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Linking Antecedents, Processes, and Outcomes of Public Sector Innovation: A Complexity Theory Perspective

Asma Omran Mohammed Alkhayyal Alteneiji[1]*, Syed Awais Ahmad Tipu[2], Abu Elias Sarker[2]

[1]DBA Candidate, College of Business Administration, University of Sharjah, Sharjah, United Arab Emirates, [2]Department of Management, University of Sharjah, Sharjah, United Arab Emirates. *Email: u19106229@sharjah.ac.ae

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ABSTRACT

Drawing upon the complexity theory, the current study posits that public sector innovation (PSI) occurs in a complex adaptive system underpinning interactions' effect between antecedents, processes, and outcomes of PSI. This rejects the notion of the traditional perspective of examining PSI through an Input-Process-Output framework. Four case studies of Federal Ministries in the United Arab Emirates are examined in which Government Excellence Model (GEM) was implemented. The findings revealed that the approaches adopted by selected ministries reflected self-organizing networks with feedback loops highlighting dynamic evolution. The national leadership vision, sense of competitiveness, and co-creation with the community played a significant role in implementing PSI. The current study focuses on the UAE's locally developed GEM, a model that introduces a novel philosophy centered on government entities' outcomes. It aligns these outcomes with government performance, citizen satisfaction and happiness, and competitive rankings. It intends to demonstrate how GEM sustains and shapes results across economic, social, and environmental dimensions.

Keywords: Public Sector Innovation, Complex Adaptive System, Antecedents, Processes, Outcomes, United Arab Emirates
JEL Classifications: M0, M1, O2, O3

1. INTRODUCTION

The call for new approaches towards innovation in the public sector has emerged in the past (Bommert, 2010; Farazmand, 2003; 2009). Eventually, innovation has gained public sector attention as many governments have undertaken radical steps to embrace innovations in public service delivery. As a result, the literature on public sector innovation (PSI) has also recently seen burgeoning growth. A wide range of conceptualizations of PSI exist. The review of available PSI literature reveals that innovation is viewed through the lens of the traditional input, process, output (I-P-O) approach, underlining a single-cycle linear path (Ilgen et al., 2005). Moreover, most of the studies remain descriptive in nature and fall short of empirical inquiry into better understanding the dynamics of PSI.

From the theoretical standpoint, various dimensions of PSI are explored in the literature, which suggests a broad appeal. The literature appears fragmented to some extent, given the coverage of myriad topics related to PSI. It covers definitional issues, PSI types (Chen et al., 2020), determinants such as national context (Cinar et al., 2022), measurement issues, outcomes, and barriers (Cinar et al., 2021). However, it is pertinent to note that the processual view of PSI dominates in the theoretical discourse. In this regard, existing models of PSI explore determinants or antecedents, processes, and outcomes of PSI with little or no focus on the role of interaction effects (Cinar et al., 2021; De Vries et al., 2016; Di Giulio and Vecchi, 2023; Ek Österberg and Qvist, 2020; Lewis et al., 2018; Salge and Vera, 2012).

It is imperative to consider the interaction effects given that organizations are open systems and innovation continuously evolves due to interactions with antecedents, processes, and outcomes (Giudici et al., 2018). This is congruent with the basic premises of Complexity Theory (CT), which allows understanding

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the interplay between the antecedents, processes, and outcomes of PSI. Drawing upon CT, Complex Adaptive System (CAS) posits that interaction among involved agents, such as individuals and sub-systems, determines outcomes. CT underpins self-organizing networks, which cause system coevolution (Braz and de Mello, 2022). Moreover, changes in CAS occur nonlinearly because system components interact through a network of feedback loops (Anderson, 1999).

Given that PSI has not been empirically examined before in the context of CAS, the current study is the first one to apply complexity theory and study public sector innovation in the UAE. It aims to address this gap and make two distinct contributions. First, it deepens our understanding of the dynamic circumstances in which PSI occurs in CAS by exploring the interaction effects between external and internal factors, processes, and outcomes of PSI. Second, drawing upon four detailed cases of the Federal Ministries in the United Arab Emirates, an in-depth examination of PSI, such as implementing the Government Excellence Model (GEM), provides valuable insights that policymakers and administrators can consider for the successful implementation of innovation initiatives and their sustainability.

In light of the above-mentioned research gaps and potential contributions of the current study, the following research questions are put forth:
Research Question 1: What are the PSI antecedents, processes, and outcomes in CAS?
Research Question 2: How do the antecedents, processes, and outcomes of PSI interact with each other in CAS considering the example of the Government Excellence Program in UAE?

The remainder of the paper is structured as follows: First, it presents the theoretical background and research methodology. This is followed by key findings, discussion, implications, future research directions, limitations, and conclusions.

