Research Monograph 49

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An Evaluation of Core Banking Software (CBS) in Banks of Bangladesh

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Foreword

As part of the ongoing dissemination of BIBM research outputs, the present research monograph contains the findings of the research project: "An Evaluation of Core Banking Software in Banks of Bangladesh." In Bangladesh, use of CBS is growing very fast. Many unbanked people are coming under the financial umbrella by using the Alternate Delivery Channels (ADCs) like ATM, POS, Internet, Apps, mobile banking etc. which has been possible due to the use of CBSs. Using the CBS systems, banks are providing real-time online banking services to its customers through all the branches across the country. It has also the capability to provide centralized MIS and ad hoc reports. CBS has enhanced information processing capacity enormously and efficiently leading the higher productivity of the bankers. In today's competitive business environment, a centralized robust CBS that can accommodate all the electronic delivery channels is a must for survival in the race of competition. To evaluate the CBSs that are being used in the banks of Bangladesh, an attempt is made to analyze the current status of CBSs in use, to see the impact of different types of CBSs on banking business in Bangladesh and to identify the problems and challenges in this respect and give some policy recommendations.

It gives me immense pleasure, on behalf of BIBM, to offer this important resource of academic inputs to the practitioners of the banks and financial institutions, regulatory agencies as well as to the academics and common readers. I hope, this monograph will be a valuable resource for professionals especially for the banking community to focus on this challenging area for better implementation, upgradation and maintenance of the Core Banking Software.

We do encourage feedback from our esteemed readers on this issue which certainly would help us to improve our research activities in the years to ahead.

Md. Akhtaruzzaman, *Ph.D.*
Director General, BIBM

Acknowledgement

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We are also very grateful to all of our faculty colleagues for their comments and positive suggestions to carry out our research. We are also grateful to the bankers who took the pain to complete the research questionnaire.

Our honest indebtedness goes to research assistants, who have facilitated us to get very much useful information from different stakeholders. Our sincere appreciation goes to Ms. Papon Tabassum, Research Officer, BIBM and other related staffs of BIBM for their support.

Finally, we would like to thank all of those who, directly and indirectly, extended their cooperation in our research work.

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An Evaluation of Core Banking Software (CBS) in Banks of Bangladesh

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Abbreviations

ADCs	Alternative Delivery Channels
AMC	Annual Maintenance Contract
API	Application Programming Interface
ATM	Automated Teller Machine
BACH	Bangladesh Automated Clearing House
BB	Bangladesh Bank
BEFTN	Bangladesh Electronic Funds Transfer Network
BIBM	Bangladesh Institute of Bank Management
BPR	Business Process Reengineering
BSTI	Bangladesh Standards and Testing Institution
CBS	Core Banking System
CIA	Confidentiality, Integrity and Availability
CIO	Chief Information Officer
CTO	Chief Technology Officer
CEOs	Chief Executive Officer
CISO	Chief Information Security Officer
COO	Chief Operating Officer
CRM	Cash Recycler Machine
DF	Degrees of Freedom
DB	Database
eBBS	Electronic Basic Banking System
eIBS	Electronic and Integrated Banking System
EOD	End of Day
EOM	End of Month
EOQ	End of Quarter
EOY	End of Year
ERP	Enterprise Resource Planning
FCB	Foreign Commercial Bank
FinTech	Financial Technology
HOIT	Head of IT
HW	Hardware
IBBS	Integrated Branch Banking System
IBM	International Business Machines Corporation
ICBS	International Comprehensive Banking System

ICT	Information and Communication Technology
MFS	Mobile Financial Service
MIS	Management Information Systems
OS	Operating System
PCB	Private Commercial Bank
PIBS	Pubali Integrated Banking System
POST	Pont of Sale Terminal
PPP	Public Private Partnership
RFP	Request for Proposal
ROI	Return on Investment
RTGS	Real-Time Gross Settlement
SB	Specialized Bank
SCB	State-owned Commercial Bank
SDLC	Software Development Life Cycle
SLA	Service Level Agreement
SMS	Short Message Service
SOCB	State-owned Commercial Bank
SOA	Service Oriented Architecture
SPSS	Statistical Package for Social Sciences
SWIFT	Society for Worldwide Interbank Financial Telecommunication
T24	Temenos 24
TCO	Total Cost of Ownership
UPS	Uninterruptible Power Supply

Executive Summary

The nature and magnitude of business along with the degree of competition in the banking business has increased manifold in recent years due to the globalization of ICT based business as well as the development of online products and services on the basis of 24 × 365 hours. Use of ICT in the banking sector increased tremendously over the years to access, process, store and distribution of information electronically. Banking sector of Bangladesh has also undertaken remarkable initiatives to accept global technological improvement and to offer ICT based financial services.

Using the CBS Systems, banks are providing real-time online banking services to its customers through all the branches across the country. The software have the capability to meet all the services being provided through various electronic delivery channels like ATM, POST, Internet, Mobile Phone, etc. It has also the capability to provide centralized MIS and ad hoc reports. Business Process Reengineering (BPR) that has been adopted by a few banks in our country has enhanced information processing capacity enormously and efficiently leading the higher productivity of the bankers. Moreover, it is also helping to ensure seamless flow of information in a secured manner at all levels of the management. In today's highly volatile and competitive business environment, a centralized robust CBS that can accommodate all the electronic delivery channels is a must for survival in the race of competition.

The central engine that runs the core operations of the banking and financial institution is the Core Banking Software (CBS). The operational efficiency of a bank largely depends on the CBS. Moreover, it determines what a bank can offer in the future. In Bangladesh, ICT embracement has got momentum in the last decade. Some first mover banks in Bangladesh are in the process of CBS upgradation, and some other banks are trying to implement CBS to improve competitiveness, operational efficiency, and regulatory compliance. However, CBS selection, implementation and operation has challenges; improper attention to these challenges may result in poor CBS performance.

The study used both primary and secondary data. Primary data have mainly been collected from all banks of Bangladesh. We have also collected data from 450 employees of different branches from all over the country to see the overall satisfaction of branch employees regarding the performance of CBSs. Data on various indicators relating to the current status, problems and prospects of CBS is collected from different sources such as Bangladesh Bank's reports, websites of different banks and journals. Information is also collected by interviewing the head of concerned divisions of different banks. Various policies and circulars of Bangladesh Bank related to CBS are also consulted for preparing this paper.

