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Innovation management systems for public organizations in the UAE

Saif Alfaqaei¹, Mahmoud Awad^{1*}  and Ayman Alzaatreh²

*Correspondence:
miawad@aus.edu

¹ Industrial Engineering
Department, American University
of Sharjah, Sharjah, UAE

² Department of Mathematics
and Statistics, American
University of Sharjah, Sharjah,
UAE

Abstract

Public and private organizations are striving to achieve excellence in their performance and services provided. Innovation has been at the forefront to provide new and creative ways to help public organizations achieve this. Despite the reported success, there are wide discrepancies in the planning and management of innovative programs in developing countries such as United Arab Emirates (UAE) public sector. The purpose of this study is to investigate the status of innovation management systems (IMS) in UAE public organizations and provide recommendations for improvement. The main research tools used are interviews and surveys targeting innovation subject matter experts and practitioners to identify challenges and opportunities of innovation management. Based on the response of 200 respondents involved in innovation management, a confirmatory factor analysis was conducted, and a structural equation model was developed. The results of the model suggest that infrastructure, process owners, and employee participation have significant direct impact on innovation management system (IMS) performance. However, other factors such as innovation have a significant indirect impact through ideation and infrastructure on IMS performance. In addition, management support has a significant indirect impact through infrastructure on performance. This implies that investing in innovation infrastructure, empowering process owners, and encouraging employees to participate to maximize the benefits of innovation systems.

Keywords: Innovation, Public organizations, Innovation management systems

Introduction

The rising level of uncertainty in the external environment and the intensification of scientific and technological advancement pose an opportunity for public and private organizations to improve its performance and reduce its costs. As a result, organizations invested in innovation to experiment with different strategies to improve their services and provide significant advancements in public administration and/or services in the public sector (Baregheh et al., 2009). Innovation can be defined as “a dynamic process through which problems and challenges are defined, new and creative ideas are developed, and new solutions are selected and implemented” (Sorensen & Torfing, 2012). One of the early attempts to standardize innovation management is the development of ISO 56002 standard. Innovation management differs from the current management

methods and practices (Roy et al., 2013), since it relies on continuous involvement of employee and stakeholders and difficulty in measuring its impact.

Literature offers a substantial number of insights into the drivers and outcomes of innovation management systems (IMS) in private sector (Idris & Durmusoglu, 2021) (Kogabayev & Maziliauskas, 2017) and public one (Podgorniak-Ktzykacz, 2014) in terms of improving the efficiency of organizational processes and services, enhancing communication with the public. The existing knowledge of IMS in the public sector is fragmentary and most of literature is framed in terms of one of the three approaches: traditional public administration, new public management, or new public governance (Waldorff et al., 2014). The framework of traditional public administration is widely viewed as a model that inhibits creativity and innovation owing to the sole reliance on formal policies and bureaucratic procedures (Hughes, 2018). Whereas small-scale IMS could be implemented within clearly determined areas based on strict rules and explicit guidance, the potential of this framework to drive large-scale change is limited. New public management offers more space because it supports decentralization and encourages entities to experiment with quasi-market structures while providing the highest possible efficiency (Reiter & Klenk, 2019). The same authors indicated that the provision of individual reward packages as an important incentive for government officials stimulates the employees to engage in innovation (Reiter & Klenk, 2019). Finally, the new public governance is focused on enabling effective collaborations among governmental and non-governmental stakeholders, which creates a solid foundation for innovation (Vinokur-Kaplan, 2018). The available evidence provides a premise to believe that the phenomenon of innovation is approached differently under these three frameworks (Hartmann, 2006). Nevertheless, existing literature suggests that there is currently no holistic and consistent model for conceptualizing and exploring innovation in public organizations.

Although there is a semi-consensus on innovation definition, there is no agreement among scholars concerning the evaluation of IMS programs. A recent study compiled 82 indicators and metrics to assess innovations (Dziallas & Blind, 2019) while (Hutagalung & Hermawan, 2018) offered an assessment model based on public services capacity. The future-oriented approach offers optimal tools to measure the benefit provided by innovations to stakeholders using risk analysis, strategic evaluation, foresight evaluation, horizon scanning, or some other methods (OECD, 2020), (Arundel & Huberm, 2013). (OECD, 2020) suggests that all performance evaluation methods focus on specific outcomes of programs and allow quantifying their implications for stakeholders. However, these methods limitations might prevent analysts from capturing the long-term consequences of innovations. Furthermore, these methods are conducted primarily from the perspective of government officials, which might be also a significant limitation. Other limitations of the current evaluation methods include the exclusion of important stakeholders (Paskaleva & Cooper, 2018) or failure to utilize big data analytics tools that provide a broader evaluation scheme (OECD, 2020) (Engin & Treleven, 2019).

Despite the attempts to develop a consistent framework, most studies on public sector innovation still focus on specific case studies with little or no room for generalization (Mergel & Desouza, 2013) (Lan & Galaskiewicz, 2012). As a result, there is no consensus among researchers and experts regarding the drivers and indicators

of innovation in the public sector. While IMS in the public sector have received little attention in Western countries, even less is known about the specifics of this initiative in the context of developing countries such as United Arab Emirates (UAE) government organizations. Public sector innovation is integrated into the UAE national innovation strategy under the “innovative government” incentive (Affairs, 2014) which makes success of IMS in the public sector critical for ensuring the country’s development and achievement UAE’s strategic vision and goals. To evaluate the success of IMS in UAE public organizations, semi-structured interviews with four innovation subject matter experts (SMEs) whose profiles are summarized in Table 1. All four SMEs suggested that not all IMS programs in UAE met their targets due to several reasons such as poor idea evaluation (SME1&2) or lack of cross-organizations cooperation (SME2&4) or culture (SME 3&4) or poor digital infrastructure (SME3). Nevertheless, all SMEs stated that innovation has been a journey where processes are continuously improved and redesigned, and challenges are tackled. They also emphasized that employee participation encouragement and training were key in IMS success. In terms of innovation performance measurement, different organizations are using different KPI’s such as number of ideas submitted per department, number of valid ideas submitted per department, money spent in developing innovative systems to improve operations and service delivery, and “readiness” for innovations which is measured through multiple factors such as leadership and direction, employee innovation awareness and training, resources available and organizational culture. Similarly, different organizations used different criteria for ideas selection such as readiness of implementation, availability of resources, creativity level, potential impact, and potential cost saving.

