Research Paper: Identifying Effective Propellants for Providing Smart Services in Rural Areas (Case Study: Kish Island in Southern Iran)

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ABSTRACT

Purpose: Smart Village aims to improve resource efficiency, empower local communities, ensure access to welfare facilities, and foster individual and social responsibility to create a vibrant and dynamic society. Therefore, the present research aims to identify a set of effective propellants for providing smart services in rural areas of Kish.

Methods: The present study is fundamentally interpretive and qualitatively based. Grounded theory and a combined model (F-ARAS + F-COPRAS) were used for data analysis. Non-probability purposive sampling was employed, and 17 individuals were selected as the sample size, reaching theoretical saturation.

Results: The results of interviews with experts to identify a set of effective propellants in providing smart services in rural areas 51 concepts, 13 semantic units, and six categories (efficient and capable management, defining visions and priority areas, achieving budget allocation for smart services, the integrated management system of regulations, sensitizing various groups and aligning with smartification, considerations and requirements of the smartification process) It was extracted, Among them, the approach of considerations and requirements of the smartification process with a weight of 72.23 is the most important.

Conclusion: The results indicate that the intermediary system is eliminated by implementing the smartification plan, and a sustainable pattern replaces it. Rural areas, which have always been economically and educationally disadvantaged compared to cities, can achieve sufficient growth.

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1. Introduction

The world's rural population accounted for 70% of the total population in 1950. This figure is estimated to reach approximately 34% by 2050 (Singh & Patel, 2018: 37). According to the United Nations, in 2050, 3.1 billion people will be living in rural areas (UN Department of Public Information, 2019). Based on the mentioned statistics, it can be inferred that rural areas' population and spatial extent cannot be overlooked due to their diverse capabilities. These rural areas are considered valuable in various human, economic, social, and environmental aspects, and they are recognized as the foundation and main criterion for national development (Somwanshi et al., 2016: 396).

Numerous approaches and strategies for rural development and sustainable rural development have been proposed within this context. However, they are generally incompatible with the extensive changes brought about by modern technologies, complex global structural and functional transformations, local variations, and unique environmental conditions that require specific planning. Thus, innovative models based on knowledge and technology become essential. One such model is called "Smart Villages" (Norouzi, 2021: 252). The smart village approach aims to achieve sustainability in rural areas without altering their fundamental way of life (Somwanshi et al., 2016: 395). Its flexible characteristics offer diverse pathways for different types of villages (Holmes & Thomas, 2015: 151). The development of smart villages ensures long-term sustainability in rural development and even urban development (Beg, 2018: 1).

Due to their distance and scattered nature, rural areas often lack essential facilities, and using smart technologies can play an influential role in providing services such as education, administration, and banking, among others (Akbaroghli & Qasemi, 2020: 211). Smartification guarantees that development is economically precise, environmentally responsible, and supportive of the community's sustainable development, resulting in an improved quality of life (Anabestani & Kalate Mimri, 2022: 1). Therefore, the need to establish smart villages is an undeniable reality, and the failure to achieve this can be considered one of the main challenges. In this regard, it is essential to note that the strategy for smart rural growth can vary depending on local conditions and the functioning of different villages (Viswanadham & Kameshwaran, 2013: 184).

The creation of smart villages depends on identifying the indicators and services to be provided and the readiness and local conditions. What happens in smart villages is essentially the integration of technology while preserving the traditional fabric of rural life. Activating the existing potential in the region to enhance employment opportunities for local communities with the help of modern and advanced technologies can be easily achievable. In this regard, the island of Kish and its rural areas have been prominent in realizing smartification over the past two decades in the country. The initial efforts to establish the infrastructure on Kish Island began in the early 1980s. In that year, projects were contracted with domestic and foreign organizations to engage in technology-related activities, and smartification of the island became one of the fundamental programs on the agenda.

Considering that the rural areas of Kish were among the first rural areas in the country to have established smart infrastructure, these activities have not had a significant impact on these regions over the past two decades. Therefore, the effective propellants in providing smart services need to be identified. Thus, this study aims to identify the following questions:

What are the sets of effective propellants for providing smart services in rural areas of Kish? And which one is more important?