We have consulted with a large number of central bankers, CEOs and professionals including HOIT, CTO, CIO, CISO, and COO of a large number of banks.

It is seen that that our banking industry is currently dominated by foreign CBS by a large margin. A total of 27 banks in our country are using foreign CBS. Popularity of software developed by our local expert is fading gradually. Before 2005, 45 banks were using local software, whereas in 2017 only 19 banks use it. The same is true for in-house software also. Number of banks using in-house software is declining day by day. But the scenario is somewhat different for joint venture software. During the period 2005 to 2017, the number of banks using joint venture software is increased from 2 to 6.

In this study it is found that a high-quality CBS has positive impact on reduction of cost–to–income ratio, operational and stationary cost. Also, it helps to maximize profit. The overall scenario of CBS has changed considerably in Bangladesh compared to 2000. According to our survey, banks want to buy core banking system that include technology, regulation, security, compliance and control. No single software vendor dominates the Bangladeshi market. It is remarkable that foreign software vendors hold a comparatively resilient position in Bangladeshi market; Temenos T24, Flexcube, Finacle and Misys are good examples. Among local CBSs, Bank Ultimus holds the topmost position in the market.

About 10% banks pointed out that they intended for upgradation or substitutes of their banking systems to start within a year. The nature of the planned changes varies: for local CBS users mainly want to change the whole systems, whereas for foreign CBS users changes are mostly limited to enhancements of existing systems. If this trend prevails, in the coming years local CBS might be replaced by Foreign CBS, harming the local software market and national economy. However, we have found that many banks want to change their local and legacy systems with foreign systems. According to our survey, a large majority of banks (5 banks) showed their interest to buy foreign software. The question of 'why banks have a strategy towards foreign CBS when there is a number of local CBSs operating in the market for a relatively long time and their market share is also good' revealed that though a little bit cost-effective bank management have found local packages are less well-designed and flexible to meet up bank's particular business demands, and therefore as less suitable.

From our study we have found that, banks increasingly purchase core banking systems and banking solutions from foreign software vendors. Still in the market there is a crying need for a good CBS. Though foreign CBS dominating the market highest satisfaction is found for In-House CBS followed by Joint Venture, Foreign and Local CBS.

It is found that, 20% of IT projects apparently fail to attain corporate objectives and waste $500 billion worldwide. Sometimes it may happen that the bank's strategic direction is

imprecise or unclear. In Bangladesh, 18% banks failed to select right CBS due to the lack of knowledge and vision and wrong suggestions by theoretical consultants. Bank management should keep in mind that, not all core systems are similar. Each system will have its own distinctive features and functionality, so they have to concentrate on what's vital to their bank.

Banks' IT systems strategy should decide whether to make or buy a technology solution. According to our survey, in Bangladesh about 10% (both local and foreign) of the banks presently use in-house developed banking platforms. According to our survey, two banks informed that they will carry on the developments of new applications on their in-house build platforms. This states that how satisfied these two banks are with the process of persistent improvement on in-house build platform. But no banks reported to start a new application development for their banks. Rather, 85% banks suggested to develop a unique CBS under PPP project where experts (local and foreign), local vendors, banks, central bank and government can take part.

The market of CBS in Bangladesh is characterized by the existence of several vendors, all contending for the attention of banks. There are more than 10 vendors with an installed base in the market. We found that, private banks particularly prefer foreign software vendors for some business actions because of their offerings that include functionality and flexibility. Foreign CBS does not match completely with our local banking practices. Always a lot of changes required. Local software giants may come forward to develop an international standard CBS which will be based on Bangladesh's practices including international standards.

According to our findings, one in four surveyed banks mentions cost effectiveness as the key driver. In banks business observes the costs of IT as high. The systems often function on pricey hardware and making modifications in this multifaceted atmosphere is also a costly journey. Though the service quality, training, and integration with current technology are vital and potentially more important but banks have to consider price also. Cost structures not only include software license and implementation but also investments in hardware, networking, third party software, Database and Operating Systems are necessary. Also added investment may be needed for training and data cleansing and migration. All these cost components make up the Total Cost of Ownership (TCO).

Struggles to accomplish a string of new regulatory requirements consume a large portion of banks' IT budgets and resources. From our experience and regular interactions with many of the banks in our survey we have found that new regulations put a real burden on IT resources of banks. On the regulatory agenda we come to know that banks will have to face a wave of requirements coming from the Central Bank and other national

regulators/agencies. Another challenge the banks are facing is the readiness and quality of data according to the regulators' requirement, and the level of detail at which banks have to deliver data to them. Success factors of banks crucially depend on data quality and reporting efficacy. Vendors of CBS must fine-tune their products to expedite this change.

In Bangladesh, use of CBS is growing very fast. Many unbanked people are coming under the financial umbrella by using the Alternate Delivery Channels (ADCs) which has been possible due to the use of CBSs. But no study has been conducted so far to evaluate the CBSs being used in the banking sector of Bangladesh. In this regard, this is the right time to evaluate the CBSs and find the major challenges in this regard. In future the findings may help the banking executives and policy maker to focus on this challenging area for better implementation, upgradation and maintenance of the core banking software.

An Evaluation of Core Banking Software (CSB) in Banks of Bangladesh

1.1 Introduction

The nature and magnitude of business along with the degree of competition in the banking business has increased manifold in recent years due to the globalization of ICT based business as well as the development of online products and services on the basis of 24 × 365 hours. Use of ICT in the banking sector increased tremendously over the years to access, process, store and distribution of information electronically. In the context of developed global economies, use of ICT and ICT based services are part of bank's day to day operation and one of the main determinants of efficiency. Developing countries are also not far behind. Banking sector of Bangladesh has also undertaken remarkable initiatives to accept global technological improvement and to offer ICT based financial services (Alam *et al.,* 2015).

