SMART NAST

A CONCEPT FOR ACTION PLAN

BY

SMART NAST COMITTTEE
COORDINATOR:
PROF. DR. ASHOK RATNA BAJRACHARYA

MEMBERS:
MR. HEMANT BARAL
PROF.DR. MANISH POKHAREL
PROF. DR. SUBARNA SHAKYA
MEMBER SECRETARY:
MR. PRADEEP DHODARI

Acknowledgement

I sincerely appreciate and thank Vice Chancellor Dr. Sunil Babu Shrestha for entrusting me with this task of leading this Smart Nast committee. Although an Orthopedic Surgeon professionally, I took up this challenge because of my interest in Smart things. Besides I have this experience of Organization and Management after founding *National Trauma center*, the first Trauma center of Nepal and a center of excellence with state of art technology, right from a concept to a full blown Organization.

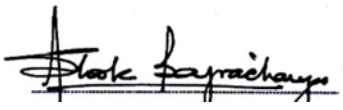
Our committee expresses sincere thanks to Secretary of Nast, Dr. Mahesh Kumar Adhikari for his support and inputs from administration side. Chief of Science faculty Ms. Jayshree Sijapati, Chief of Technology faculty Dr. Rabindra Dhakal, Head of personal department Mr. Niranjan Kumar Acharya are also appreciated for their valuable inputs. Similarly, Dr. Suresh Dhungel, Ms Luna Vajra are appreciated for their kind cooperation. This committee appreciates interest shown by *Academicians* Prof. Dr. Ganga Shrestha, Dr. Gopal Bahadur KC and *Staffs of Nast* Mr. Govinda Prasad Subedi and Mr. Din Bandhu Parajuli by their suggestions.

Expert Committee members, Prof. Dr. Manish Pokharel PhD in e-governance, professor of computer Science & Engineering, Prof. Dr. Subarna Shaky PhD in computer engineering, professor of computer engineering, and ICT consultant Mr. Hmanta Raj Baral MSc in network & computer science had worked untiringly to contribute from their fields of expertise to form this report. I highly commend them their input with great appreciation!

Member secretary Mr. Pradip Dodhari MSc, IT System administrator NAST, has worked efficiently in close association with me and committee to prepare this work. I fondly appreciate his work.

Hoping that this report will serve to be a foundation to build SMART NAST upon very soon!

Sincerely,



(Prof. Dr. Ashok Ratna Bajracharya, *Academician, NAST*)

Coordinator,

SMART NAST Committee,

13th March 2020

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Preamble

The concept of making NAST smart was conceptualized by present Vice Chancellor Dr. Sunil Babu Shrestha. A committee was formedby him to materialize it, as follows:

Coordinator: Prof.Dr. Ashok RatnaBajracharya – Academician, NAST

Member Secretary:Mr. Pradeep Dhodari – IT System Engineer, NAST

Members:

Prof.Dr. Subarna Shakya

Prof.Dr. Manish Pokharel

Mr. Hemant Baral

Chief, Promotion &Communication division, NAST *

Task of this committee was to:

- To prepare concept of making SMART NAST
- To prepare Action Plan based on this concept
- To identify Challenges and solutions
- Time frame (of this mission?)

Series of consultative meetings of this committee were held. At different stages Vice Chancellor, Secretary as administration chief, chief of Science faculty, chief of Technology faculty werealso invited for their share of input focusing on present state, facing problems and solutions for smartness.

Later a brief report was presented at the *First International Youth conference on Science &Technology& Innovation*as " *SMART NAST – Initiatives*" by the coordinator to share our initiatives with the young scientistsas well as to openly invite interested scientists to send their smart solution inputs at our official email address"smart@nast.gov.np".

Similarly, suggestions/inputs werealso sought from Academicians, Associate Academicians as well as all staff of NAST via this email.Two Academicians and two staff of NAST responded. Their inputs are cited in annex- 4

What follows are the result of these endeavors in brief.

*(Due to retirement of erstwhile chief and new appointment pending, this position was vacant during preparation of this report)

Introduction

This is the era of SMART things like Smart Phone, Smart watch, Smart License, Smart Buses, Smart Village, Smart City, Smart offices, etc.

Therefore, NAST as an autonomous Apex body for Science&Technology, it has to go SMART in keeping with changing times to keep its organization, function and service delivery system to public up to date and beyond.

More so, this is required to justify and prove the status of NAST being placed*as apex body*for Science, Technology and now added *"Innovation"*in newly formulatedScience, Technology & Innovation (STI) Policy on 16 June 2019 (B.S. 1/3/2076) by Government of Nepal.Besides , NAST has to set itself as an exampleas well by becoming SMART, in the field of Science, Technology& Innovation.

Advent of SMART NAST will be complimentary to National campaign of"Digital Nepal "which in turn is in keeping with ongoing trend of Digital world.

Above all this endeavor willuplift, the very much needed, public image of NAST.

To Define:

SMART NAST will be "A paperless automated Intelligent, state of the art organization, driven by e- governance using ICT & AI". In other words, it simply means use of available modern technology for efficient running of NAST as an organization.

The needs of NAST are mainly as follows:

- Organizational:
- Modus operandi
- Administration
- Finance
- Service
- Human resource;

Smart Solutions:

Smart solutions to address above needs, thereby making NAST SMART are stated briefly as a concept for action plan in this report.

SMART SOLUTIONS: - I

On Administration:

Need based Office automation software is to be made and installedwhich will manage from day to day administration, finance, store toall other required office work.

Human Resources: will be broadly categorized as *Technical, Administrative, Support staff*. Proportionately more technical and less administrative staff and still lesser support staff will be relevant to the vision, mission and purpose of NAST as an Apex organization for ST&I.

*Technical Staff:*to be appointed on contractual service, by quality-based selection, without any age/ sex/caste &creed bar and incentive/salary is to be paid onperformance-based basis. Current age bar and gender biasness has been a hurdle to hire best Scientists, Technologists and Innovators of the country. Such manpower usually become aged by the time they become best.It is to be noted that most of good scientists will have studied & worked for a long time to become good enough.

Administrative Staff: should be from Govt service on deputation under govt. regulation for vital posts like **Secretary**, **Chief Financial officer**etc.as permanent staff. After being automated only a minimum number of administrative staff, if any,will be required to run the office.

*Support staff:*like cleaner, driver, security, technical assistants where necessary, are to be hired on contractual basisand governed by rules of autonomous NAST (insteadof Govt. regulation).

Vice Chancellor, Pro-Chancellor &Chancellor of course remaining as it is.

Organization:Fresh Organization and management(O&M survey) will be required for a SMART OFFICE.Amendment of current Organogram may become necessary to go Smart as most Regular work will be done by Machine with AI, meaning more machine and less human to run this organization. This means more efficiency, transparency, less corruption, free from human error and inherent HR issues like (appointment, carrier development, promotion,allowances, pension or gratuity and above all the "Unions"). Financially, this may incursome one-time investment cost. It may be high initially but running cost will be very low. Incidentally, reports on annual budgets of NAST in past fiscal years had consistently shownthat Administrative cost

washigherthan its program expenses. Economically, sucha situation is said to be*not cost effective*,as running cost was more than itsfunctionexpense. Going smart will hugely cut down on administrative cost of running NAST, making it more efficient, transparent and *cost effective*than present manually run administration. Thus,saved money, in turn, can be spent on more programs i.e.its function rendering this organization not only a cost effective but also a fruitful organization.

Modus Operandi:

1. By upgrading physical facilities to Smart status: see Annex-1, for example
2. By instituting e-governance in administration,as mentioned below:
3. By introducing online systems, latest technology, state of art facility and procedure in Science, Technical Innovation faculties as stated below;
4. Proposed use of Artificial Intelligence in NAST: See below and Annex -3.
5. Digitization of all records. Establishment of A digital Library. (see illustration in ppt)
6. By establishment of a separate **faculty of Innovation**! Rationales being:

   a. To promote Innovation in the country following our new STI Policy.

   b.To fulfil aim of uplifting current position of Nepal at 109th in Global Innovation Index by at least 3 steps up. (Quote, Vice Chancellor's address, 43rd Assembly of Academicians, 3rd Mangshir)

   c.Of these three faculties *Innovation faculty* will have much better prospect to prosper rapidly by producingresult-oriented work relevant to everyday life of people and society, ultimately bringing prosperity in the country. Therefore, NAST stands to gain instant name and fame with development of this faculty!

A. SMART OFFICE SYSTEM (SOS)

1. Internet Connectivity
2. Wi-Fi / hotspot within the office premises
3. Cameras with CCTVs
4. E-Attendance
5. Door Sensor
6. E-Identity Cards

7. GPS Installation in office's vehicles (Cost Per Vehicles 13500 +VAT) Annual Charge 4800 +VAT)

B. OFFICE AUTOMATION SYSTEM (OAS)

1. HR Database
2. A/C Database
3. Store Database
4. Documents Tracking, (DartaChalani / Tippani/ Memos/ Demand Form / Vehicle Demand Form)
5. e-tender for procurement
6. Integrated Finance & accounting system in place.

