and objectives sourced from databases such as Science Direct, Google Scholar, and SAGE Journals on which the scenarios countries chosen and depicted will be based on the convenience sampling method due to the number of relevant data that will allow this narrative literature review to provide an outlook on the objectives at hand.

4. Results and Discussion

4.1 Criteria and Factors

The effect of the CoViD-19 pandemic in every nation became important once after the 2020 Stock market crash occurred. We have gone from being a Globalized group of nations to localized nations that led to the disruption of Supply Chains, which led to the economic crises that all nations must endure (IMD, 2020). The criteria on which we can determine the effective resiliency of a certain solution include The Implementation, Innovation, and the application of Innovation and practical technologies. Effective resiliency is defined as the ability of a certain solution to remain in operation or the system's ability to adapt to ever-changing and abrupt changes to its environment (Leveson et al. 2006). The environment in which this study aims to understand is its resiliency and ability to conform to ever-growing needs amidst an ongoing health pandemic. According to Ågerfalk, Conboy, & Myers (2020), Information Systems during the CoViD-19 allows the depiction of value by which the ability of these systems to effectively collect, manage, and transform information to more usable knowledge will allow organizations to make use in better utilization in decision making.

Based on the journal of Thong, Yap, & Raman (1994), to measure the effectivity of the solution mentioned is to compare which and what criterium was met in terms of organizational goal in implementing such systems in the first place, including a lack of internal technical knowledge, which the same literature said was one of the highest points of failure in which these systems are improperly implemented. The same study also mentions the effect of management-based decisions and the economic status of the organization in question that influence the general outcome of the overall system implementation. Understanding how each case was implemented and understanding the inner working on the decisions made while implementation gives us the overall direction of the solution itself.

According to Swanson (1994), Information Systems Innovation can be categorized into three types: Type I, Type II, and Type III. Type I innovations include the addition of Information systems in a single business task or activity. However, Type II innovations include the inclusion of such Information systems to provide analytic and statistical aid towards managerial or administrative planning and decision. Lastly, Type



III innovations include the inclusion of such information systems to the internal workings of the “core” of the organization as described in the same study. Based on the same literature, knowing how these systems were developed from implementation as mentioned in our first criteria and factor to its primary and practical use after development would allow this study to provide a developing story on whether how these solutions handle these solutions to a timely manner to meet ever-changing demands.

4.2 South Korea

Based on the Korean Public Finance Information Service (KPFIS), the Korean Government in 2004 initially developed the plan to integrate and create a financial solution for the majority of all Korean Government Agencies that aims to strategically plan, spend, and track government funds in real-time that allows them to scale the government’s assets and budget more effectively and efficiently through the means of allowing officials to strategically see data to react to sudden changes in Korea’s Sociopolitical landscape. The System was named d-BAS and was using d-BRAIN as it is the backend. D-BAS, which stands for the digital-Budget and Accounting system, is considered as the beating heart of the Korean Financial Management System that integrates it with government assets and funds to it is the central economy with linking to its financial institutions that essentially makes their FMIS self-aware, which was the reason the system was also called the d-BRAIN or the Digital Brain as it was praised by the KPFIS as its strategic system (comparing a human brain’s thinking on scenarios).

Jeong (2021), describes South Korea as a nation with great economic resiliency, which Jeong describes as their great and fully integrated online shopping economy, the demand for their greatest exports of electronics (such as 5G chips, semiconductors) that remains in growing demand as most people remain in their homes getting more connected to the Internet and using it as their primary means of communicating with their peers. Zastrow (2021) describes the nation’s response as one of the best as it focuses on strict contact tracing and aggressive testing of its population, which is made possible by the massive resiliency as described by Hwang (2020) as the means of the nation’s FMIS automated response that allows it to further relocate budget effectively and efficiently to support the nation’s testing and tracing program. Aside from the CoViD-19 Stock Market Crash, the 1997 Asian Financial Crises remained a lesson for the nation to build better resiliency for the upcoming or possible crisis to come (Fackler, 2011).