Using the CBS systems, banks are providing real-time online banking services to its customers through all the branches across the country. The software have the capability to meet all the services being provided through various electronic delivery channels like Automated Teller Machine (ATM), Point of Sale Terminal (POST), Internet, Mobile Phone, etc. It has also the capability to provide centralized MIS and ad hoc reports. Business Process Reengineering (BPR) that has been adopted by a few banks in our country has enhanced information processing capacity enormously and efficiently leading the higher productivity of the bankers. Moreover, it is also helping to ensure seamless flow of information in a secured manner at all levels of the management. In today's highly volatile and competitive business environment, a centralized robust CBS that can accommodate all the electronic delivery channels is a must for survival in the race of competition.

Banking and financial sectors all around the world have embraced ICT to facilitate their customers with efficient services and innovative products through multichannel. The central engine that runs the core operations of the banking and financial institution is the Core Banking Software (CBS). The operational efficiency of a bank largely depends on the CBS. Moreover, it determines what a bank can offer in the future. In Bangladesh, ICT embracement has got momentum in the last decade. Some first mover banks in Bangladesh are in the process of CBS upgradation, and some other banks are trying to implement CBS to improve competitiveness, operational efficiency, and regulatory compliance. However, CBS selection, implementation and operation has challenges; improper attention to these challenges may result in poor CBS performance (Rahman M. A. and Xu Ki, 2016).

It is seen that that our banking industry is currently dominated by Foreign CBS by a large margin. A total of 27 banks in our country are using Foreign CBS. Popularity of software

developed by our local expert is fading gradually. Before 2005, 45 banks used local software, whereas in 2017 only 19 banks use it. The same is true for In-House software also. Number of banks using In-House software is declining day by day. But the scenario is somewhat different for Joint Venture software. During the period 2005 to 2017, the number of banks using Joint Venture software is increased from 2 to 6.

In Bangladesh, use of CBS is growing very fast. Many unbanked people are coming under the financial umbrella by using the Alternate Delivery Channels (ADCs) which has been possible due to the use of CBSs. No study has been conducted so far to evaluate the CBSs being used in the banking sector of Bangladesh. In this regard, this is the right time to evaluate the CBSs and find the major challenges in this regard. The findings may help the policymakers of banks to focus on this critical area for better implementation, upgradation and maintenance of the Core Banking Software (CBS) in upcoming days.

1.2 Objectives

The paper aims to evaluate the CBSs that are being used in the banks of Bangladesh. In this broader framework, an attempt is made to achieve the following specific objectives: **one**, to analyze the current status of CBSs being used by the banking sector; **two**, to see the impact of different types of CBSs on banking business in Bangladesh and **three**, to identify the problems and challenges in this respect and give some policy recommendations.

1.3 Methodology

This study is mainly based on both primary and secondary data. Primary data has been collected from all banks of Bangladesh. We have also collected data from 450 employees of different branches from all over the country to see the overall satisfaction of branch employees regarding the performance of CBSs. A good number of literature is reviewed to sharpen the thought on CBS in the context of Bangladeshi banks. Data on various indicators relating to the current status, problems and prospects of CBS is collected from different sources such as Bangladesh Bank's reports, websites of different banks and journals. Information is also collected by interviewing the head of concerned divisions of different banks. Various policies and circulars of Bangladesh Bank related to CBS are also consulted for preparing this paper.

To develop the evaluation criteria of the CBSs, we have followed some international standards that are being used by academia and organizations like IBM, Oracle, Gartner, Infosys, etc. We have consulted with a large number of central bankers, CEOs and professionals including HOIT, CTO, CIO, CISO, and COO of a large number of banks. We have followed the "Guidelines on Core Banking Solution (CBS) Features and

Controls" of BB before designing the questionnaire. A pilot survey was also done to check the fitness of the questionnaire.

The questionnaire of the survey has been designed using 44 statements relating to the objective of the research. A ten point 'Likert' scale ranging from 'Strongly Disagree' to 'Strongly Agree' was used as the scale of measurement for each question in the questionnaire. Data has been analyzed by using relevant statistical techniques like central tendency and non-parametric tests. The data has been analyzed by using MS-Excel and SPSS software.

1.4 Organization of the Research Report

The paper is organized into three sections. After an introductory section (Section 1) with objectives, methodological issues and literature review. Section 2 presents the major part of the study i.e., analysis and findings and identifies the problems and challenges. Finally, Section 3 puts forward concluding remarks and some recommendations.

1.5 Literature Review

This part reviews relevant literature and findings of previous researches that addressed the Core Banking Software (CBS) operations in the globe. The studies conducted in the context of developed and developing countries, are presented herein to highlight the existing knowledge.

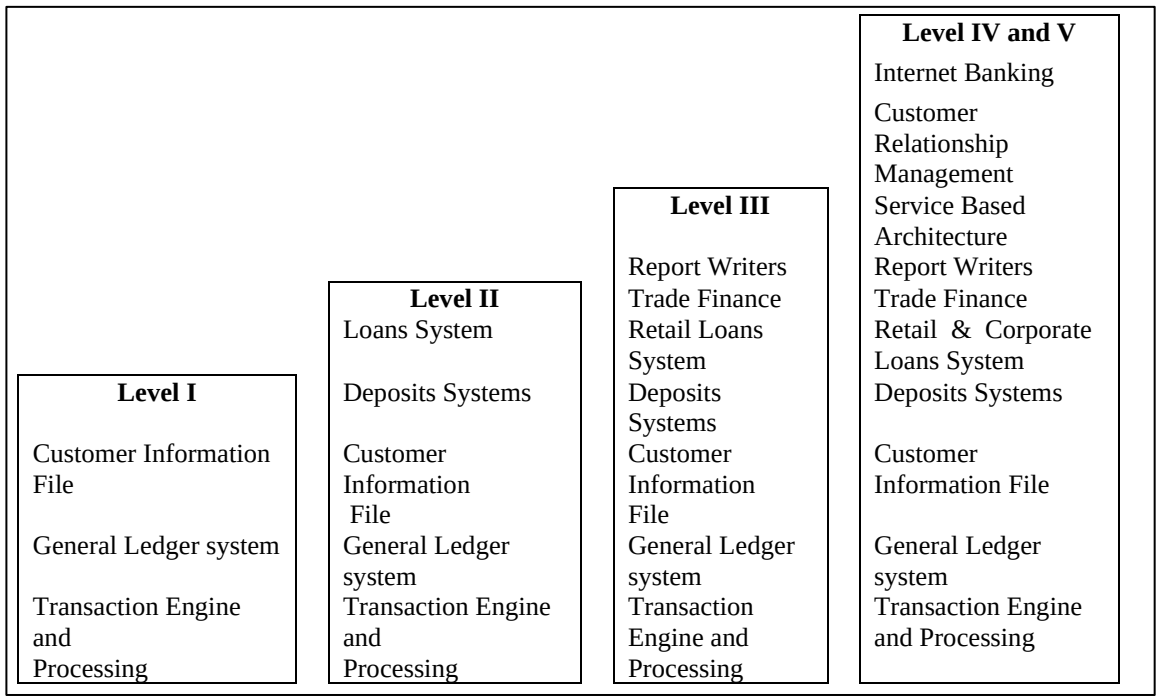
Banks traditionally are the intermediaries, which collect a deposit from various entities and provide to those who need it for profit. But, new generation banks with the help of technology are not only collecting and disbursing money to different entities but also providing numerous services to various entities which facilitate their business operations (Rahman M. A. and Xu Ki, 2016).