C. OFFICIAL WEBSITE: for

1. Reports/ Journal/ Proceedings/
2. Online Application Form (vacancy, awards, comments and suggestion)

Training for the Staff toOrient them to this new system

D. ACCESS CONTROL:

1. Main Gate Automatic Sensor Sliding Door System

2.Secondary Gate Access entry by:

- Card
- PIN
- Remote
- Thumb (option)
- Face (option)

-Restricted access for high security areas.

e-Government System Architecture for Nast

Three essential infrastructures are needed for smart Nast

- e-Gov Applications: application and services software components

- IT Platform: data center, application servers and storage
- Government Info-communications Infrastructure (GII): physical network components

SMART SOLUTIONS: - II

For Science & Technology Faculty

Smart governance in Science Technology and Innovation are as follows:

- Science Technology and Innovation in research
- Science Technology and Innovation data center and recovery center
- e-service for research
- HRD
- e- Administration

Preparations needed:

Develop e-Government strategy plan and policy

Develop e-administration system

Develop Management Information System

Establishment of NAST data center

Supercomputers

Proposed steps of using Artificial Intelligence (AI) in NAST

AI refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making. Initially conceived as a technology that could mimic human intelligence, AI has evolved in ways that far exceed its original conception.

NAST has to be rejuvenated as per the demand of industrial revolution 4.0 (IR 4.0). The features of IR 4.0 has to be understood and the future technologies such as AI, Cloud Computing, Big Data, Internet of Things (IoTs) and Robotics which drives these features are to be used efficiently and effectively. In order to be in pace of new era, the business plan (flow) of NAST is to be understood. Redundancies are to be identified and eliminated. Routine tasks are to be automated using AI and other appropriate technologies. These are the following where NAST has to give high priority in order to achieve SMART NAST vision.

1. Identify the business process flowin NAST(Business Plan of NAST)
2. Apply BPR (BusinessPlan/Process Reengineering) in the existing business plan (process)
3. Determine AI applications for each process and make a decision to adopt the types of machine learning algorithm (Supervised Learning, Unsupervised Learning, Reinforcement Learning)
4. Use AI in Faculty of Science, Faculty of Technology and Faculty of Technology.
5. Research with AI.
6. AI for climate change
7. AI for weather prediction
8. Robust AI is to be built.
9. AI for security such as face recognition,
10. Research on AI for AI

SMART SOLUTIONS: - III

For Miscellaneous Items:

Solution for NAST to Public smart communication and service:

1.SMART NAST Mobile application: to provide easy access to information of NAST anywhere anytime in hand held smartphone.

2.SMART NAST Dynamic web page not only to provide information but also to interact with public.

3. SMART NAST in Social Media so popular among young generation like YouTube, Instagram, Twitter. for public awareness, education, notices etc. on STI

4.SMART NAST conducting meetings via video conferences across distant places and persons that are recorded for minute. All Official programs are to be electronically inaugurated giving up traditional lighting Torches (Panus light) or worshipping gods etc. Inaugural session should be for names sake and nominal. Minimum speeches, more scientific talks.

Solutions for a SMART Conferences to be held by NAST;

1. online registration.
2. Bar coded Name tags for access to conference, Lunch, dinner, tea etc.
3. Pen-drive containing all materials including abstracts of all presentation'sparticipant, instead of a paperback souvenir.
4. Conference app: containing all information about the conference including program.
5. e -inauguration
6. Inaugural session should short and sweet.
7. Presentation: 3 types
    a. Podium presentation:
    b. Virtual presentation:online presentation
    c. E poster presentation:
8. Announcer or MC'should be fluent and less poetic. "Token of Love" word should be rephrased as "Token of Appreciation" while presenting moments.