2. THEORETICAL BACKGROUND

2.1. Complexity Theory in the Context of the Public Sector

By nature, the innovation process is evolutionary, interactive, unpredictable, and emergent (Chae, 2012). While facing uncertain economic and environmental challenges, governments worldwide are becoming more entrepreneurial in delivering sustainable public services. Due to the growing importance of PSI in today's turbulent environment, it is pertinent to employ CT and take the CAS perspective in exploring the dynamics of PSI. Drawing upon CT, the CAS suggests that the interaction between involved parties determines system outcomes and highlights interdependencies among various system levels (Rhodes and Mackechnie, 2003). In other words, the development of the system depends on the interaction of the parts as it shows emergent patterns (Klijn, 2008). The key elements of CT include non-linear dynamics, adaptation, and evolution (Schneider and Somers, 2006). Klijn (2008) contended that self-organization, co-evolution, and various feedback mechanisms are key elements of CT and are pertinent to consider in the public sector context.

Researchers have identified CAS as a potential framework to be employed in public sector literature (Klijn, 2008; Rhodes and Mackechnie, 2003). CT has helped public administration scholars examine governance processes (Teisman and Klijin, 2008), understand institutional effects, identify best practices to manage complexity (Eppel and Rhodes, 2018), and enhance public program implementation (Castelnovo and Sorrentino, 2018). However, our understanding of examining PSI through the lens of CT is incomplete. Therefore, the current study extends the debate on CT in the public sector and applies a CAS theoretical lens in examining PSI dynamics.

2.2. Existing Conceptualizations and Main Strands in PSI Literature

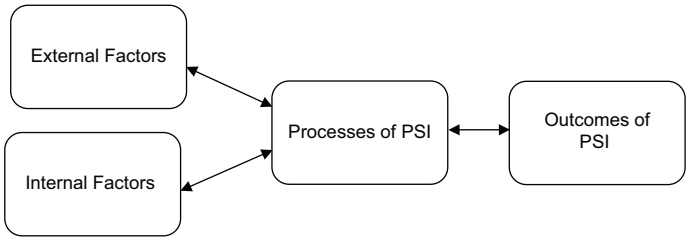
Existing conceptual models of PSI provide linear view of PSI and in many instances incorporate few determinants (Cinar et al., 2021; De Vries et al., 2016; Di Giulio and Vecchi, 2023; Ek Österberg and Qvist, 2020; Lewis et al., 2018; Salge and Vera, 2012). The literature also explores the types of PSI, the role of technology (Velsberg et al., 2020), the barriers of PSI process (Cinar et al., 2021), and the environmental determinants of PSI (Bernier et al., 2015). Korac et al. (2017) reported environmental antecedents of innovation adoption, such as socio-economic factors, competition, and citizen expectations. Other environmental factors include globalization and competition (Ansell et al., 2023) and economy (Cinar et al., 2022).

In addition to environmental factors, organizational antecedents of PSI are also explored in the literature. These factors include experimentation, motivation to make improvements, feedback to employees (Demircioglu and Audretsch, 2017), perceptions of organizational stakeholders regarding innovation adoption process (De Vries et al., 2018), customer and learning orientation (Salge and Vera, 2012), role of leadership in enhancing innovation capacity (Lewis et al., 2018), resource availability (De Vries et al., 2016), and employee autonomy, empowerment and participation (Al Zahrani, 2012; De Vries et al., 2016). The process of PSI underpins implementation mechanisms within the organizations (Mergel, 2015). Various outcomes of PSI are mentioned in the literature, including citizen participation and satisfaction, increased efficiency, and effectiveness (De Vries et al., 2016), faster delivery, and enhanced user satisfaction (Arundel et al., 2015).

Overall, the review of the available literature shows limitations of existing studies as most PSI literature takes a linear or sequential perspective of PSI and provides limited insights into the dynamic interactions among external and internal factors, processes, and outcomes of PSI. It is insufficient to view the dynamics of PSI linearly or sequentially. Therefore, better understanding the circumstances in which PSI occurs will benefit governments in embracing innovation in varying contextual settings.

Drawing upon the limitations of the available literature, the current study examines the interaction effects among the external and internal factors, processes, and outcomes of PSI. The basic research framework of the current study is shown in Figure 1. The model highlights the interactions among internal and external factors, processes, and outcomes of PSI in a complex adaptive system.

Figure 1: Study framework – External and internal factors, processes, and outcomes of PSI in complex adaptive system



3. RESEARCH METHODOLOGY AND DATA

Multiple case study design was employed in this qualitative research. Multiple cases generate a more robust theory and enhance external validity (Yin, 1994). A theoretical sampling technique was used, focusing on cases considered suitable for illuminating and extending relationships among study constructs (Eisenhardt and Graebner, 2007). Multiple case designs, interview transcripts, and document analysis enhance the validity and reliability of a study (Yin, 2009). In particular, reliability was achieved by conducting interviews, preparing interview transcripts and related observations as concrete as possible, and developing a case study database. Further, internal validity was achieved through within-case analysis, and external validity was ensured through replication logic in multiple cases and comparison of evidence with extant literature (Agarwal et al., 2020).

