



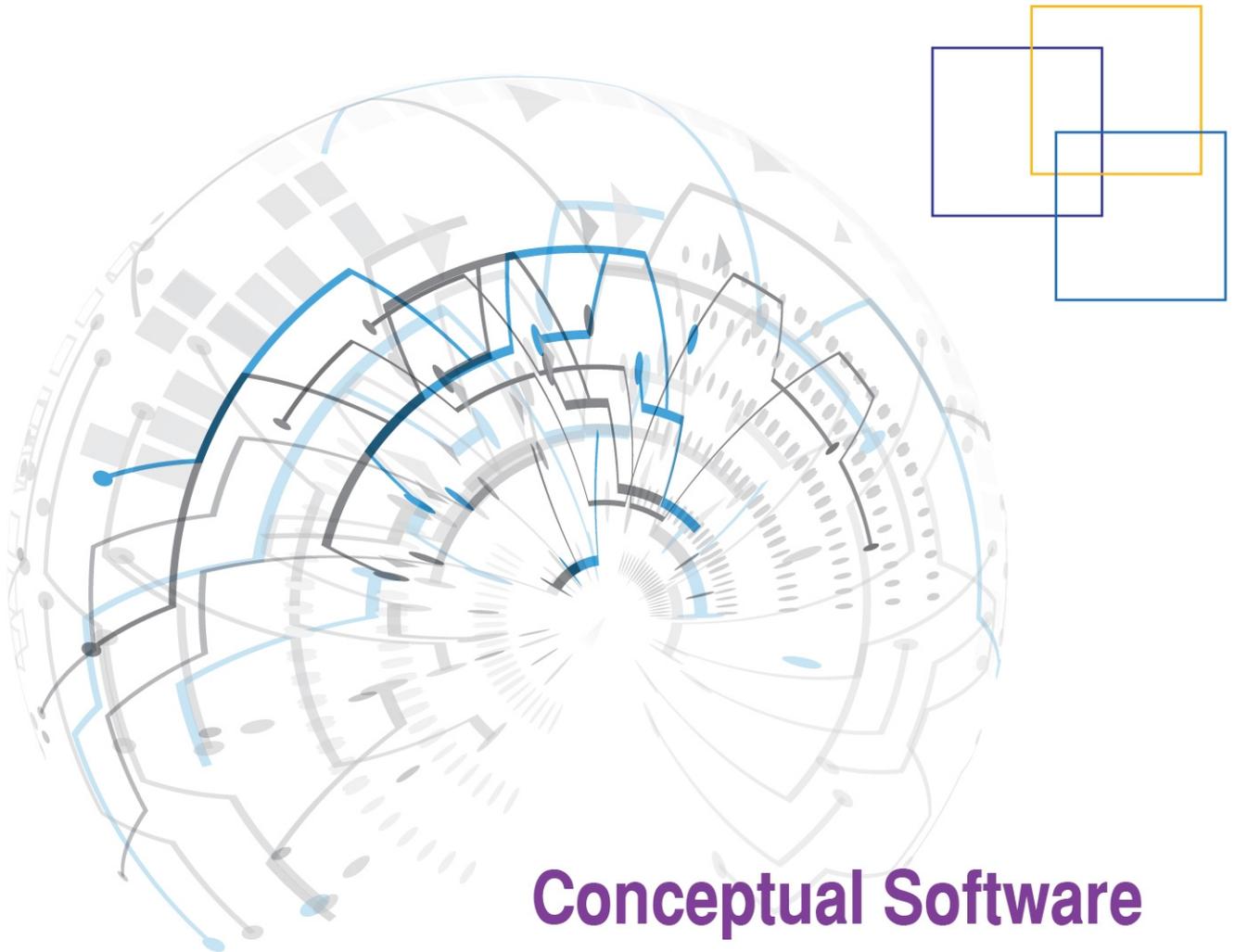
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Swiss Agency for Development
and Cooperation SDC



International
Labour
Organization

Managing Migrant Worker Information in Bangladesh



Conceptual Software Architecture & Design

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Preface

As Bangladesh is fast developing into a middle income country, the contribution of overseas employment and remittances to the country's economy has gained prominence in its overall strategy, especially through the development of a more pro-active and migrant worker-oriented approach to management.

This has led to changes in the overall legislative and policy framework, and a gradual recognition of the need to develop improved information systems for management, including concrete measures for social protection, for complaints investigation and redress, and for investment in building the skills and qualifications of workers to improve the quality of their overseas employment.

In order to move into full implementation of the Overseas Employment and Migrants' Act 2013 and the Expatriates' Welfare and Overseas Employment Policy 2016 as part of ongoing improvements in labour migration, it has now become pertinent to develop the institutional capacity of the government to collect, manage, and monitor migration and labour market information

As such, through the Swiss Agency for Development Cooperation (SDC) funded "Application of Migration Policy for Decent Work of Migrant Workers" project, the International Labour Organization in close collaboration with the Refugee and Migratory Movements Research Unit (RMMRU), has developed a set of four reports on the Integrated Migrant Workers Information System and the Labour Market Information System in Bangladesh.

This particular report *Conceptual software architecture and design* recommendations for an integrated Migrant Workers Information System and Labour Market Information System in Bangladesh proposes design recommendations for an integrated database information system on migrant workers' information (MWMIS) and a labour market information system (LMIS), identifying sources of data and software requirements.