2. Literature Review

Smart villages, with the advancement of information and communication technologies, can improve rural people's access to various health and educational services, create job opportunities, increase awareness of agricultural and promotional activities, and promote the marketing of agricultural and non-agricultural products, among other things. This technology is considered one of the comprehensive tools and platforms for all-round development (Akbaroghli & Qasemi, 2020: 2012). The approach to smart villages is a broad approach to development and innovation and includes six dimensions: smart and innovative economy, generation, entrepreneurship; modern and sustainable transportation; sustainable energy and environment; citizens, quality of life in various cultural, health, safety, and educational aspects; efficient and transparent management and administrative system (Stenson, 2017: 6). In general, it can be stated that the concept of smart villages is a concept that has recently been introduced in political approaches, and its focus is on growth through information technology,

human capital, and the environment (Viswanadham & Kameshwaran, 2013: 179).

The initiative for smart villages focuses on improving resource utilization, empowering local communities, providing access to reliable welfare facilities, and individual and social responsibility to create a happy and dynamic society. The use of technology as a means of development and growth, encompassing education, trade, electronic health, and welfare services, is vital (Kale et al., 2017: 767).

However, it is generally said that smart villages are a concept beyond the application of information and communication technologies in rural areas and are different from what is known as a smart city. Although the smart city approach emphasizes digital technologies and solving urban problems based on technology, it generally focuses on knowledge development. It does not place much importance on citizen-oriented service delivery. On the other hand, the smart village model focuses on regional issues and attention to the local community (Visvizi & Lytras, 2018: 2).

Overall, three main perspectives can be identified regarding smart rural growth. One group takes a pessimistic view and considers general constraints in rural areas as obstacles to realizing this policy. The second group optimistically refers to the natural, recreational, and tourism potentials of rural areas and considers them suitable capacities. Finally, with a more logical approach, the third group considers specific and suitable rural areas as the best option for achieving smart rural growth. The research background indicates that the first steps in the field of smart villages were taken in 2011 to improve the quality of life in rural areas (Poggi et al., 2015: 45). In fact, what is vital in smartification is the importance of rural quality of life, although defining the exact meaning of quality of life or well-being through smartification is challenging (Bocinell et al., 2015: 107). Several studies have been conducted on this topic, some mentioned below. Safari Aliakbari (2022) analyzed the infrastructure of smart tourism in target rural areas and the barriers ahead (Case study: Paveh County). The results showed that social, economic, and infrastructural factors in rural smart tourism infrastructure were significantly below 0.5, indicating the inappropriate state of these factors in target tourist villages. The analysis of the factors at the level of the three villages of Shamshir, Khanqah, and Hajij with the ANOVA test also confirms that no significant difference was observed between the villages, and all three villages have the same status regarding smart tourism indicators. In this way, the obstacles facing the smartening of tourist villages are summarized in 5 categories: infrastructural, economic, socio-cultural, administrative, and legal, and infrastructural obstacles with a special value of 21.06 play the greatest role. Norouzi (2021) analyzed the indicators and feasibility of smart development in Avergan village. The results showed that the smart village's most important indicators are agriculture, industry, services, education, health, etc. In research, Akbaroghli & Qasemi (2020) investigated the effective factors in the performance of ICT office services to make villages intelligent (case study: villages of Tabas city). The research results show that the performance of the 24 rural ICT offices studied in terms of customer attraction and their familiarity with the process of smartification are not significantly different from each other. Akhavan Touisegani et al. (2017) investigated the extent of the implementation of smartification in improving education in rural schools. The results show that the educational centers that are the research target are not compatible with the smartification horizon. There is no significant relationship between creating smartification conditions in schools and improving teachers' educational levels. Still, according to the findings, it was found that there is a relationship between the facilities required for intelligentizing schools and creating motivation in learning. There is a meaningful relationship between the students in such a way that the smart facilities of the schools create attractiveness and increase the level of learning and the permanence of the knowledge learned. Anabestani and Vaziri (2011) analyzed the social, economic, and physical effects of ICT in developing rural areas of Gorgan City. They concluded that with the introduction of information technology to villages in Gorgan City, the traditional user-friendly and efficient methods of agriculture and animal husbandry have been replaced. in modern and effective ways, and this issue has increased the income sources of the villagers. Also, the expansion in these areas eliminates the conventional boundaries of access to facilities and information and connects the rural areas directly and easily to the world. Barghi and Ghanbari (2010), in research entitled "Analysis of the Role of Science and Information Technology in Rural Development reached these results that at the rural level, information and communication technology in the expansion of e-commerce, e-health, leisure time, e-government, and Electronic proceedings are effective. To develop information and communication technology at the rural level, it is necessary to create legal, commercial, cultural, security, technical, and communication infrastructures. Azizi et al. (2009) studied its impact on the rural economy of Iran. They concluded that using ICT has caused the mobility and dynamism of the ru-