Based on the SMEs feedback and reviewed literature, it is evident that there is a lack of studies focused on IMS performance evaluation of UAE public organizations. Moreover, there is a need to understand the enablers and barriers of innovation management systems launched and provide recommendations to enhance the likelihood of its success. The main goal of the current study is to conduct a critical investigation of innovation management in the UAE public sector. The study is an attempt to fill the research gap of IMS performance measurement in UAE public organizations and identify the main drivers of success. The remainder of this article is organized as follows; section two provides a summary of the related literature, and section three discusses the research methodology used. The results and findings are presented in section four and the conclusion and future work are offered in section five.

Table 1 SMEs profiles (Source: authors)

SME	Role/Position	Organization	Experience (years)	IMS Involvement (years)
1	Middle management	Electricity, water and gas authority at utilities 1	10	10
2	Top management	Municipality 2	30	7
3	Consultant	Government executive office	7	5
4	Middle management	Transportation	20	9

Literature review

Surveyed literature can be grouped into three major sections: first literature focused on innovation in public sector along with its barriers and enablers, second management of IMS programs, and finally research focused on innovation in UAE.

Several researchers such as (Kogabayev & Maziliauskas, 2017) and (Sorensen & Torfing, 2012) argued that innovation in the public sector is understood similarly to the ways in which they are interpreted within the context of the private sector. At the same time, their implementation by public organizations is inhibited by several unique barriers, including the monopoly position, public values, uncommon risks, short termism, rule obsession, and publicness (Acker, 2017). The development of effective strategies that could eliminate these barriers to a large extent predetermines the success of public sector innovations.

Despite the similarities between the public and private sectors, researchers argued that the two are either fundamentally different or not transferable (Podgorniak-Ktzykacz, 2014) or public organizations are mostly recipients of innovations offered by the private sector (Pratama, 2020). In the latter situation, the role of public organizations boils down to the adaptation of private-sector innovations to the unique settings of specific government entities using policy diffusion and policy transfer frameworks (McCann & Ward, 2013). Alternatively, (Bekkers et al., 2011) argued that a holistic classification of innovation program that include both public and private sector innovations is possible. They proposed a typology that includes governance, conceptual, product or service, and process innovations.

Research of public sector innovations has been adapting a multi-value perspective to reflect the different values of all the stakeholders that engage in strategic collaborations to launch innovations at government organizations (March & Olsen, 2010a, 2010b). The successful implementation of innovation in the public sector is linked to multiple outcomes, such as increased service quality, higher process efficiency, enlarged savings, and increased citizens' satisfaction with government services (Demircioglu & Audretsch, 2017; Podgorniak-Ktzykacz, 2014; Vinokur-Kaplan, 2018; Waldorff et al., 2014).

One of the most well-known barriers in IMS implementation pertains to the large size and diversity of government organizations. Whereas the adoption of new management practices at a small or medium enterprise might be conducted in a fast manner, such reforms could be difficult to launch at larger scale organizations (Demircioglu & Audretsch, 2017; March & Olsen, 2010a, 2010b; Podgorniak-Ktzykacz, 2014) especially less-flexible ones (Baregheh, et al., 2009). Heritage and legacy (De Lancer Julnes & Gibson, 2015) are also known as critical obstacles to management innovations that might inhibit or at least slow down the implementation of large-scale IMS (Osborne & Brown, 2015). Resistance to change is another barrier where employees are reluctant to embrace changes because of different reasons, such as age (Taneva, et al., 2016), poor skills (Yilmaz & Kilicoglu, 2013), or job insecurity (Adekkiya, 2015). Furthermore, a conservative organizational structure, stable policies rooted in old traditions, a high uncertainty avoidance index of a national culture, unclear benefits of a change, the absence of change agents, and poor administration could increase this reluctance even more, turning the staff into a major obstacle to IMS implementation (March & Olsen, 2010a, 2010b). In the context of public organizations, a resistance to change may be observed not only by staff

but also among citizens especially when it comes to e-service innovation (Al-Khafarji et al., 2012). Other barriers include poor learning environment (De Lancer Julnes & Gibson, 2015), insufficient staff technical skills (Shrestha et al., 2019), poor motivation (Hartmann, 2006), rigid regulation (Perrin, 2002), and the absence of incentives and lack of resources (Osborne & Brown, 2015).

Lack of top management commitment and support and employee participation are obvious barriers to innovation in the public sector and likely to translate into the failure of innovation programs (OECD, 2020). Risk aversion is a natural pattern that is inherent to most government organizations (De Lancer Julnes & Gibson, 2015). Therefore, the implementation of high-risk innovation programs in the public sector might be problematic. Finally, technical and operational issues such as human errors, equipment failures, hacker attacks (De Lancer Julnes & Gibson, 2015; Osborne & Brown, 2015), privacy issues, misinformation, and technological disconnection (Vogels et al., 2020) are known barriers that might prevent the swift realization of benefits related to management innovations. In light of all these barriers, it becomes evident that the implementation of management innovations in the public sector is usually a more challenging process than in the private sector.

To overcome these barriers, effective innovation management requires the reliance on specific enablers that could help entities overcome the barriers discussed above. Table 2 provides a summary of enablers and barriers cited in literature. The main hypothesis of this study is that applicable enablers will enhance performance of IMS programs while presence of barriers will deter IMS team from achieving objectives. For example, it is expected that top management support will positively impact IMS and enhance its performance. Alternatively, rigid organization will hinder the implementation of new initiatives and negatively impact IMS performance.