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Table of contents

Topic	Page
Preface	iv
Table of contents	v
Lists of tables and figures	vi
Abbreviations and acronyms	vi
1. Introduction	01
1.1 Goals and objectives	01
1.2 Project overview and scope	01
1.3 System overviews for a national database	01
1.4 Modules	03
2. Description of the software design	04
2.1 Layers	04
2.1.1 Database layer	04
2.1.2 Application layer	04
2.2 Core features	05
2.3 Additional features	05
2.4 Software context	05
2.5 Major constraints	06
3. System architecture design and development environment suggestions	07
3.1 Confidentiality and data security in the long term	07
3.2 Glimpses of a future design document for the simple IOA detailed in this report	07
3.3 Technology platform and backbone	08
3.4 User interface design	09
3.5 Class, responsibilities, and collaborators (CRC) cards	11
3.6 Application roadmap for a simple IOA	13
4. Ensuring user accessibility and satisfying the requirements of multiple user types	14
4.1 Data variables to be available for each user type	14
4.2 Visualization of the application dashboard	21
5. Conclusion	22

Lists of tables and figures

Topic	Page
List of tables	
Table 1. Data variables to be seen and used by select application users	14
List of figures	
Figure 1. Lifecycle of a database system	02
Figure 2. Proposed proper cloud-based LMIS and MWIMS architecture over the long term	07
Figure 3. Sample CRC card layouts to serve as examples for application development	12
Figure 4. Application roadmap for a simple IOA	13
Figure 5. Quick visualization of a possible dashboard	21

Abbreviations and acronyms

A2i	Access to Information
API	application programming interface
BMET	Bureau of Manpower Employment and Training
CRC	class, responsibilities, and collaboration
IOA	Inter operable Application/ Interconnection Oriented Architecture
LMIS	Labour Market Information System
MWMIS	Migrant Workers' Management Information Systems

1. Introduction

The purpose of this software design document is to provide a conceptual description of the Migrant Workers' Management Information System (MWMIS) and Labour Market Information System (LMIS) integrated interconnection (interoperable) oriented application (IOA) system, providing insight into the structure and design of each component. The whole system will be divided into different modules. Here, the term “modules” means the ultimate parts of a system, basically referred to as a platform.

1.1 Goals and objectives

The purpose of this application is to facilitate and completely digitize the migration process and to manage migrant-related activity in a very organized way. At the moment, migrant-related activities are not properly organized across the spectrum, and the necessary data or information related to migrant workers is kept in different, unconnected data sources. As a result it becomes too complex to manage all these tasks in a timely manner and with precision. That is why it is essential to develop the institutional capacity of the Government to support and monitor labour markets in order to move into full implementation of the Overseas Employment and Migrants Act 2013 and the Migration Policy 2016 as a part of a push to bring improvements in fair labour migration. The application addressed in this report aims to:

- provide regular, generally accurate and real time information analysis;
- integrate data from multiple sources to support robust tracking processes and analyses;
- track returning workforce and enforce naturalization processes at home; and
- identify medium and longer term opportunities and invest in training to develop a supply for those upcoming demands.

After all, the main goal of this application is to ensure the accurate collection of migrant and labour market information in a place that will help the Government to make better development policy according to data analysis and to manage migration-related tasks digitally.

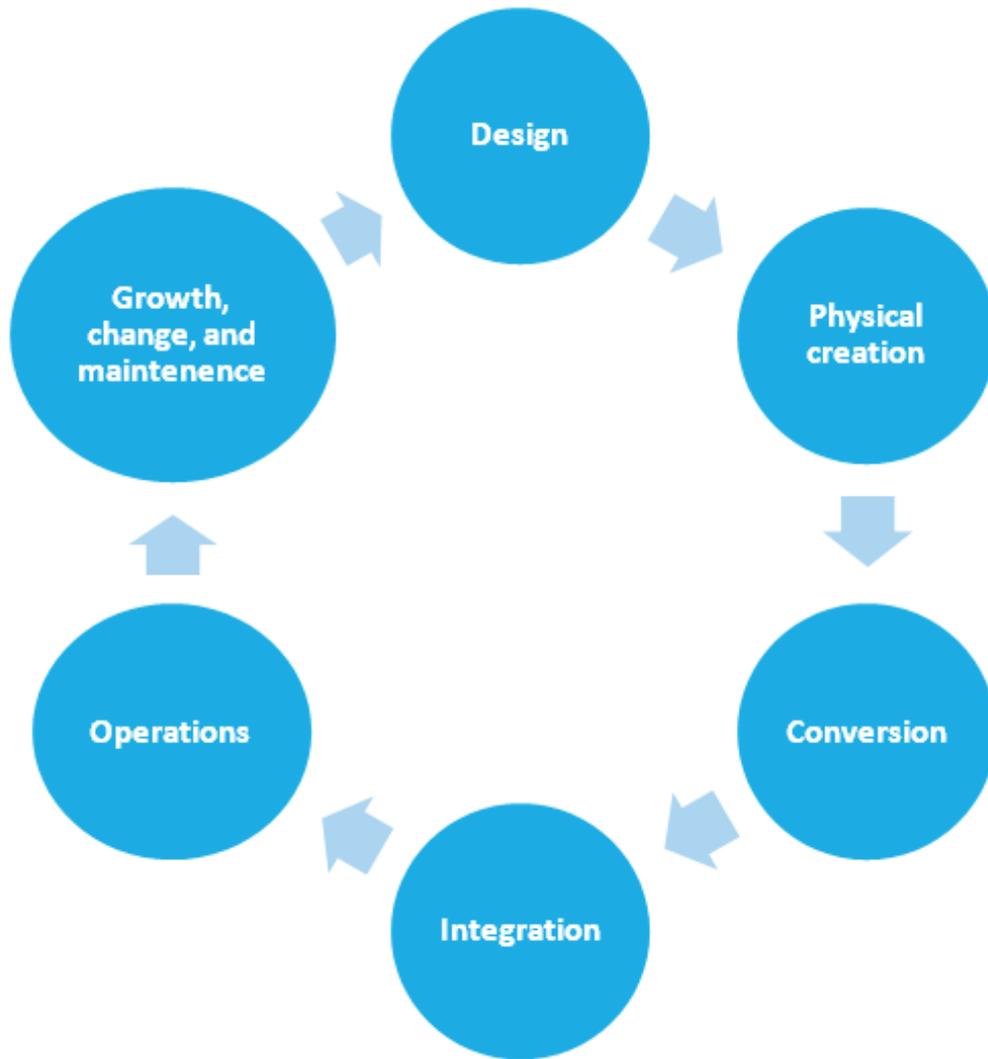
1.2 Project overview and scope

The aim of the design concept is to fulfill all requirements by laying emphasis on maximum quality and the optimality of the solution. A basic precondition of achieving system stability and robustness is to derive functions from primary processes that are to be supported by the system. High flexibility and parameterization (external criteria) are to be achieved by employing a modular structure (internal criterion) that utilizes modern techniques, allowing further increase in flexibility and parameterization. In the solution proposed here, we have designed subsystems supporting data acquisition processes, their processing, and their provision to other organizations. Subsystems are designed with a minimum number of links (loose coupling), thereby allowing flexibility. The design of analytic models is a tool that considerably supports flexibility.