ral economy and to achieve development. Zhang et al. (2022) evaluated smart cities in 15 new cities in China. The study results showed that these 15 new first-level cities still had a relatively low level of intelligence, and the gaps between different cities were significant. Due to the difference in the emphasis on building a smart city in different cities, their performance in different dimensions was widely different. Among the five dimensions of smart infrastructure, economy, and life performed poorly compared to smart governance and environment. Lyons (2018) investigated how intelligence and sustainability are related and finally stated that smart urban mobility and mobility are affordable, effective, attractive, sustainable, and smart and sustainable paradigms towards a common framework. They move to develop urban mobility.

3. Methodology

The present study, in terms of its objective, is fundamental and interpretive, and in terms of its method, it falls under the category of qualitative research. Grounded theory was used for data analysis. Data were collected through documentary studies, library research, and field investigations (interviews). Therefore, unstructured, in-depth interviews were conducted for exploratory research. Data analysis in this method was carried out using open coding (identifying concepts), axial coding (developing ideas), and selective coding (final selection of concepts) (Glaser, 2017: 56).

The population of this research includes professors, experts, and specialists in the field of technology on Kish Island. In this study, sampling was conducted until theoretical saturation was achieved using non-probability purposive sampling. In total, 17 in-depth interviews were conducted. The interviews (40 to 50 minutes) were recorded, noted, and transcribed immediately.

Finally, a combination model (F-ARAS + F-COPRAS) was used for ranking the extracted concepts.

Kish Island, located at coordinates 26°32’ north and 53°58’ east, is a recreational island in Bandar Lengeh County, Hormozgan Province, in southern Iran, situated in the Persian Gulf (Figure 1). The island covers an area of 91.5 square kilometers. Iran borders it to the north, the Strait of Hormuz to the east, the United Arab Emirates to the south, and Bahrain, Qatar, and Saudi Arabia to the west. Due to a free trade zone, recreational and commercial centers, tourist attractions, and abundant hotels, Kish Island is considered a major tourist destination in Iran and the region (Kish Free Zone Organization, 2022).

4. Findings

In this part of the research, the participants were experts and specialists. The required information was extracted from the experts’ perspectives. Initially, in the review and revision stage, which serves as a prelude to the analysis phase, the recorded interviews and personal notes taken by the researcher throughout the study were collected, reviewed, and revised to prevent personal bias when arranging the data.

Furthermore, the data extraction stage (open coding) aimed to understand the underlying concepts in the interviewees’ statements. Some concepts were derived from prior knowledge, while others were invented by the researcher or mentioned by the participants, referring to the available data. In this stage, 51 concepts were extracted from the interview texts (Table 1).

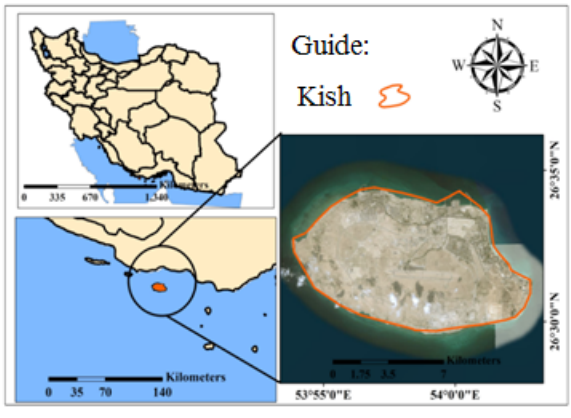

Figure 1. Study area location. Reference: Authors, 2022

Table 1. Data obtained from the research (open coding)