Boot (2009) mentioned that, "For the new generation banks the technological gene is called Core Banking Systems (CBS). CBS of a bank, an engine of the e-Banking, determines what a bank is going to offer and how efficiently they can meet it. CBS developers are constantly adding new features to make banks enable and gain competitive advantages in the market. Like ERP, CBS has eliminated the need for different software for various functions."

According to Kreća & Barać, (2015), "The CBS evolved in the 1970s and has gone through different significant changes over time and the recent CBS has the capacity of real-time processing and multi-channel integration." Chairlone (2009) mentioned that "The fundamental function of CBS is to perform deposit and lending in a bank." Abbate (1999) defined a CBS as "A back-end system that processes daily banking transactions, and posts updates to accounts and other financial records." Hariharan & Reeshma (2015) defined CBS as "The software used to sustain banks, most common dealings which include

providing service loans, opening new accounts, processing cash deposit, withdrawals, calculating interests, client relationship management actions and maintenance of records for the bank's transactions." CBS helps to get a comprehensive view and real-time information of their customers (Abbate, 1999). It has become imperative for banks to identify their profitable customers and to make sure they are adequately taken care of with different services and offerings. According to Zineldin (2009) there are four core levels of CBS. Each of the levels of CBS includes additional functionality that was absent in the previous levels (Figure-1).

Figure 1: Levels of CBS



Adamson *et al.* (2003) opined that, "A CBS implementation project is, like all other large IT investment projects, costly, time-consuming and complex. Due to that, only 25% of the CBS projects were successfully implemented and rest 50% experienced cost and schedule overrun and other failed. There are lots of challenges in implementing CBS."

Zineldin (2009) and Blanchard (2008) opined that, "Like all other systems, CBS needs to be constantly upgraded for greater efficiency, responsiveness, getting platform independent, adding new module to meet new demand, and for fewer system crashes." They also think that, "There are several key drivers for CBS upgradation: upgradation of vendor software and discontinuation of maintenance service for existing software; obsolete technologies that can't meet new requirements; incorporating changes in the business model and new innovative services; and better risk management and compliance.

Depending on the size of the institution, such an initiative could cost several hundred million Taka and could take three to five years to complete."

Turnbull (2007) identified that, "A core banking solution, once implemented, should be robust, scalable and future-proof and serve the business interest for at least ten years. Banks need to focus on the main factors, which make the core banking transformation a successful experience."

According to Seybold & Foss (2001) and Chairlone (2009), "Technological advances enable close and long-term relations with customers. Banks aim to reduce costs, enhance efficiencies and guarantee customer retention with use of technology. In banking, the relationships between institutions and their customers are critical and technology such as ATM, POST, SMS Banking, Online Banking and Mobile Banking is the mediator in that interaction."

Zineldin, (2009) and Haller & Heuberger (2009) identified that, "The key challenges in core banking transformation evolve out of its principal parties involved i.e. the bank and bank management (in our study we used the bank characteristics and management in a single term management), vendors and the CBS itself. The bank management, in the first phase, needs to assess the requirements of the banks based on the product and services they offer or like to offer in future, its manpower, current and future infrastructure. Once the assessment is done, in the second phase, they have to develop a consensus on the module and capabilities they will be looking in a CBS. Some may want all encompassing CBS, and some may want just a few functions. Then the management will go for looking for the available CBS in the market to match their requirements. The challenges they face are that often vanilla software does not match their organizational requirements and culture fully, CBS is not flexible and scalable to cope with new changes, lack of skill set to run the system properly and the user interface is boring and unfriendly. In the third phase comes vendor. CBS implementation is the joint effort of bank management and vendor. Vendor related challenges include: whether the supplier has capabilities and credentials to install, migrate data, support CBS; how much vendor is charging for installation and maintenance, etc."

2.0 Analysis and Findings

2.1 Current ICT Infrastructure of Bangladeshi Banks

Following the international trend Bangladeshi banks are now using E-Banking software. The way of doing traditional banking has become outdated. By using CBSs, banks of Bangladesh are shifting from conventional manual systems to modern e-Banking systems.