3.1. Research Context- PSI in UAE- the Case of GEM

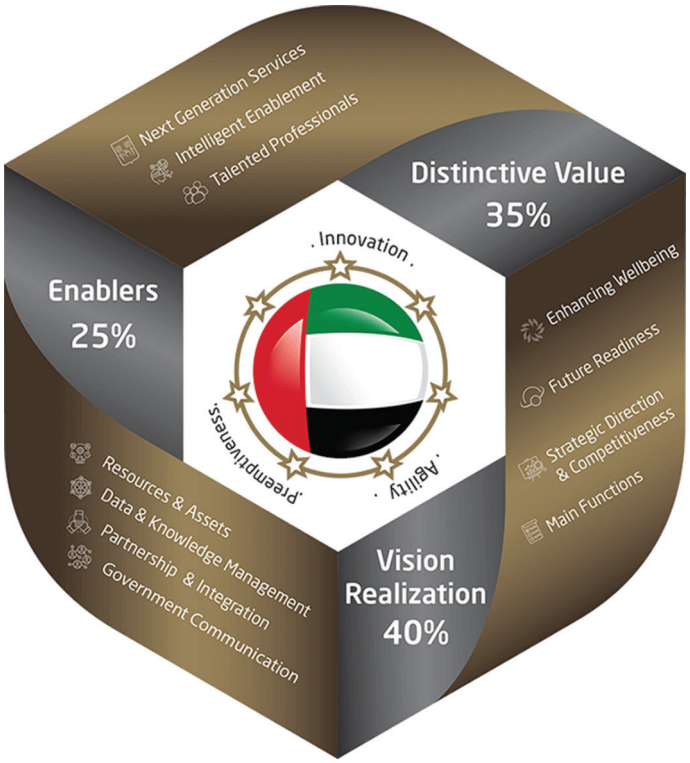
Globalization, the global financial crisis, and the need for competitiveness posed significant challenges to the UAE. The country also has a growing demand for improved public services. The UAE's innovation journey began in the late 1990s, but the innovation efforts were intensified during the following decade. The UAE's national leadership encouraged innovation, emphasizing service quality and excellence. Innovation has become necessary, resulting in significant performance improvements (Khalid and Sarker, 2019).

National leadership in the UAE has prioritized PSI as the country faces the challenges of volatile oil prices and the need for a service-based diversified economy. The increasing demand for an innovative, efficient, and effective public sector to improve public service delivery has been envisaged by UAE leadership. Furthermore, the UAE has established a multi-faceted strategy known as the National Innovation Strategy (NIS), which lays out the country's route to national innovativeness (Parahoo et al., 2017). The GEM is the UAE's innovation trajectory hallmark. Beginning with a modest approach of TQM, the GEM has become an integrated and comprehensive platform of PSI. The basic components of the UAE GEM framework are shown in Figure 2.

3.2. Selected Cases

Multiple case study design included two federal ministries and two federal government independent authorities for examining the implementation of GEM in UAE. The selected entities include the Ministry of Interior, the Ministry of Economy, the Federal Authority of Identity, Citizenship, Customs and Port Security, and the Telecommunications and Digital Government Regulatory Authority. These entities were selected because they were winners or finalists during the 2022-2023 Mohammed Bin Rashid Government Excellence Award round. The details of these organizations are presented in Table 1.

Figure 2: The UAE Government Excellence Model (Sheikh Khalifa Government Excellence Program, 2020, p. 24)



3.3. Interviewees' Details

An official request was sent to the senior officials in selected organizations for participating in the study. After getting the briefing about the study objectives, the participants consented to participate. The details of the interviewees are presented in Table 2.

3.4. Data Collection

Semi-structured interviews were conducted with senior officials in the selected organizations. Interviews were recorded and detailed notes were taken. For data triangulation, organizations'' websites were also reviewed for supplementary information and analysis of internal documents used in implementation mechanisms of GEM, such as assessment and feedback reports. Given that one of the authors was employed in one of the selected organizations, access to internal organizational processes and key documents was available. This facilitated verifying and validating the findings of primary data.

3.5. Data Analysis

Gioia et al.'s (2013) methodology was employed for data analysis. First, open coding was done, in which 48 codes were identified. These were then reduced to 33 first-order categories, followed by nine second-order themes, resulting in 4 aggregate dimensions. A complete data structure is presented in Figure 3.