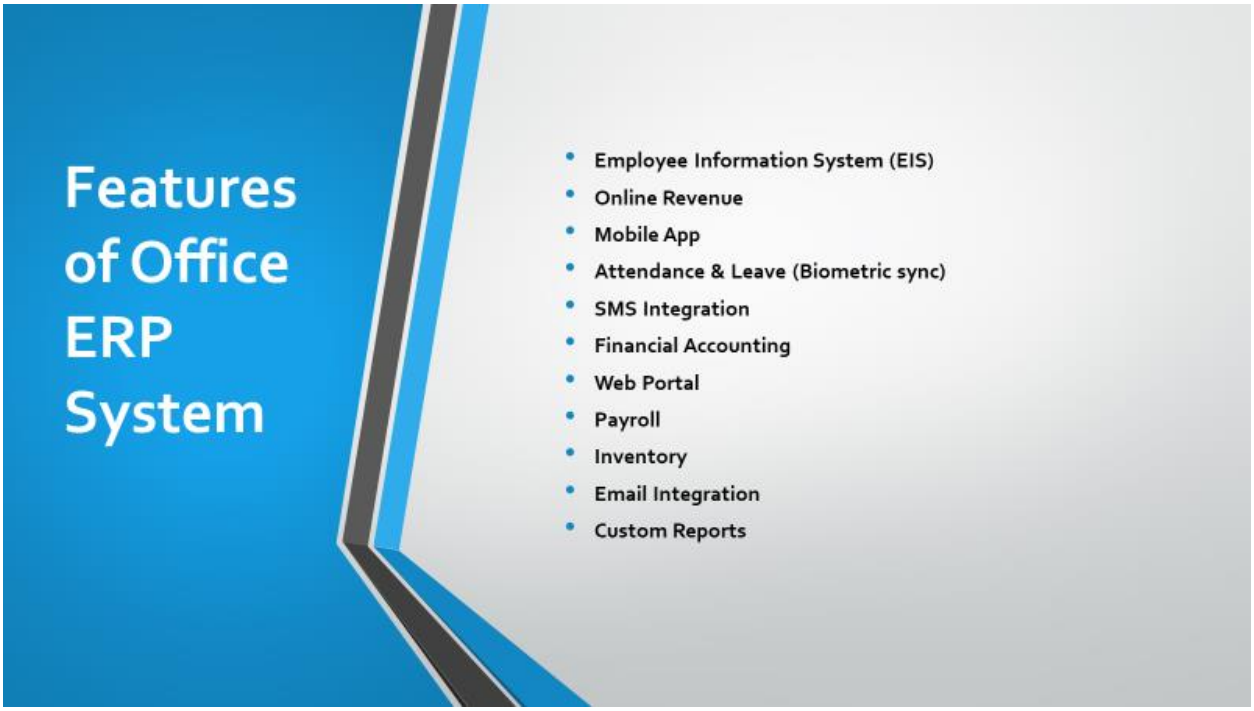
SMART SOLUTIONS: - IV

Some Expected features of Smart NAST: are given in PowerPoint format

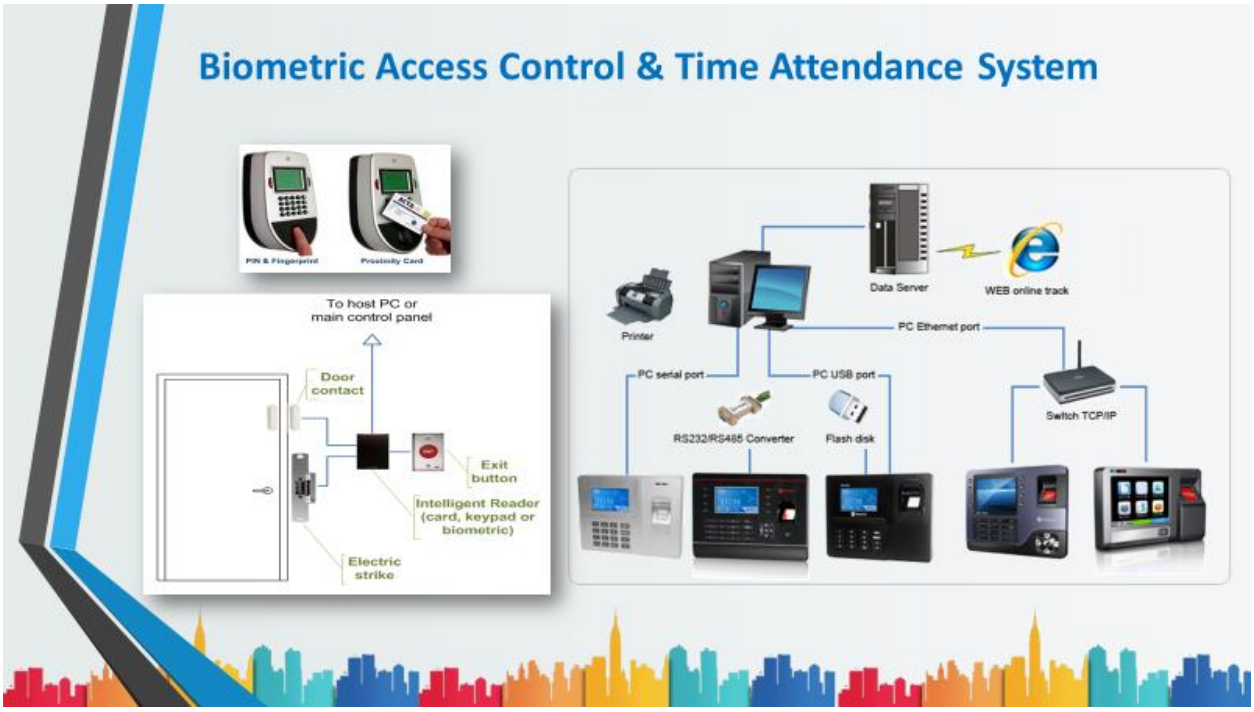

Smart NAST
using
ICT, IoT & Cloud Computing


Application
Office
ERP System

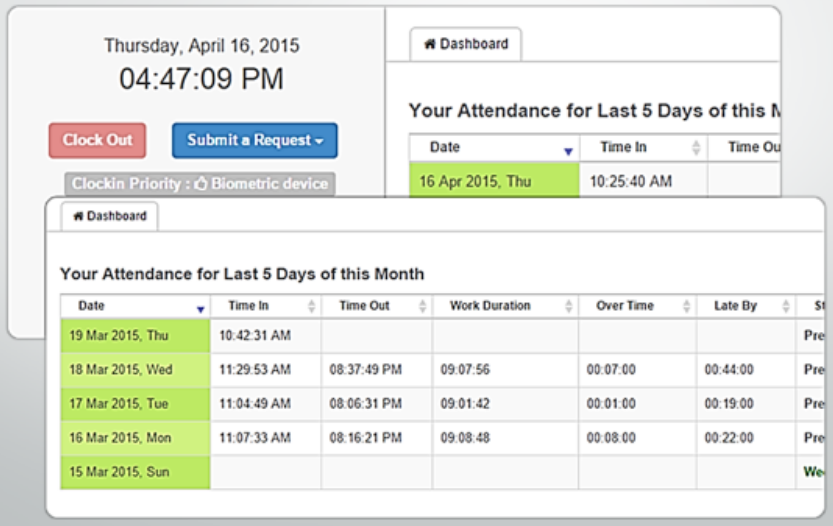

Application
Office
ERP System


Features of Office ERP System
Employee Information System (EIS)
Online Revenue
Mobile App
Attendance & Leave (Biometric sync)
SMS Integration
Financial Accounting
Web Portal
Payroll
Inventory
Email Integration
Custom Reports

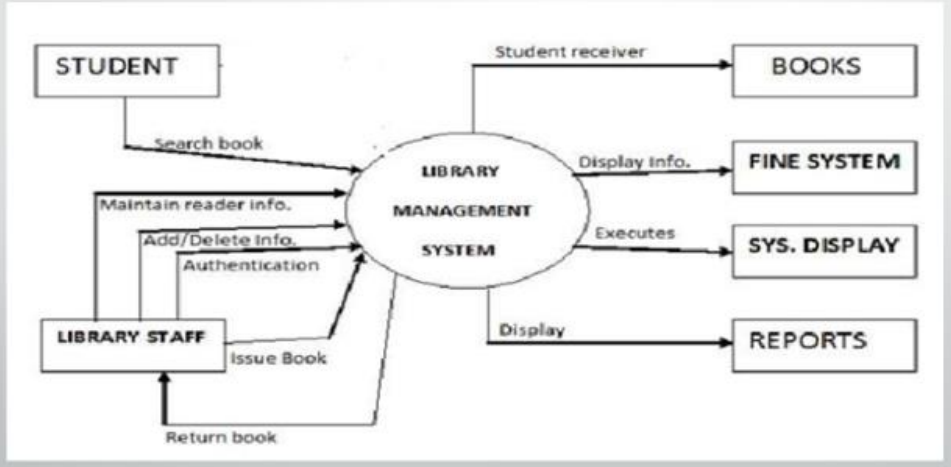

Unique Employee ID Card
Proximity or
Contactless
ID Card
Samantha Jones
DOB: 29/01/1995
Year 8
ADVANCED
HIGH SCHOOL
RFID
ID Card
ERIN WESTHOUSE
Touchstone
K2000
RFID ACCESS CONTROL


Biometric Access Control & Time Attendance System
PIN & Fingerprint
Proximity Card
To host PC or
main control panel
Door
contact
Exit
button
Intelligent Reader
(card, keypad or
biometric)
Electric
strike
Data Server
WEB online track
Printer
PC Ethernet port
PC serial port
PC USB port
RS232/RS485 Converter
Flash disk
Switch TCP/IP

Attendance Management System



Library Management System



SMART Individual

- At least Smart Phone on Pocket or PC
- Data Pack or Easy WiFi Access
- Familiar with Technology [2G - GPRS (General Packet Radio Service), 3G, 4G)
- Compatible Set, Settings to activate 3G/4G, Service Providers
- Familiar with NAST Activities
- Familiar with available Office Applications
- Application download from Play Store (Android), App Store (iOS) & Others
- Proper use of the available Applications (Mobile/Web apps)
- Service Centres

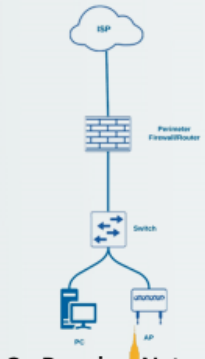
Remote Control for Building Appliances

Technology:

- Information Technology (IT) – Computing
- Information Communication Technology (ICT) – Computing, Networks
- Internet of Things (IoT) – Sensors, Network, Internet & Cloud

Network:

- On Premises
- Cloud



On Premises Network

Today & Beyond Network

SMART NAST Parameters

Infrastructure

1. Hardware
2. Connectivity
3. Network/Security
4. Server/Storage
5. Data Centre Infrastructure

Application

1. Enterprise E-mail
2. Website
3. Smart Office System (e-Gov ernance with e-Tippani, Accounting etc...)
4. Mobile/ Web Apps for
   - Local Applications
   - Apps as per Smart NAST Components

Smart NAST Components

1. Smart Building
   1. Swing/Sliding Gate
   2. E-Attendance
   3. Online Appointment
   4. Biometric Access
   5. Digital Display
   6. Alarm and Forecast
   7. Motion Sensing Lights
2. Smart WiFi
3. Smart Surveillance System
4. Smart Communication
5. Smart Energy (Power Backup)
6. Smart Waste Management
7. Others

Infrastructure

- Hardware
- Connectivity
- Network/Security
- Server/Storage
- Data Centre Infrastructure

Hardware

Desktop, Laptop, Notebook, TV

Connectivity

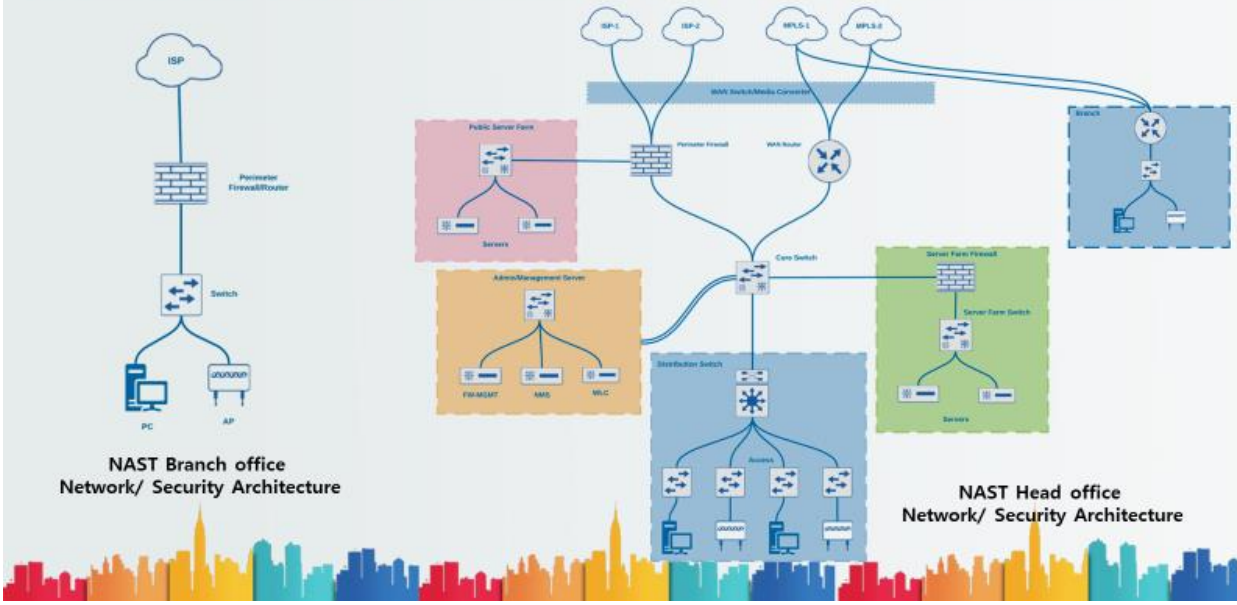
NAST Head Office & Branch Offices

Intranet:
Data Link Layer (L2 Link)

Internet:
Network Layer (L3 Link)

Broadband Connection:
- DSL (ADSL/ SDSL)
- Cable Modem
- Optical Fiber
- Wireless (Radio)
- Satellite (VSAT)
- Broadband over powerline (BPL)