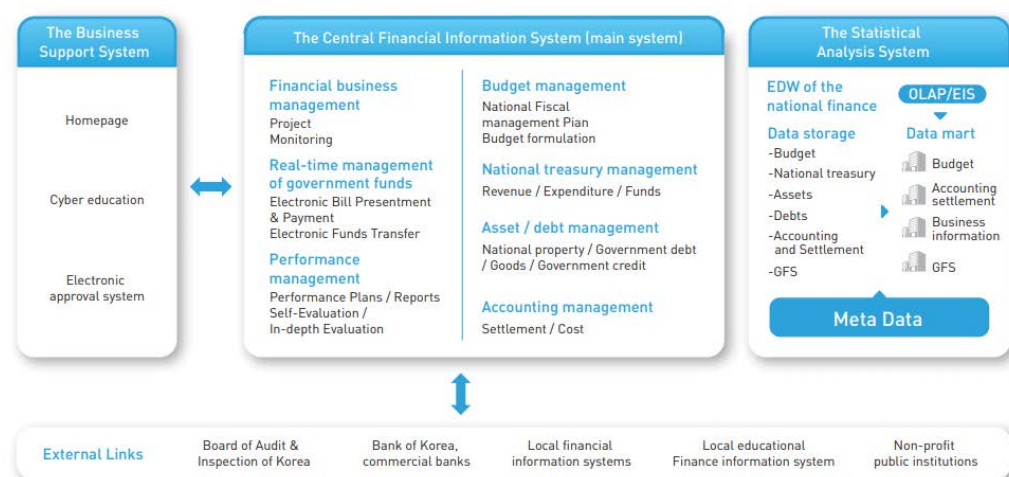


Figure 1 Korean e-BAS Framework. From the Korean Public Finance Information Service (n.d)

According to the Whitepapers made by the Korean Public Finance Information Service (n.d), the d-BAS was designed to integrate with Korea’s overall economy. The Business Support System is composed of the Homepage, Cyber education (which educates users of the systems on it is proper to use or new features), and an Electronic approval system for fund requests or bidding/procurement. The CFIS (Central Financial

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Information System) is considered the heart of this system as it is considered the planning, spending, accounting, and budget management plugins of the entire e-BAS or simply it manages the Government's funds and assets. The Statistical Analysis System is considered the Business Intelligence Component of the FMIS as it allows the system to manage, collect analyze and interpret data either for automated actions/uses or the means for its officials to make economic decisions.

An article published by the World Bank (n.d) provided insights on what d-BAS and the South Korean Financial Management Information System has to offer (FMIS). It was one of the first systems that pushed for stronger citizen participation not only of individuals but also of public enterprises in a nation built on a Highly Technological landscape allowing the South Korean Government to push towards automation of Data insights that allow its officials to use this system as a real-time support system that functions more of like a Business Intelligence Component. The uniqueness of South Korea's approach is its level of integration towards its overall economy. Allowing rapid, fast, and automated diversion of funds as needed like for say in a public health emergency that allowed them to early on allocating funds for their aggressive testing and contact tracing strategies, which made the system highly proactive to such cases.

South Korea, while a capitalistic nation, did makes use of its Digital economy as it continues to provide basic and essential services to its citizen. A publication made by PreventWeb (n.d), states that the government was successful in utilizing key infrastructure already integrated into South Korea's government and allowed them to implement CoViD-19 Restrictions without creating too strict quarantine protocols and made use of mandated Information systems to keep track of its Citizens through innovative contact tracing solutions. With good policies, bundled with carefully, efficiently, and effectively managed funds thru their Financial Management Systems, they were able to push thru with these pandemic programs.

World Leading Economies such as the United States, China, and the European Union lacked in integration due to fragmentation in funds, policymaking, and governments. In Example, the United States while having a Federal Government still have separate state policies enforced making a nationwide implementation of funds (and their FMIS) to be fragmented with the Federal Government and its state funds having various effects in fund management and policymaking. This issue was more relevant when massive applicants flooded the state's unemployment application system amidst the employment losses in 2020, which resulted in a 600 thousand applicant backlog based on Pena (2020)'s report on the news article. It is not yet including the different state policies and that some states do these benefits on a manual scale.

The comparison on how South Korea and the United States handle sudden economical shifts is that the United States, The EU, and China are more Reactive due to the Capitalistic nature of their economies than South Korea being more in a Proactive Approach. Hence each nation (like in the EU) or state (like in the United States) uses, processes, and/or manages funds on their own Financial Management Systems with their higher body (in the case of the United States is the Federal Government and the EU Government for the EU nations) as their overseeing and supporting institutions, leading to the non-integration of such funds that slowed down fund and asset management in emergencies.

South Korea, on the other hand, is one of the first in the world to introduce a Universal Income Scheme, which allowed the low income to no income has a basic level of income to support their everyday lives. It does not only lower poverty but also enables the stimulus of the Local market amidst a growing pandemic. It was made possible by South Korea's resilience enabled by its wide integrated economy that was made possible with the strives in their Financial Management Systems that allowed them to focus more on their constituents and gain more value for every taxation made in their nation (government funds).

4.3 Philippines

The Philippines is one of the hardest-hit nations during the covid 19 pandemic as one of the worst-performing nations in the Southeast Asian Region (SEA) that saw its GDP shirk by 9.5% on the data by Venzon (2021). Industries and factories closed as the Philippines undergoes one of the strictest Lockdowns in the world. A news article by Ridby (2020) on the Telegraph, describes the impact as a Big Turning point for each Filipino's lives that effectively cripples many industries with the transportation sector being described in the articles as one of the native modes of transportation unique to the country has left jeepney



drivers with empty pockets awaiting what is to come for their future. In a nation where the majority live on the edge of what they earn, Rigby (2020) describes the event as inevitable as the Philippines experience these strict lockdown policies.