4. RESULTS

Table 1: Details of selected cases

Case	Name	Established	Entity type	Entity activity	Vision	Initiatives
Case 1	Ministry of Interior	1971	Federal Ministry	1) Protecting the security of the state against domestic threats, setting the general policy for the prevention and control of crime and supervising its implementation. 2) Establishing and organizing the federal security forces and supervising them 3) Coordinating and enhancing cooperation among police forces across all emirates 4) Supervising the traffic safety system on federal roads 5) Ensuring the protection for lives, facilities and property	To have the United Arab Emirates as the best country in the world in achieving safety and security	• Average Response Time to Emergencies Index. • Ben Warika service. • Sense Of Security Index. • The "UAE Mystery Shopper" application • "Council of Happiness and Positivity." • Government Services Observatory. • The Government Accelerators Initiative. • Innovation Incubators.
Case 2	Federal Authority of Identity, Citizenship, Customs & Port Security	2004	Federal Authority	1) Registering personal data for the whole population. 2) Registering the vital statistic data and connecting the same to the personal data 3) Setting the general policy in terms of nationality affairs, passports, entry and residence of foreigners 4) Preparing regulations, laws, rules and procedures governing nationality, passports, entry and residence of foreigners in the State and issuing them in accordance with Law	A reliable identity for a pioneering security system that enhances the attractiveness of tourism and facilitates business for a safe society	• Smart service of issuing citizens passport 24/7. • "Mabrouk Ma Yak" package. • "Closer to You" initiative for students. • The "UAE Government's Promise for Future Services." • "Digital Identity" project. • "Digital Wallet" project. • Innovation Month initiative.
Case 3	Ministry of Economy	1971	Federal Ministry	1) Increase the contribution of small and medium-sized enterprises to non-oil GDP 2) Increase foreign direct investment flow to the future economy sectors 3) Raise the growth rate of non-oil GDP 4) Improve per capita gross national income 5) Enhance the UAE's position on the Global Entrepreneurship Index 6) Increase the UAE's ranking on the Global Innovation Index	Resilient and sustainable global economy for leadership and prosperity	• The Gender Balance Index. • Ministry of Economy office in the Metaverse. • The government experience exchange program. • Customer's Pulse" program. • The First Artificial Intelligence Chatbot Assistant. • "Know Your Customer" (KYC) platform. • "Basher" service. • The Golden Visa. • Fifty-Year Economy Plan.
Case 4	Telecommunications and Digital Government Regulatory Authority	2003	Federal Authority	1) Regulating the telecommunications sector 2) Enabling government entities in the field of smart transformation.	An innovative digital system to enhance the quality of life and the competitiveness of the country	• Center of Digital Innovation (CoDI). • UAE PASS. • The UAE Hackathon. • The "Happy Family" initiative. • The "Employees Majlis" initiative. • "Coverage" initiative.

Table 2: Details of interviewees

Entity	#	Interviewee Code	Position	Frequent	Duration
Ministry of interior	1	MOI1	Deputy Director General of the General Department of Central Operations	3	1 h 20 m
	2	MOI2	Deputy Director General of Resources and Support Services. Sharjah police	1	50 m
	3	MOI3	Director of Software and smart Solutions Department. the General Directorate of Smart Services and Digital Security.	1	50 m
	4	MOI4	Head of the human resources department Sharjah police	1	45 m
	5	MOI5	criminal laboratory - Sharjah Police	1	60 m
	6	MOI6	Head of corporate excellence section. Strategy and performance development department- sharjah police	1	1 h 15 m
Federal authority of identity, citizenship, customs and port security	7	ICP1	Executive Director of the General Directorate of Residency, Foreigners Affairs and Ports in Sharjah	2	1 h
	8	ICP2	Director of the Violators Follow-up Department	1	35 m
	9	ICP3	Director of establishments Management department	1	35 m
	10	ICP4	Director of Support Services Department	1	40 m
	11	ICP5	Director of Entry and Residence Permits Department	2	1 h 20 m
	12	ICP6	Head of the Innovation and Future Foresight Department	2	1 h
Ministry of economy	13	MOE1	Undersecretary of the Ministry of Economy	1	1 h
	14	MOE2	Assistant Undersecretary for the Intellectual Property Sector	1	35 m
	15	MOE3	Assistant Undersecretary for the Support Services Sector	1	30 m
	16	MOE4	Director Of Information Technology at Ministry Of Economy	2	1 h 15 m
	17	MOE5	Director of the Department of Innovation Development and Patents in the Ministry of Economy	2	40 m
	18	MOE6	Director of Strategy Department	1	40 m
Telecommunications and Digital Government Regulatory Authority	19	TDRA1	Advisor to the General Manager	1	45 m
	20	TDRA2	Advisor to the General Manager for Quality and Excellence	1	55 m
	21	TDRA3	Consumer Affairs Director	1	30 m
	22	TDRA4	Director of Project Management	1	30 m
	23	TDRA5	Senior specialist in strategic planning and performance management.	1	30 m
	24	TDRA6	Senior Innovation Officer	1	45 m

4.1. Interaction Effects between External Factors, Processes, and Outcomes of PSI

The following section explains how different external factors such as national leadership, community, competitiveness, and economic factors interact with the processes and outcomes of PSI.

4.2. Leadership, Processes, and Outcomes of PSI

The role of leadership in encouraging PSI in well documented in the literature (Lewis et al., 2018). The current study examines the interaction effects between leadership, processes, and outcomes of PSI. MOE1 noted that "the continuous development in the performance of the UAE government and the recent qualitative shift came after Sheikh Mohammed bin Rashid assumed the position of Prime Minister in the government, where he began to change the concepts of managing government work." The implementation of GEM provided leverage to the national leadership in establishing strong reputation. This was highlighted by MOI1 given that "the UAE's success and achievements have contributed to building a positive reputation and strong branding for the country. The UAE is recognized globally for its modernity, innovation, safety, and high quality of life."