1.3 System overviews for a national database

A database is a collection of information that is organized so that it can be easily accessed, managed, and updated. Data is always kept in an organized way in rows, columns, and tables, and it is indexed to make it easier to find relevant information. Data gets updated, expanded, and deleted as new information is added. Databases process workloads to create and update themselves, querying the data they contain and running applications against it. We have planned a multi-layered application where the databases will be a separate part of the application but will be synchronized. Database systems typically have a lifecycle of several steps, which can be seen in figure 1

Figure 1. Lifecycle of a database system



Source: Created by authors

One module of the application is a database layer that consists of the database control system and provides centralized storage of application data. Moreover, it includes selected portions of application logics that provide data consistency, user access rights, and optimizations enhancing application performance. An application layer includes its own system functionality based on object-oriented principles utilizing Java language and J2EE technologies. A further presentation layer is also based on J2EE technologies on the server side, which allows fulfillment of thin client requirements based on standard web browsers. Standardization of the user interface and a decrease in the level of application maintenance of client workplaces is thereby attained. Standard web browsers can be used at client workplaces. Centralized architecture accessible through the Internet represents a very progressive solution, which is, however, also very security-demanding. Along with standard security requirements (especially authentication and allocation of access rights), communication security and protection against external attacks from the Internet are required. To effectively protect the Decent Work Project against such external attacks, we assume the need to create a special “demilitarized zone” isolated from the Internet and LAN by firewall. This demilitarized zone includes a portal that is isolated and protected against external (and internal) users by a protocol firewall. This described topology decreases the risk of penetration into local networks of the system. The requirement of utilizing existing hardware and software is one of the key preconditions of public procurement, which was fulfilled from our side to the maximum extent.

1.4 Modules

The modules of the application will be:

- Database layer
- Application layer:
 - Security layer
 - Service layer
 - Client layer

Topics covered in this report include the following subsystems to ensure the highest security, scalability, flexibility, and maintainability of a software solution:

- Database layer
 - Solve data cache placement
 - Establish distributed data repository
 - Place edge analytics and streaming flows
 - Manage metadata and data pipelines
- Application Layer
 - Security
 - o Establish boundary control
 - o Create an inspection zone and locate identity or key management pattern
 - o Integrate security analytics and logging.
 - Service
 - o Implement application program interface (API) management
 - o Apply distributed coordination
 - o Position complex event processing
 - o Introduce predictive algorithmic services
 - Client site
 - o Mobile friendly user interface
 - o Fonts and language localization according to the user experience.
 - o Meaningful input form according to end user considerations and institutional needs.
 - o Necessary resource information for research purpose
 - o Multi-level user friendly dashboard.

In short, this document is meant to equip the reader with a solid understanding of the inner workings of the MWMIS and LMIS integrated interconnection-oriented application system.

2. Description of the software design

2.1 Layers

The whole system has been divided into these layers: the database layer and the application layer.

2.1.1 Database layer

The database layer contains the following:

- Data cache and edge placement – Covers data performance and sovereignty of data imported from different data sources.
- Distributed data repository – Solves for data availability by placing a global namespace over the edge nodes and extending that into various formats as appropriate. It also demonstrates how to optimize for high availability and data protection.
- Data analytics and streaming flows – Covers how to integrate all the imported data by eliminating data redundancy and other unnecessary fields to combine data from disparate sources into meaningful information and deliver it as trusted data.
- Data pipelines and provenance – Covers the needed data orchestration and data provenance to facilitate and track data flows and consumption from disparate sources across the data fabric. This pattern demonstrates how to deliver an automated self-updating view of all data movement inside the environment and across applications.

2.1.2 Application layer

The application layer contains the following:

- Security:
 - Boundary control – Can be defined as the edge across the different users according to their roles in the system. This security feature will work as a boundary of the users' access area according to the access policy.
 - Inspection zone and locate identity, or key management pattern – Can be defined as user access authentication and other related terms, like which IP or network the user is using to access the application and what kind of data/information they are accessing. It will also be ensured to track the bi-directional flow of users and services without latency or undue complexity.
 - Integrate security analytics and logging – Can be defined as the deployment and scaling an appropriate level of security intelligence.
- Service:
 - Implement API management – Can be defined as managing those APIs that will be used to import or pull all the data from different data sources. Here APIs can be used as services or micro services according to needs.
 - Apply distributed coordination – Means coordinating in between different data sources and different users from various types of organizations or stakeholders.
 - Position complex event processing – This means that events will be requested by the users

according to their positions of access.

- Introduce predictive algorithmic services – This is for ensuring accurate statistical and other analytical calculations according to the needs of policy-makers and researchers.

■ Client Site:

- Mobile friendly user interface – Refers to a fully responsive user interface that can be accessed from all sorts of smart phone screen sizes.
- Fonts and language localization – This will be implemented by considering users' needs in this locality and their level of education.
- Meaningful input form according to end user considerations and institutional needs – Refers to the data input forms that will be designed by considering all stakeholders' needs, but each specific user will only get access in line with the access policy of the Government of Bangladesh.
- There will be different users from different positions levels and organizations, so their dashboards should be different from one another. This important issue also will be counted into this application's development phase.

2.2 Core features

1. User/organization registration and login;
2. Organization approval;
3. Organization-oriented user creation;
4. Data input from different organizations;
5. Recruiting migrants for business stakeholders;
6. Internal and external labour market information;
7. Internal/external business and employment demographic visualization;
8. Migrant worker tracking facilities;
9. Statistical and other quantitative data tables;
10. Graphical and geological data visualization;
11. Demographic information; and
12. Research-oriented sections.

2.3 Additional features

1. Module-based dashboard system to go across multiple linked applications/data sources;
2. Services for migrant workers; and
3. Necessary report generation.

