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Perceptions and Key Factors Influencing the Concept of Smart Bangladesh

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Abstract. This study explores the concept of a smart Bangladesh, focusing on the roles of smart citizens, government, society, and economy. It argues that leveraging technology is not limited to digitizing government services but also involves transforming the interactions between citizens, society, the economy, and the government. The findings highlight the significant influence of smart citizens and a smart economy on this concept, emphasizing its relevance for both developing and underdeveloped countries. A total of 179 responses were collected using random sampling, ensuring comprehensive coverage for structured interviews based on the Likert scale. The impact was analyzed using inferential statistics with SmartPLS (Version: 4.0.9.9). Bibliographic data spanning from 2018 to 2023 were visualized using VOSViewer, mapping 214 pieces of literature from the Web of Science (WoS) database to support the concept. Structural Equation Modeling (SEM) and Exploratory Factor Analysis (EFA) yielded an R-square value of 51%. The results confirm the acceptance of hypotheses H1 (β = -0.057, t = 0.730, p > 0.233) and H4 (β = 0.603, t = 5.459, p < 0.000), showing a direct effect on the smart concept. This study presents a holistic approach to sustainable development through technological transformation, consolidating research across smart domains like healthcare, education, agriculture, payments, and grids.

Keywords: Smart Bangladesh, Smart Citizen, Smart Government, Smart Society, Smart Economy

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1. INTRODUCTION

The term "smart" encompasses the application of cutting-edge technological advances such as the IoT, AI, blockchain, massive amounts of data, robots, technology for drones, three-dimensional printing, and others to better society. Smart Bangladesh refers to the comprehensive initiative undertaken by Bangladesh to connect technology and innovation for economic, social, and infrastructural development. It involves integrating smart solutions across various sectors like agriculture, healthcare, education, transportation, and governance. The program uses technology to solve social problems, boost productivity, and improve residents' lives. Smart Bangladesh promotes digital infrastructure, e-governance, smart cities, digital literacy, innovation, and entrepreneurship. Smart Bangladesh uses information technology to build a more connected, digitally empowered community, enhance public services, and boost economic growth [1]. The ecosystem of "Smart Bangladesh" is going to be founded on four major cornerstones: "Smart Citizen," "Smart Government," "Smart Society," and "Smart Economy." The objective of "Smart Citizen" will be to instill in the populace of Bangladesh a "digital first" mentality through the implementation of campaigns and extensive digital literacy initiatives. These individuals will access information via digital technologies, including mobile devices and the internet. Across essential fields including medical care, schooling, farming, financing, and safety for everyone, the "smart government" ought to fully adopt digital offices and hyper-personalized service platforms [2]. Although Bangladesh has initiated the process of digitalizing the automation of public services for more than 2,000 public services, a substantial acceleration has remained necessary to fulfill the 2041 deadline.

A smart nation seeks to improve the welfare of its populace and increase competitiveness via technology and innovation. It emphasizes governance bolstered by robust cybersecurity and innovative technology, requiring collaboration among government, industry, and citizens. This encompasses advanced infrastructure, transparent data policies, and the development of new competencies and administrative skills [3]. Globalization lowers manufacturing costs, allowing businesses to provide cheaper products, which contributes to improved living standards. The adoption of Industry 4.0 boosts output by further reducing costs and increasing efficiency. Bangladesh is working towards integrating Industry 4.0 technologies as part of its

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development efforts [4]. In the modern digital age, the incorporation of Artificial Intelligence (AI) has become essential for countries pursuing holistic growth. Bangladesh, with its aspirational goal of realizing a Smart Bangladesh, is at the vanguard of utilizing AI technology to augment government, enhance public services, and stimulate economic growth [5]. Bangladesh is diligently attempting to achieve the objective of becoming a smart nation. By 2041, it will evolve into a Smart Bangladesh by emphasizing supply chain management, electoral systems, healthcare, renewable energy use, trash management, and leveraging the potential of blockchain technology [6].

A "smart society" is a civilization that raises the living standards of its citizens through the incorporation of technology and innovation. The general population will adopt digital values, ethics, and tolerance. The ecosystem for wireless payments will incorporate "Smart City" and "Smart Grid" as essential components. The essence of this term "Smart Economy" resides in the realization that Bangladesh intends to incorporate ICT as a primary source of revenue by 2041 [3]. According to projections, the ICT sector will generate an aggregate value of $50 billion by 2041, with a minimum of fifty unicorn firms establishing market dominance in Bangladesh. While the nation's audacious objective for establishing "Intelligent Bangladesh" around 2041 is commendable, the execution is going to present some formidable obstacles[7][7]. Before preparing a tangible master plan, the government must engage in in-depth dialogues with pertinent interested parties. It is generally advisable to establish a group determined to facilitate coordination via pertinent interested parties [7]. To provide assistance to emergent technologies, regulatory frameworks must be expeditiously adjusted. Policies should be implemented to support and safeguard the valuation of technology IP. Finally, human resource development should be given the utmost care and attention. Universities have been unable to incorporate emerging technologies into their curricula until now. An enormous disparity still exists between academia and industry, which must be closed immediately. The major objective of this research is to figure out and visualize the influential pillars of the Smart Bangladesh concept. Specific objectives are:

1) RO1: To identify the impact of smart citizens on the concept of smart Bangladesh.
2) RO2: To state the impact of smart government on the concept of smart Bangladesh.
3) RO3: To measure the impact of smart society on the concept of smart Bangladesh.
4) RO4: To show the impact of smart economy on the concept of smart Bangladesh.

2. THEORITICAL FRAMEWORK

2.1. Smart Citizen

Urban centers globally are undergoing fast urbanization and a growing population, necessitating the urgent implementation of intelligent infrastructure to improve citizen services. Given the comparable technological and socio-economic obstacles, it is imperative to convert Dhaka, the capital of Bangladesh, into a sustainable smart city [8]. Intelligent transportation systems (ITS) have emerged as helpful tools for developing traffic infrastructure in smart cities, thanks to recent advances within the realms of advanced computational techniques and visual perception technologies. Several computer vision algorithms for vehicle detection have been presented; however they were restricted in their ability to handle chaotic, crowded, and laneless traffic circumstances. Furthermore, many of the local vehicle configurations typical in South Asian nations, including Pakistan, Bangladesh, and India, were not included in these frameworks. Vehicle identification and counting model for unstructured settings such as busy and laneless traffic, occlusions, and a varied spectrum of local cars [9].

A study examines Bangladeshi passengers' views about mobile application-based transportation sharing. This analysis directly evaluates the happiness of passengers using Bangladeshi mobile application-based transportation sharing, as well as the implied value and superiority of the service. Through passenger satisfaction in mobile application-based transportation sharing services, this research analyzes the passive association between implied value and superiority of the service to enhance financial gain and foster passenger allegiance. The research shows that the perceived value and benefits for making money greatly affect how satisfied passengers are, with their happiness directly affecting their loyalty to mobile application-based transportation sharing services, helping companies become more competitive and trustworthy [10].

Hypothesis 1: A substantial correlation exists between smart citizens and the concept of a smart Bangladesh

2.1.1. Widespread Digital Literacy and Use of Digital Technology

In recent years, the development of low-cost broadband plans and handsets has expanded the appeal of communication media platforms. People are utilizing digital

platforms for interaction, often perceiving it as more straightforward than in-person dialogue. Their communication initiates in the digital realm and gradually extends. Social media has evolved into an online socializing medium [11]. Significant benefits accrue to the lodging sector in Bangladesh from financial technology services. Research examining how client experience and attitude may facilitate the relationship between clients' loyalty intentions and fintech services is scarce. Hence, the present research investigates the correlation between fintech services and the intention of customers to remain loyal to the Bangladeshi hotel sector. In Bangladesh, the hospitality industry will increase efficiency and improve service quality with the aid of the study's results. Financial technology companies and the lodging enterprises must devise strategic initiatives to advocate the pervasive adoption of fintech [12]. The service-profit chain model delineates profitable tourism through sustainability, the application of SMART technology, and social inclusion, thereby ensuring benefits for all stakeholders involved. Central areas of technological emphasis encompass smart education, strategic employer utilization, comprehension of customer value, sustainable practices, and collaboration with government entities, illustrating the relationship between well-being and service quality in the hospitality and tourism sectors [13].