The ways in which innovation ideas are created, discussed, selected, and implemented have a major impact on the success of any innovation program. In many situations, ideas for management innovations are produced in line with the top–bottom approach (OECD, 2014) where priorities are first defined by management then ideas from employees are sought. This approach could be beneficial owing to the commitment of senior management. Ideas proposed by employees might be powerful since they have access to data on many important processes and more capable of realizing the main shortcomings (Franklin, 2020). However, it is limited to employees and other stakeholders may not be able to participate in the process (OECD, 2014). Several researchers suggested that more effective innovation ideas could be generated with the participation of external parties including citizens (McGann et al., 2021; Schoellhammer et al., 2016). The choice of particular ideation instruments depends on the main features of a particular society and public organization.

Despite its significance, there are few limited studies focused on various aspects of innovation in UAE public organizations. For example, (Alzawati et al., 2017) compared innovation capabilities of municipalities of Jordan with UAE while (Moonesar et al., 2019a, 2019b) provided a description of DubaiOX innovation program adopted by Dubai government. Hana (Hana, 2017) provided a broad overview of the development of innovation in the UAE government and its link to economic diversification. Similarly, several researchers suggested that the UAE government has already achieved significant

Table 2 Public IMS Implementation Enablers & Barriers (Source: authors)

Enabler	Citation	Barrier	Citation
Top management commitment	(OECD, 2020; Sun, 2021; Suwannathat et al., 2015)	Lack of Flexibility	(Baregheh et al., 2009; Perrin, 2002)
Vision/strategy of change	(De Lancer Julnes & Gibson, 2015; Errida & Lotfi, 2021; Kundu et al., 2020)	Short termism	(Acker, 2017)
Stakeholders Collaboration	(King & Koppenjan, 2016; Voorberg et al., 2015)	Customer resistance to change	(Al-Khafarji et al., 2012)
Experimentation	(Demircioglu & Audretsch, 2017)	Poor learning environment	(De Lancer Julnes & Gibson, 2015),
Employee motivation, Incentives/compensation	(Demircioglu & Audretsch, 2017; King & Koppenjan, 2016; Pratama, 2020; Serrat, 2017; Weibel et al., 2010)	Poor motivation, Absence of incentives	(Hartmann, 2006; Osborne & Brown, 2015)
Responses to low performers	(Demircioglu & Audretsch, 2017)	Employee resistance to change	(Adekkiya, 2015; March & Olsen, 2010a, 2010b; Osborne & Brown, 2015; Taneva, et al., 2016; Yilmaz & Kilicoglu, 2013; Yilmaz & Kilicoglu, 2013)
Employee skill/competency	(De Lancer Julnes & Gibson, 2015; Hur & Perry, 2016)	Insufficient staff technical skills	(Osborne & Brown, 2015; Shrestha, et al., 2019)
Network connection	(OECD, 2014)	Technical and operational (human errors, equipment failures...etc.)	(De Lancer Julnes & Gibson, 2015; Osborne & Brown, 2015; Vogels et al., 2020)
Organizational culture	(Hendry et al., 2019; King & Koppenjan, 2016)	Heritage and legacy	(De Lancer Julnes & Gibson, 2015)
Dedicated channels	(De Lancer Julnes & Gibson, 2015; De Vries, et al., 2016)	Public values (privacy, misinformation)	(Acker, 2017; Vogels et al., 2020)
Infrastructure	(McGann et al., 2021; Paskaleva & Cooper, 2018; Trindade, et al., 2018)	High risk program	(Acker, 2017; De Lancer Julnes & Gibson, 2015)
Dedicated time	(Demircioglu & Audretsch, 2017; Demircioglu & Audretsch, 2017; Mergel & Desouza, 2013)	Large size and diversity of government organizations	(Demircioglu & Audretsch, 2017; March & Olsen, 2010a, 2010b; Podgorniak-Ktzykacz, 2014)
Cross functional teams	(Hertog, et al., 2010; Stipp, et al., 2018)	Policy diffusion and transfer	(Mccann & Ward, 2013)

progress in fostering smart innovation, which is already sufficient for leveraging innovation achievements into improving citizens' happiness (Al Shamsi et al., 2018; Hana, 2017; Khalid & Sarker, 2019). There is a consensus among scholars that the UAE prioritizes innovations as one of the main pillars of its strategic development, building a knowledge-based economy (Byat & Sultan, 2015) and implementing a plethora of strategies to increase the quality of public services. Some of these initiatives are driven by large-scale transformations in government organizations, which are in line IMS requirements.

According to Moonesar et al. (Moonesar et al., 2019a, 2019b), innovations are approached in Dubai, one of UAE emirates, in a systematic manner, covering the layers of individuals, teams, and organizations. Alternatively, Al Hawi and Alsyouf (Al Hawi & Alsyouf, 2020) argued that despite its criticality, there is no consistent IMS model in UAE public sector that would guide the implementation at the federal level. Similarly,

Hana (Hana, 2017) highlighted that public sector entities should be more flexible and open to collaboration with the public and other relevant stakeholders.

Existing literature is valuable for analyzing some aspects of UAE IMS governmental programs, but none of them provides a consistent model for analyzing the current state with an emphasis on specific barriers, success factors, and ideation frameworks. A recent systematic review (Idris & Durmusoglu, 2021) illustrates that the conceptualization of IMS in the public sector has not become a mature research area yet and concluded that there is an evident research gap pertaining to the conceptualization of IMS in public organizations. Most studies on public sector management either describe public organizations as passive recipients of innovations offered by the private sector or employ models that do not consider unique features of the public sector into account (Zanfei, 2013) or have poor external validity (Waldorff et al., 2014). As a result, innovation management in the public sector remains an under researched problem. At the same time, little is known about the ways in which UAE government organizations have been embracing management innovations and examine IMS drivers and barriers.