2.4 Software context

The MWMIS and LMIS will be available as a web service and free of charge (according to the future policy, if it can be modified). Development and maintenance costs are provided by the Government of Bangladesh, so funding should not be an issue. If, however, this situation changes at some point, it may be possible to fund the project by incorporating various international stakeholders.

Future development or upgradation plans will be based on the features (if any) that do not make it in the initial release of the application. If all of these features are included, there are several experimental features that will potentially be incorporated. These features are not covered in this document.

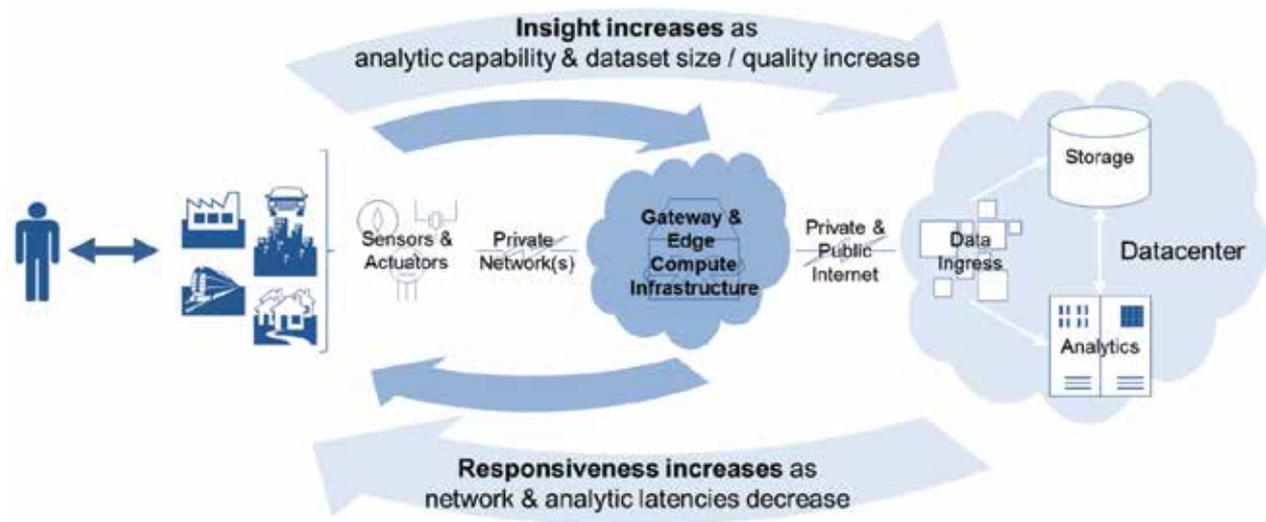
2.5 Major constraints

The greatest constraint for this application project is time. There is roughly eight to nine months allocated to the development, testing, and documentation of this project, including both the server side application and database. Collectively, the development team may need to upgrade themselves to develop this platform, as a significant portion of this time will be dedicated to learning the environment. Consequently, time is an even greater constraint. This may result in fewer features in the initial release; however the core functionality of the system will be unaffected.

3. System architecture design and development environment suggestions

While the application architecture will be designed with necessary documents, it should then be written for a more general audience so non-technical persons can easily understand the internal methodologies and processes. The design documents should be written and indexed sequentially. A complex design option of the software for contemplating all aspects over the long run can be seen in figure 2 below.

Figure 2. Proposed propercloud-based LMIS and MWIMS architecture over the long term



3.1 Confidentiality and data security in the long term

A brief explanation has been given in the scope area about confidentiality and data security. The system's data security will be ensured via a multi-layered process and functionality. All the segregated data will be encrypted into the database; so raw data will be highly secured from any kind of violation. During data access, the data desired by and accessible to the user will be decrypted and presented to the user through automated security functionality. A system's security must be ensured in all phases by maintaining security rules pertaining to physical security, digital security, integrating security, complacency, and policy and code security. All these measures will be ensured.

But considering the pros and cons of the government machinery and how bureaucracy works, particularly the sensitivities of the individual data holding agencies/directorates under different ministries, this study focuses on a simple modular-based interconnected interoperable application that will connect all database systems and present this integrated data through a single dashboard for ease of use. This simple IOA has been designed and detailed out below.

3.2 Glimpses of a future design document for the simple IOA detailed in this report

Below is a brief overview of each part of the design documents that should be done accordingly:

- Part 1 – Data Design:
 - Data structure
 - Data flow patterns
 - Data analysis process patterns
 - Data integration/pulling plans
- Part 2 – Architectural and component-level design:
 - Development process
 - Class diagrams
 - Sequence diagrams
 - Object diagrams
 - Package diagrams
 - Deployment diagrams
 - Use cases
 - State machine diagrams
 - Activity diagrams
 - Communication diagrams
 - Composite structures
 - Component diagrams
 - Collaborations
 - Interaction overview diagrams
 - Timing diagrams
 - Algorithmic models
- Part 3 – User interface design
- Part 4 – Restrictions, limitations and constraints
- Part 6 – Testing issues
- Part 7 – Appendices

3.3 Technology platform and backbone

By considering the application as an object oriented application, all the system design documents have been recommended here, and the recommended development environment and technologies have also been suggested accordingly. Below are the recommended technologies for this application:

- | | |
|-------------------------------------|------------------------------------|
| ■ Server side Programming Language: | Java 8.0/9.0 |
| ■ Framework: | Spring Framework 5.0 |
| ■ Security Framework: | Spring Security 5.0 |
| ■ User Interface: | Angular JS 5.0 & Angular Material. |
| ■ Database technology: | Hybrid database |

In the above list, a “hybrid database” refers specifically to a combination of Oracle Database and NoSQL, bearing in mind that government servers and database systems are mostly written in Java and built on around Oracle.

The following matters also need due consideration:

- Database back up will be done both online and offline.
 - Automatic database back up will be done into server machines.
 - Weekly all the automatic database backup files should be stored in an offline computer.
- An audio message about all fields and circulations should be placed in the web application’s user interface.
- 24/7 availability is expected (“zero downtime”). Unplanned down times are not acceptable at all.
- Concerning API development, remember Fred Brooks’ “Rule of 9”.
- Be wary of API versioning.
- Requires support for low bandwidth.