2.1.2. Access to Information

Various efforts have been undertaken to close the digital divide in Bangladesh. A. Islam et al. (2011) examine Community Information Centers (CICs), which are distinctively and strategically contributing to the reduction of the digital divide and emphasize the current activities that are facilitating the creation of a digital Bangladesh [14]. Despite the consensus that information is crucial to development, no proven method for using it for sustainable development has been found. Hoq (2012) explores the significance of having data in remote Bangladesh's socio-politico-economic sectors, highlighting the government's commitment to a Digital Bangladesh by 2021. This includes food production, medical care, equality in school, work, the marketplace, and financing and handling catastrophes, emphasizing the importance of informed rural populations for long-term prosperity[15]. Local area computing initiatives aim to enhance access to data and improve communication technologies to facilitate network goal attainment. Although their objective is to cultivate competencies that enhance network profitability, the sustainability of the organizations transmitting data to local assemblies is rarely taken into account during project creation. [16]. The Bangladeshi media transmission partner is

developing an application to store all SMS sent by members, with plans to update it after completion and charge a membership fee. However, members have secured valuable information for further basic arrangements. This research suggests that data access should be planned for from the start in local area computing initiatives in agricultural nations [16].

2.2. Smart Government

Internet-based government aims to attain intelligent administration, which is expected to eliminate misconduct due to its alleged responsibility and openness. E-government is being used in Bangladesh and Pakistan to try to change people's behavior by promoting openness and responsibility in combating crime. The research shows that e-government plays a big part in reducing corruption. Transparency and accountability also significantly contribute to this process by serving as intermediaries between e-government and users' intentions to act, while users' intentions to act further facilitate the connection between e-government and the reduction of corruption [17].

Hypothesis 2: A notable connection exists between smart governance and the idea of a smart Bangladesh.

2.2.1. Smart Healthcare

Healthcare is among the least supported sectors in Bangladesh and numerous other similarly impoverished nations. When they do, the cost of adequate healthcare for individuals living in remote and isolated areas is too high [9]. The healthcare system is a crucial component of society. Khan et al., (2021) discuss the development of online and smartphone applications for Bangladeshi residents. These systems enable patients and clinicians to register and get medical care via video calling. Patients may use the built online and mobile applications to enroll using their contact digits, save health records, seek up doctors nearby, text or video contact the doctors, set an alarm to remember to take their prescription on time, and make payments online. Physicians may also sign up for the system, which uses a human verification procedure to guarantee the accuracy of the information they supply. When a patient contacts the physicians via text or video call, the doctors have access to the patient's medical history and can change their course of treatment as needed. The system has been implemented and tested. The applications ensure that treatments are available in remote areas and provide a faster and more

efficient manner of obtaining them. The system will contribute to the countrywide development of medical facilities and deliver physicians to assist in enhancing the well-being of Bangladeshi inhabitants [18].

Currently, technology is regarded as a boon not only for the general populace but also for individuals with physical disabilities. The accelerated progression of technology has created new options for individuals with physical disabilities. Gesture-based Smart Wheelchair (GBSWC) control algorithm focuses that can be managed by the person's hand motion through the utilization of connected devices. The tailored, sophisticated wheelchair can go onward, right side, and left side and halt according to the hand motion commands provided to the system. Furthermore, if the user encounters any sort of trouble, difficulty, urgent scenario, or requires an emergency contact, just one click on the detector will facilitate the transmission of an urgent SMS to designated subscribers. And just make a second push on the detector, on the other hand, will halt the smart wheelchair's progress [19]. An Android application has been created to assist individuals suffering from appendicitis, a disorder characterized by getting ill and discomfort in the appendix [20]. Information technology has revolutionized and democratized health care. Information technology has made health services accessible to everybody. Many indigenous people now utilize smart phones for internet. Mobile phone-based services will benefit indigenous people because there are not enough health care groups or physicians. Mobile phone-based health services can bridge the digital gap and benefit indigenous communities, particularly those with chronic diseases who live at home [21].
A decentralized medical record server was needed in Bangladesh. We struggle with doctor's visits, report organization, and follow-ups. When used with database management systems, blockchain (smart contract) technology enhances safety of data, genuineness, periodic management, and various facets of record maintenance. Blockchain is a revolutionary, decentralized data security system. Management will be happy with patients after smart contracts. It means only authorized users may view the material. This document utilizes an immutable ledger, encrypted electronic agreements, and decentralized encryption to prevent hackers from accessing it. Blockchain technology will protect medical data, benefiting patients and clinicians [22].

In Bangladesh, technological advances have transformed healthcare and enhanced service affordability. Numerous tribal populations utilize smartphones for internet

access, rendering mobile phone-based services advantageous. The key objectives are surveillance of patients and medical leadership in remote medical centers [23]. Bangladesh's health and social care systems lack the ability and infrastructure to protect ASD (autistic spectrum disorder) juveniles. The physically disabled youngster is unable to provide nurturing for himself; no individual is capable of monitoring him 24/7 for panic, safety zone, position changes, falls, etc. A belt, wristwatch, or locket-sized smart gadget was proposed that monitors children 24/7 and communicates with parents for emergency action [24]. The researchers look into how feeling uncomfortable with technology affects the link between business information (BI) and the use of e-Pharmacy in Bangladesh, finding a strong connection with website information, medical services, expectations for capacity, return policies, and social stigma. As consumers exhibit interest in e-pharmacy, policymakers must improve their services through development programs to expand e-pharmacy based on previous e-commerce studies and give a general overview of buyers from developing countries [25].

2.2.2. Smart Education

In the contemporary context, acceptance of digital tools in academia is crucial, particularly with regard to the implementation of digital education, particularly before and subsequent to the COVID-19 issue [26]. However, the target of the high-tech industry is experiencing a considerable shortage of human resources, which implies that both rising and developing countries are confronted with this difficulty. As a result, productivity is reduced and waste product increases. The term "Industry 4.0" suggests a wide range of complex and advanced gadgets that dominate production, creating a demand for individuals who are both highly qualified and astute. However, neither the educational curriculum nor the teaching techniques in those nations have been updated to accommodate the new language, nor will they be in the near future. [27].

Equal weight is given to the critical components of personnel quality and the likelihood of recruiting creative human resources for smart enterprises in this study. Quality is the key criterion for evaluating any learning outcome, and this study gives engineering students the organized guidelines they need to receive the sustained quality education necessary for 4IR.[27]. Hasan et al. (2021) represent the critical parts of vocational education and competency enhancement for approaching difficulties and potential solutions necessary for 4IR. As a result, to alleviate the deficiency of proficient personnel

necessary pertaining to the 4th Industrial Boom, students should be made aware of the challenges they face in their professions as well as the worries of the educational system [27].