Table 1: ICT Infrastructure of Bangladeshi Banks

Level of ICT Infrastructure	2010	2017
Category-I*	59%	88%
Category-II**	24%	5%
Mixed (Category-I and Category-II)	17%	7%

Source: BIBM Research

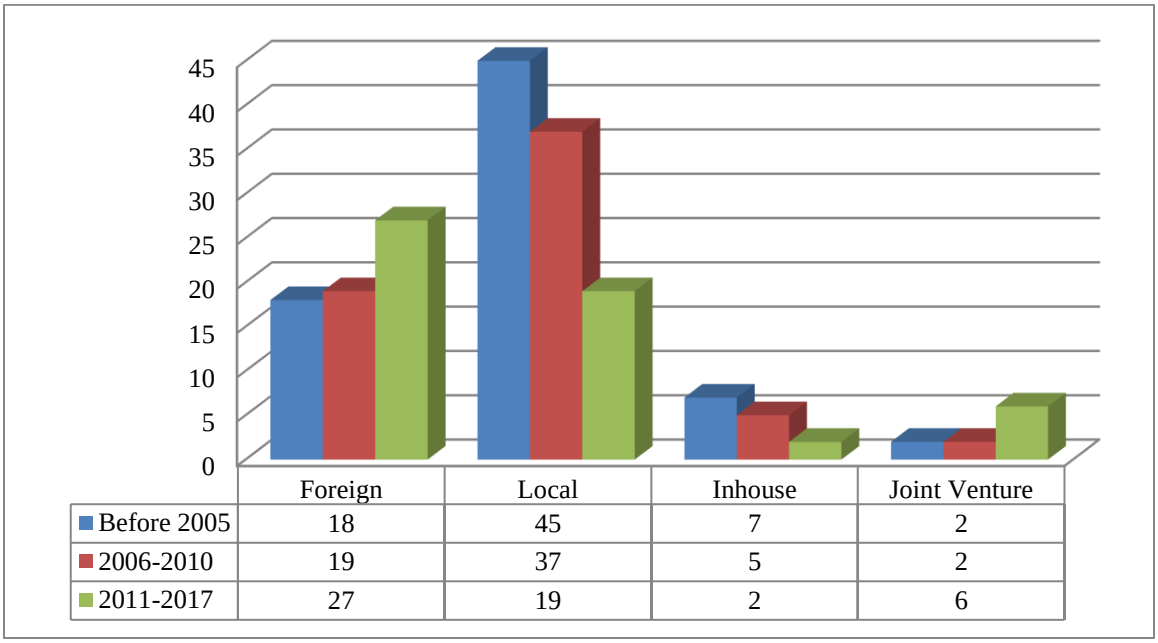
From Table-1, we have a clear idea about the advancement of information technology in our banking sector. In 2010, only 59% banks acquainted with real time e-banking, which resembles Category-I architecture, whereas in 2017, around 88% banks fall in Category-I (Centralized ICT Operation for managing core business application solution through Data Center with backup assets for continuation of critical services including Disaster Recovery Site /Secondary Data Center to which all other offices, branches and booths are connected through WAN with 24x7 hours attended operation, Bangladesh Bank). Percentage of banks that belong to Category-II (Decentralized ICT operation for managing distributed business application solution hosted at DC or operational offices/branches with backup assets for continuation of critical services connected through WAN or having standalone operations.) was 24% in 2010, which reduces to mere 5% in 2017. Banks which are in mixed category, partially achieved Category-II architecture and progressively shifting their branches to meet the Category-I architecture from Category-II architecture. During the period 2010 to 2017, percentage of mixed category banks is reduced from 17% to 7%.

2.2 Status and Market Share of CBSs in Bangladesh

From the graph (Figure-2), it is clearly understood that our banking industry is currently dominated by Foreign CBS by a large margin. Presently 27 banks in our country are using Foreign CBS. Popularity of Software developed by our local expert is fading gradually. Before 2005, 45 banks used local software, whereas in 2017 only 19 banks use it. The same is true for In-House software also. Number of banks using In-House software is declining day by day. But the scenario is somewhat different for Joint Venture software. During the period 2005 to 2017, the number of banks using Joint Venture software is increased from 2 to 6.

Number of bank branch run by different types of CBSs is shown in the Figure-3. It is evident that currently more than 3000 branches in our country are maneuvered by Foreign CBS. Next position is captured by Local CBS. From the table, it is also seen that number of branches run by Joint Venture CBS is more than In-House CBS.

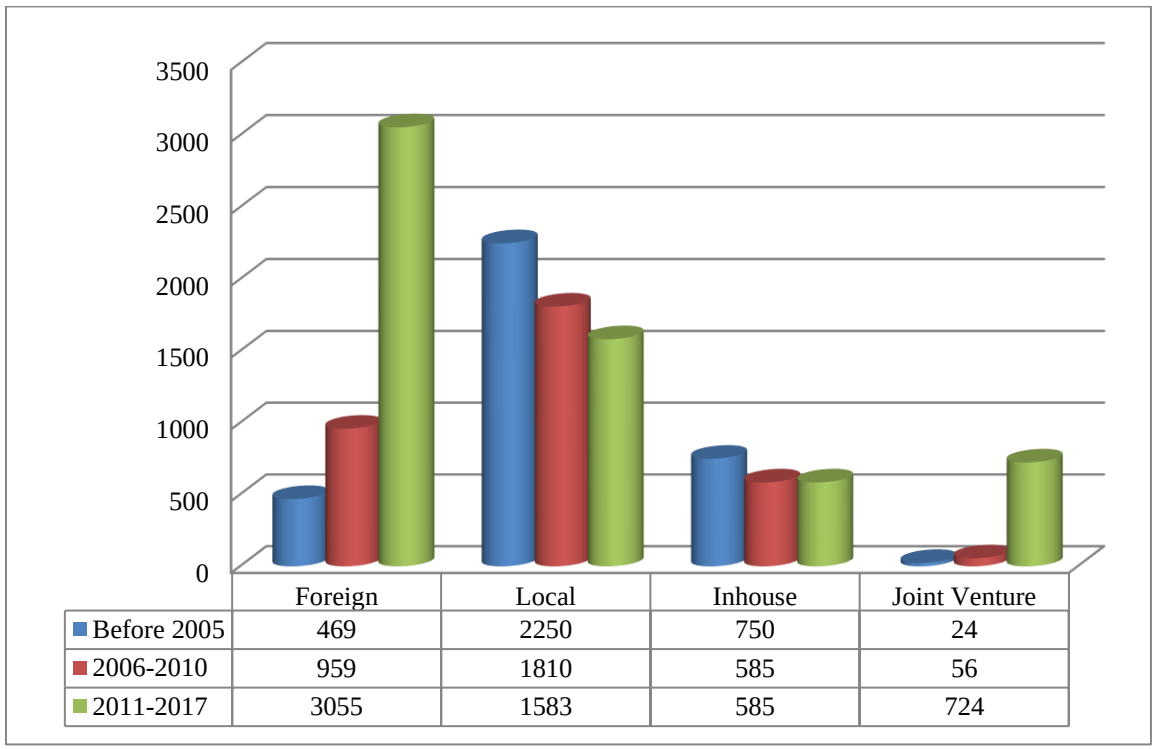
Figure 2: Market Share of CBSs with Respect to Number of Banks