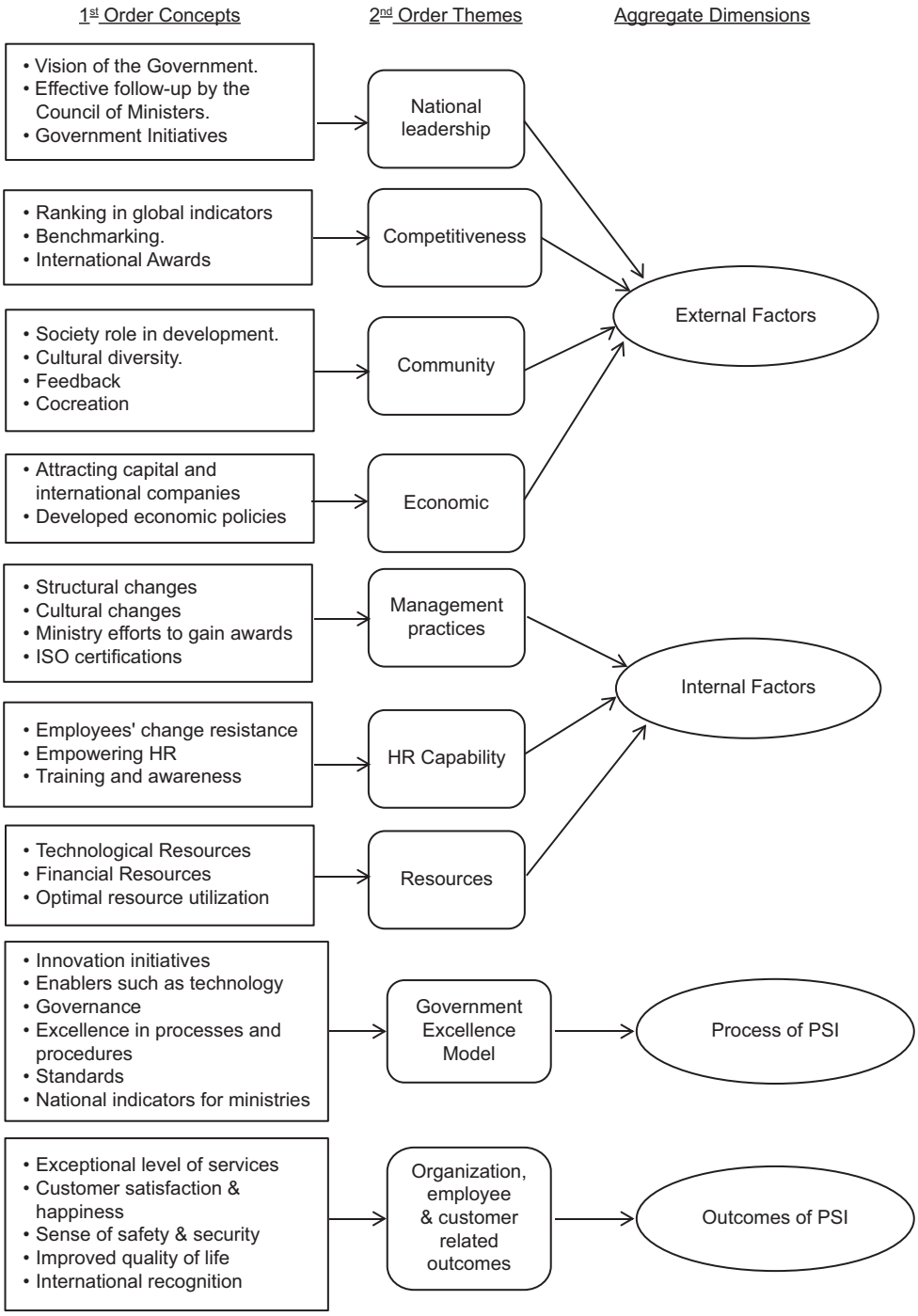
ICP5 referred to another leadership initiative and stated that "the Soft Power Council worked hard to place the Emirati passport at the first level in the world through foreign relations, participation in the development of friendly countries, and humanitarian support for afflicted countries." Further, as noted by MOE2 "GEM helped in adopting new administrative trends, activities, and proactive services." The national leadership of the country has also launched the Government Exchange Program which emphasizes the exchange of knowledge and experience and fosters continuous development. MOE2 appreciated the significant contribution of MOE in promoting the Government Exchange Program and mentioned that "we work in a specific, transparent, constantly evolving work methodology that suits all countries. Meanwhile, the participating countries will benefit from each other's capabilities and experience, boosting continuous development."