2.2.3. Smart Agriculture

Because of its geographical location, Bangladesh is not an exception to the rule that coastal lives and agriculture are extremely vulnerable to changing climates worldwide. Climate change will continue to affect agriculture. Small-scale production systems should prioritize climate change adaptation, but inexpensive mitigation measures in agriculture boost food security and reduce climate change severity and the need for more adaptation [28]. Bangladesh is heavily reliant on agriculture, which is influenced by the climate. The production of food in Bangladesh is under threat from climate change. Accurately forecasting future variations in precipitation is crucial for both systematic agricultural strategizing and ecological resilience [29]. Bangladesh's long-term growth goals emphasize strengthening food, energy, and water systems for people's welfare. The ruling party encourages advanced technology for ecologically sound agricultural production. The adoption of solar-powered irrigation systems and suggested compost doses is affected by factors such as land classification, views regarding earth's fertility, understanding, ecologic consciousness, supplementary earnings, and funds supply. Farmers that implemented these technologies reduced production expenses by 1.36% and had an 8.92% greater ROI [30].

Detailed econometric analysis demonstrates that adaptation tactics selected by farmers who grow rice are significantly affected by variables such as the education level of the parent, income at home, crop size, and availability of knowledge, along with outreach programs. To reduce farmers' risk, we advise increasing funding for research, farmer education, and focused extension services. These efforts will also help spread knowledge and technologies related to climate smart agriculture [31]. Globally, farmers are embracing smart agricultural techniques. Bangladeshi farmers can benefit from the IoT-based savvy cultivation solution. The Internet of Things facilitates e-governance by facilitating an efficient and straightforward data interchange between the state and its agricultural constituents. The smart board will be useful for farmers since it will notify them of any government announcements that pertain to agriculture. It is an organized combination of many technologies, one of which is a smart sensor network [32]. AI and IoT are crucial

for smart farming due to advanced technologies, high interoperability, and sensor capabilities. They promote intelligent farming techniques, empowering accountable leadership to safeguard sustainable agriculture, surpassing conventional methods and promoting sustainable practices. This study contributes to intelligent agriculture literature by implementing smart farming through AI and IoT, assisting policymakers in Bangladesh in responsible initiatives [33]. The technological revolution is occurring in fishing and farming. Fishery is encountering difficulties due to the rising world population and its associated demands. A sophisticated microcontroller-driven technology designed to effectively oversee and manage fish farming operations via a smartphone app. The device possesses the ability to track essential parameters of fishing, such as the volume of water, acidity, and temperature, as well as clarity. A smartphone application featuring an intuitive interface is developed to track these elements and enhance decision-making [34].

The three main measures of ecological viability in farming practices are water consumption (WC), emissions of greenhouse gases, and biological carbon in the soil (BCS). It is possible to achieve high crop production with minimum environmental effect by boosting BCS while minimizing emissions of greenhouse gases and water consumption [35]. Educating farmers on effective input management and complementary technologies (CT) is crucial for the development of innovative intensification options for climate-resilient wheat agriculture. In addition to discussing tillage alternatives within Connecticut, progress in farming programs ought to concentrate on tackling variabilities in feeding practices [36]. Although the practice of conservation agriculture is frequently promoted as a climate-savvy cultivation system, its adoption among Bangladeshi farmers has been notably low. Research demonstrates that farmers' decisions to adopt and maintain conservation agriculture are influenced by economic classes and mental determinants. Interventions aimed at promoting sustainable practices among farmers should highlight the long-term benefits of conservation agriculture, including its impact on soil health, crop yield, and the ecology [37].

Aquaculture is a rising food and economic source for underdeveloped nations. Infrastructure shortages have lowered aquaculture output in developing nations, where 18 million people work. Aeration increases yields and dissolved oxygen (DO), but it's expensive. A feasibility study compared the airflow scheme with a system for controlling

energy consumption through dispersion to show potential. For widespread and intense fish farming in Bangladesh, the airflow scheme with dispersion was run in a one hundred m^3 reservoir. In contrast to perpetually running, comprehensive, and robust aquaculture, employing a system that provides feedback resulted in power cost savings of 78.66% and 52.48%. Smart instrumentation might reduce aeration technology energy needs and boost yield for developing world farms [38]**.** Farmers have traditionally spent a lot of time cultivating, which often fails. In several nations like Bangladesh, an IoT-based system actively analyzes soil pH, uploads data to the cloud, and notifies farmers via IFTTT if pH is out of range. This data being released to the cloud might also benefit geologists who are always looking for soil quality data. It will help farmers cultivate rice and automatically adapt to little environmental conditions, keeping them away from the rice fields. The device uses a water pump to irrigate rice plants at different growth phases. Electric lamps and fans keep the temperature within a restricted range [39]**.** The research assesses solutions for reducing releases of greenhouse gases utilizing data from peasant crop and animal farmers in Bangladesh. It encompasses model outputs for CO_2, CH_4, and N_2O emissions together with their atmospheric warming threat. The data facilitates the prioritization of agricultural research and development initiatives, aligning with dietary and ecological targets. It facilitates the organization of farming extension and assistance services to enhance farmer awareness.[40]. How much of this mitigation benefit is realized depends on how well supportive policies and programs encourage farmers to embrace climate-smart farming practices. Thus, the government should promote these possibilities through agricultural extension, legislative interventions, and incentive systems [28].

2.2.4. Revenue Management and Public Security

The increase in road accidents recently has prompted experts to investigate the reason for the tragedy. In this regard, a smart system that integrates recorded information such as velocity, acceleration, rotation, and vehicle location may assume significant duties in recognizing the existence of an accident and sending fast notifications to first responders. A 'Blackbox' module that performs two functions at the same time to decrease the frequency of accidents. The 'BlackBox' module may map and record data on a specific road's government, which can then be compared to accident data from that area kept in a database. Based on the data, a warning might be sent to those who are concerned about accident-prone areas [41], [42]**.**In developing nations like Bangladesh, the

procedure of registering title, possession, or other rights for properties, such as land, is a laborious one [43].

Bangladesh, a developing country, takes CSR seriously. As a result, the study seeks CSR sustainability opportunities while taking into consideration sustainability challenges in Bangladesh's corporate sector and the country's fast increasing ready-made garment (RMG) industry [44]. The globalization of enterprise has complicated the creation of a standardized resilience framework for corporate social obligation, despite this strategy potentially offering an opportunity for longevity. A smart urbanization needs a carefully thought-out upgrade process, which could be sped up by wisely using CSR, showing a strong link between social responsibility and achieving green cities [44].

The public of days is subjected to a great deal of harassment from society, particularly women and children. The number of illegal acts committed against women and children has been steadily rising. We frequently hear about stories of sexual assault, eve-teasing, and attempts to mole state or even kill victims of rape in public or open spaces. Additionally, a lot of instances have been dismissed for lackluster evidence. The number of sexual assaults and other illegal actions in Bangladesh is on the rise [45].

2.3. Smart Society

Even though the digital world makes life simpler, quicker, and more intelligent overall, it also presents significant risks to information privacy over time because a variety of actors constantly watch over or track our online conduct, often without our knowledge. As a result, the discussion surrounding information privacy seems to be one of the most contentious topics in modern international politics, legislation, and industry. Globally, many policy measures have been enacted in response, but Bangladesh is falling behind [46].

Hypothesis 3: A profound correlation exists between a smart society and the concept of a smart Bangladesh.

2.3.1. Digital Tolerance and Values &Ethics

Blockchain (BC) technology is attracting the interest of academics and industry because of its inherent transparency and security without the involvement of a tertiary entity.

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This technology has gained acceptance from both universities and corporations, which have utilized it in various applications, such as cryptocurrency, the Internet of Things, logistics management, contract technology, and other key distributed gadgets [47]. A complex monitoring system has been set up that uses machine vision and deep learning to identify motorcyclists without helmets and read identification codes from tags using Tesseract OCR, along with necessary machine vision methods and tools. The testing of our system on our dataset showed accuracy rates of 90%, 55%, 80%, and 95% for helmets, people, bikes, and number plates, respectively, using SSD MobileNet V2, and 92%, 58%, 81%, and 96% for the same categories using quicker R-CNN Insight V2. [48].