Research methodology

The purpose of the study is to examine the implementation of IMS's in UAE public sector. The research aimed to collect data concerning the challenges, success factors, enablers, and performance indicators of IMS in different public and provide recommendations to enhance the success rate of these initiatives. Figure 1 depicts the research methodology used to address the research objectives, which consists of four main phases: survey development, data collection, analysis & modeling, and recommendations. The survey was created and validated using literature reviewed and recommendations from six subject matter experts (SME's) in the field of innovation management. Next, the survey was distributed to employees of public organizations in the UAE to solicit their feedback. Based on the findings and analysis, recommendations for improving innovation management have been provided.

The study utilizes qualitative and quantitative hybrid research methodology. The study starts with semi-structured interviews with SMEs to assess the need and significance of this research followed by collection of quantitative data on the current IMS practices using a survey. According to the thematic analysis, experts believe that the UAE has reached the same or higher levels of innovation that some western countries reached. Based on the findings of the reviewed literature and the SME's semi-structured interviews listed in Table 1, a survey was developed and validated by the SMEs to identify influential factors and barriers of IMS projects success. Table 3 summarizes the questions used to assess the performance and contribution of six independent variables that have potential impact on IMS success/failure. The independent variables are management support, infrastructure, process ownership, ideation, employee participation and innovation process, while the dependent variable is the performance of innovation

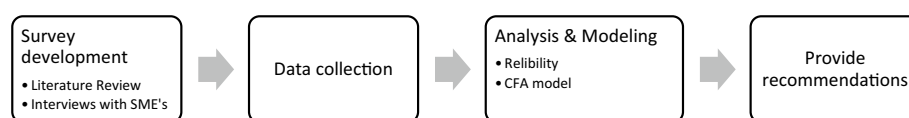


Fig. 1 Research methodology (Source: authors)

Table 3 Survey constructs design (Source: authors)

Construct	Indicators
Performance (Perf)	<p>C1. The IMS in general is effective</p> <p>C2. The IMS improved the overall performance</p> <p>C3. The IMS reduced costs</p> <p>C4. The IMS increased productivity</p> <p>C5. The IMS improved customer satisfaction</p> <p>C6. The IMS improved employee satisfaction</p> <p>C7. The IMS increased the company's gain of access to non-tradable assets like the knowledge that optimizes performance</p> <p>C8. The IMS reduced costs of supplies</p>
Management support (Supp)	<p>D1. The organization's leadership acknowledges and encourages creativity, critical thinking, and discipline for an innovative culture</p> <p>D2. The company puts employees' ideas and suggestions into effect as quickly as possible</p> <p>D3. Leaders actively engage people and hold them accountable for making personal contribution to the business strategy and long-term goals</p> <p>D4. The organization ensures that competitive advantage and customer value stem from the activities performed inside the business</p> <p>D5. Management at my organization allows job swaps that foster new perspectives from different employees</p>
Infrastructure (Infrast)	<p>F1. The organization is highly flexible and adaptive to changes by updating its strategies to increase customer satisfaction</p> <p>F2. The organization has an R and D department that focuses on updating its operations per the changing nature of innovation</p> <p>F3. The organization invests substantially in the knowledge infrastructure as it does on the physical innovation infrastructure</p> <p>F4. The organization has sufficient technological and communication tools needed for a smooth innovation process</p> <p>F5. The organization has a dedicated IMS team</p> <p>F6. The organization constantly measures its innovative growth and rewards individual/group efforts towards innovative ideas and milestones</p>
Employee Participation (Empart)	<p>G1. I am involved with innovation programs at my organization</p> <p>G2. The organization acknowledges human capital management as one of the important success factors</p> <p>G3. The organization encourages society growth and innovation</p> <p>G4. The organization offers training to employees that will inspire new thoughts and approaches to the business</p> <p>G5. The organization uses rewards to encourage employees to suggest ideas even if they're not carried out</p>
Process owners of IMS projects (POs)	<p>E1. PO have responsibility and authority to make changes</p> <p>E2. PO comprehensively explain how the innovation management process links and interacts with other processes</p> <p>E3. PO provide staff with adequate information and resources</p>
Ideation (Ideat)	<p>H1. My organization seeks ideas based on financial value only</p> <p>H2. Ideas selected based on ease of implementation (low budget and short time to implement)</p> <p>H3. The organization has a well-established selection criterion that defines strategy, capability, market, customer, budget, and value</p> <p>H4. My organization seeks non-financial value ideas only</p> <p>H5. My organization seeks financial and non-financial value ideas</p> <p>H6. My organization encourages employees to think and suggest ideas</p> <p>H7. My organization seeks ideas to solve specific problems or needs</p> <p>H8. My organization encourages customers and suppliers/contractors to participate in idea propositions</p>
Innovation Process (Innov)	<p>I1. Ideas selected are based on long-term potential</p> <p>I2. Ideas selected based on ease of implementation</p> <p>I3. The person who suggests idea is involved in execution</p>

management system. A five-point Likert scale, from strongly disagree to strongly agree, was used to collect survey respondents' feedback.

Based on the SMEs interviews, there are roughly 213 federal and local public organizations in UAE with approximately 4000 public employees who are involved in IMS systems. The research team decided to target 5% of the population, i.e. 200 employees who are involved with different capacities in IMS across various public organizations. Once data is collected, Cronbach's alpha (α) and composite reliability (CR) are employed to evaluate the reliability of the measurement model using SAS software. Furthermore, average variance extracted (AVE) will be used to determine the amount of variance between the construct and measurement error. The Cronbach's α measures the internal consistency of the constructs while the CR evaluates the reliability of the indicator variables to the same latent factor and AVE is used to determine if the measurement questions reflect the characteristics of the latent variables.

Next, the measurement model is then validated using confirmatory factor analysis (CFA), which validates the relationship between the indicators and each variable in Table 3. Next, a structural equation model (SEM) is used to test the hypothesized relations between the independent variables as well as the effect of each one on the performance of IMS.