4.3. Community, Processes, and Outcomes of PSI

The role of socio-cultural factors in encouraging PSI is studied in the literature (Korac et al., 2017). In the current study, the role of community emerged as a significant factor in underpinning interaction effects with processes and outcomes of PSI. As noted by MOI6, "government considers society as a key partner in implementing the government excellence system." The involvement of different segments of the society in the process of PSI is also noted by MOI6 who mentioned that "the existence of an open society with more than two hundred nationalities with different cultures, societies, and education affects the level of services provided. They contributed to the development of services because the diversity of cultures leads to the development of the service or the process."

The role of community in innovation diffusion is highlighted by ICP1 who mentioned that "some customers still prefer to come in person rather than using the smart application because they cannot enter data or photos." This underlines the challenges faced by the government if the readiness level of the society is low in

Figure 3: Data structure



terms of innovation adoption. However, ICP2 noted that "gradual change in the methods of service provision, the simplification of procedures, and the speed of receiving services contributed to society's acceptance." MOI1 also indicated towards a gradual approach in which "traditional channels were not closed, and services were provided on the various channels in an integrated manner while working in parallel to study the classifications of customers and their preferences."

ICP5 highlighted the importance of community satisfaction in the success of GEM by noting that "authority is keen to provide its services to all segments of society without any discrimination so that they are provided to citizens and residents in the same manner and with the same quality." MOI1 further pointed out that "the UAE government has launched the "UAE Mystery Shopper" application, which enables all customers to rate the services, the performance of government entities, and the efficiency of the services provided and send any notes about them to the concerned officials in the country. Further, "according to MOI2," satisfaction rates are monitored and followed up by the council chaired by His Highness the Minister of Interior, called the "Council of Happiness and Positivity." Another evaluation mechanism was noted by MOI3 who mentioned that "the government has monitored customer satisfaction with the

effectiveness of government services using the "Government Services Observatory," approved by the Council of Ministers at the beginning of 2023. It is an interactive platform with more than over 1400 government services and more than one million evaluations are conducted monthly." Another example of GEM related initiative is "Mabrouk Ma Yak" which started after participation in the "Government Accelerator" program. As noted by ICP5, this initiative has increased customers' satisfaction due to "simplified procedures for citizens to obtain the newborn's primary documents for getting passport, identity card, birth certificate, and health insurance." As noted by MOE2, other examples which show interaction effects the include "Customer's Pulse" program and "Customer Councils" "which create a participatory climate between the federal government and customers in the UAE and to exchange ideas to improve and develop government services."

4.4. Economic Factors, Processes, and Outcomes of PSI

Researchers have examined the link between economic factors and government excellence initiatives (Sarker and Athmay, 2019). Interviewees noted various strands of interactions between economic factors and PSI processes and outcomes. MOE6 mentioned that "during the Covid-19 pandemic, the UAE was one of the fastest to recover economically from the repercussions of the pandemic. Further, MOE adopted a set of substantial economic incentives to support entrepreneurs and small and medium-sized companies and dedicated financial and monetary support packages to accelerate the pace of recovery."

The current study also reveals some examples of PSIs developed in the UAE which were commercialized. As highlighted by TDRA6, "We began selling innovative ideas, which became a new income source for the government. For example, the Ministry of Interior was able to sell a product that detects the forgery of passports with extreme accuracy through an innovative idea presented by a passport service employee. It is now being used in one hundred airports worldwide in twenty countries. Further, AlHosn application was sold to other countries during the COVID-19 pandemic, in addition to selling the idea of Salik system through the Roads and Transport Authority in Dubai."

4.5. Competitiveness, Processes, and Outcomes of PSI

In the global arena, governments increasingly strive to achieve competitive position to attract global talents and investments. This has resulted in increased calls for government excellence initiatives to enhance competitiveness (Ferdowsian, 2016). The current study underpins the UAE government's efforts to enhance its competitiveness in a highly competitive international arena.

One of the approaches adopted by the UAE government is highlighted by ICP5 who mentioned that "the authority participates in many external conferences, international events, and exhibitions, and we benchmark our services with others. We find ourselves in the ranks of developed countries and can compete and excel among countries. One of the examples of the country's distinction and competitiveness is hosting many international conferences and exhibitions, such as Expo 2020 and the United Nations Climate Change Conference COP 28." ICP2 mentioned that "we visited Singapore to learn about their experience and procedures with violators of the residency system." This shows the ministry's openness to learning and continuous improvement even after implementing GEM. This has also resulted in a significant reduction in time to get a residency visa or business permit compared to other countries.

MOE1 referred to the digital transformation of the UAE government and indicated that "the UAE government and the performance of its institutions become an example to be emulated in the world. This success enabled participation in global competitions and obtaining advanced ranks in competitive reports on the business environment, quality of life, innovation, and digital transformation."

4.6. Interaction Effects between Internal Factors, Processes, and Outcomes of PSI

The following section explains how different internal factors interact with the processes and outcomes of PSI.