Individuals characterized by sensitivity and ethical values are hypothesized to exhibit a greater propensity for engaging in activities that promote social welfare. However, the existing literature presents conflicting proof concerning the influence of sentimentality and ethical duty on the development of communal business plans in Bangladesh, a frontier economy. Ukil et al. (2023) assert that an individual possessing empathy and a moral imperative to assist others will refrain from initiating a social venture unless they perceive themselves as competent and endorsed, elucidating the connections between individual-level variables (sentiment, ethical duty, and social independent self-confidence) and contextual-level variables (perceived social backing) in relation to communal business plans [49]. A system employing GSM and IoT technologies is being developed to detect sewage gas poisoning and Aedes mosquitoes to avert health complications. The system employs an ultrasonic sensor to measure sewage distance and a water level sensor to check water flow. Upon reaching a specified threshold, it transmits a GSM text message to authorities, identifying areas requiring attention. Real-time data is accessible via an online platform utilizing NodeMCU, enabling both authorities and the public to remain informed [50].

2.3.2. Cashless Payment

E-ticketing, as a technology that provides self-service, has gained significant popularity in travel, particularly within the airline sector. The implementation of e-ticketing by heritage visitors garners considerable attention within the tourism sector, particularly in emerging economies. Attitude significantly influences e-ticketing usage patterns by influencing the connections between e-ticketing intention and many categories, including simplicity of use, personal standard, and concern over privacy. The study offers major

insights into the gadget uptake behavior of tourists for researchers and administrators of cultural sites in emerging economies [51].

The proliferation of internet purchasing globally has transformed consumer behavior and corporate operations. Bangladesh's dependence on online shopping offers both prospects and challenges. The substantial business is increasing demand for internet buying. The Technology Acceptance Model (TAM) is employed to investigate and forecast the online purchasing intentions of Bangladeshi consumers. Research shows that the Technology Acceptance Model (TAM) is still useful for explaining how people's behavior changes when they buy products or services online. Furthermore, this study holds significant educational and business implications for forecasting client purchases via the internet within the online marketing sphere [38].

2.3.3. Smart Grid

Bangladesh is a heavily populated country. With conventionally scarce resources, the government has undertaken numerous measures to electrify this densely populated area. Numerous academics suggested a hybrid power generation system to electrify this island and rural areas. One of the main problems with on-grid hybrid power generation is stability [52]. Smart-grid architecture serves as a platform that integrates several advanced technological characteristics throughout the electrical system spectrum. An effective intelligent power system encompasses smart metering, a resilient communication network, comprehensive integration of clean energy sources, and decentralized generation, along with other critical elements [53].

Smart grid denotes an electrical energy infrastructure that enhances grid quality and efficiency by addressing system disturbances. Energy scarcity is a significant issue for a developing nation such as Bangladesh. The transmission and distribution of power, together with necessary power sources, are critical for serving citizens and supporting economies [54]. Saint Martin's Island in Bangladesh attracts many domestic and foreign tourists. Internet of Things implementation can maximize Saint Martin's resources according to smart city standards. The optimum microgrid setup for the seventh Sustainable Development Goal was found by maximizing distributed sources of electricity. Dynamical simulations, eco-wave strength, and second-life devices give planners the transdisciplinary insights they need to turn Saint Martin into a tourist-

intensive intelligent municipality [55]. Formulating a novel Time of Use (TOU) price framework for Demand Side Management (DSM) targeting residential users in Bangladesh. In our advanced technological era, the need for electrical energy is perpetually rising. Nevertheless, the total expansion of power generation is somewhat sluggish due to the exhaustion of fuel supplies. A strategic plan must be executed at the consumer level to alleviate the energy issue. The DSM concept is presented, allowing users to save power expenses by altering their consumption habits. It subsequently decreases the generation demand during peak hours, hence providing managerial versatility and economic advantages to the utility. The literature has utilized the DSM in home, business, and industrial contexts [56].

2.4. Smart Economy

Smart economy is based on ICT revenue generating pillar. As one of the world's rapidly expanding economies, Bangladesh must enhance its electrical infrastructure and strive to diminish reliance on fossil fuel-based energy sources. Implementing a smart transformer is essential to ensure reliable, economical, and ecological electrical power for the existing and growing power network. As Bangladesh seeks to include distributed generation (DG) into its electrical supply system, it is imperative to consider the integration of a smart distribution transformer into its electrical infrastructure [57]. The mechanisms of the smart economy, particularly the advancement of smart manufacturing and the establishment of smart markets, have been examined through diverse research efforts for enhancing smart manufacturing processes such as digitalization, artificial intelligence, industrial robotics, the Internet of Things, global supply chain integration, and the establishment of a new production network [58].E-commerce profoundly influences operations such as advertising, ordering, and the online supply of items. It has emerged as a 'border crossing' for nascent enterprises, with developing nations embracing it for micro- and medium-sized businesses. Perceived difficulty, reliability, knowledge intensity, and managerial support influence the adoption in Bangladesh. The government has implemented frameworks for e-commerce adoption; yet, complexity persists as an obstacle. Enhancing compatibility may bolster the future viability of SMEs in Bangladesh and enable them to compete with quality requirements worldwide [59].

The core principle of SMART Tourism is the coordination of efforts among different vendors in the tourism industry, as well as their relationships with visitors. The traditional method of travel has been transformed into a smart tourism system by the use of innovative gadgets and technologies. There are three pillars of sustainability—economic, socio-cultural, and environmental—and savvy tourism tools are employed throughout the phases to produce value in co-created services [60].In the Hospitality 5.0 age, smart tourism has significantly evolved through technologies like artificial intelligence, the Internet of Things, robotics, and big data, enhancing tourist experiences and value creation for enterprises. These advancements improve experiential designs, products, and services, allowing businesses to better meet consumer needs, thus fostering growth in Bangladesh's economy [61].

Hypothesis 4: A substantial correlation exists between smart economy and the notion of a smart Bangladesh

3. METHODS

An inductive research approach is used, where quantitative methods (survey method) and statistics are utilized for data analysis. From the unknown population for the study, 179 respondents are selected randomly as stakeholders. Out of 179, 103 responses are used for analysis of the research. The rest of the respondents are treated as having unengaged responses. The researchers are attempting to conduct their random sampling technique using participants from the native population of Bangladesh. The aforementioned sampling technique involves segregating the regional divisions of Bangladesh: Barishal, Chattogram, Dhaka, Khulna, Rajshahi, Rangpur, Mymensingh, and Sylhet. To fulfill the objectives of the study, data are collected from primary and secondary sources. Secondary data are collected from the Web of Science (WOS) database for the last 5 years (2018–2023) for theoretical and literary support. We collected conference papers, articles, and book chapters from the WOS database in December 2023. A total of 214 papers were found in the literature search from WOS, and these papers are grouped into subjects like Engineering Electrical Electronic, Telecommunications, Computer Science Information Systems, Computer Science Theory Methods, Robotics, Chemistry Analytical, Computer Science Hardware Architecture, Energy Fuels, Instruments Instrumentation,

Computer Science Artificial Intelligence, Green Sustainable Science Technology, and Urban Studies.