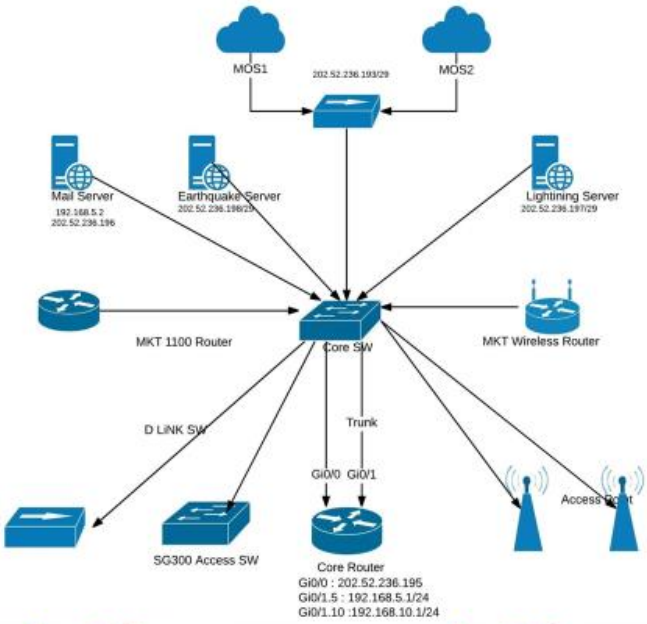
Network/Security along with Endpoint Security, Digital Signature, SSL Certificate



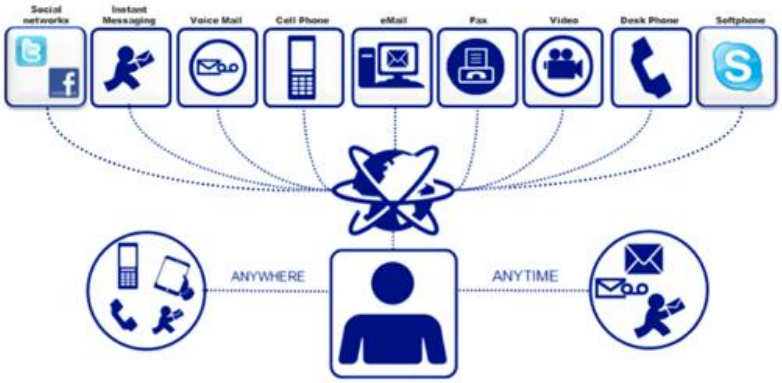
NAST Branch office
Network/ Security Architecture

NAST Head office
Network/ Security Architecture

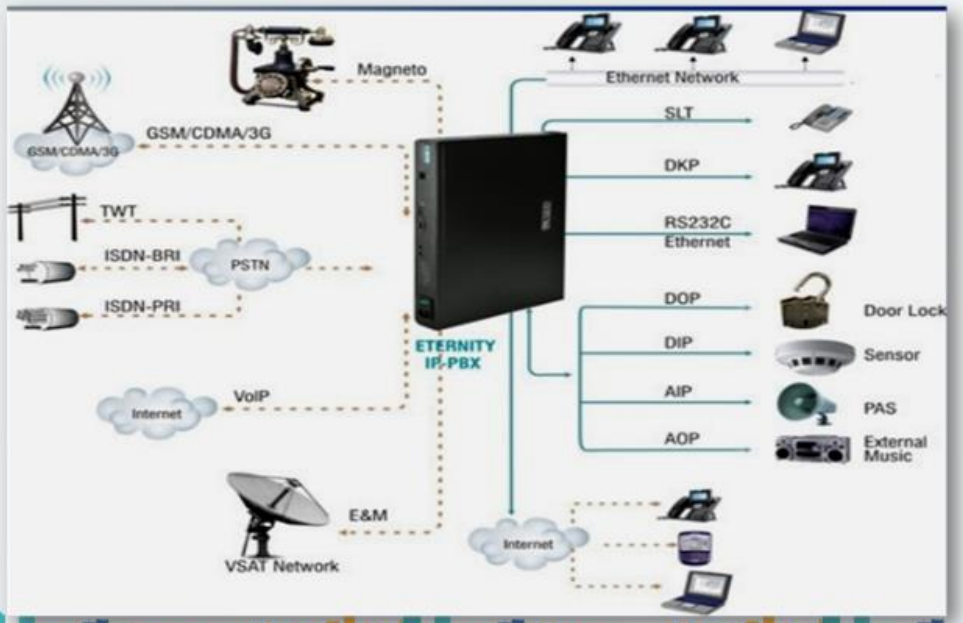
Existing NAST Network/Security Architecture



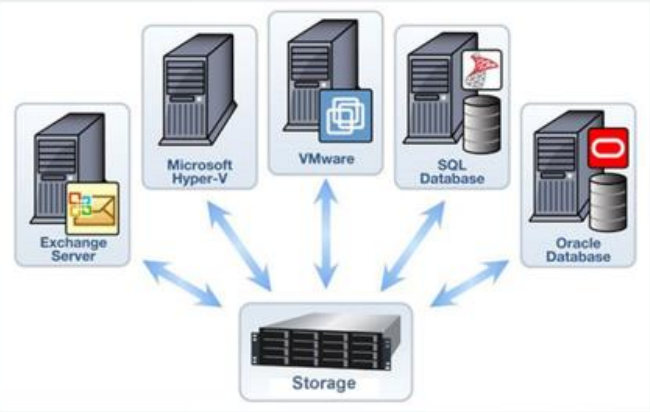
Unified Communication



ePABX



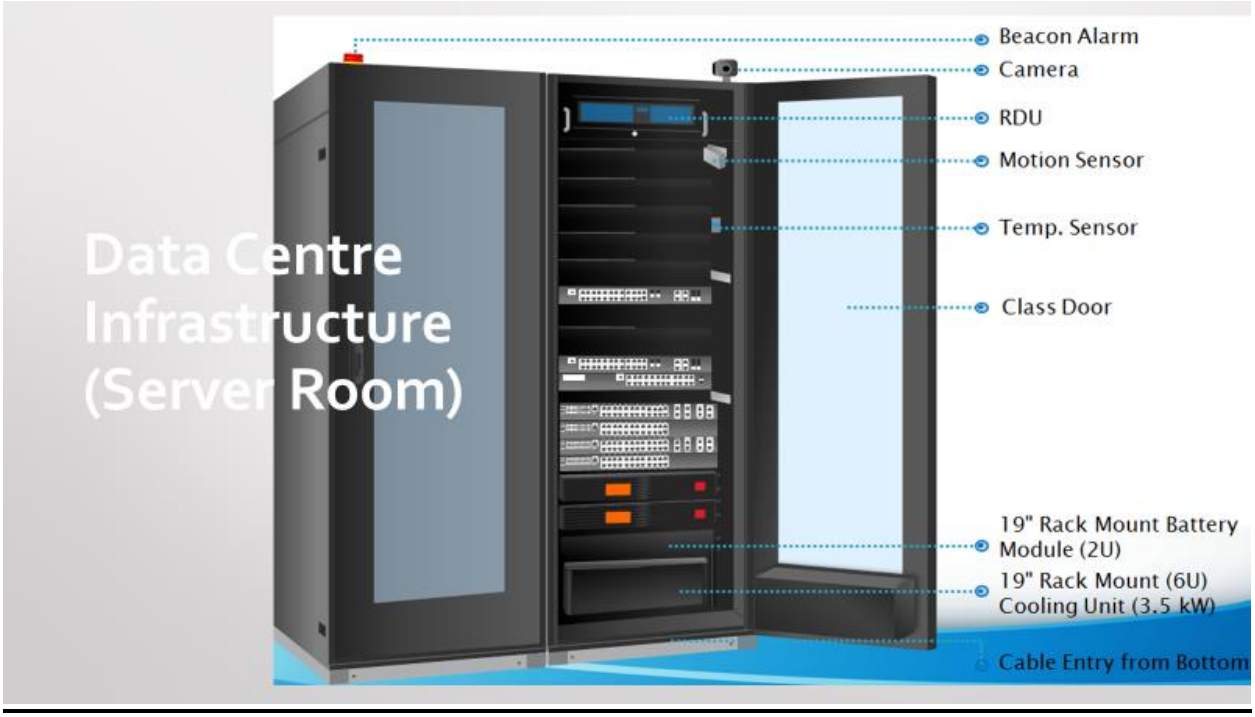
Server with Virtualization/Storage



Servers:
1. Application Servers
2. Database Server

Network Storage:
1. SAN (Storage Area Network) – high-end servers, high-capacity disk arrays, and Fibre Channel
2. NAS (Network Attached Storage) – NAS devices onto the LAN via TCP/IP
3. Storage on Cloud

Automation of the NAST Services/ Applications & Centralized Monitoring, Control & Management



Data Centre Infrastructre

Primary DC

DR Site at NAST Premises

Applications

- Enterprise E-mail
- Website
- Smart Office System (e-Governance with e-Tippani, Accounting etc…)
- Mobile/ Web Apps for
- Local Applications
- Apps as per Smart NAST Components

Centralize E-mail & Web Service

Web Mail (existing solution)

- Read or send email through browser and the web mail interface
- Or.. web mail service provided with ISP

Centralize E-mail and Web service to entire Municipalities through Email & Web Server

e-mail Client

- Application that runs on PC/Tablet/Mobile
- Enables to send, receive and organize e-mail
- **Faster and more accessible**
- E.g. IBM Lotus Notes, Outlook/Outlook Express, Thunderbird

Notes

Digitization by implementing:

e-Governance: It is the transformation of NAST processes to provide efficient, convenient and transparent services to the Citizens through Information and Communication.