4.6.1. Management, processes, and outcomes of PSI

Management practices in an organization instill a conducive culture to nurture innovation (De Vries et al., 2016; Demircioglu and Audretsch, 2017). The current study reveals a range of internal management practices that interact with processes and outcomes of PSI. ICP6 stated that "the authority's senior management shows significant support for adopting the concepts of excellence and innovation. This support has increased over the past years through partnerships and sponsorships." MOI1 referred to other initiatives such as "change in organizational structure in the Sharjah Police General Headquarters and creation of the Department of Strategy and Performance."

Another management approach underpins an openness to collaboration with other ministries, knowledge sharing, and adaptation. MOI6 noted that "the Ministry of the Interior supported a group of federal authorities, ministries, and agencies. The team in charge of developing the rest of the ministries looked at experiences and positive practices and added to them. In addition to a competitive atmosphere among various police commands at the level of the seven emirates, every commander-in-chief and general manager wants to highlight the capabilities, skills, and efforts exerted in his workplace."

Various other management activities helped in the successful implementation of GEM initiatives and generated desired outcomes. The importance of feedback also underlined the interaction effects between management activities, processes, and outcomes of PSI. These activities were highlighted by MOE2 such as "instilling conducive organizational culture, implementing ISO procedures, following modern methods in managing projects, setting targets, measuring and following up performance indicators, benefiting from feedback reports and opinion polls, and using project tools such as Six Sigma and kaizen and the accelerator system." MOE5 gave an example in which "the time taken for the issuance of the result of the patent examination has been shortened to 6 months starting from receiving the application,

compared to 42 months previously."

Effective implementation of GEM has also resulted in significant changes in the governmental approach which is now more focused on considering technology as an enabler. This is explained by MOE1 who stated that "entities began to adopt practices and create laboratories for innovation. It started with brainstorming, then the creation of branches for innovation in departments and ministries, and then the government created a ministry for artificial intelligence." ICP1 highlighted how GEM implementation prompted to the creation of different branches such as "The Strategic Planning Branch, the Excellence, Innovation and Future Foresight Branch, the Entrepreneurship Branch, and the Governance Branch and how these branches instilled excellence among employees through periodic meetings, emails, and internal competitions." This reflects how PSI is managed in UAE in the context of CAS.

4.6.2. Resource availability, processes, and outcomes of PSI

Resources are considered a pre-requisite for successfully implementing innovation initiatives (Lee and Whitford, 2013). The current study reveals abundant resources available to ensure effective implementation of PSI in selected organizations the UAE. In this regard, MOI5 mentioned that "the higher management in Sharjah police provided financial support for equipments and materials to adopt the forensic laboratory as one of the five innovation incubators. This forensic laboratory now has eight intellectual properties." ICP6 noted some of the resources available to encourage PSI and stated that "financial support was an important element such as providing advanced technologies and systems, training and motivating employees financially, honoring the owners of ideas and implemented proposals, coordinators, administrators, and supervisors of innovation systems."

The UAE government invested more in resources due to successful GEM implementation and achieving PSI outcomes. MOI3 noted, "many projects and initiatives would not have achieved the desired outcomes without implementing GEM, such as artificial intelligence projects and applications, blockchain applications, and the metaverse." ICP5 also mentioned that "GEM calls for enhancing the use of the available infrastructure, achieving efficiency in the use of technology, and employing all the capabilities provided by advanced technologies" Similarly, TDRA5 stated that "GEM calls on all parties to plan, manage, maintain, optimally utilize, and preserve institutional property with all effectiveness and efficiency." This highlights interaction effects and underpins that successful implementation of GEM, in return, increases the provision of resources and increases investment in technology.

4.6.3. HR Capability, processes, and outcomes

Enhancing HR capability is a key to the success of PSI (Demircioglu and Audretsch, 2017). In order to ensure the success of GEM, a wide range of initiatives were launched in UAE to enhance HR capability. MOE3 indicated that "many workshops and training sessions were offered to spread the culture of excellence among employees at various administrative levels." MOI4 stated that "the GEM added new concepts of continuous education, so a Learning Branch was introduced to transfer explicit and tacit knowledge is transferred to new employees. Moreover, learning methods such as shadow training, career counseling, effective mentoring, experienced learning mentor, and teamwork have been used as learning methods. Further, game-based training was the latest, where gaming and interactive activities were used to teach and train employees." MOI4 further mentioned that "at Sharjah Police, we focus on employees' happiness because a happy employee provides happy services. Employees' Life coaching was recently introduced which is certified by the International Coaching Federation and has been translated into Arabic." TDRA2 shared the insights in terms of ensuring HR capability by hiring young and educated staff. TDRA2 stated that "one of the factors that helped implement GEM efficiently and effectively is the nature of the human resource in the Authority, as the number is small and is characterized by the presence of young people with a very high level of skill, hardworking, and dedicated to their work."

Enhancing HR capability generated a positive outcome when an employee was introduced to the idea of UAE PASS. TDRA1 noted that this "resulted in the substantial national project concerned with digital signature system as a basis for the digital transformation project and linking it to all government services." Further, the interaction effects between HR capability, processes and outcomes of PSI are evident given that the implementation of GEM also helped in increasing employee effectiveness. MOI1 noted that "the level of quality of human resources has improved. Also, many Sharjah police officers won government medals." TRDA3 mentioned that "GEM encourages attention to talents, so we have created a talent management department that aims to improve the performance of employees at the individual and institutional levels by developing their functional capabilities by acquiring new knowledge and skills and developing their current competencies."