Row	Code	Concepts (open coding)	Row	Code	Concepts (open coding)
1	X1	Public participation to enhance the smart presentation	22	X22	Providing smart services according to abilities and needs
2	X2	Coherence of cooperation for the development of smart services	23	X23	Attention to the diversity of economic activities
3	X3	Changing the attitude of officials and managers of related organizations toward the non-entry of the local community into management	24	X24	Compatibility with the environment and the existence of infrastructure and supply chains
4	X4	Increasing managerial stability in related organizations	25	X25	Interactive and face-to-face engagement with residents
5	X5	Increasing governance in related organizations	26	X26	Close cooperation with different population groups to identify local and specific needs of the region in line with the development of smart services
6	X6	Change in the traditional views and thoughts of management towards new management methods and the foundation of managerial creativity in all its dimensions	27	X27	Developing smart projects with youth-oriented social interactions and youth leadership
7	X7	Implementation of previous and current governments' approvals and allocation of additional credits	28	X28	Officials' belief in creating more jobs through the development of smart services
8	X8	Avoiding a political view on the issues of smartization	29	X29	Officials' particular view on the development of smart services in the villages of Kish according to the economic conditions
9	X9	Trying to solve issues related to the development of smart services away from political expectations	30	X30	Emphasizing the issue of improving the economy of Kish through the development of intelligence by choosing the slogan of recent years
10	X10	Implementation of programs and avoiding constant management changes and transformations at the macro and sub-group level	31	X31	Increase in the motivation of public sectors to plan and invest in the field of smartness
11	X11	Changing management thoughts from top to bottom	32	X32	Decentralization of responsibilities and division of tasks related to the development of intelligence among different institutions and organizations in villages
12	X12	Respect for the principles of good governance	33	X33	Specialization of intelligence activities and the use of specializations in a decentralized manner among the responsible organizations
13	X13	increasing the role of residents in villages in line with the development of smart services	34	X34	Integrating and harmonizing plans related to smartification away from any centralism
14	X14	High decentralization and attention to the rights of residents	35	X35	Increasing the state of the budget allocated to different administrative departments in the field of villages
15	X15	Coherent planning in the field of intelligent service development	36	X36	Determining the budget structure based on the needs of the regions
16	X16	Considering smartification as one of the main axes of development	37	X37	Increasing the budget at rural levels
17	X17	Strengthening the laws related to the development of smart services	38	X38	Efficiency and effectiveness in related organizations
18	X18	Strengthening the legal communication system between the government and the private sector (transportation systems, etc.) through drafting the required legal bills	39	X39	Transparency in the field of intelligence
19	X19	Creating a mechanism for coherence and coordination between the organizations and institutions in charge of smartification in Kish and exploiting all the available capacities.	40	X40	Expanding the term intelligence in organizations
20	X20	Specific and responsible legal entities to provide smart services	41	X41	Correct and scientific perception of intelligence and development of service provision among the residents of villages and officials
21	X21	Appropriate rules and regulations and systematic and institutional thinking for management	42	X42	Investing in the development of advantageous fields of intelligence

Table 1. Data obtained from the research (open coding)

Row	Code	Concepts (open coding)	Row	Code	Concepts (open coding)
43	X43	Active participation of local Kish stakeholders in choosing advantageous areas	48	X48	Choosing priorities according to the capabilities of human resources
44	X44	Proportion between Kish's investment areas with the amount of investment	49	X49	Attention to support institutions
45	X45	Selection of investment areas according to the capability of rural manpower in Kish	50	X50	Training villagers on how to use new equipment and technologies
46	X46	Development of supportive policies according to the amount of investment	51	X51	Increasing digital literacy
47	X47	Attention to services			

Reference: Research findings, 2022

In the next stage, the initial codes were converted to secondary codes due to their abundance (the initial codes are organized in similar classes). Several secondary codes are transformed into meaningful codes. Table 2 presents the decoding results based on the secondary code, significant codes, and provided terms.