3.4 User interface design

The following rules are advised to be followed during user interface design for a better and more usable application. These rules are derived from Ben Shneiderman’s “Eight Golden Rules of Interface Design”. They are:

1. Strive for consistency.
 - Consistent sequences of actions should be required in similar situations. Identical terminology should be used in prompts, menus, and help screens, and consistent commands should be employed throughout.
 - According to the user’s needs, each menu should be placed in the right place in the application.
2. Enable frequent users to use shortcuts.
 - As the frequency of use increases, so does the user’s desire to reduce the number of interactions and to increase the pace of interaction. Abbreviations, function keys, hidden commands, and macro facilities are very helpful to an expert user.
3. Offer informative feedback.
 - For every operator action, there should be some system feedback. For frequent and minor actions, the response can be modest; while for infrequent and major actions, the response should be more substantial.
4. Design dialog to yield closure.
 - Sequences of actions should be organized into groups with a beginning, middle, and end. The informative feedback at the completion of a group of actions gives the operators the satisfaction of accomplishment, a sense of relief, the signal to drop contingency plans and options from their minds, and an indication that the way is clear to prepare for the next group of actions.

5. Offer simple error handling.
 - As much as possible, design the system so the user cannot make a serious error. If an error is made, the system should be able to detect the error and offer simple, comprehensible mechanisms for handling the error.
6. Permit easy reversal of actions.
 - This feature relieves anxiety, since the user knows that errors can be undone; it thus encourages exploration of unfamiliar options. The units of reversibility may be a single action, a data entry, or a complete group of actions.
7. Support an internal locus of control.
 - Experienced operators strongly desire the sense that they are in charge of the system and that the system responds to their actions. Design the system to make users the initiators of actions rather than the responders.
8. Reduce short-term memory load.
 - The limitation of human information processing in short-term memory requires that displays be kept simple, multiple-page displays be consolidated, window-motion frequency be reduced, and sufficient training time be allotted for codes, mnemonics, and sequences of actions.

The following are a few user experience suggestions:

- Default usage patterns must be apparent ad-hoc.
- Advanced usage patterns must also be easily learnable.
- Trainings or reading user manuals upfront are a no go.
- Appealing design is a matter of course.
- Responsiveness:
 - Response times >1.0 seconds to create a frown.
 - Response times > 5.0 seconds to create strong negative feelings.
 - The back end just must work.
 - Mobile first is a matter of course.
 - Audio format messages should be placed in user interface.

Testing issues is one of the most important features of a software development phase; so all of the following test cases are recommended to be conducted before initial release of this application:

- White box testing;
- Black box testing;
- Feature testing, including:
 - Account creation testing;
 - Connecting to server;
 - User create and access level;
 - Organizational access and approval testing; and
 - Data accuracy and demographic visualization.

For a better understanding about the project concept and internals a CRC (class, responsibilities, and collaborators) Diagram and the application blueprint have been attached with this conceptual analysis report.

3.5 Class, responsibilities, and collaborators (CRC) cards

CRC cards are like index cards that are used to represent the responsibilities of classes and the interaction between classes (figure 3). CRC cards are an informal approach to object oriented modeling. The cards are created through scenarios based on system requirements that model the behaviour of the system. The name CRC comes from class, responsibilities, and collaborators, which the creators found to be the essential dimensions of object oriented modeling.

In the context of this initiative, a “class” represents a collection of similar objects; a “responsibility” is something that a class knows or does; and a “collaborator” is another class that a class interacts with to fulfill its responsibilities.

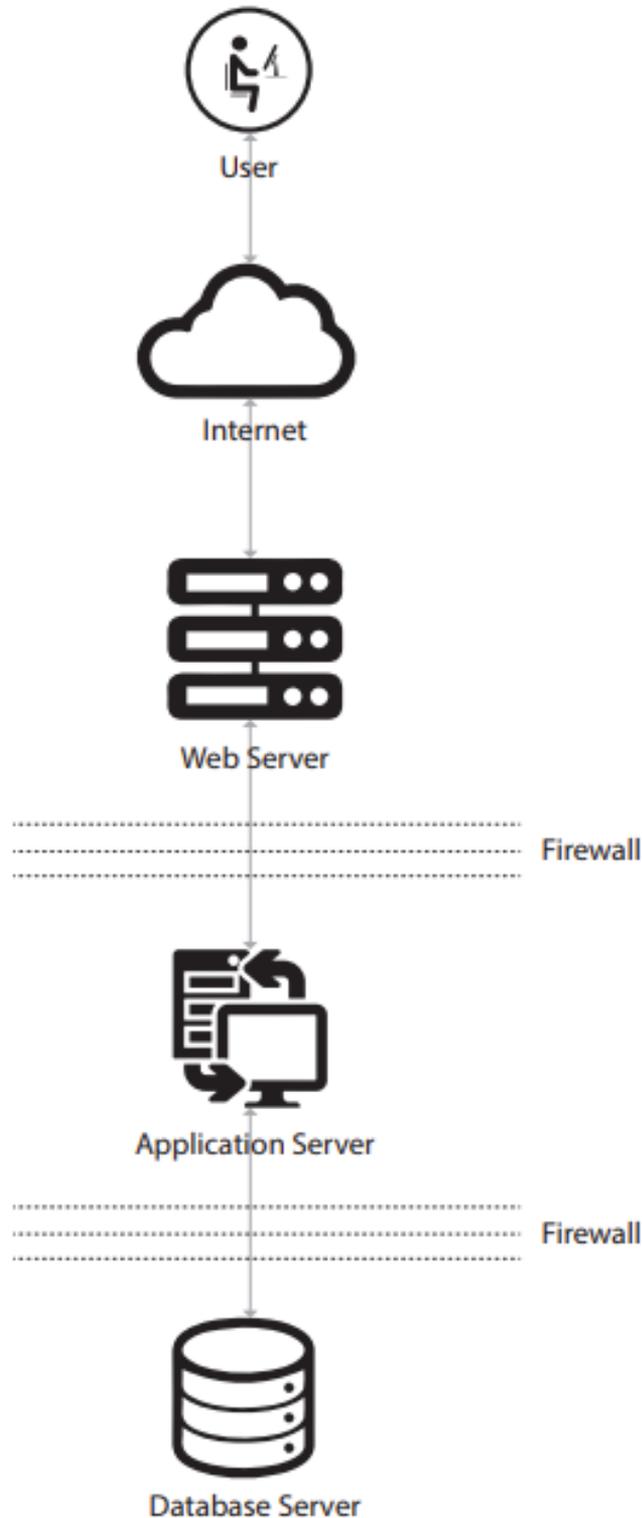
Figure 3. Sample CRC card layouts to serve as examples for application development