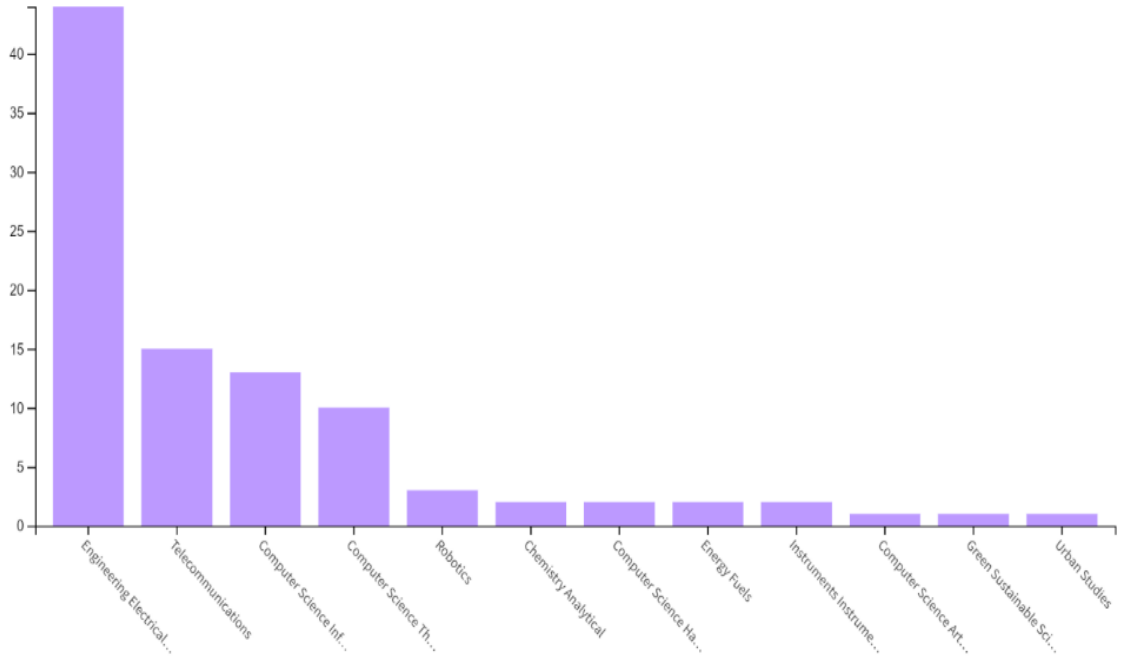

Figure 1. Web of science (WOS) categories for article search

Primary data are collected from the desired participants by using structured questionnaire. In the first phase, data are collected from face-to-face interview for pretesting the questionnaire. After confirmation of the questionnaire, data are collected by using Google form by emailing the link of the questionnaire to the selected respondents by confirming the proper guideline. In the questionnaire two parts are mentioned demographic profile and objective based question. For demographic profile descriptive statistics is used and for objective based question inferential statistics is used for factor analysis. 5-point Likert scale is used where 1= strongly disagree, 2 disagree, 3= Neutral, 4= agree and 5 = strongly agree. SmartPLS (Version: 4.0.9.9) software is used for Structural Equation Modeling (SEM) to evaluate the model and for bibliographic visualization VOSViewer is used to showing the co-occurrence of influential keywords for measuring the relevancy of the research as well as for referencing Zotero is used.

4. RESULTS AND DISCUSSION

4.1. Demographic Information

Table 1. shows the age distribution of the study participants who answered the survey. Based on age, less than 20-year-old respondents are 23 (12.8%), between 20 – 29 years 98 (52.0%), from 30 – 39 years 40 (22.3%), 40-49-year-old respondents are 10 (5.6%) and greater than 50, merely (8) 4.5% of participants. Respondents are from Barishal division 5 (2.8%), Chattogram division 74 (41%), Dhaka division 58 (32.4%), Khulna division 10 (5.6%), Rajshahi division 6 (3.4%), Rangpur division 7 (3.9%), Mymensingh 18 (10.1%) and Sylhet 1 (0.6%). In terms of the respondents' educational backgrounds, the above figure (table-01) shows that 87 (48.6%) of them are undergraduate students, 61 (34.1%) students are graduate, 17 (9.5%) respondents fell into the category of those with less than a higher secondary certificate, 10 (5.6%) respondents are post graduate, and the remaining 4 (2.2%) had other degrees. Based on the respondents' employment status, the above table 01 reveals that (90) 50.3% of the respondents are students enrolled in various levels of education, (35) 19.6% employees are from private organizations, 25 (14%) are other-employed individuals from the categories, 17 (9.5%) are government employees, and the remaining 10 (5.6%) are businessman.

Table 1. Demographic characteristics of respondents

Variables	Categories	Frequency	Percentage
Age	Less than 20	23	12.8%
	20 – 29	98	52.0%
	30 – 39	40	22.3%
	40-49	10	5.6%
	Greater than 50	8	4.5%
Division	Barishal	5	2.8%
	Chattogram	74	41%
	Dhaka	58	32.4
	Khulna	10	5.6%
	Rajshahi	6	3.4%

Variables	Categories	Frequency	Percentage
	Rangpur	7	3.9%
	Mymensingh	18	10.1%
	Sylhet	1	0.6%
Educational Background	Others	4	2.2%
	Above Masters (Post Graduate)	10	5.6%
	Masters (Graduate)	61	34.1%
	Honors (Undergraduate)	87	48.6%
	Below HSC	17	9.5%
Employment Status	Government Job	17	9.5%
	Semi-Government Job	2	1.1%
	Private Organization Job	35	19.6%
	Businessman	10	5.6%
	Student	90	50.3%
	Others	25	14%

4.2. SMART Concepts in Different Field of The Study Over the World Based on WOS Database

By picking a co-occurrence analysis method that counts all instances of keywords, we discovered that when we set the minimum occurrence for keyword 5, 50 out of 1497 keywords met that requirement. For each of the 50 keywords, the total strength of the co-occurrence links with other keywords is calculated. The keywords with the greatest total link strength were selected. The number of keywords was 50, and we got 50 items with 5 clusters (green, yellow, blue, red, and purple), and the normalization method was association strength. From the figure 2, thern surmise that the most influential keywords which are listed based on top ranking. List of the top 10 are stated below (table 2.).