G2C, G2B, G2G, G2E, C2G
(E-Governance Models)

Digitization of
NAST Documents & Services
[Paperless system]

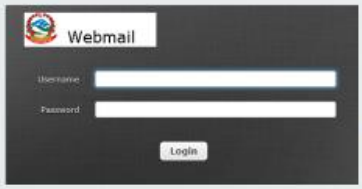
Think BEFORE You Print: 1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere. 3 sheets of A4 paper = 1 liter of water

Centralized Database of the Research Papers

Application

Citizen Charter | Notice | Hotline | Online Applications

Smart NAST Mobile App



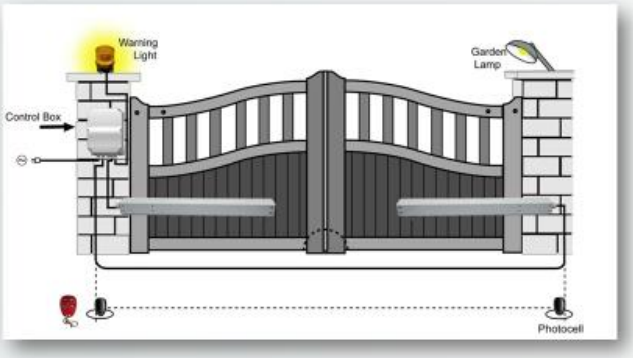
Cloud Based
Smart Office Application
(Attendance, HRMS, Accounting, Online Appointment, e-Library, DMS System, DBMS System etc..)

Smart Office System

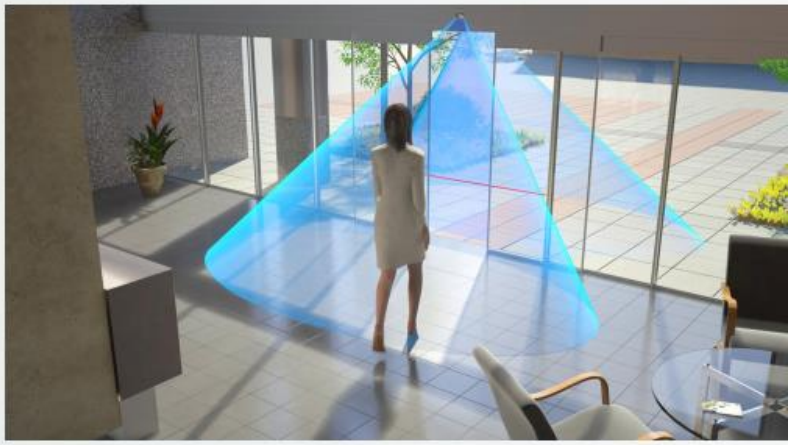
Smart NAST Components

- Smart Building
- Swing/Sliding Gate
- E-Attendance
- Online Appointment
- Biometric Access
- Digital Display
- Alarm and Forecast
- Motion Sensing Lights
- Smart WiFi
- Smart Surveillance System
- Smart Communication
- Smart Energy (Power Backup)
- Smart Waste Management
- Others

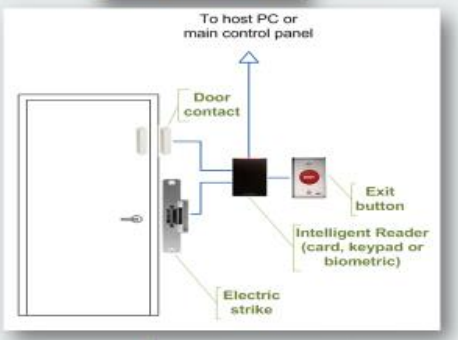
Main Gate Automation with Remote Control



Auto Swing Main Entrance Door (Sliding)



Biometric Access Control & Time Attendance System



Smart Blinds, Smart Lights

Auto-on within 10 feet, auto-off after 25 seconds when no motion detected.

Provides enough light to shine your area and ensures safety.

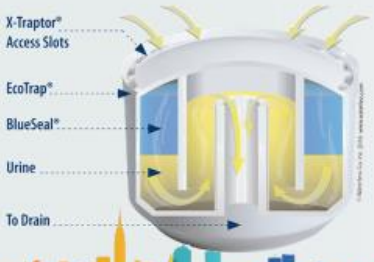
Power by 3 AAA batteries (not included).

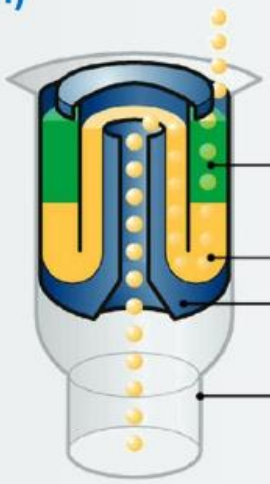
Drinking Water

Smart Wash Room

Smart Urinal (Water Less System)

Cross-Section of the Patented Vertical EcoTrap®





Trap liquid has a lower specific gravity than urine. Holds back drain and urine odours and is biologically degradable.

Urine sinks through, no smell produced.

The **siphon insert** is made of recyclable polyethylene and can be quickly exchanged using a special tool.

Incrustation of the **drain pipe** is not possible.

Canteen Management System

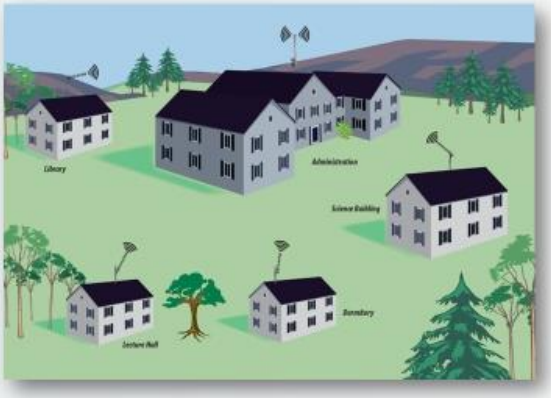
LP400

- Breakfast,Lunch, Dinner attendance Reports
- Meal Planning Reports i.e. Breakfast, Lunch Dinner.
- Meal Planning Reports/ SMS to warden or meal incharges
- In and out attendance
- Visitors Record

CCTV Surveillance System

Smart WiFi (WiFi Zones - Hotspots)

Indoor

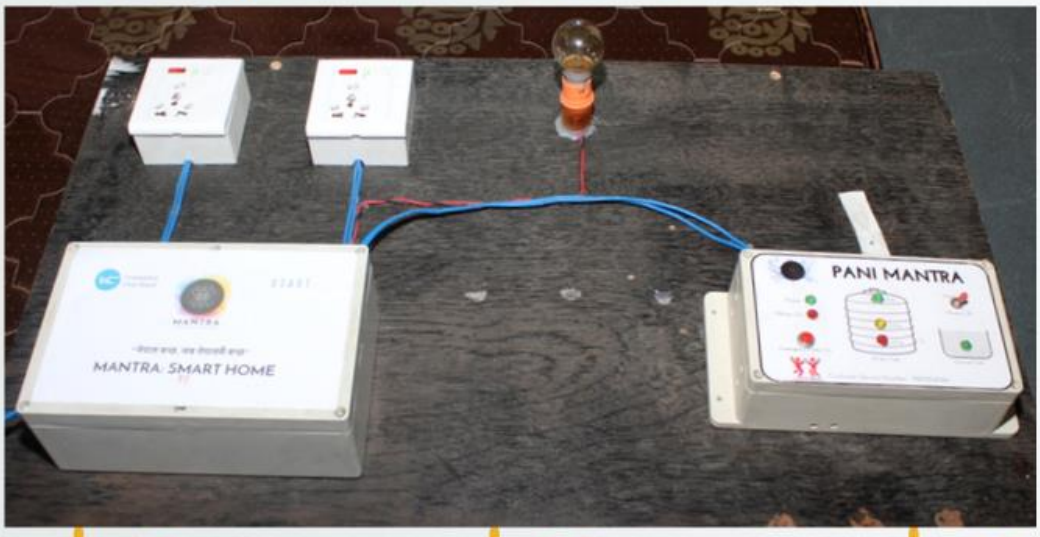


Outdoor

Building Fire Fighting System

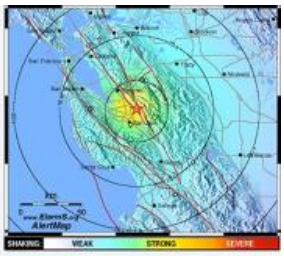
Temperature & Humidity Control

Smart Water Tank (Auto Power-Cut System)