Table 2. Results of open coding based on secondary code

Row	Semantic unit	The concepts
1	Development and improvement of management performance in the rural area	Public participation to enhance the smart presentation Coherence of cooperation for the development of smart services Changing the attitude of officials and managers of related organizations towards the non-entry of the local community into the management Increasing managerial stability in related organizations Increasing governance in related organizations Change in the traditional views and thoughts of management towards new management methods and the foundation of managerial creativity in all its dimensions Implementation of previous and current governments' approvals and allocation of additional credits Avoiding a political view on the issues of smartification Trying to solve issues related to the development of smart services away from political expectations Implementation of plans and avoiding constant management changes and transformations at the macro and sub-group levels Changing management thoughts from top to bottom Respect for the principles of good governance
2	village management	Highlighting the role of residents in villages in line with the development of smart services High decentralization and attention to the rights of residents
3	Rules and regulations in the field of providing smart services	Efficiency and effectiveness in related organizations Considering smartification as one of the main axes of development Strengthening the laws related to the development of smart services Strengthening the legal communication system between the government and the private sector (transportation systems, etc.) through drafting the necessary legal bills Creating a mechanism for coherence and coordination between the organizations and institutions in charge of smartification in Kish and exploiting all the available capacities. Specific and responsible legal entities to provide smart services Appropriate rules and regulations and systematic and institutional thoughts for management
4	Place-based development	Providing smart services according to abilities and needs Attention to the diversity of economic activities Compatibility with the environment and the existence of infrastructure and supply chains

Table 2. Results of open coding based on secondary code

Row	Semantic unit	The concepts
5	Result of innovation path and process	Development of support policies according to the amount of investment
		Attention to services
		Choosing priorities according to the capabilities of human resources
		Attention to support institutions
6	Active stakeholder participation	Interactive, face-to-face engagement with residents
		Close cooperation with different population groups to identify local and specific needs of the region in line with the development of smart services
		Developing smart projects with youth-oriented social interactions and youth leadership
7	A unique view of the development of smart services	Officials' belief in creating more jobs through the development of smart services
		Officials' special view on the development of smart services in the villages of Kish according to the economic conditions
		Emphasizing the issue of improving the economy of Kish through the development of intelligence by choosing the slogan of recent years
		Increasing the motivation of government departments to plan and invest in the field of intelligence
8	Decentralized approach in the development of smart services	Decentralization of responsibilities and division of tasks related to the development of intelligence among different institutions and organizations in villages
		Specialization of smart activities and the use of specializations in a decentralized manner among the responsible organizations
		Integrating and harmonizing plans related to smartification away from any centralism
9	Increasing budget	Increasing the state of the budget allocated to different administrative departments in the field of villages
		Determining the budget structure based on the needs of the regions
		Increasing the budget at rural levels
10	transparency	Efficiency and effectiveness in related organizations
		Transparency in the field of intelligence
11	The development of the concept of intelligentization	Expanding the term intelligence in organizations
		Correct and scientific perception of intelligence and development of service provision among the residents of villages and officials
12	Increasing the educational level	Training villagers on how to use new equipment and technologies
		Increasing digital literacy
13	Determining priority areas	Investing in the development of advantageous fields of intelligence
		Active participation of local Kish stakeholders in choosing advantageous areas
		Proportion between Kish's investment areas with the amount of investment
		Selection of investment areas according to the capability of rural manpower in Kish

Reference: Research findings, 2022

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Extraction of Themes and Main Concepts (Encoding Orientation): Encoding orientation is the second data theory analysis stage. This stage aims to establish a relationship between the generated classes (in the decoding stage). This process is performed based on the paradigm model and helps the theorist to facilitate the theoretical process. Essentially, relationship building in encoding orientation focuses on expanding and extending one of the classes. In this stage, the themes and main concepts are extracted using horizons or significant statements from the previous stage. This is done by categorizing statements into larger information units called semantic units. Semantic units represent different dimensions and provide descriptions based on the subsequent stage. In this stage, six themes or concepts were extracted, and the constituent concepts of each theme were identified (Table 3).

According to the obtained results, the propellants (efficient and capable management, determining vision and priority areas, achieving budget related to intelligent services, integrated rule management system, sensitizing different groups, and harmonizing with smartification, considerations, and requirements of the smartification process) was proposed by experts for rural areas of Kish in the following order.