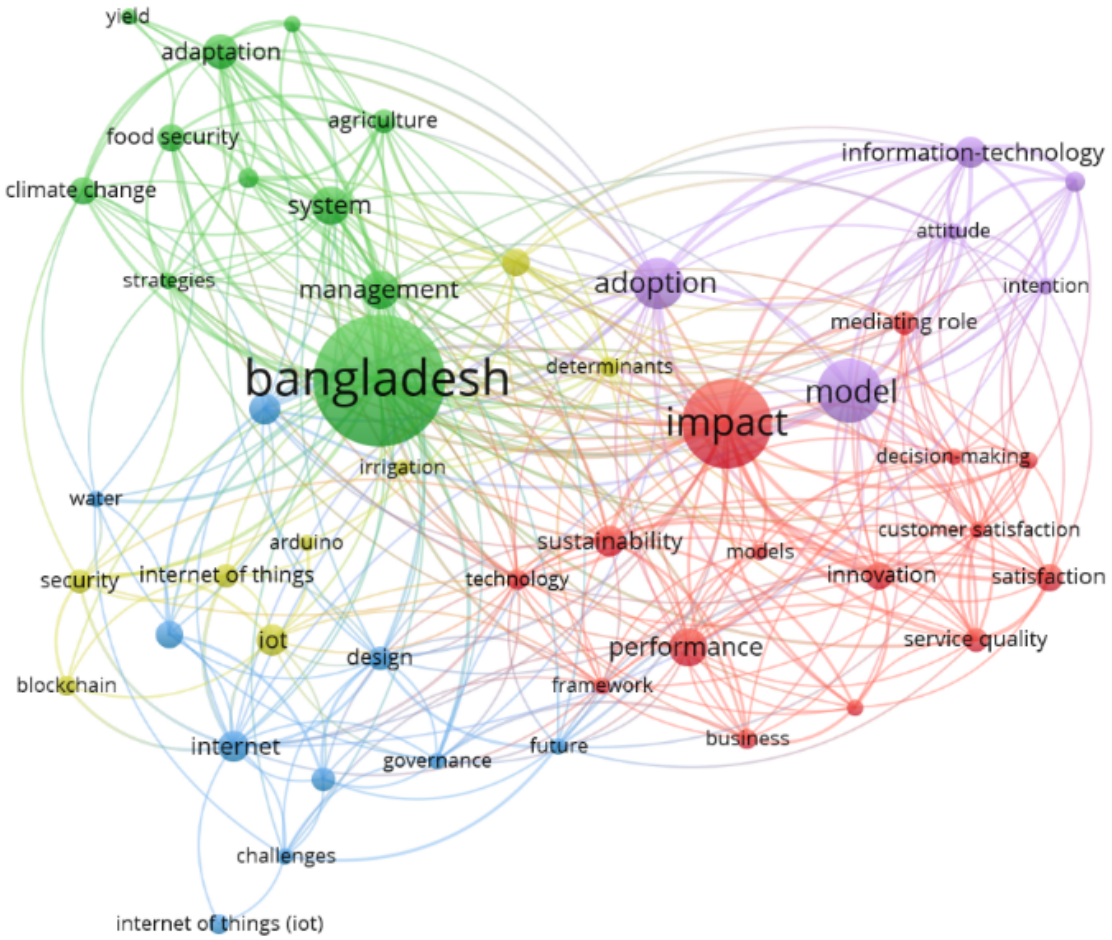

Figure 2. Visualization of co-occurrence with unit of keywords

Table 2. Top 10 keywords with occurrences and total link strength

SL	Keywords	Occurrences	Total link strength
1	Bangladesh	40	86
2	Impact	27	89
3	Model	19	45
4	Adoption	15	44
5	Management	11	36
6	System	11	26
7	Performance	11	20
8	Adaptation	10	33
9	Information-technology	9	32
10	Sustainability	9	28

4.3. Model of the Framework

The purpose of this study is to ascertain how the smart Bangladesh ecosystem, viz., smart citizens, smart government, smart society, and smart economy, influences the smart Bangladesh concept. Figure 3. shows the relationship with the variable in a diagram.

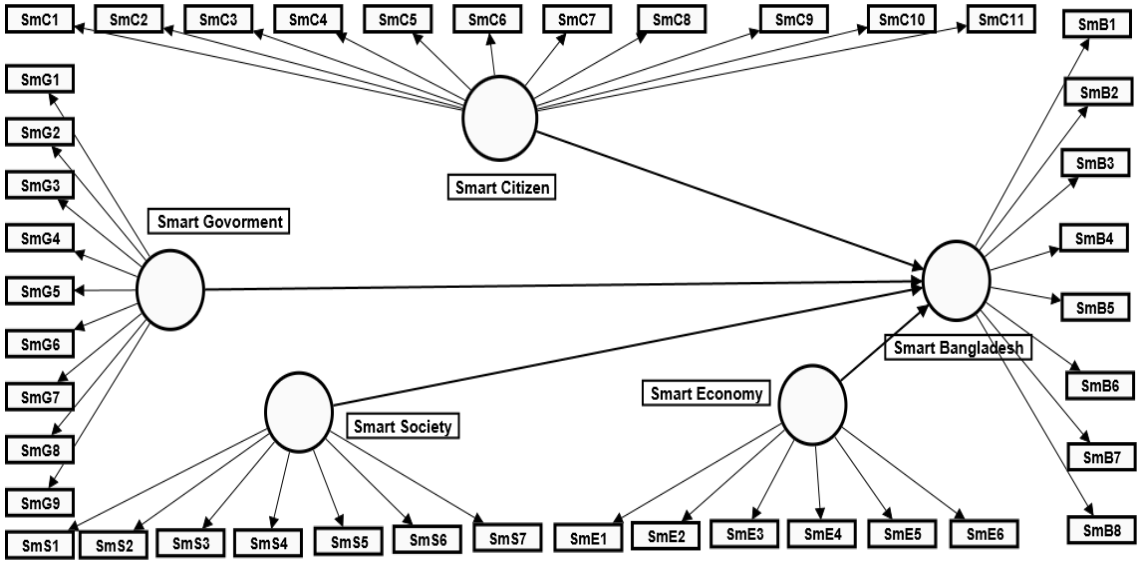

Figure 3. Conceptual Framework of the influential factors of concept of smart Bangladesh (author's creation).

4.4. Model Evaluation

4.4.1. Exploratory Factor Analysis

One of the most popular and extensively utilized statistical methods in the social sciences is EFA. This part of the study analyzed a total of 179 responses, yielding 103 valid replies after accounting for unengaged responses. From the sample survey, influential pillars of smart Bangladesh concepts are identified. The rotated factor matrix was utilized to obtain the five factors. The subsequent paragraph will elaborate on those variables in greater detail.

1) Factor-1 (Smart Citizen)

This includes eleven observed variables (Which are denoted to the model as SmC1 to SmC11) such as ease of online information; online payment and shopping service; benefit of utility and smart card; smart transportation; modern city facilities; visualization of digital literacy, smart urbanization, use of technology in pre-primary to higher education. All of the observed variables are shown in the figure 3.

2) Factor-2 (Smart Government)

This component includes nine latent variables denoted as SmG1 to SmG9 to visualize the pillar. The variables are (see figure 03) easy access to government information, harmonized website of government organization, availability of government policy and law, initiative of privacy protection and reducing health risk, ample opportunity of learning and gaining knowledge, use of technology for better planning and decision making; ethical, accountable, responsive and transparency for government activities, guideline for agriculture that is easily accessible to the step door of the farmer and aiming to the paperless government office.

3) Factor-3 (Smart Society)

There are seven variables (assigned as SmC1 to SmS7) that can be used to evaluate the robustness of the concept of smart Bangladesh. Which are digital currency services; general citizen benefits; personal protection service; smart citizen facilities for disabled, marginalized and minority citizen; clean urbanization; social equality and social development; and smart gird for best production.

4) Factor-4 (Smart Economy)

A smart economy depends on some latent factors, which are the use of digital technology to improve the efficiency of economic processes; the use of automation to reduce operational costs for increasing competitiveness; a willingness to use 4IR for a smart economy; reducing higher inflation, budget, and trade deficits; innovative and new entrepreneurial ventures; and striving to promote technological innovation, resource efficiency, sustainability, and high social welfare (See Figure 03).

5) Factor-5 (Smart Bangladesh)

In the observational model, smart government is the dependent variable, and the accumulated concepts of smart pillars are used. Latent factor of the smart Bangladesh depicted as honest, efficient, compassionate and non-communal; long-term investment plan and budget for educational instruction, health, agriculture and industry for providing the advantage of digital technology; to support vision 2041 need to ascertainment of smart citizen, , smart agriculture, smart health care, smart education, smart energy, smart governance and smart institutions; need to take opportunity for smart Bangladesh from internet of things (IoT), artificial intelligence (AI), Block chain, big data, robotics, drone

technology, 3D printing and other advanced technologies; digital mindset is required for the empowerment of Bangladeshi citizen by ensuring the digital signature program; use of technology and innovation to improve the standard of living of the people of Bangladesh; by using the digital literacy and implementation this sector can be one of the dominating revenue generating sources; and ensuring social and societal equity, eradicate extreme poverty and achieve high-income country status by 2041.