5. DISCUSSION

The CT is a relevant theoretical lens that highlights the interplay between antecedents, processes, and outcomes of PSI. Drawing upon CT, the CAS deepens our understanding of how system components interact to generate certain outcomes (Klijn, 2008; Rhodes and Mackechnie, 2003). The current study posits that PSI occurs in CAS underpinning the interaction effects between individuals and sub-systems. This was reflected in cooperation among different selected ministries. For example, the partnership between ICP and TRDA to carry out "Digital Identity" and "Digital Wallet" projects. Similarly, many different projects such as "Mabrouk Mayak" and "Basher" were carried out through collaboration among various ministries and government entities. Further, the nonlinear nature of CAS underlines that a nonsequential approach is more meaningful to successfully implement PSI than employing a traditional Input-Process-Output framework (Ilgen et al., 2005). The approaches adopted by selected ministries reflects self-organizing networks with feedback loops highlighting dynamic evolution (Braz and de Mello, 2022).

The GEM implementation in selected organizations represented a more gradual approach. As noted by MOE2, "Once GEM became part of work routines, then it became a catalyst for every PSI

initiative." GEM was continuously developed based on emergent patterns and feedback. TDRA1 noted that "the focus on innovation, agility, and proactiveness was gradually increased." Given that GEM calls for flexibility, proactivity, and innovation as noted by MOE5, this underlines dynamic coevolution and adaption which are key elements of CT (Schneider and Somers, 2006).

National leadership support and commitment (Lewis et al., 2018) instilled a sense of requirement and urgency which resulted in a wide range of GEM initiatives. Leadership vision was a guiding principle to achieve excellence in all aspects of governance. Moreover, a significant role of the community and its interaction with processes and outcomes of PSI was evident. This aligns with the literature on co-creation in public services (Torfing et al., 2019).

The current study also revealed some challenges the selected organizations face in implementing PSIs. These initial challenges included a need to change organizational culture, lack of documentation, overcoming resistance to change, and lack of knowledge. MOE1 highlighted the complexity of the change process and underpinned the importance of training and awareness to have employees on board. According to MOE1, "During the past five years, people were afraid at the beginning of the system's implementation." ICP1 also noted similar challenges by stating, " Initially, we faced some resistance and difficulties because some employees were not convinced of the importance of change." According to MOI5, the biggest challenge was the institutional maturity to accommodate the system's requirements, so it took time because most of the employees working in the government and the entities concerned with applying GEM were not well informed about it." However, as noted by MOE2, these challenges were eventually tackled as a wide range of innovative initiatives were undertaken as part of GEM implementation.

6. CONCLUSIONS

A dynamic perspective is needed to explore PSI instead of viewing it through a traditional Input-Process-Output framework. The CT and, more specifically, CAS offers a theoretical lens to study the interaction effects between antecedents, processes, and outcomes of PSI at a more granular level. Public sector organizations can successfully overcome challenges in implementing PSI through adopting a more gradual approach. The national level leadership vision and cooperation with the community play a crucial role in nurturing PSI initiatives. Openness to collaboration and desire for competitiveness can also pave the way for successful PSI initiatives. Leadership's drive for excellence has played a key role in the success of PSI in UAE.

Policy needs to focus on a balanced approach by clarifying the expectations and creating a sense of healthy competition among ministries. It was noted that the selected ministries faced significant challenges in maintaining their distinction and uniqueness in applying GEM. Policy can address this by clarifying the expectations for each ministry within its domain of services. Moreover, the policy can prioritize and determine the number of initiatives to be launched by each ministry, which could be effectively managed to achieve optimal results. In this regard, the policy may propose mechanisms to correctly measure PSI and make PSI last. Therefore, incentives can be designed to reward sustainable PSI. Moreover, the policy can also ensure that it remains aligned with the broader goals of social and economic development in the UAE.

Policy can also consider the impact on employees' morale and motivation, given that they operate in a competitive environment and face the pressure to achieve the set targets. This is noted by MOI2 who stated that "senior management in government institutions was under tremendous pressure to adopt, consolidate, and enhance these concepts because they have to monitor, follow up, and evaluate." Therefore, monitoring mechanisms for GEM can also incorporate the impact on employee satisfaction.

The current study unveils a selected set of external or internal antecedents of PSI that could interact with the processes and outcomes of PSI. Future research can also focus on additional factors which could also influence these interactions. Additional studies are also needed which can compare the developed and developing nations in order to deepen our understanding of the dynamics of PSI and related interaction effects. Future replication studies may also be conducted in other government departments and varying contextual settings in order to confirm the findings of the current study. Moreover, an additional broader quantitative and qualitative research addressing all new aspects of GEM is necessary for validating the generality of these results.

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