While some industries succumbed to the pandemonium to the economy that Covid -19 brought, many have risen and the digital transformation of the Philippine Economy became more relevant as more people switch to delivering what they need due to the shift caused by what the Philippine government calls “the new normal” (Bernie, 2020). One relevant conglomerate that shifted this focus was SM Group, which launched its all-digital platform SHOP SM Online on October 9 (ABS-CBN News, 2020). The SM Group most known for its brick-and-mortar stores and malls as its main revenue growth has been expecting the shift as more Filipinos, we are advised by the government to stay at home for essential travels and depicted the shift as an evolution from its main and core business. The gains and benefits were not only seen by enterprises shifting to the new digital economy but existing players themselves. An ABS-CBN News (2020) article noted online giant Lazada Philippines an increase of 250 percent in their sales as it enters the Fresh Groceries and the Medicine Delivery Service by December and is expected to rise more as its platform is seeing more growth due to the influence made by the pandemic on consumer behavior. With more consumers being online and transactions become digital, a Financial Market Infrastructure (FMI) must be developed to shoulder this need.

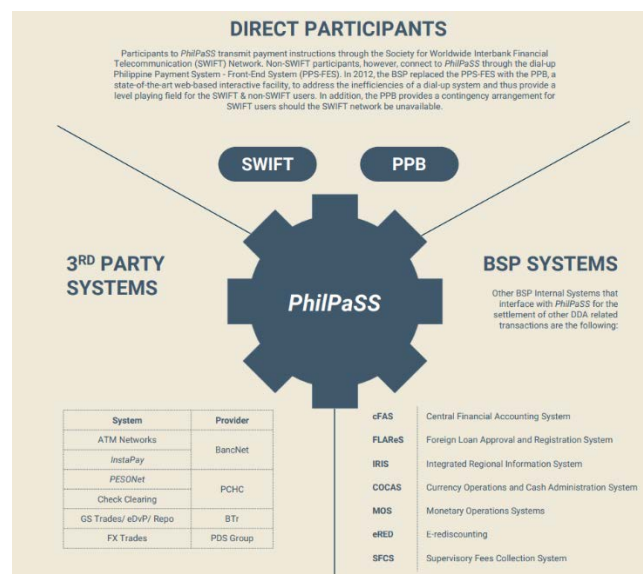


Figure 2 PhilPaSS Framework. From the Banko Sentral ng Pilipinas (n.d)

The Philippine Payment and Settlement System or PhilPaSS is part of the National Retail Payment System (NRPS) that enables the Philippine Central bank to enable consumers to transact with businesses or with other consumers creating a secure, efficient, and effective financial payment System. PhilPaSS is an integral component of the Banko Central ng Pilipinas (BSP)'s portfolio it's Financial Management Information System as the institution is responsible to overlook the Philippines' economy. As seen in Figure 2, PhilPaSS is an integration component that combines BSP's Financial Management and Information System with consumer activity via third-party integrations from the NRPS and its international counterparts (SWIFT and PPB). The inclusion of the NPRS essentially will allow the BSP to have a clearer outlook and direct regulation to the ever-growing economy of the Philippines, aiding in government and financial management in budget and procurement employing economic data (Banko Sentral ng Pilipinas [Whitepaper], 2019).

A Speech made by Diokno (2020) defined the National Retail and Payment System as the key to the Philippines' resilience against CoViD-19 as it hits the retail sector. InstaPay, which Diokno describes as a



key alternative to cash and PESONet as a key alternative to checks and bulk transactions, became a clear incentive for the institution, the BSP, to continue in pursuing a digital transformation in the nation's economy. The use of Instapay and PESONet rose by 624% and 130% due to more consumers using these facilities as they follow government quarantine restrictions. It was enabled by the fact that the NRPS is integrated deeply into the financial system (i.e. independent Universal Banks and Commercial banks), which allowed it to be in the reach of many consumers and businesses. Going forward, Diokno stated that his vision for BSP was to utilize these systems to enable the Philippines to go from a "cash-heavy" economy to a "cash-lite" economy. The success of the NRPS was attributed to the participation of most of the Philippine banking industry and an increase in demand the effect of its success and adoption was greatly intensified when during the pandemic, many banks waived the payment processing fee in doing Instapay and PESONet transactions (Cordero, 2021).