4.4.2. The Measurement Model

The table labeled as Validity and Reliability (Table 3.) presents data regarding the convergent validity of the research model. The table indicates that all latent variables or model constructs possess Average Variance Extracted (AVE) values exceeding 0.50. The AVE values for smart Bangladesh, smart citizen, smart economy, smart government, and smart society are 0.601, 0.629, 0.646, 0.646, and 0.579, respectively. These values indicate that all constructs meet the acceptable threshold of 0.50 for AVE values. Cronbach's alpha was used to assess the internal reliability of the model structures. Cronbach's alpha results, shown in Table 3 as 0.862, 0.710, 0.727, 0.733, and 0.758, are all acceptable because they are greater than or equal to 0.70. These findings indicate a strong relationship among the indicators of the model constructs (see Table 3.). Table 3. assesses the convergence validity of the model's constructs by examining the loading values. Sarstedt et al. (2017) suggest that the factor loading values for each indicator of the latent variable should exceed 0.70 (Sarstedt et al. 2017). In this study, no items were eliminated since all factor loading values fell within the range of 0.60 to 0.70. The structural model was analyzed to identify the influential factors of the concept of smart Bangladesh. These findings support the convergence validity of the research model, indicating a strong correlation among all construct indicators, as evidenced in Table 3. The IR (indicator reliability) of all the latent constructs is higher than the threshold value (>=0.4)[62].

Table 3. shows that all T-statistic values were over 2.33 at a 5% significance level, which strongly supports the importance of the outer model loadings. Therefore, based on this evidence, our structural equation modeling (SEM) can be deemed valid. In path modeling, a global goodness-of-fit (GoF) measure can be used, which is found by taking the geometric mean of the average commonality and average R^2, especially for dependent variables [66].

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Table 3. Exploratory factor analysis incorporating indicator reliability and model fit statistics

Variables	Influences	Factor Loading	SD	T-Statistic	IR	Construct Reliability		
						Cronbach's alpha (CA)	Composite reliability (rho_a)	Average variance extracted (AVE)
Smart Bangladesh	SmB2 <- Smart Bangladesh	0.775	0.068	11.354	.600	0.867	0.869	0.601
	SmB4 <- Smart Bangladesh	0.796	0.053	15.141	.634			
	SmB5 <- Smart Bangladesh	0.820	0.060	13.651	.672			
	SmB6 <- Smart Bangladesh	0.726	0.084	8.630	.527			
	SmB7 <- Smart Bangladesh	0.748	0.070	10.629	.560			
	SmB8 <- Smart Bangladesh	0.785	0.066	11.822	.616			
Smart Citizen	SmC6 <- Smart Citizen	0.783	0.078	10.047	.613	0.710	0.743	0.629
	SmC7 <- Smart Citizen	0.742	0.106	6.996	.551			
	SmC8 <- Smart Citizen	0.851	0.055	15.540	.724			
Smart Economy	SmE2 <- Smart Economy	0.790	0.056	14.153	.624	0.727	0.728	0.646
	SmE3 <- Smart Economy	0.808	0.055	14.675	.653			

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Variables	Influences	Factor Loading	SD	T-Statistic	IR	Construct Reliability		
						Cronbach's alpha (CA)	Composite reliability (rho_a)	Average variance extracted (AVE)
	SmE5 <- Smart Economy	0.814	0.071	11.540	.663			
Smart Government	SmG1 <- Smart Government	0.807	0.116	6.952	.651	0.733	.775	0.646
	SmG2 <- Smart Government	0.860	0.089	9.614	.740			
	SmG3 <- Smart Government	0.741	0.136	5.432	.549			
Smart Society	SmS3 <- Smart Society	0.740	0.076	9.742	.548	.758	.766	0.579
	SmS4 <- Smart Society	0.727	0.077	9.469	.529			
	SmS5 <- Smart Society	0.747	0.062	12.096	.558			
	SmS6 <- Smart Society	0.827	0.057	14.617	.684			

Table 4. Reliability indexes and criteria; Source: SmartPLS 4.0.9.9

Reliability Indexes	Criteria	Reference
AVE	>0.5	[63], [64], [65]
Alpha	>0.70	[66], [67]
Indicator Reliability	IR≥0.40	[62]

[Note. AVE = average variance extracted; α = Cronbach's alpha; IR = Indicator Reliability]

4.5. Discriminant Validity

To check if the model's constructs are truly different from each other using the Fornell-Larker criterion, the researchers looked at the square root of the Average Variance Extracted (AVE) for each hidden variable and compared it to how much it is related to the other hidden variables. According to this rule, the square root of the AVE should be greater than the correlations. This needs to be confirmed by looking at both the correlation matrix and the values along the diagonal. According to the criterion, the square root of the AVE coefficients should exceed the correlations. This condition needs to be verified by examining both the correlation matrix and the diagonal elements [63]. The results of the discriminant validity analysis are shown in Table 5. which indicates that the square root of the AVE values is higher than the correlations with any other constructs or latent variables in the model. This finding confirms that the model's constructs possess discriminant validity (see Table 5.).

Table 5. Discriminant validity

	Smart Bangladesh	**Smart Citizen**	**Smart Economy**	**Smart Government**	**Smart Society**
Smart Bangladesh	0.776				
Smart Citizen	0.428	0.793			
Smart Economy	0.697	0.356	0.804		
Smart Government	0.258	0.366	0.350	0.804	
Smart Society	0.472	0.508	0.506	0.375	0.761

4.6. HTMT Test

If the association between two factors is less than 0.85, there is no common method bias present among the factors. The analysis below indicates that the relationship of any other factor to it is less than 0.85. Consequently, we can conclude that our analysis shows no common technique bias, as indicated by the correlation metrics.

Table 6. HTMT Test; Source: SmartPLS 4.0.9.9

	Smart Bangladesh	Smart Citizen	Smart Economy	Smart Government	Smart Society
Smart Bangladesh					
Smart Citizen	0.534				

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Smart Economy	0.874	0.486			
Smart Government	0.328	0.481	0.460		
Smart Society	0.578	0.705	0.678	0.493	

4.7. Common Method Bias Test

The Variance Inflation Factors (VIFs) provide insights into the extent of inflation in the variance of each coefficient, with a range of 1 to 10 and above. The VIF helps us understand the degree of inflated variance for each coefficient. Interpreting the VIF values, a value of 1 indicates no correlation, 1-5 suggests a moderate correlation, and a value greater than 5 indicates a high correlation [63]. To examine the presence of multicollinearity among the variables, we calculated the VIFs and found that the maximum value was 1.648 (refer to Table 7). This value falls within the acceptable range recommended by [63], indicating the absence of multicollinearity issues among the factors. A VIF exceeding 3.3 is considered an indication of pathological collinearity and potential common method bias in a model. However, in our model (refer to Table7.), all VIF values are equal to or lower than 3.3, indicating the absence of common method bias.

4.8. Structural Model Assessment

Hypotheses were tested (H1, H2, H3, & H4) to identify the direct influence of independent variables on dependent variables. Independent variables are denoted as "smart citizen," "smart government," "smart society," and "smart economy," where "smart Bangladesh" is dependent upon the smart pillar. A variance-based structural equation model using SmartPLS software version 4.0.9.9 was performed to test the direct effects of H1, H2, H3, and H4. The VIF value of the model was below the cut-off value of 5.0, indicating the absence of multicollinearity in it. The results of the test are summarized in Table 6.