	Foreign	Local	Inhouse	Joint Venture
Before 2005	18	45	7	2
2006-2010	19	37	5	2
2011-2017	27	19	2	6

Source: BIBM Research

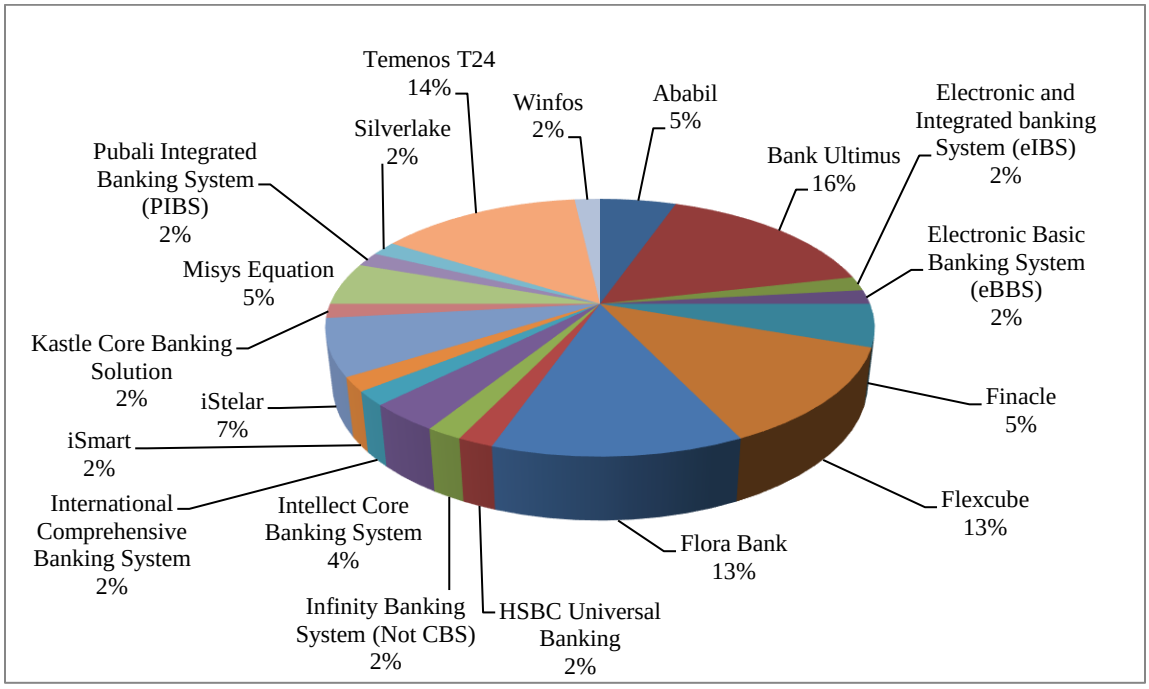
Figure 3: Market Share of CBSs with Respect to Number of Branches



	Foreign	Local	Inhouse	Joint Venture
Before 2005	469	2250	750	24
2006-2010	959	1810	585	56
2011-2017	3055	1583	585	724

Source: BIBM Research

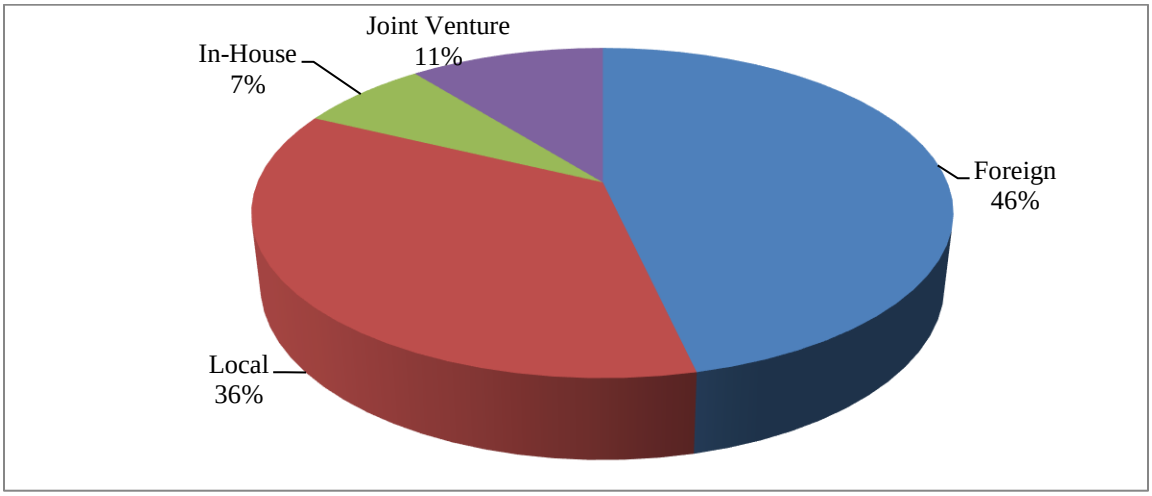
Figure 4a: Distribution of CBS (Percentage of Banks Using)



Source: BIBM Research

From Figure-4a (considering number of banks), we found that the most popular core banking software in our banking industry is Bank Ultimus. About 16% banks in our country are using this software. Second largest portion (14%) is led by Temenos T24. After this, market share is equally dominated by Flexcube and Flora Bank by 13%. Other popular software are I-Stelar, Misys and Ababil. Share of the market considering CBS types is shown in Figure-4b.