Table 3. Main categories and themes

Row	category	Semantic unit
1	Considerations and requirements of the smartification process	Location-oriented development Active stakeholder participation Decentralized approach in the development of smart services Development of innovation path and process village management
2	Determining the vision and priority areas	Determining priority areas
3	Sensitization of different groups in line with intelligence	Increasing digital literacy Development of the concept of intelligence A special view of the development of smart services
4	An integrated system of rules	Rules and regulations in the field of providing smart services
5	Realization of the budget related to smart services	Increasing budget
6	Efficient and capable management	Development and improvement of management performance in the rural area transparency

Reference: Research findings, 2022

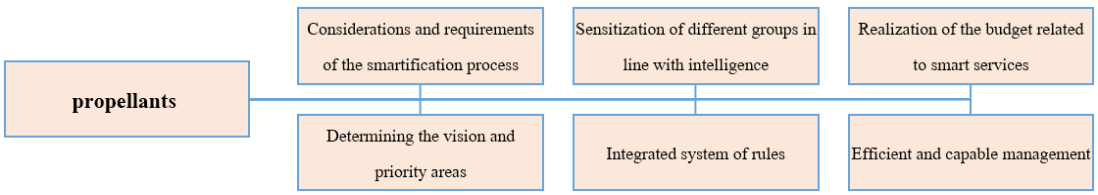

Figure 2. The Effective Model of Propellants for Intelligent Services Delivery in Rural Areas of Kish.
Reference: Research Findings, 2022

Furthermore, a combined model (F-ARAS + F-COPRAS) was used to rank each of the concepts. The ranking results of each concept are presented in Table 4.

According to the results obtained in Table 4, the most effective propellants, in order, are process considerations and requirements of intelligent automation with a weight of 72/23, efficient and capable management with a weight of 72/00, alignment of different groups with intelligent automation with a weight of 71/88, determination of vision and priority areas with a weight of 71/55, integrated system of rules with a weight of 71/21, achievement of budget related to intelligent services with a weight of 71/04. Experts have assigned the highest and lowest levels of importance based on their perspectives.

Table 4. Ranking results of each of the effective propellants of providing smart services in rural areas of Kish

propellants	Achieved score (QL)	Maximum score (QMAX)	Minimum score (QMIN)	Distance between	Score out of 100
Considerations and requirements of the smartification process	13/345	14/654	12/221	2/433	72/23
Determining the perspective and priority areas	12/556	13/665	11/334	2/331	71/55
Sensitization of different groups in line with intelligence	13/107	14/213	12/089	2/124	71/88
An integrated system of rules	12/321	13/435	11/123	2/312	71/21
Realization of the budget related to smart services	13/213	11/098	11/089	2/115	71/04
Efficient and capable management	13/213	14/334	12/123	2/211	72/00

Reference: Research findings, 2022

5. Discussion

The present study aimed to identify the key propellants for the adequate provision of smart services in rural areas of Kish. The results indicate that the effective propellants for the development of smart rural services in Kish include considerations and requirements of the intelligent process, determining vision and priority areas, sensitizing various groups to align with digitalization, establishing an integrated regulatory framework, achieving budget allocation for smart services, and ultimately efficient and capable management. Among these, the intelligent process's driver of considerations and requirements has been assigned the highest importance.

Due to their distance and dispersion, rural areas are deprived of many facilities, and intelligent technologies can be influential in providing services (educational, administrative, banking, etc.). Therefore, using technological tools is not a choice but a necessity. On the other hand, based on the obtained results, the development of smart services in rural areas of Kish faces challenges such as centralized management issues in relevant organizations, lack of collaboration between the public and executive officials, and the absence of a comprehensive plan and desired vision for digitalization. Meanwhile, the governing system in rural Kish lacks responsiveness, transparency, inclusivity, justice, participation, accountability, and legality, which poses challenges to the sustainable development of rural areas.

Smart development planners and managers need to pay attention to this issue. Unless smart development in rural areas aligns with its noble goals beyond mere rhetoric and slogans, unless widespread public participation takes place in a genuine and non-political space, and unless education and awareness in the field of smart development become a meaningful scientific and applied specialty at the local level, rural areas in Kish will not progress towards sustainable development. Therefore, in rural areas of Kish, a transformation and the emergence of effective management must take place. Finally, it can be said that achieving the model of a smart village requires time and effort, but in this regard, the successful experiences of regional countries such as the UAE and Turkey, which have made significant progress in achieving smart village indicators and sustainable rural development, should be utilized to expedite the process of rural digitalization at the regional level. Ultimately, the results of this study are in line with the findings of Akbaroghli & Qasemi (2020), Barghi & Ghanbari (2010), and Lyons (2018).

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Conflict of Interest

The authors declared no conflicts of interest.

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