<p>Users</p> <p>Will complete Registration, Encrypt his/her password and information, Add, Edit, Get Services, Research skills, Recruiting Migrants or can be recruited</p> <p>User Role Organization Encryption Logs Locality Location Registration</p>	<p>Users Roles</p> <p>Different Types of jobs will be performed by different types of user roles according to the organization type</p> <p>Users Organizations</p>	<p>Organizations</p> <p>Organization means different types of Stakeholders excluding the general migrant labor, Research Section access, Organizational Approval</p> <p>Organization Type User Flow Users Encryption Privacy Registration</p>	<p>Marketplace</p> <p>Local And International Marketplace according to the skill demand.</p> <p>Location MarketPlace Skills MarketPlace Type</p>
<p>Encryption</p> <p>Password and Data encryption process and algorithms according to the needs.</p> <p>Users Organizations</p>	<p>Logs</p> <p>Here the users and organizations daily logs will be kept to trace their access, request and ensuring security issues for any type of investigation if needed.</p> <p>Users</p>	<p>Skill Categories</p> <p>Different Types of Skill categories.</p> <p>Skill Type MarketPlace Users</p>	<p>Location</p> <p>Geological mapping of different countries and cities.</p> <p>MarketPlace Skills</p>
<p>Approval</p> <p>Approving the organizational registration according to their level, access right and needs.</p> <p>Users</p>	<p>Marketplace Type</p> <p>Different Market places according to the geographical differentiation and Skill Types.</p> <p>MarketPlace</p>	<p>Registration</p> <p>Users and Organizational Registration process will be done here.</p> <p>Users Organizations User Flow Organization Type</p>	<p>Create User</p> <p>Organization Can create their own employee accounts according to their organizational access level.</p> <p>Organization</p>
<p>Organizations Own Details</p> <p>Different Registered organizations can upload their own details into the system and they can control those countries privacy according to their policies.</p> <p>Organizations</p>	<p>Recruiting Migrants</p> <p>Recruiting Potential/Returne Migrants for new marketplace (Internationally/Extern all) by the recruiting agencies</p> <p>Organizations</p>	<p>Migrants Types</p> <p>Migrants Types will be defined here from users/WHO's user role (migrant worker)</p> <p>Users</p>	<p>Employment Opportunities</p> <p>According to the marketplace demand the external/Internal Employment opportunities will be visualized here.</p> <p>MarketPlace Skill</p>
<p>Job Location</p> <p>Skill and location based job opportunity can be placed here.</p> <p>MarketPlace Employment Company Location</p>	<p>Recruiting Agencies</p> <p>Recruiting agencies can perform recruiting tasks here from the migrants lists.</p> <p>Organizations</p>	<p>Research Data</p> <p>Research oriented data generation and developed into the system though the research workers can perform their research oriented tasks.</p> <p>Organizations</p>	<p>Different Linked Modules</p> <p>Different existing data sources will be linked and the modules will be kept on database. The registered Users can go through the links.</p> <p>Users Organizations</p>
<p>Migrant Workers Service</p> <p>Migrant Workers service stated sections will be kept here. Through the Registered Migrants services can be provided something like that. Help from this application more faster than anything.</p> <p>Users Organizations</p>	<p>Reports</p> <p>Different types of reports can be generated from this application according to the access level and needs of registered organizations.</p> <p>Demographic Data/Information</p>	<p>Privacy</p> <p>Users/Organizations can apply privacy in their data according to their organizational policies.</p> <p>Organizations Users</p>	<p>Organizations Own Details</p> <p>Demographic view of Migrants/Returne Migrants for new marketplace (Internationally/Extern all) by the recruiting agencies</p> <p>Organizations' Own Details (Skill/MarketPlace/ Skills)</p>

3.6 Application roadmap for a simple IOA

An application roadmap diagrams the flow of requests and responses from the Internet to the servers through security firewalls. Figure 4 provides a representation of the roadmap for a simple IOA.

Figure 4. Application roadmap for a simple IOA



4. Ensuring user accessibility and satisfying the requirements of multiple user types

The following list is a directional one only. It shows the information that each of the users may wish to find when they log into their customized individual or organizational dashboards. Individual users like migrants, local workers, independent researchers, and government-approved sub-agents (i.e., all those who are without organizational affiliations) will have to log in using their national ID number and another authenticated previously ID or an authentication created on the portal IOA. Examples of these additional authentications may include the following:

- Potential or returnee migrants might use their registration serial number with the Bureau of Manpower, Employment and Training (BMET).
- Independent researchers might use their registration number with the Social Science Research Council of the Government.
- For local workers a serial number can be created on the portal through an authentication system that can be activated through the mail or at the local union and upazilla level information centres of the Government.
- For government approved sub-agents, bearing in mind that sub-agent registration is likely to be happen this year, they can use their registration number.

Each of the organizations to be granted access, however, will be issued a unique ID by the authority holding this database system, and members of those organizations will use that ID to access this portal.

4.1 Data variables to be available for each user type

Table 1 is a list of variables to be seen and used by each of the selected user groups listed in the report.