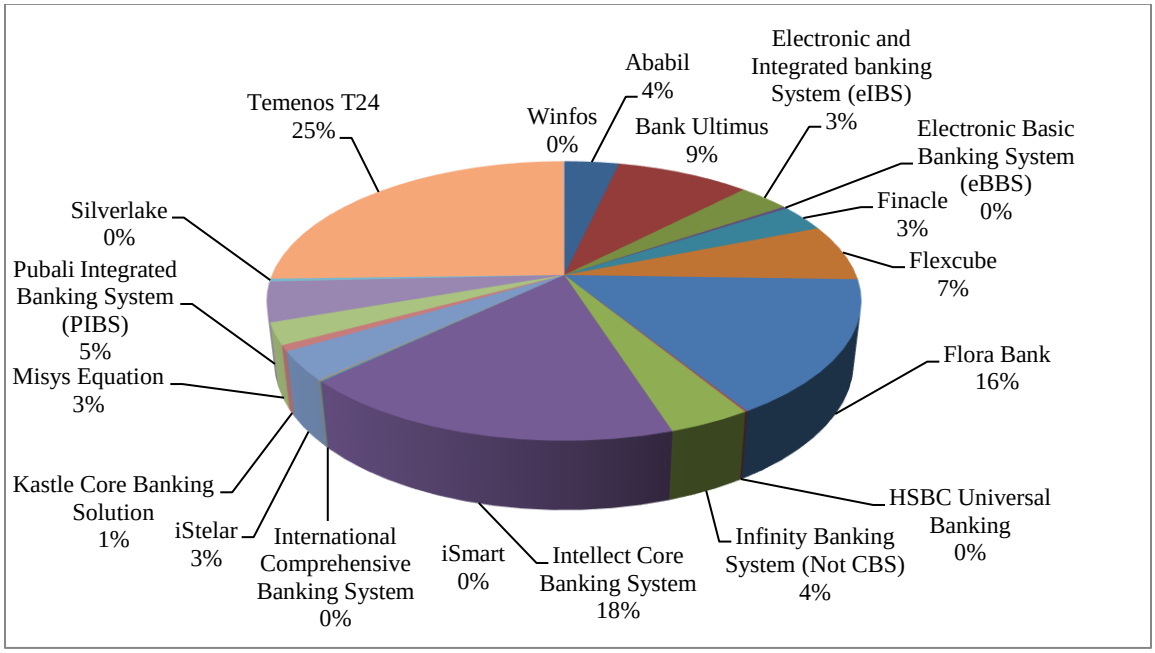
Figure 4b: Percentage of Banks using Different Types of CBSs



Source: BIBM Research

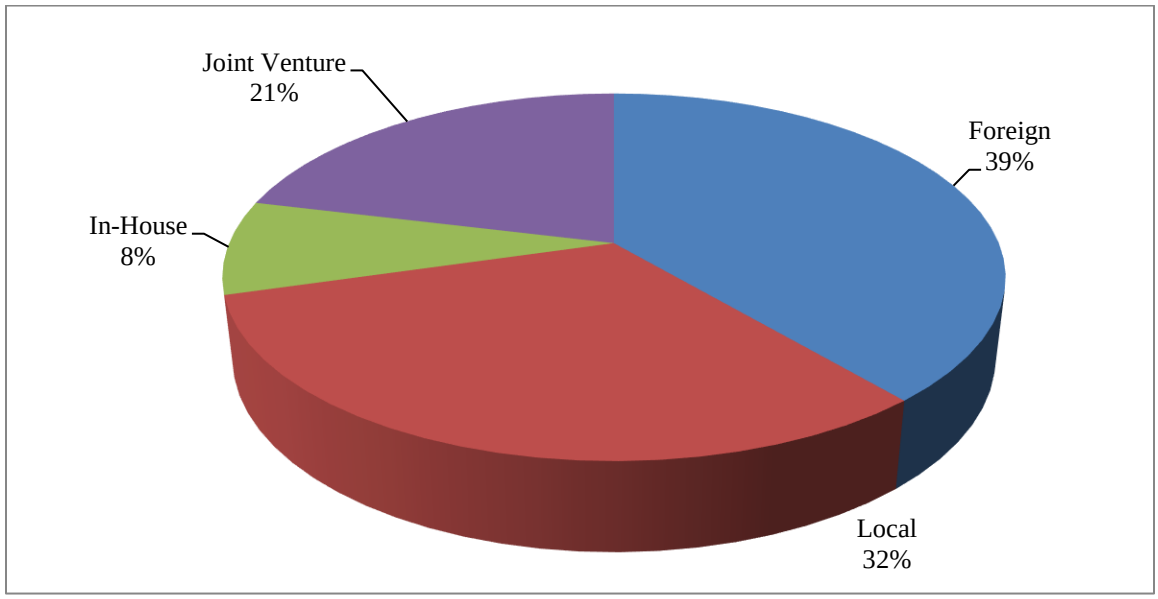
From Figure-4c (considering number of branches), we found that the most popular core banking software in our banking industry is Temenos T24. About 25% banks in our country are using this software. After this, market share is dominated by Intellect CBS by 18%. Other popular software are Flora, Ultimus, Flexcube, etc. Share of the market considering CBS types is shown in Figure-4d.

Figure 4c: Distribution of CBS (Percentage of Branches Using)



Source: BIBM Research

Figure 4d: Percentage of Branches using Different Types of CBSs



Source: BIBM Research

List of banking software in the market in 2005, 2010 and 2017 including the list of banks with banking software in use at the end of 2017 are given in Table-2 to 5 to see the change of the CBS market over time.