Payment Kiosk Terminal and ATM

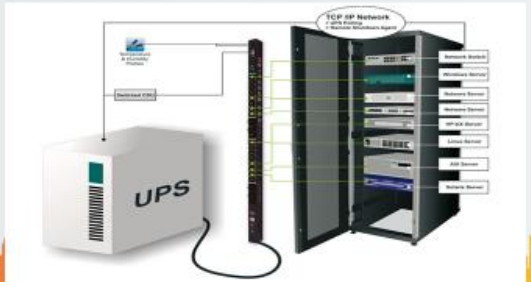
Remote Control for Building Appliances, Digital Dis play, Digital Signage, Weather/Earthquake Forecast



Smart Communication

Secured Inter-Connection among Government Authorities (Voice, Chat, Video)

Building Power Management



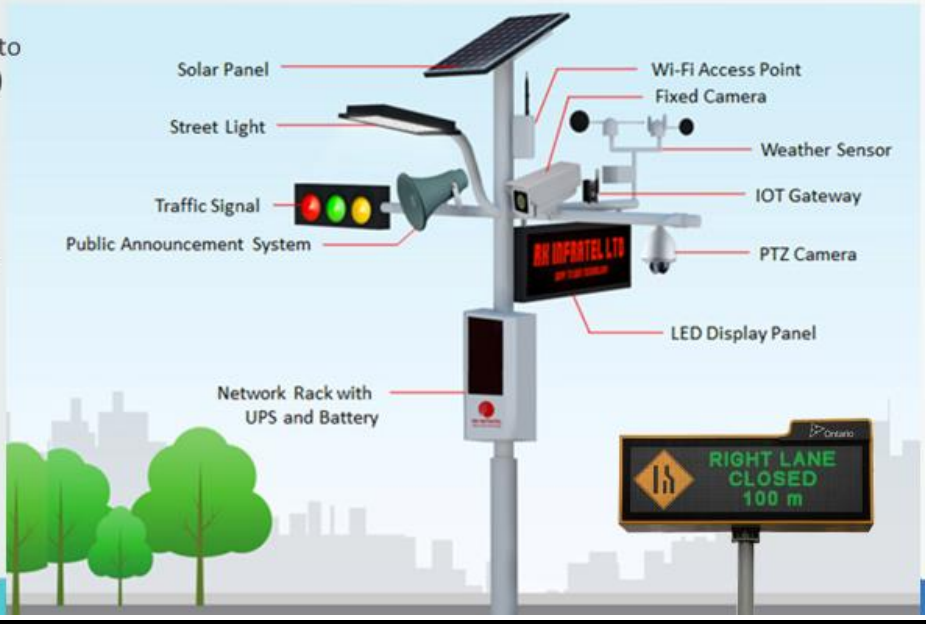
Smart Waste Management

Intelligent Waste Collection Solution

Dramatically reduces waste collection costs by up to 80%

Intelligent Traffic System (Smart Traffic Light, CCTV)

- Smart Lighting with photo sensing switching (Auto)
- Smart Sight (CCTV)
  - Main Road Junctions
  - Bus Stops
  - Other Public places like Court, Police/Traffic Stations
- Smart Traffic Light
- Digital Signage



How SMART NAST can be achieved?

1. Smart Employee/ Citizen
2. Smart Building
3. Smart Society (NAST)

SMART Employee/ Citizen

1. At least Smart Phone on Pocket
2. Easy WiFi Access
3. Mobile Technology [2G - GPRS (General Packet Radio Service), 3G, 4G)
4. Service Providers, Compatible Set/Settings
5. Familiar with NAST Activities (Citizen Charters)
6. Familiar with NAST Applications
7. Application download from Play Store (Android), App Store (iOS) & Others
8. Proper use of the available Applications (Mobile/Web apps)
9. NAST Service Centres

SMART Building

(Office Automation)

1. Internet, WiFi
2. EPABX
3. CCTV Surveillance
4. Access Control (Biometric, Time Attendance)
5. Smart Light
6. Security Sensors (Smart Locks – Anti Theft, Emergency Services etc...)
7. Smart Appliances (Remote ON/OFF system)
8. Auto Cooling (Temperature/Humidity)
9. Automatic Gate/ Door (Swing, Slide)
10. Fire Fighting System
11. Smart Blinds
12. Smart Meter (Water, Electricity)
13. Visual Display, Payment Kiosk, Smart Urinal, Smart Water Motor etc...

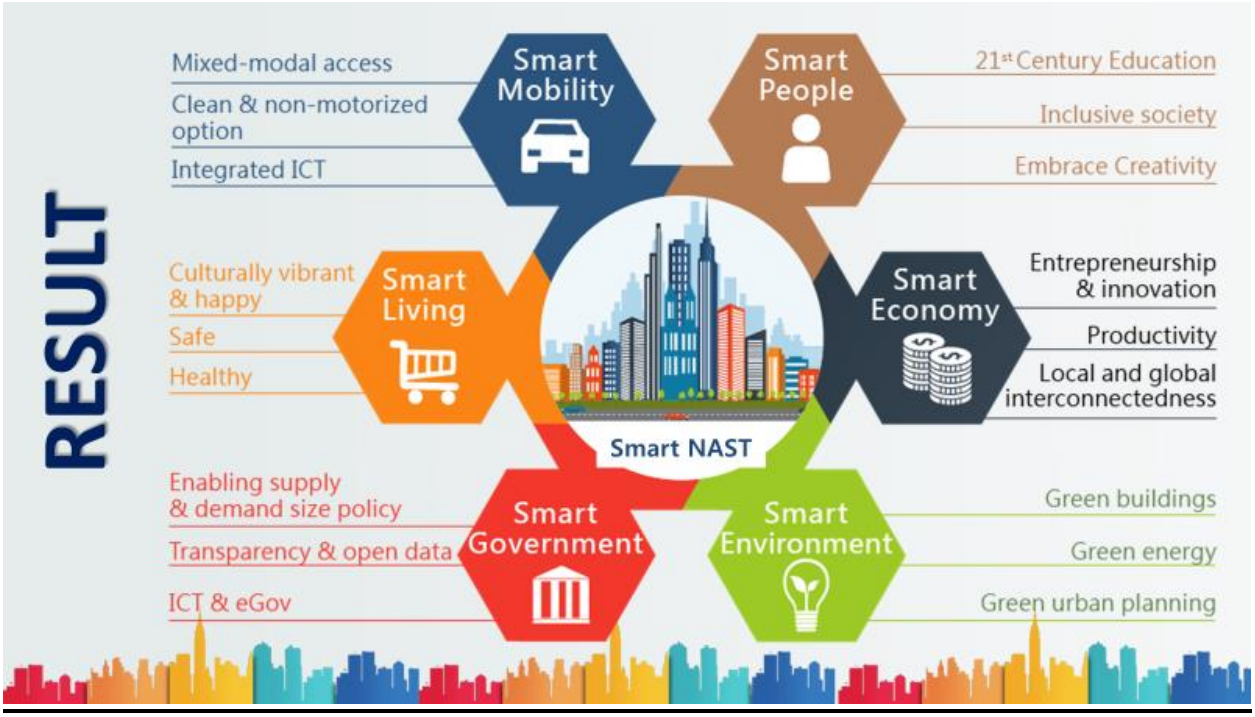
SMART NAST

1. Hardware (PC, Printer, Photocopy)
2. Network with basic level of security
   (Basic LAN and WAN connectivity to connect Palika)
3. Connectivity (Internet L3/Intranet L2)
4. Email Access
5. Paper Less system (Digitalization)
6. Citizen Charter through Local Applications (Mobile/Web Apps)
7. Security system to the Premises (Ambulance, Anti-theft alarm, siren etc..)
8. Citizen to NAST (Complaints/Feedback)
9. Awareness to the public about available services
10. NAST Service Centre

Educate/Aware Citizens through Digital Online Media

Solution:

1. **Create Social Media Pages**
   - YouTube Channel
   - Face book Page
   - Twitter Page etc..
2. Upload educational and awareness Contents in Social media pages and Share it publicly.
3. Develop user friendly Mobile Apps


RESULT
Mixed-modal access
Clean & non-motorized option
Integrated ICT
Smart Mobility
Smart People
21st Century Education
Inclusive society
Embrace Creativity
Culturally vibrant & happy
Safe
Healthy
Smart Living
Smart Economy
Entrepreneurship & innovation
Productivity
Local and global interconnectedness
Smart NAST
Enabling supply & demand size policy
Transparency & open data
ICT & eGov
Smart Government
Smart Environment
Green buildings
Green energy
Green urban planning


INTERNET OF THINGS
SMART NAST
Waste Management
CLOUD & SERVICES
Smart IT & Communications
Smart Home
Smart Society
Smart Mobility
Smart Education
Smart Care
Smart Building
Smart Energy

Annex -1 Reference material

E-Governance for NAST

The main concept of e-governance is one of the most novel applications of Information Technology whereby it is changing the lives of millions across the globe. Computerization of Government activities makes it easier to supervise and audit, and makes the administration more responsive to the needs of society. It also bridges the divide between the Government and the people. Technologies like touch-screen kiosks help disseminate information on land records, photo identity cards, pending bills etc. and enable even illiterate people to take more informed decisions. India is leading the world in the effective use of IT for elections.