Descriptive analysis and discussion

Out of 236 questionnaires that were distributed, 200 responses were received, resulting in a response rate of 84.7%. The demographics of the respondents are summarized in Table 4. The majority (67.0%) of respondents worked at Utilities 1 organization with a good representation from other organizations. In terms of organization there are around 213 public organizations in UAE with the majority large size (above 100 employees). As a result, it is not surprising that the majority (83%) of the respondents are working in these large organizations. Results also indicate that most respondents are first line managers (head of section) with around 69% with good representation from consultants and middle management with good range of experience level and gender. In terms of program execution, most of the respondents (70%) had an execution role while the rest had different roles. Results also suggest that around 60% of the innovation programs were developed internally by the organization's own resources while around 25% of the programs were co-developed with the help of external consultants. Different organizations adopt different strategies to manage their IMS with the majority using ISO 56001 while the remaining are using either OECD or GINI. ISO standards are well accepted and more internationally recognized across the globe. This might justify the wide adoption of this standard.

The results of the performance perception analysis are presented in Table 5. The % agree is defined as the percentage of respondents who selected 4 (agree) or 5 (strongly agree) as a percentage of total respondents. The results suggest that 29.0% of respondents agreed that the IMS in general is effective while 52% disagreed. Similarly, 31.0% of respondents agreed that the IMS improved the overall performance while 33.0%, 40%, and 37% agreed that it reduced costs, increased productivity, and improved customer satisfaction, respectively. Overall, more than 60% of the respondents believed that the IMS benefited the organization in at least one of the indicators above. It is worth noting

Table 4 Survey respondents' demographics (Source: authors)

	Frequency	Percent
Organization		
Utilities 1	134	67.0
Utilities 2	24	12.0
Human resources	14	7.0
Police	9	4.5
Transportation	8	4.0
Municipality 1	6	3.0
Municipality 2	5	2.5
Respondent position		
Head of section	137	68.5
Consultant	32	16.0
Manager	21	10.5
Employee	10	5.0
Respondent role in IMS		
Executor	141	70.5
Leader of the project	27	13.5
Management	22	11.0
Process owner	5	2.5
Participant	5	2.5
Organization size		
100 to 999 employees	166	83.0
Less than 100 employees	33	16.5
More than 999 employees	1	0.5
Respondent Gender		
Female	119	59.5
Male	81	40.5
Respondent experience		
3 to 10 years	141	70.5
10 to 15 years	32	16.0
1 to 3 years	26	13.0
Over 15 years	1	.5
IMS resources		
Internal	118	59.0
Internal and external	49	24.5
External	33	16.5
Standards/guidelines		
ISO	182	91.0
OECD	9	4.5
GINI	9	4.5

that some respondents indicated that IMS helped their organizations on multiple levels. For example, 19% of respondents believed that all performance indicators (C2–C8) were positively impacted by IMS while 22% indicated that IMS impacted C2–C6 only.

The selection of key performance indicators (KPI) is another critical aspect of any innovation program. Table 6 provides a summary of the KPIs used by the respondents' organizations. Results suggest that there is no agreement on KPIs, and the emphasis is more on the number of ideas rather than savings.

Table 5 Descriptive Statistics for Performance (Source: authors)

Cons	Indicator	Median	Frequency (%)					% Agree
Performance			5	4	3	2	1	
	C1: Effectiveness	2	21 (10.5)	37 (18.5)	38 (19.0)	94 (47.0)	10 (5.0)	29.0
	C2: Overall Performance	3	14 (7.0)	48 (24.0)	58 (29.0)	47 (23.5)	33 (16.5)	31.0
	C3: Cost reduction	3	25 (12.5)	41 (20.5)	54 (27.0)	52 (26.0)	28 (14.0)	33.0
	C4: Customer satisfaction	3	16 (8.0)	64 (32.0)	44 (22.0)	58 (29.0)	18 (9.0)	40.0
	C5: Gain	3	23 (11.5)	51 (25.5)	46 (23.0)	41 (20.5)	39 (19.5)	37.0
	C6: Reduction cost of supply	3	24 (12.0)	51 (25.5)	50 (25.0)	45 (22.5)	30 (15.0)	37.5
	C7 Positive changes in products/services	3	12 (6.0)	46 (23.0)	78 (39.0)	53 (26.5)	11 (5.5)	29.0
	C8 Time saving	3	20 (10.0)	59 (29.5)	55 (27.5)	48 (24.0)	18 (9.0)	39.5

Table 6 Organizational IMS KPI's (Source: authors)

Organization	Main KPI	Frequency	%
Utilities 1	Total savings due to implemented ideas	62	31
Utilities 2	New ideas/employee/year	51	25.5
Human Resources	No. of implemented ideas/year	42	21
Police, transportation, municipality 1 and 2	Total No. of New Ideas per year	11	5.5
Combination of KPIs	Total number of new ideas per year, new ideas/employee/year, Number of implemented ideas/year	34	17

Table 7 provides a summary of respondents' feedback on the impact of study variables on IMS performance. Results indicate that less than one-third of respondents agreed that the organization's leadership acknowledges and encourages creativity, critical thinking, hard work, and discipline for an innovative culture. All other management related variables have similar agreement percentages of around 30–35%. In general, this is a low agreement percentage which reflects the general impression of top management leadership and support for IMS.

In terms of process owner (PO), 41.0% of respondents agreed that the POs of the innovation projects have responsibility and authority to make changes while 45.5% of respondents agreed that they provide staff with adequate information and resources needed to optimize innovation. In summary, more than half of the respondents did not believe in the effectiveness of POs in enhancing IMS. Results call for a more effective role of top management and POs to support and execute innovation projects and culture.