Table 1. Data variables to be seen and used by select application users

Potential migrants

- | | | |
|---|--------------------------------------|---|
| ■ employers' name in country of destination | ■ demand note | ■ areas of investment/business |
| ■ address | ■ offered salary/wage per hour/month | ■ any past incident in sending remittance from country of destination |
| ■ country | ■ required skill(s) | ■ food and culture of country of destination |
| ■ province/district | ■ working hours per day | |
| ■ contact no. | ■ contract period | |
| ■ email | ■ required language(s) | |

Employers in the country of destination

General administration

- Names of agents/employers in country of origin
- Addresses of agents and employers in country of origin
- Number of people entered under company visa

Personal information of migrant workers employed in country of destination

- name
- father's name
- mother's name
- spouse's name
- national ID
- birth country
- birth district
- nationality
- religion
- birth date
- sex
- marital status
- weight
- height
- no. of sons
- no. of daughters
- passport issue date
- passport no.
- current working status
- desired job
- permanent address
- mailing address

Personal information of migrant workers' nominees

- nominee name
- nominee address
- relation to worker
- phone/mobile

Health status of migrant workers

- disabilities
- any chronic disease
- vaccination
- health insurance
- workplace injury
- workplace death
- injury abroad
- death abroad

Language skills of migrant workers

- spoken
- written

Previous employment information of migrant workers

Employers in the country of origin

Personal information of potential migrant workers

- name
- father's name
- mother's name
- spouse's name
- national ID
- birth country
- birth district
- nationality
- religion
- birth date
- sex
- marital status
- weight
- height
- no. of sons
- no. of daughters
- passport issue date
- passport no.
- current working status
- desired job
- permanent address
- mailing address

Personal information of potential migrant workers' nominees

- nominee name
- nominee address
- relation to worker
- phone/mobile

Health status of potential migrant workers

- disabilities
- any chronic disease
- vaccination
- health insurance
- workplace injuries
- injury abroad

Language skills of potential migrant workers

- spoken
- written

Previous employment information of potential migrant workers

- previous employer name
- position held
- served from (work tenure)
- served until (work tenure)
- employer address
- employer phone/mobile
- contact person
- email
- sector
- salary/wage
- working hours per day
- responsibilities
- achievements

Training information of potential migrant workers

- training name
- institution
- duration
- description

Information on employers in the country of destination

- employers' name in country of destination
- address
- country
- province/district
- contact no.
- email demand note
- offered salary/wage per hour/month
- required skill(s)
- working hours per day
- contract period

Recruitment agencies

Information on employers in the country of destination

- employers' name in country of destination
- address
- country
- province/district
- contact no.
- email demand note
- offered salary/wage per hour/month
- required skill(s)
- working hours per day
- contract period

Personal information of potential migrant workers

- name
- father's name
- mother's name
- spouse's name
- national ID
- birth country
- birth district
- nationality
- religion
- birth date
- sex
- marital status
- weight
- height
- no. of sons
- no. of daughters
- passport issue date
- passport no.
- current working status
- desired job
- permanent address
- mailing address

Language skills of potential migrant workers

- spoken
- written

Previous employment information of potential migrant workers

- previous employer name
- position held
- served from (work tenure)
- served until (work tenure)
- employer address
- employer phone/mobile
- contact person
- email
- sector
- salary/wage
- working hours per day
- responsibilities
- achievements

Middlemen/subagents

Information on employers in the country of destination

- employers' name in country of destination
- address
- country
- province/district
- contact no.
- email demand note
- offered salary/wage per hour/month
- required skill(s)
- working hours per day
- contract period

Personal information of potential migrant workers

- name
- father's name
- mother's name
- spouse's name
- national ID
- birth country
- birth district
- nationality
- religion
- birth date
- sex
- marital status
- weight
- height
- no. of sons
- no. of daughters
- passport issue date
- passport no.
- current working status
- desired job
- permanent address
- mailing address

Language skills of potential migrant workers

- spoken
- written

Previous employment information of potential migrant workers

- previous employer name
- position held
- served from (work tenure)
- served until (work tenure)
- employer address
- employer phone/mobile
- contact person
- email
- sector
- salary/wage
- working hours per day
- responsibilities
- achievements

Government organizations

Personal information of migrant workers

- name
- father's name
- mother's name
- spouse's name
- national ID
- birth country
- birth district
- nationality
- religion
- birth date
- sex
- marital status
- weight
- height
- no. of sons
- no. of daughters
- passport issue date
- passport no.
- current working status
- desired job
- permanent address
- mailing address

Personal information of migrant workers' nominees

- nominee name
- nominee address
- relation to worker
- phone/mobile

Health status of migrant workers

- disabilities
- any chronic disease
- vaccination
- health insurance
- workplace injury
- workplace death
- injury abroad
- death abroad

Data concerning migrant flows

- no. of workers sent abroad
- no. of returnee migrants
- employers' information in country of destination
- employers' information in country of origin
- training information
- child labour data

Labour attachés

Personal information of migrant workers

- name
- father's name
- mother's name
- spouse's name
- national ID
- birth country
- birth district
- nationality
- religion
- birth date
- sex
- marital status
- weight
- height
- no. of sons
- no. of daughters
- passport issue date
- passport no.
- current working status
- desired job
- permanent address
- mailing address

Personal information of migrant workers' nominees

- nominee name
- nominee address
- relation to worker
- phone/mobile

Data concerning migrant flows

- no. of workers sent abroad
- no. of returnee migrants
- employers' information in country of destination
- employers' information in country of origin
- training information
- child labour data
- demand for labour in country of destination, by sector
- information on labour shortages in country of destination

DEMOs, TTCs, and DYDs

Personal information of migrant workers

- name
- father's name
- mother's name
- spouse's name
- national ID
- birth country
- birth district
- nationality
- religion
- birth date
- sex
- marital status
- weight
- height
- no. of sons
- no. of daughters
- passport issue date
- passport no.
- current working status
- desired job
- permanent address
- mailing address

Personal information of migrant workers' nominees

- nominee name
- nominee address
- relation to worker
- phone/mobile

Data concerning migrant flows

- no. of workers sent abroad
- no. of returnee migrants
- employers' information in country of destination
- employers' information in country of origin
- training information
- demand for labour in country of destination, by sector
- required skills in country of destination
- no. of trainees sent abroad

Research organizations and independent researchers

Data concerning migrant flows

- no. of workers sent abroad
- no. of returnee migrants
- countries of destination
- education levels of migrant workers
- employment figures by sector
- health data
- training information
- child labour data
- remittance figures
- investment/business creation data