Scientific progress is almost entirely dependent on the use of computers and other microprocessor-controlled devices. Using supercomputers, meteorologists predict future weather by using a combination of observations of weather conditions from many sources, a mathematical representation of the behavior of the atmosphere, and geographic data. Computer-aided design (CAD) and computer-aided manufacturing (CAM) programs have led to improved products in many fields, especially where designs tend to be very detailed. Computer programs make it possible for engineers to analyze designs of complex structures such as power plants and space stations.

E-Government

- “e-Government” refers to the use by government agencies of Information and Communication technologies that have the ability to transform relations with citizens, businesses, and other arms of government.
- These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management.

  The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.

E-Governance

- E-Governance/digital Governance refers to governance processes in which Information and Communications Technology (ICT) play an active and significant role.
- e-governance deliver SMART governance
  - S- Simple
  - M- Moral
  - A- Accountable
  - R- Responsive
  - T -Transparent

Types of E-governance

- G2G
- G2C
- G2B
- G2E

Here we are specially focusingon G2G (Government to Government) and G2C (Government to Citizen) or rather NAST to Government and NAST to Citizen.

Reference material Annex-2

Artificial Intelligence (AI) for SMART NAST

We are moving towards the era of industrial revolution 4.0. Entire world has been revolutionized with the features of previous revolution such as industrial revolution 1.0, industrial revolution 2.0, industrial revolution 3.0 respectively except our country. We were deprived from the features of previous industrial revolutions. Thus, this is the high time for us to catch up the speed of IR 4.0 and make our country better than before.

Industrial revolution 4.0 consists of smart factories with smart machines which are augmented with wireless connection and set of smart sensors connected to a main system for the efficient production and proper decision making. The crux of this revolution is SMART such as Smart manufacturing, Smart factory, Smart city, Smart education, Smart health etc. In order to be Smart or to make Smart, ICT (Information communication Technologies) play the vital role. Future technologies such as: Artificial

Intelligence (AI), Internet of Things (IoTs), Cloud Computing, Big Data and Robotics make the system smarter and help the country to achieve the goals of Industrial Revolutions 4.0.

National Academy of Science and Technology (NAST) is an autonomous apex body established in 1982 to promote science and technology in our country. The Academy is entrusted with four major objectives: advancement of science and technology for all-round development of the nation; preservation and further modernization of indigenous technologies; promotion of research in science and technology; and identification and facilitation of appropriate technology transfer. All these objectives can be achieved by making SMART NAST and AI is the approach of making SMART along with other technologies such as IoTs, Cloud Computing, Big Data and Robotics.

Artificial Intelligence (AI) is the ability of a machine to think and learn like humans. We make machines which can learn, think, and act as we do in our daily life. Artificial intelligence is the science of training machines to emulate human tasks through learning and automation and also the ability for the machine to learn how to apply logic and reasoning capacity to gain an understanding from big data sets. Machines learn from these data sets. Based upon the types of AI uses and implementation, AI is classified intro machine learning and deep learning. Machine Learning is subset of AI and Deep Learning is the subset of Machine Learning.

Advances in AI have been achieved by applying machine learning to very large data sets. Machine-learning algorithms detect patterns and learn how to make predictions and recommendations by processing data and experiences, rather than by receiving explicit programming instruction. The algorithms also adapt in response to new data and experiences to improve efficacy over time.

The outcomes of machine learning are classified into three areas. First one is descriptive which describes what happened and second one is predictive that describes what will happen and prescriptive what is to be done to achieve the goals. These outcomes of machine learning such as descriptive, predictive and prescriptive can be used in NAST to know the state of arts of NAST, to visualize what may happen in future and the way to achieve the vision.

Based upon the learning methods, machine learning is classified into three learning methods such as Supervised Learning, Unsupervised Learning and Reinforcement Learning. In all these learning methods, machines learn with data. The quality of making decision by each method depends upon the volume and quality of data. Supervised Learning is an algorithm that uses training data and feedback from humans to learn the relationship of given inputs to a given output. This type of machine learning is used when we know how to classify the input data and the type of behavior we want to predict, but we need the algorithm to calculate it for us on new data. Unsupervised Learning is an algorithm that explores input data without being given an explicit output variable (eg, explores customer demographic data to identify patterns) and it is used when we do not know how to classify the data, and we expect the algorithm to find patterns and classify the data for us. Reinforcement Learning is an algorithm that learns to perform a task simply by trying to maximize rewards it receives for its actions (eg, maximizes points it receives for increasing returns of an investment portfolio) and it is used when we don't have a lot of training data and we cannot clearly define the ideal end state; or the only way to learn about the environment is to interact with it.

Deep learning is a subset and the type of machine learning which has the huge potential to interpret the huge data resources, requires less data preprocessing by humans, and can often produce more accurate results than different machine-learning algorithms. In deep learning, interconnected layers of software-based systems are known as "neurons" form a neural network and they interact to each other for the common goals. The network can ingest vast amounts of input data and process them through multiple layers that learn increasingly complex features of the data at each layer. The network can then make a determination about the data, learn if its determination is correct, and use what it has learned to make determinations about new data.

NAST has to use AI system to be the Smart and meet the visions and objectives. AI makes the machines smart. Machine does not make the mistakes. More than 80% errors are due to human involvements whereas machine does not make an error.

AI has the huge potentials to address the issues of SMART NAST. Before using these potentials, there is a need of identifying priorities areas for NAST and an institutional AI strategy needs to be frame worked. The strategy should include AI beneficial, AI threats, AI safety, AI ecosystem etc. Once the AI strategy is made then the areas where AI can be used are to be identified.
AI refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making. Initially conceived as a technology that could mimic human intelligence, AI has evolved in ways that far exceed its original conception.

NAST has to be rejuvenated as per the demand of industrial revolution 4.0 (IR 4.0). The features of IR 4.0 has to be understood and the future technologies such as AI, Cloud Computing, Big Data, Internet of Things (IoTs) and Robotics which drives these features are to be used efficiently and effectively. In order to be in pace of new era, the business flow in NAST is to be understood. Redundancies are to be identified and eliminated. Routine tasks are to be automated using AI and other appropriate technologies. These are the following where NAST has to give high priority in order to achieve SMART NAST vision.

Annex-3

Prof. Dr. Ashok Ratna Bajracharya (Coordinator)

Education

Intermediate in Science (I. Sc): Amrit Science College, Kathmandu, 1970

MBBS : Assam Medical College,Dibrugarh,, Assam, **India** 1975

M.S.(Orth) (Master of Surgery in Orthopaedics): Dhaka University, **Bangladesh**.1987

M.Ch.Orth.(Master of Orthopaedic Surgery): University of Liverpool, U.K.1990

Sub- Speciality : International Fellowship in **Spine Surgery**

Spine Surgery, Louisville, Kentucky, **USA,** 1997.

*Present position***:**

Retired from Govt of Nepal Health Services, at Level 11 Chief Consultant Orthopaedic Surgeon in October 2015 after 40 years of Government health service as:

Professor & Head of Orthopaedic Surgery Department, National Academy of Medical Sciences, Bir Hospital and

Executive Director,National Trauma Centre, Mahabouddha, Kathmandu, Nepal:

Academician :National Academy of Science and Technology, Khumaltar. Patan,Nepal

Overseas Tutor:**AFRCS Program**, *Royal College of Surgeons, Edinburgh, **UK*** Since1998

Visiting Professor: The Tamilnaddu Dr. MGR Medical University, Chennai**, India**

National Patron:*Association of Spine Surgeons of Nepal*, Since 13 July 2012.

Chairman &M.D.: Capital Hospital & Research centerPvt. Ltd, Putalisadak, Kathmandu, Nepal

International Associate Editor: Journal of Clinical Orthopedics& Trauma, *Elseveir*,

Trainings received:

A) *CLINICA L TRAININGS: 16 in India*, Malaysia, South Korea, UK, USA etc,

B) MANAGEMENT TRAININGS:

Healthcare Executive Management Development Program
: Organized by Dept. of Hospital Administration, AIIMS & WHO, Delhi, 21- 27 Oct 2012 at Goa**, India**

Effective Negotiation Skills forsuccessful Businessmen: By Forum P Ltd, Kathmandu,**2010**

Senior Executive Development Program : for Gazetted class I Officers ofGovt of Nepal by **Nepal administrativeStaff college**, **2009**,

Training forExaminers: by National Academy of Medical Sciences, Kathmandu, **2005.**

Postgraduate Teachers' training for Research Methodology: NAMS, Kathmandu, **Feb 2005**

General AdministrativeTraining:*Administrative College, Ministry of GeneralAdministration* Nepal 1980.

Prof. Dr. Subarna Shakya (Member)

Present position:

Professor of Computer Engineering, Dept of Electronics & Computer Engineering, Institute of Engineering, Pulchowk, T.U

Member of National Information Technology Advisory Committee, Government of Nepal

Member, Board of Studies (BOS), South Asian University, New Delhi, India.

Member, Academic Council, Purbanchel University, Nepal

Chairman, Computer Engineering Subject committee, Ministry of Education, National Curriculum Development Center, Sanothimi, Bhaktapur.

Academic Qualifications:

MSc and PhD degrees in Computer Engineering from the Lviv Polytechnic National University, Ukraine, 1996 and 2000.