In terms of infrastructure, 26.0% of respondents only agreed that the organization is highly flexible and adaptive to industrial changes through frequent strategy updates. Respondents had similar feedback on R and D for innovation, knowledge infrastructure, availability of technical communication tools, availability of dedicated IMS

Table 7 Descriptive statistics for study variables (Source: authors)

Construct	Indicator	Median	Frequency (%)					% Agree
Management Support		5	4	3	2	1		
	D1. Leadership acknowledgment	3	18 (9.0)	47 (23.5)	55 (27.5)	46 (23.0)	34 (17.0)	32.5
	D2. Employees' ideas support	3	15 (7.5)	50 (25.0)	55 (27.5)	51 (25.5)	29 (14.5)	32.5
	D3. Leaders' engagement	3	14 (7.0)	48 (24.0)	58 (29.0)	62 (31.0)	18 (9.0)	31.0
	D4. Organization internal activities	3	20 (10.0)	54 (27.0)	48 (24.0)	54 (27.0)	24 (12.0)	37.0
	D5. Job swaps	3	15 (7.5)	57 (28.5)	49 (24.5)	54 (27.0)	25 (12.5)	36.0
Process owner (PO)	E1: PO Responsibility and authority	3	23 (11.5)	59 (29.5)	40 (20.0)	58 (29.0)	20 (10.0)	41.0
	E2: Link to other processes	3	7 (3.5)	57 (28.5)	88 (44.0)	36 (18.0)	12 (6.0)	32.0
	E3: Provision of info & resources	3	29 (14.5)	62 (31.0)	45 (22.5)	36 (18.0)	28 (14.0)	45.5
Infrastructure	F1 Org. flexibility and adaptive	3	18 (9.0)	34 (17.0)	73 (36.5)	41 (20.5)	34 (17.0)	26.0
	F2: Availability of R&D	3	14 (7.0)	45 (22.5)	66 (33.0)	51 (25.5)	24 (12.0)	29.5
	F3: Knowledge infrastructure investment	3	21 (10.5)	42 (21.0)	48 (24.0)	59 (29.5)	30 (15.0)	31.5
	F4: Tech & communication tools	3	29 (14.5)	42 (21.0)	39 (19.5)	53 (26.5)	37 (18.5)	35.5
	F5: Dedicated IMS team	3	21 (10.5)	28 (14.0)	69 (34.5)	51 (25.5)	31 (15.5)	24.5
	F6 Innovation growth measurement	3	16 (8.0)	40 (20.0)	54 (27.0)	56 (28.0)	34 (17.0)	28.0
Employee Participation	G1: Employee involvement	3	28 (14.0)	60 (30.0)	54 (27.0)	34 (17.0)	24 (12.0)	44.0
	G2: Acknowledgment of human capital	3	27 (13.5)	56 (28.0)	36 (18.0)	48 (24.0)	33 (16.5)	41.5
	G3: Society growth encouragement	3	30 (15.0)	54 (27.0)	49 (24.5)	41 (20.5)	26 (13.0)	42.0
	G4: Training	3	21 (10.5)	69 (34.5)	42 (21.0)	36 (18.0)	32 (16.0)	45.0
	G5: Rewarding	3	37 (18.5)	48 (24.0)	55 (27.5)	44 (22.0)	16 (8.0)	42.5
Ideation	H1: Ideas based on financial value only	3	18 (9.0)	34 (17.0)	67 (33.5)	47 (23.5)	34 (17.0)	26.0
	H2: Ideas selected based on ease of implementation	3	21 (10.5)	52 (26.0)	44 (22.0)	65 (32.5)	18 (9.0)	36.5
	H3: Well-established ideas selection criteria	3	22 (11.0)	49 (24.5)	53 (26.5)	54 (27.0)	22 (11.0)	35.5
	H4: Ideas based on non-financial value only	3	24 (12.0)	41 (20.5)	54 (27.0)	48 (24.0)	33 (16.5)	32.5
	H5: Financial and non-financial value ideas	3	25 (12.5)	50 (25.0)	57 (28.5)	41 (20.5)	27 (13.5)	37.5
	H6: Employees encouragement to think and suggest ideas	3	29 (14.5)	60 (30.0)	40 (20.0)	38 (19.0)	33 (16.5)	50.0
	H7: Ideas to solve specific problems or needs	3	24 (12.0)	57 (28.5)	54 (27.0)	39 (19.5)	26 (13.0)	40.5
	H8: Customers and suppliers/contractors' participation	3	24 (12.0)	57 (28.5)	35 (17.5)	42 (21.0)	42 (21.0)	40.5

Table 7 (continued)

Construct	Indicator	Median	Frequency (%)					% Agree
Process	I1: Ideas selected based on long-term potential	3	41 (20.5)	54 (27.0)	49 (24.5)	38 (19.0)	18 (9.0)	47.5
	I2: Ideas selected based on ease of implementation	3	26 (13.0)	58 (29.0)	45 (22.5)	41 (20.5)	30 (15.0)	42.0
	I3: Involvement of suggester in implementation	3	28 (14.0)	43 (23.0)	55 (27.5)	43 (21.5)	28 (14.0)	27.0

teams, and innovation growth management. The responses are in line with reviewed research that indicates relatively lower levels of innovation within public-sector organizations (Khalid & Sarker, 2019). According to (Alzawati et al., 2017), there has been fewer engagements of the relevant stakeholders to enhance innovation, despite the increasing awareness among public service entities in Dubai. Innovation intermediaries such as incubators and labs that support the creation and implementation of ideas in various organizational settings (McGann et al., 2021) are needed for IMS success.

Almost half of respondents consider themselves involved in the IMS program while 41.5% agreed that the organizations they work for acknowledge human capital management as one of the important success factors. Similar disappointing results are perceived for training and recognition systems. Overall results point out to the absence of a robust innovation culture within public sector organizations which is in line with (Moonesar et al., 2019a, 2019b) who noted that failure to address cultural factors such as diversity, inclusion, and cross-cultural teams, recognition and rewards, and other HR practices contribute to the low innovation culture among Dubai public organizations. Motivation is undoubtedly a critical driver for any innovation program especially for large scale ones where government officials often do not have the motivation to launch large changes (King & Koppenjan, 2016; Pratama, 2020; Serrat, 2017).