The NRPS presents a new means in digitalizing the economy, which unlike global powers like the United States and European Union that heavily rely on card networks, allows direct consumer-to-consumer (C2C) transactions and consumer-to-business (C2B) transactions through heavy integration through its financial framework. With this kind of system, local businesses may be able to transact effectively and efficiently with each other without the need for a card payment network and allows real-time, effective, effective, and direct bank credit of their transactions, which would essentially empower local businesses and startups to have a greater financial reach in a growing financial market essentially allowing BSP to have more data points regarding its nation's economy (Berkowitz, 2021). Bancnet, Instapay's operator made use of its existing partnership with its ATM network (as the largest in the nation) to essentially enabled the use of the NRPS with its existing clientele of universal and commercial banks. The use of an existing network and reengineering them to support these systems allowed the existence of Instapay and contributed to the overall acceptance of financial institutions in the country (Villanueva, 2021).

4.3 Discussions

Table 1 Summary on the comparison of two country cases

Case / Country	Technology Application	Innovations	Remarks
e-BAS & d-BRAIN / South Korea	<ul style="list-style-type: none"> Interbank network integration Web-Based Government Resource Planning System Web-Based Front-End 	Type I	Used in all financial and economic tasks giving more data points.
		Type II	Used as a Decision Support Aide in Redirecting funds as necessary for pandemic response.
		Type III	Tight integration as a part of its government financial management from the public (every agency) to the private sector (such as the banking).
			Integrated Government Asset, Procurement and Budget Management System both public sector, private sector, and government sector use.

**Table 1** Summary on the comparison of two country cases (Cont.)

PhilPaSS / Philippines	<ul style="list-style-type: none"> • Internetwork 3rd Party Integration: BancNet PCHC, BTr, PDS Group, etc. • API based System 	Type I	Used only in BSP Regulated and operated entities tasks.	Financial Payment and Financial Management System for use only in the financial sector to facilitate automated management of interbank / inter-financial network transaction.
		Type II	Used as an aide to support economic target and basis for government economic decisions	
		Type III	Only integrated wholly as a “core” in BSP itself not in use as an inter-agency effort for fund management.	

Upon analyzing and understanding South Korea comparing to the Philippines’s case, it was seen that the outlook on how South Korea has used a Financial Management Information System and the timeliness it was implemented allowed it to be resilient in such sudden Economic changes in the landscape of a growing health pandemic. As seen in Table 1, effective fund management allows governments to enact rapid, effective, and efficient government solutions lessening the effects of an economic recession on its constituents. South Korea’s wide access to funds due to the tight integration within its economy allowed for fast reliable, effective, and efficient fund access for policy reforms. It also allowed efficient management of its assets that allowed effective management of current resources and with the help of the tight integration of Banks and industries (Public and Private) allowed further stimulus to its industries (which was further improved of the importance of South Korea’s exports such as Electronics, and others that remained essential amidst the pandemic).

The Philippines’ Financial Management Information System bundled with its implementation of a Financial Market Infrastructure (FMI’s) introduced more data points for its government regarding the health and state of its economy. It allowed the consumers to benefit by having an effective, efficient, and direct means of doing financial transactions and benefited the financial institutions and or governments by either inducing the economy through growing the digital economy and creating more data points to be more integrated with BSP’s Financial management and Information system. Combining effective government budget management systems as seen in the case with South Korea and inducing a Retail Payment System that provides more data points as seen in the case of the Philippines will allow for governments to provides a combined role-model solution that effectively will allow their greatest economic strengths and allow the leverage to manage resources in a nation.

These two solutions from the Philippines and South Korea depict two different types of aspects and perspectives of an information system utilized to allow the resiliency of their respective constituents. While the majority of PhilPaSS’ functions are leaned towards being a Real-time Gross Settlement System (RTGS), which according to the Bank for International Settlements (1997) is a system that facilitates internetwork fund transfers. The addition of other subsystems from BSP’s system allows PhilPaSS to function more like a hybrid of both a Financial Management Information System and a Real-time Gross Settlement System that shows rich economic data and knowledge allowing for quick and responsive economic reforms for its government. It, during the pandemic, was one of the Philippine Government’s primary key factors in considering lockdowns in the nation (Yu et al, 2020).



5. Conclusion

Financial Management Information Systems provides critical insights, essential decision support, and essential financial management for its intended use cases. While both the Philippines and the South Korean FMIS implementation have different intended functions, they were both competent in their intended functions in providing both their respective governments and organizations either the needed asset or the needed information to enact policies. While the South Korean d-Bas and d-BRAIN allow for effective fund reallocation, the Philippines' PhilPaSS allows for strategic decision support, which is both the functions of an FMIS. Combining these concepts can allow a Financial Management system to enable resilience through effective implantation of applicable technologies by means of innovation. The cases depicted earlier are insights into how capable FMIS' could be useful not only to consumers, organizations but also to governments while this study was only able to cover 2 countries, further studies must be able to include more applicable systems and instances that will allow further research on a greater view of what Financial Management Information Systems can enable not only in nations but the application of these concepts in an inter-nation global integration and financial market, budget and asset management.

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