The results in Table7. and Figure 4. show a significant positive relationship, considering the current situation of Bangladesh, between smart citizen and smart Bangladesh (β= 0.186, t= 2.436, p<0.007). Consequently, our hypothesis H1 is supported. Accordingly, from H2, there is no direct effect visualized in the pillar of smart government with smart Bangladesh (β = -0.057, t = 0.730, p > p>0.233). As a result, H2 is not supported because of the greater p-value from .05. Influences between smart society and smart Bangladesh (β = -0.094, t = 1.088, p > p>0.138), there has also been an adverse relation, and that is why

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H3 is rejected because of the greater p-value from .05. On the other hand, H4 has the influence of smart economy on smart Bangladesh that is significant (β= 0.603, t= 5.459, p<0.000). Therefore, H4 is supported.

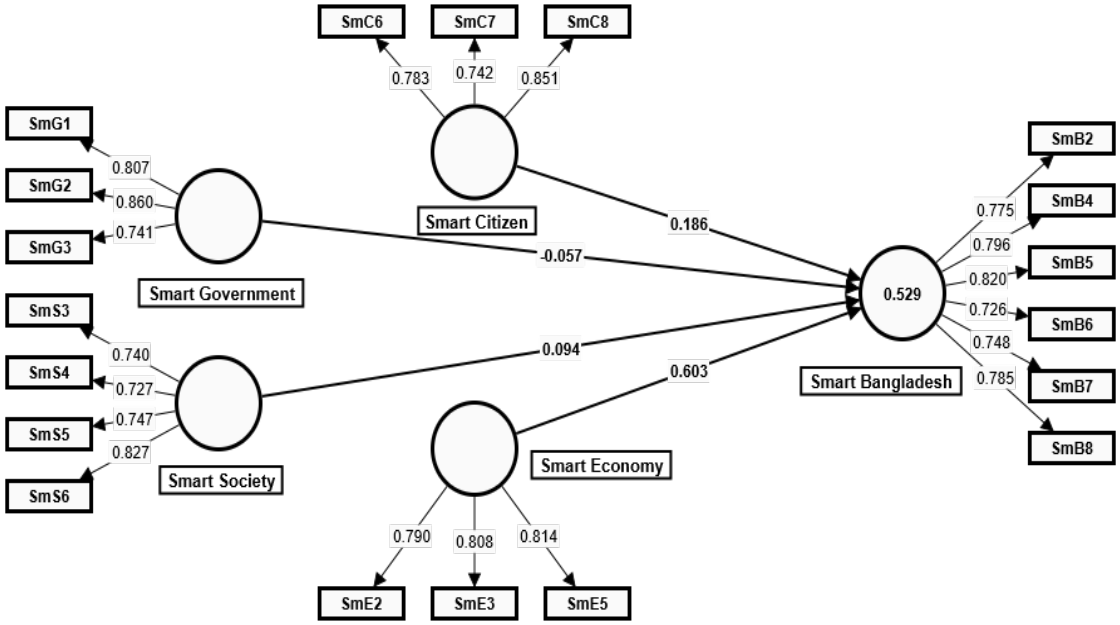

Figure 4. Value of path model

The coefficient of determination (R^2) for the dependent variable, smart Bangladesh, is 0.51, as presented in Table 7. The four independent variables—smart citizen, smart government, smart society, and smart economy—account for 0.529 of the variances, with an adjusted R-square of 0.510.

Table 7. Path model

	Hypotheses	Path coefficient (Beta-β)	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Comments	VIF
H1	Smart Citizen -> Smart Bangladesh	0.186	0.186	0.174	0.077	2.436	0.007	Accepted	1.429
H2	Smart Government -> Smart Bangladesh	-0.057	-0.057	-0.040	0.078	0.730	0.233	Not Accepted	1.262

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	Hypotheses	Path coefficient (Beta-β)	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Comments	VIF
H3	Smart Society -> Smart Bangladesh	0.094	0.094	0.112	0.086	1.088	0.138	Not Accepted	1.648
H4	Smart Economy -> Smart Bangladesh	0.603	0.603	0.582	0.110	5.459	0.000	Accepted	1.413
Smart Bangladesh			R-square		0.529	R-square adjusted			0.510

4.9. Discussion

Based on the research objectives and hypotheses, some key discussions are needed to conclude based on specific findings of the research work. When searching for keywords, titles, and topics related to smart concepts for a country's development, the powerful research database Web of Science (WOS) visualizes keyword co-occurrences, with "Bangladesh" ranking first out of 1497. As a result, smart concepts are now the buzzword for Bangladeshi citizens to reap benefits from the smart pillar of smart Bangladesh, and the highest result shows a total link strength of 86 with occurrences. H1 is supported by the fact that smart citizens have a great influence on the concepts of smart Bangladesh (P<0.007). Because of the prior initiative taken by the government, the people have visualized the positive impact on their daily lifestyle. Accordingly, H2 is not accepting that smart government has less impact on smart Bangladesh concepts based on the perception of the respondent (P > 0.233). As a result, the Bangladeshi government should take extra care about the establishment of the concept of smart government. Based on hypothesis H3, smart society has less influence on the concept of smart Bangladesh, which is why it gets rejected (P > 0.138). Smart society also requires greater emphasis in the context of Vision 2041. The government is currently making progress towards the fourth pillar of smart Bangladesh, namely a smart economy. As a consequence, H4 is accepted by ascertaining the desired value (P < 0.000). ICT-generated income should continually increase to achieve the desired vision. The value of R-squared shows that the pillar of smart concepts has 51% explainable capabilities, and the government should specify or segregate the specific pillar as a goal and mission for ascertaining the vision of 2041. The value of p will achieve its desired outcome once the Smart Bangladesh

concept is implemented. Decision makers can obtain a clear idea about the inclusion of sub-pillars of the smart Bangladesh concept from the literature and observed variables of this article for detailed elaboration of the smart Bangladesh concept.

5. CONCLUSION

Smart Bangladesh is a forward-thinking strategy to use technology and innovation to enable holistic development across several industries. As the country embraces digital change, the program strives to increase efficiency, services, and residents' quality of life. Smart Bangladesh creates the groundwork for long-term growth and advancement by making strategic investments in technology integration, data-driven decision-making, collaboration, talent development, and customer-centric methods. It emphasizes the utilization of digital technologies and intelligent solutions to tackle societal issues, develop economic possibilities, and create a more connected and digitally empowered society. However, Smart Bangladesh's success is dependent on effective management, ongoing adaptation to emerging technology, strong regulatory frameworks, and an emphasis on inclusion to guarantee that the benefits of these innovations reach all sectors of society. To cooperatively lead this transition toward a smarter and more affluent Bangladesh, governmental entities, commercial sectors, educational institutions, and individuals must work together. The collected data are limited in their ability to represent the population of Bangladesh. To obtain more accurate results, the sample size should be increased to better reflect the total population. Additionally, the coefficient of determination (R^2) is 52.9%, indicating that 47.1% of the variability is unexplained and should be explored through further research, suggesting that additional factors beyond Smart Citizen, Government, Society, and Economy may influence the outcome.

Future studies could also consider incorporating a more diverse range of demographic factors to enhance the understanding of the underlying issues. By addressing these gaps, researchers can develop more targeted interventions that effectively address the unique challenges faced by different segments of the population. The model explains approximately 53% of the variance in Smart Bangladesh, suggesting that additional factors beyond Smart Citizen, Government, Society, and Economy may influence the outcome. In essence, the Smart Bangladesh concept significantly influences how managers make decisions, plan, and implement strategies across various domains. This

includes leveraging technology, utilizing data-driven decision-making, fostering collaboration, investing in employee training, adhering to regulations and policies, prioritizing customer needs, managing risks, and monitoring progress. Together, these factors enhance efficiency and promote innovation across industries. By adopting these principles, organizations can more effectively navigate the rapidly evolving landscape and ultimately achieve sustainable growth and development.

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