Research Area

E-Government system, Computer Systems & Simulation,Distributed & Cloudcomputing, Software Engineering & Information System, Computer Architecture, Information Security for E-Government, Multimedia system

Recent Publications: 42

Book Chapter Publications: 2

Prof. Dr. Manish Pokharel (Member)

Education

Post Doctorate [Feb 2012 to Jan 2013]	Korea Aerospace University, South Korea
PhD in E-government	Korea Aerospace University, South Korea [Sep 2007 to Aug 2011]
Master of Engineering (Software System)	Birla Institute of Technology & Science, (BITS), Pilani, India
Bachelor of Engineering (Computer Science)	Karnataka University, India

Hemanta Raj Baral, ICT Consultant (Member)

Job Profile:

- Consultant for Smart City, Data Centre and ICT Projects
- ICT Projects Management
- Training for the Trainers (Front Desk, Presentation Skills, Customer Service, Leadership Dev
- Teaching GCSE/GCE level IT courses
- Ms. Office Expert (ECDL – British Computer Society certitifed)
- Web Design, Upload and update using FTP
- Graphics/Desktop Designing

Educational Qualification:

Level	Year	Institution
MSc - Network Security	2010	Anglia Ruskin University, Cambridge/Chelmsford, The United Kingdom
P.G. Diploma in Information Security & Assurance	2009	ABP (The Association of Business Practitioner) – School of Information Risk Management, London, The United Kingdom
Bachelor in Computer Science	2008	Barbican University – Stratford College London, London, The United Kingdom
Bachelor in Business Studies (BBS)	2004	TU, Nepal Commerce Campus, Minbhavan, Kathmandu
Diploma in Electrical Engineering	1996	Tribhuvan University, Institute of Engineering, Purwanchal Engineering Campus, Dharan, Nepal

Pradeep Dhodari(Member Secretary)

Qualification

2018 Master of Public Administration[MPA]
Public Administration Campus, T.U., Nepal

2015 Master of Science in Information Technology [MScIT]
College for Professional Studies, Kathmandu, Nepal

Professional Course

- Microsoft Certified Systems Engineer (MCSE)
- Microsoft Certified Systems Administrator (MCSA)
- Microsoft Certified Professional (MCP)

Other Course

- Professional training in Cisco Certified Network Associate (CCNA), (*CISCO Certified Network Associate Track)*
- Professional training in Oracle Certified Professional (OCP), *(Database Administration Track)*
- Professional training in Red Hat Certified Engineer (RHCE), *(System, Network Administration and Security Track)*
- Training program in "Decision Support System (DSS)" Computer Application Program
- Training program in "Design and Management of Infrastructure using IT"
- Diploma in Computer Hardware and Networking
- Professional Training in Geographic Information System (GIS), in Natural Resource Management
- Training program in Networking (A+, N+) and ITIL
- SW Education Professional Course

Annex -4

Suggestions Received

A.From Academicians:

1. Prof. Dr. Ganga Shrestha
   NAST Academician

Respected Sir,

Thank you for your mail. As a statistician, i have designed rough format related to data in each ward level. This may help in generating data related to each ward, Palika, Province and Federal Nation which can further be used for planning and policy making as well in monitoring and evaluation of nation's development. I have attached the format.

With regards

Sincerely, Ganga Shrestha

Academician NAST

This is a suggestion related to data which may prove to be valuable in progress of various wards, Municipalities, Province and Federal Structure of Democratic Republic of Nepal.

Data collection related to socio, economic, demographic, environmental and cultural features should be there in every WARD. This data has to be regularly monitored and evaluated. A format has been designed for each WARD.

The data will also give idea about basic necessities demanded by people living in ward – related to water supply, open space/parks, waste management, electric poles and lights

The demographic profile whole ward can also be known from above data – number of elderly people/adults/married couples/adolescents/children so services demanded by the ward population can be estimated. This data is important from security point of view and also to assess socio economic potential of the WARD

2.**Dr. Gopal Bdr. KC**

NAST Academician

Dear Pradeep ji

It is a good idea to have good rules at first for smartness, then implementation. I have following suggestions.

1. Fulfill all vacancies unbiasly.
2. Follow proper monitoring, evaluation, reward and punishment system.
3. Make proper use of lab equipment and chemicals. Do not buy unnecessary things to pile up as a junk.
4. Heads should follow the rules first of all by sitting on chair whole office time.
5. Do not centralize power but decentralize and monitor well.
6. Try to have timely promotion of the staves in competition basis.
7. Minimize politics as much as possible.
8. Provide opportunities to competent staves for career development.
9. Have weekly discussions of heads with VC and secretary for better management.
10. Make efficient use of each staff. Do not leave them idle.
11. Try to create/provide better working environment to each staff.
12. Try to have national and international collaborations as much as possible in mutual benefit basis.

Thank you

B. From Staff of NAST:

1. Mr. Govinda Prasad Subedi

smart nastबनाउनकाे लागि म्यानेजमेन्ट smartचाहियाे म्यानेजमेन्ट भन्नाले उपकुलपति देखि तल गेट पालेसम्म सवै । संकाय माहाशाखाकाे नेतृत्व विज्ञ प्राग्यहरुबाट हुनु राम्रो हाेला कि जस्तो लाग्दछ । सचिवकाे नियुक्ति मन्त्राायमा जस्तै मन्त्रीपरषदबाट याेग्य ५८ बर्ष उमेर हद भित्रकै प्रशासन चलाउन अनुभबी मान्छे नियुक्त

हुनेब्यबस्था हुनु राम्रो। अहिले सम्म चलेका कार्यक्रमले सम्मृध नेपाल सुखी नेपाली भन्ने सरकरको कार्यक्रमलाई सम्बोधन गर्लाजस्तो लागेन यो मेरो ३४/३५ बर्षको अनुभवको कुराले .....

लेखा प्रणालीमा सरल सफ्टवेयर प्रयोग गरि ब्यपक सुधार गर्नु पर्ने । अधिकार बिकेन्द्रकरन गरि सानातिना निर्णयको लागि पनि उपकुलपि र सचिव कहाँ पुग्न नपराेस । खरिद प्रक्रिया पार्दसी,सरल,गुणस्तर हुनुपर्ने । कर्मचारीको बृती बिकास हुनु पर्ने , नियममा भएको पेन्सन वा उपदान ब्यबस्था लागु गर्न ब्यबस्थापनले पहल गरि छाेड्न चाहाने पुुरााना कर्मचारीहरुलाइ छाेड्ने वातावरण बनाई अहिलेकाे सवै सिस्टममा फिट हुने smart कर्मचारी सोर्स फोर्समा होइन लोकसेवाबाट प्रतिस्पर्धा गराइ आवस्यक कर्मचारी भर्ना गर्नु उपयुुक्त होला .....। रास्ट्रमा दैविक प्रकोप परेको बेलामा nastले अग्र स्थानमा आफुलाइ उभ्याउने । ..... गर्ने चाहना नै राख्ने हो भने कति छन् कति .....।

-गोबिन्द प्रसाद सुदेदी ।

नास्ट ।

Translated into English as follows: -

- For smart NAST management should be smart including low level staff to high designated staff.
- Faculty and division should be led by academician.
- While appointing NAST Secretary he or she should be qualified and age below 58.
- Accounting system software should be implemented as the earliest.
- Authority should be decentralized to the faculty and division head.
- Staff motivation program (e.g. promotion, training), should be implement by the management.
- Staff recruitment should be governed by Public Service Commission.
- During the catastrophic events NAST role should be at the top.

2. From Mr.DinBandhu Parajuli

cj:yf

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Translated into English:

Situation Analysis:

RONAST then	**NAST now**
King chaired academician assembly	Prime minister chairs it now
Nine officials including special class VC	VC& Secretary are the only officials
Work load high in absence of S&T Ministry	With existence of S&T ministry coordination is required.
RONAST promulgated in 2048	Needs to be updated
Roughly 200 staff were there in 2048	Currently only 100 roughly
Good communication between staff & office beares	Not so good communication these days
Conducive environment for team work then	Not now
Said to have 120 Ropani of land	Said to have only 80 Ropanis of land

Suggestions to make NAST SMART:

- NAST promulgation should be rectified in keeping with constitution of Nepal 2072
- Appointment & promotion of staff have not taken place since last 12 years. Human resource recruitment committee is to be formed for this purpose.

- For a smart NAST, besides V.C &Secretary, there must be special class or academician or Associate academician should be appointed either as part time or full-time coordinator to run faculties/divisions of Science, Technology, Innovation, renewable energy, planning &general administration in order to build capacity to make quick decisions.
- Academicians, officials and staff from relevant fields should get together to form team to work and achievements must be made public.

Annex: 5

Some steps already initiated by this committee towards achieving SMART NAST:

1. Sensor operated Sliding Door at the entrance of NAST building
2. NAST Mobile App developed
3. NAST Account software with features like: notices,citizen charter, activities,events, contact us, updates. Nast meetingsetc.
4. CCTV cameras
5. SMART conference with online registration, e-inauguration, pen drives instead of paperback souvenirs, conference program in the app etc. in the International youth conference on Science, Technology & Innovation held by NAST recently in 21-13 October 2019.