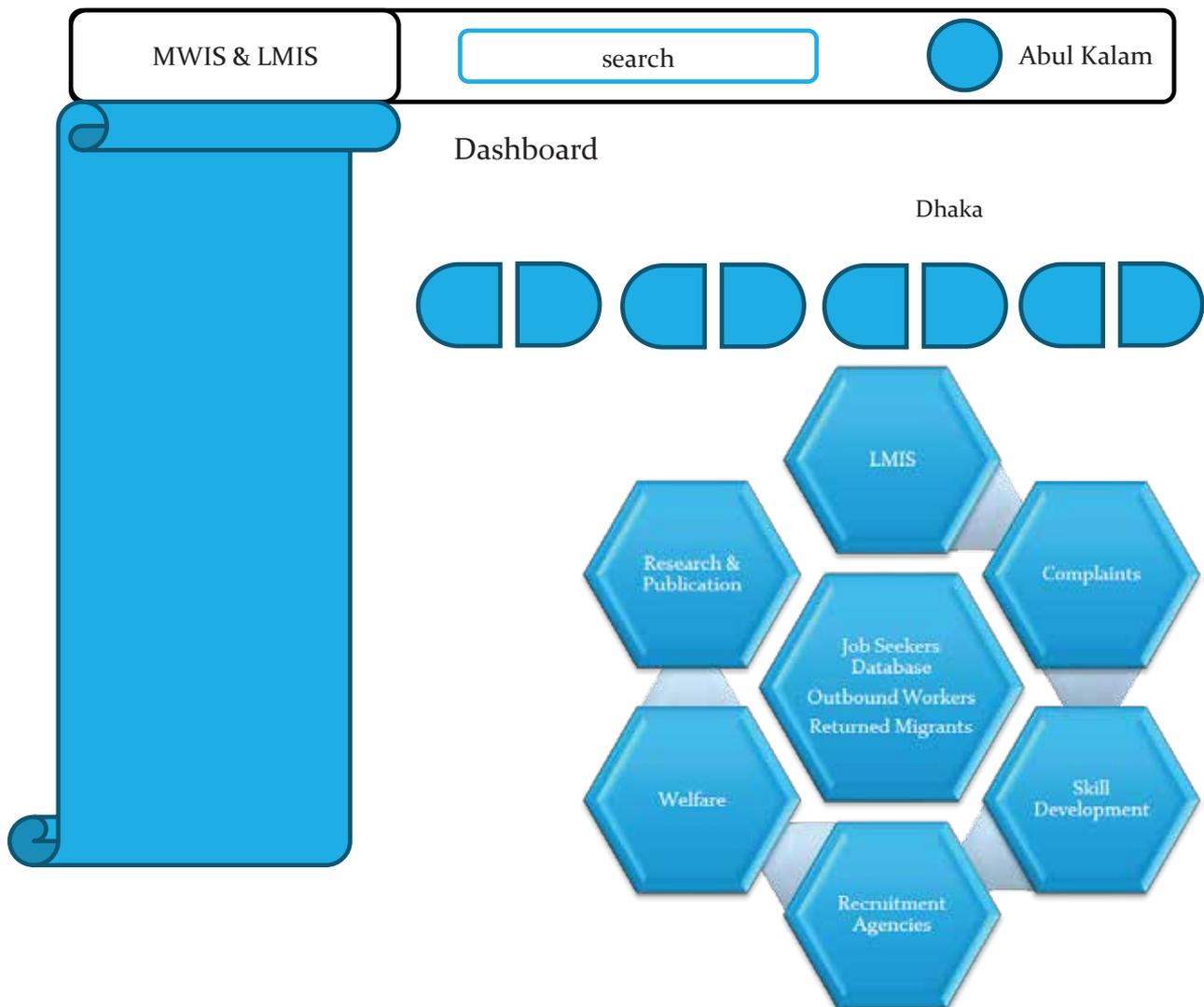
Source: Compiled by the authors

4.2 Visualization of the application dashboard

An application roadmap diagrams the flow of requests and responses from the Internet to the servers through security firewalls. Figure 4 provides a representation of the roadmap for a simple IOA.

Figure 5 below provides a quick view of what the homepage of the application portal might look like.

Figure 5. Quick visualization of a possible dashboard¹



¹ The hexagonal representation in the visualization was developed by Ms. Rahnuma S. Khan, National Programme Officer, ILO.

5. Conclusion

Ahamed, S.S.; Karim, M.R. no date. “Manpower export in Bangladesh: Problems and prospects”. This software is being proposed with focuses on integration of existing data, locating and including returnee data, new data generation, sharing of data, and adequate storage of data. While it is understood that macro data for the last ten to 20 years is worth keeping for the analytics purposes of researchers and policy-makers, the changing nature of micro data implies that the focus can be more on preserving authentic data in the coming future from the point of system building, software launching, and the eventual mechanism established to populate the fields with data. This will better serve the technological side of the project and also consumer communities of these database systems, namely the overseas short-term contract labour migrants and workers in the domestic labour market. Possibly in future an integrated database may also hold data on non-resident Bangladeshis or the diaspora.

This software design can have other design routes and options as well. This particular design path was chosen to make it a modular ensemble of several different and separate database systems, and to enable gradual sharing/access and population of data in the respective systems under different government bodies. However, for better access, data merging without flagging and conflict, and better comparability in the long run, a repository should be maintained to serve as a mirror server under the national data centre. The design and technology solution has been proposed to enable the current use of technology to be synched easily and without technological barriers, and to avoid any future major rework.

This software development warrants involvement of authorities and/or projects like the Bangladesh Bureau of Statistics, the Civil Registration and Vital Statistics project, the BMET, Access to Information (A2i), and other migration expert think tanks that can validate the final development design and perhaps share responsibility to continuously improve efforts to run and sustain this software and database system in the long run.

Managing Migrant Worker Information in Bangladesh: Conceptual Software Architecture & Design

This particular report *Conceptual software architecture and design* recommends for an integrated Migrant Workers Information System and Labour Market Information System in Bangladesh proposes design recommendations for an integrated database information system on migrant workers' information (MWMIS) and a labour market information system (LMIS), identifying sources of data and software requirements.