In terms of ideation, results suggest that organizations seek ideas based on financial and non-financial value as well regardless of the ease of implementation. However, only 35.5% of respondents agreed that the organizations have a well-established ideas selection criterion. This is in line with (Moonesar et al., 2019a, 2019b) who established that only 13% of the creative ideas that employees propose are implemented as part of the IMS among public sector organizations.

Finally, results show that only 47.5% of respondents agreed that the ideas selected are based on long-term potential, while 27.0% respondents concurred that people who suggest ideas are involved in execution. This is alarming since shutting down good ideas and failure to authorize innovators to implement their own ideas may demotivate them to participate in the future and jeopardize the IMS performance.

Quantitative analysis and model development

Prior to model development, the reliability of the questionnaire was examined to determine which questions would be retained for inferential analysis. Cronbach's alpha is an internal consistency measure that assesses how closely each item is related to the construct (Hair et al., 2014). The composite reliability (CR) is another measure of internal

consistency which is considered to be more consistent than Cronbach's alpha (Henseler et al., 2009). Table 8 shows that the Cronbach's alpha and the composite reliability coefficients are both higher than the acceptable level of 0.6. Table 8 also summarizes the results of Average variance extracted (AVE) and the standardized factor loadings

Table 8 Evaluation of the measurement model (Source: authors)

Factor	Alpha	CR	AVE	Standardized Estimates
<i>Performance</i>	0.911	0.912	0.566	
C1				0.742
C2				0.771
C3				0.769
C4				0.763
C5				0.738
C6				0.803
C7				0.633
C8				0.789
<i>Innovation</i>	0.777	0.779	0.541	
I1				0.653
I2				0.786
I3				0.762
<i>Support</i>	0.867	0.868	0.567	
D1				0.806
D2				0.724
D3				0.755
D4				0.724
D5				0.754
<i>Owner</i>	0.771	0.78	0.544	
E1				0.837
E2				0.683
E3				0.682
<i>Infrastructure</i>	0.857	0.858	0.547	
F1				0.693
F2				0.745
F3				0.723
F4				0.772
F5				0.761
<i>Employee Participation</i>	0.857	0.857	0.6	
G1				0.794
G2				0.754
G3				0.79
G4				0.759
<i>Ideation</i>	0.893	0.894	0.546	
H1				0.688
H2				0.775
H4				0.719
H5				0.722
H6				0.771
H7				0.75
H8				0.743

Table 9 Correlation matrix for the factors (Source: authors)

	Perf	Innov	Supp	Owner	Infrast	Empart	Ideat
Perf							
Innov	0.752						
Supp	0.009	0.736					
Owner	0.108	0.019	0.753				
Infrast	0.414	-0.060	0.084	0.738			
Empart	0.435	0.071	0.176	0.201	0.739		
Ideat	0.344	-0.005	0.259	0.320	0.168	0.774	

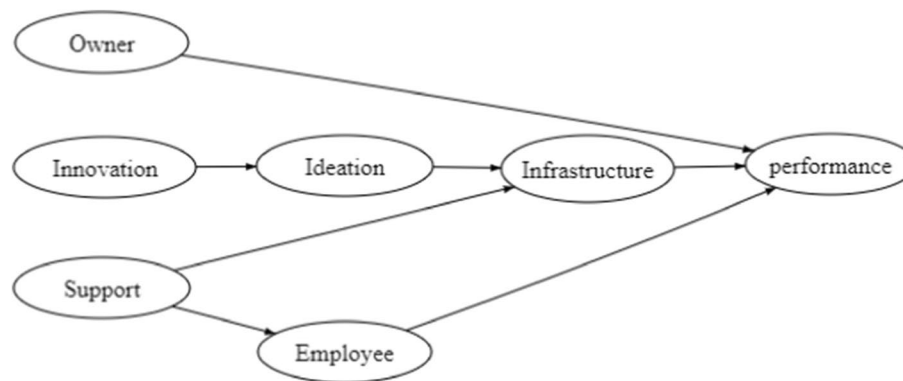


Fig. 2 Final SEM model (Source: authors)

(standardized regression weights) for each indicator. All indicators were significant (p values < 0.05) and the standardized estimates were higher than the threshold of 0.5 (Hair et al., 2014).

The standard loadings of the indicators for the underlying concept were used to calculate convergent validity. Furthermore, discriminant validity can be checked by comparing the squared correlations between constructs to the average variance extracted (AVE) values for each component. Discriminant validity is achieved since the square root of average variance extracted for each variable is larger than the correlation between any pair of variables (see Table 9).

To investigate the relationship between the independent variables and the dependent variable, a SEM framework was developed. First, research team examined the statistical significance of the causal effect of each exogenous variable on the endogenous variable in the SEM model. Next the covariances between the independent variables were examined and significant. Finally, a modified SEM framework was built based on the effect of independent variables on dependent variables along with the covariance coefficient between independent variables. Figure 2 depicts the final and modified framework and the structural path results (note that CFA and reliability remain unchanged). All paths are highly significant with positive impacts on performance. The standardized loadings are summarized in Table 10.

The fit of the SEM model was assessed using Chi-square (Minimum Discrepancy—CMIN/Degrees of Freedom—DF), Comparative Fit Index (CFI) and Root Mean

Table 10 SEM path loadings (Source: authors)

Path List		Standardized estimate	Standard error*	t value*	P value*	Path
Innov	-->Ideat	0.441	0.098	5.003	<0.001	Significant
Ideat	-->Infrast	0.549	0.095	6.431	<0.001	Significant
Supp	-->Infrast	0.208	0.090	2.873	<0.003	Significant
Supp	-->Empart	0.263	0.086	3.210	<0.001	Significant
Owner	-->Perf	0.300	0.105	3.853	<0.001	Significant
Infrast	-->Perf	0.369	0.084	4.705	<0.001	Significant
Empart	-->Perf	0.221	0.095	2.975	<0.002	Significant

* The reported values are for the unstandardized path estimates

Squared Error (RMSEA) criteria. The value of CMIN/DF was 1.640, which is lower than 3 implying an acceptable fit (Taber, 2018; Nizar, 2019). Similarly, the CFI and RMSEA are 0.900 and 0.057 respectively. These values imply an acceptable model fit. Table 9 summarizes the results of the *p* values for the unstandardized paths and the standardized factor loadings.

The results suggest that infrastructure, process owners, and employee participation have the most significant direct impact on IMS performance. However, innovation have a significant indirect impact through ideation and infrastructure on IMS performance. In addition, management support has a significant indirect impact through Infrastructure on IMS performance. This implies that with improved infrastructure, innovation performance in UAE public entities will improve. The findings are in line with (March & Olsen, 2010a, 2010b) and (Paskaleva & Cooper, 2018; Trindade et al., 2018) who highlighted that enabling infrastructure is critical to IMS performance enhancement. It also implies that improving process ownership, IMS performance of entities is expected to improve which is in line with previous research which noted that Dubai-based public entities need to feature process ownership as part of their efforts to improve innovation (Moonesar et al., 2019a, 2019b). Finally, results advocates investing in enhancing employee participation which is in line with (De Lancer Julnes & Gibson, 2015) who noted that the involvement of employees with diverse knowledge and skills boost innovations performance.

Despite past studies such as (Suwannathat et al., 2015) and (Sun, 2021) who noted that management support is one of the most important factors in innovation performance, results of this study indicated insignificant direct relationship between the two. However, the SEM suggests positive impact of management support on both infrastructure and employee participation which both impact performance. Management support can manifest itself through providing adequate infrastructure and encourage employee participation using motivation schemes and training among other items. Innovation performance is likely to be more successful in organizations where employees are encouraged to generate ideas and being involved in the implementation stage. However, researchers expected a positive and significant impact of management support on ideation as well. It is also noted that the lower approval ratings given by respondents in Table 7 implies that this is an area which merits further study in the future and needs further practical improvement within those

organizations to realize IMS potential. Moreover, management support is required in many other UAE wide initiatives such as excellence awards, sustainability, and future needs provision which may impact management involvement in innovation.

The study also established that ideation and innovation process did not have any direct and significant impact on innovation. This could be due to its lack of maturity within the public organizations as has been noted in several SME interviews. Some SME's stated that the ideation process is still an evolving one that has seen significant improvement but still faces obstacles, such as organizational culture and lack of middle management support. Nevertheless, the final framework suggests that innovation process impacts ideation where the latter has a positive impact on performance. It is worth mentioning here that all organizations included in this study use digital means (websites, portals, data base, etc.) for ideation and selection which require good infrastructure.

Conclusions and future direction

A CFA and SEM models were developed to model the IMS in UAE public organizations. Despite the success of some organizations in implementing IMS, there are wide discrepancies in terms of implementation and results. The results suggest that less than half of employees consider themselves involved in their organizations IMS. Similarly, less than half of employees indicated that their organization has a well-defined ideas selection criterion. This is alarming since shutting down good ideas and failure to authorize innovators to implement their own ideas may demotivate them to participate in the future and jeopardize the IMS performance. Moreover, the results indicate that employee participation, infrastructure, and role of process owners and top management are critical for boosting IMS performance.

Based on the results above and feedback of SMEs, IMS performance in public organizations can be enhanced by empowering process owners to make changes and train them to encourage, along with management, employees to participate in the program. Moreover, investing in proper infrastructure and building a well-defined mechanism to capture and select ideas while involving all employees is important for boosting and sustaining IMS success.

In terms of ideation, the general practice is to seek ideas from employees without restrictions on the scope of the idea. Results of survey and SME interviews advocates having campaigns focused on specific problems or opportunities and open ideas. Leveraging suppliers and the public in the ideation phase can enrich the ideation sustainability with positive performance. The above findings have important implications in both practice and academia. IMS has been a proven initiative for improving public organizations performance in terms of quality, cost and resource utilization. However, such initiative requires investment in terms of time, effort, and money. The above recommendations will improve the likelihood of IMS deployment success and increase employees' trust in its effectiveness.

In terms of future direction, examining and comparing results with private sector is warranted. Furthermore, the impact of experience in terms of years of experience and job title might affect performance. Finally, extending the study to a larger and stratified sample size will improve internal validity of the study while extending it to other countries to improve the external validity is recommended.

Acknowledgements

The work in this paper was supported, in part, by the Open Access Program from the American University of Sharjah. This paper represents the opinions of the author(s) and does not mean to represent the position or opinions of the American University of Sharjah.

Author contributions

SA conducted literature review, collected data, and contributed to data analysis. MA conceived and designed the analysis and wrote the paper. AA performed the analysis. All authors have read and approved the manuscript.

Funding

No funding was obtained for this study.

Data availability

The data sets used in this study is available from the corresponding author upon request.

Declarations**Ethics approval and consent to participate**

Data collection plan was reviewed and approved by the internal review board (IRB) committee of the American University of Sharjah (AUS) before data collection. Data collected for this study were conducted in accordance with (Protocol# 23–030) which has been determined to pose minimal risk to participants and qualifies for Exempt IRB approval under 45 CFR 46.104(d) (ii). You may now proceed with your project. The survey and interviews started with a request for a voluntary participation statement. A written consent of participation is required and obtained before respondents can fill in the survey.

Consent for publication

Data collected from surveys or interviews do not include any identifying images or other personal or clinical details of participants that compromise anonymity.

Competing interests

Authors of this study have no financial or non-financial interests that are directly or indirectly related to the work submitted for publication.

Received: 3 April 2024 Accepted: 31 July 2024

Published online: 21 August 2024

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