Table 2: List of Banking Software in the Market in 2005

Sl. No.	Banking Software	No. of Banks Using
1	Agrani Solution	1
2	Ababil	3
3	A-To-Z	2
4	Bank Smart	1
5	Bexi Bank	8
6	Castle Core Banking	1
7	C-Bank	1
8	CBS-MBS	1
9	Daffodil Bank	2
10	Desktop Easy Banking	2
11	Eagle	1
12	Easy Banking	1
13	IBBS	1
14	Finalcle	3
15	Flexcube	4
16	Flora System	2
17	Hub,One HSBC System	1
18	International Comprehensive Banking System	1

Sl. No.	Banking Software	No. of Banks Using
19	Infinity Banking	3
20	Janata Bank	1
21	Kranti	1
22	Kernel	2
23	Microbanker	1
24	Misys	3
25	PC Bank 2000	8
26	PC Bank M	8
27	Probank	1
28	PIBS	1
29	Silver Lake	1
30	Sonali Banking Solution	1
31	Stelar	2
32	Temenos T24	2
33	Ultimus	1
34	Uttara Integ	1
35	Win FOS	1

Source: BIBM Research

Table 3: List of Banking Software in the Market in 2010

Sl. No.	Banking Software	No. of Banks Using
1	Agrani Solution	1
2	Ababil	3
3	Bank Smart	1
4	Bexi Bank	4
5	Kastle Core Banking	1
6	C-Bank	1
7	Daffodil Bank	2
8	Desktop Easy Banking	2
9	Easy Banking	1

Sl. No.	Banking Software	No. of Banks Using
10	eBBS	1
11	eIBS	1
12	Finalcle	3
13	Flexcube	4
14	Flora System	8
15	Hub, One HSBC System	1
16	ICPS	1
17	Infinity Banking	6
18	Janata Bank	1

Sl. No.	Banking Software	No. of Banks Using
19	Kranti	1
20	Microbanker	1
21	Misys	3
22	PC Bank 2000	6
23	PIBS	1
24	Silver Lake	1

Sl. No.	Banking Software	No. of Banks Using
25	Sonali Banking Solution	1
26	Stelar	2
27	Temenos T24	2
28	Ultimus	1
29	Uttara Integ	1
30	Win FOS	1

Source: BIBM Research

Table 4: Market Share of CBS (December, 2017)

Sl. No.	Name of the CBS	Type of CBS	No. of Banks Using	% of Total Banks	No. of Branches Using	% of Total Branches
1	Ababil	Local	3	5.4	354	3.6
2	Bank Ultimus	Local	9	16.1	866	8.7
3	Electronic and Integrated banking System (eIBS)	In-House	1	1.8	331	3.3
4	Electronic Basic Banking System (eBBS)	In-House	1	1.8	26	0.3
5	Finacle	Foreign	3	5.4	310	3.1
6	Flexcube	Foreign	7	12.5	651	6.5
7	Flora Bank	Local	7	12.5	1559	15.7
8	HSBC Universal Banking	In-House	1	1.8	10	0.1
9	Infinity Banking System (PC Based)	Local	1	1.8	379	3.8
10	Intellect Core Banking System	Joint Venture	2	3.6	1774	17.8
11	International Comprehensive Banking System	Foreign	1	1.8	11	0.1
12	iSmart	Foreign	1	1.8	7	0.1
13	iStelar	Joint Venture	4	7.1	335	3.4
14	Kastle Core Banking Solution	Foreign	1	1.8	68	0.7
15	Misys	Foreign	3	5.4	250	2.5
16	Pubali Integrated Banking System (PIBS)	In-House	1	1.8	458	4.6
17	Silverlake	Foreign	1	1.8	33	0.3
18	Temenos T24	Foreign	8	14.3	2526	25.4
19	Win FOS	Foreign	1	1.8	5	0.1

Source: BIBM Research

Table 5: List of Banks with Banking Software in Use at the End of 2017

Sl. No.	Bank	Name of CBS	CBS Type*	Total IT Employees	Total Branches
1	AB Bank Ltd.	Misys Equation	F	52	104
2	Agrani Bank Ltd.	Temenos T24	F	106	937
3	Al-Arafah Islami Bank Ltd.	Ababil	L	66	151
4	Bangladesh Commerce Bank Ltd.	i-stelar	J	25	54
5	Bangladesh Development Bank Ltd.	i-stelar	J	17	42
6	Bangladesh Krishi Bank	Flora Bank	L	57	1031
7	Bank Al-Falah	iSmart	F	12	7
8	Bank Asia Ltd.	i-stelar	J	32	119
9	BASIC Bank Ltd.	Kastle Core Banking Solution	F	41	68
10	BRAC Bank Ltd.	Finacle	F	156	186
11	Citibank N.A	Flexcube	F	6	3
12	Commercial Bank of Ceylon PLC	International Comprehensive Banking System ICBS)	I	5	11
13	Dhaka Bank Ltd.	Flexcube	F	46	98
14	Dutch-Bangla Bank Ltd.	Flexcube	F	152	173
15	Eastern Bank Ltd.	Flexcube	F	60	84
16	EXIM Bank Ltd.	Temenos T24	F	56	115
17	First Security Islami Bank Ltd.	Bank Ultimus	L	64	168
18	Habib Bank Ltd.	Misys Equation	F	3	7
19	ICB Islamic Bank Ltd.	Silverlake	F	15	33
20	IFIC Bank Ltd.	Misys Equation	F	36	139
21	Islami Bank Bangladesh Ltd.	Electronic and Integrated banking System (eIBS)	I	210	331
22	Jamuna Bank Ltd.	Flora Bank	L	41	115
23	Janata Bank Ltd.	Temenos T24	F	140	907
24	Meghna Bank Ltd.	Bank Ultimus	L	15	39
25	Mercantile Bank Ltd.	Temenos T24	F	48	121
26	Midland Bank Ltd.	Flora Bank	L	23	21
27	Modhumoti Bank Ltd.	Bank Ultimus	L	15	27
28	Mutual Trust Bank Ltd.	Flora Bank	L	46	112
29	National Bank Ltd.	Temenos T24	F	49	194
30	National Bank of Pakistan	Bank Ultimus	L	3	4
31	National Credit & Commerce Bank Ltd.	Flora Bank	L	60	108
32	NRB Bank Ltd.	Flexcube	F	28	32
33	NRB Commercial Bank Ltd.	Bank Ultimus	L	12	55
34	Global Islami Bank Ltd.	Temenos T24	F	14	46

Sl. No.	Bank	Name of CBS	CBS Type*	Total IT Employees	Total Branches
35	ONE Bank Ltd.	Flexcube	F	60	91
36	Premier Bank Ltd.	Bank Ultimus	L	28	102
37	Prime Bank Ltd.	Temenos T24	F	150	150
38	Pubali Bank Ltd.	PIBS	I	120	458
39	Rajshahi Krishi Unnayan Bank	Infinity Banking System (PC Based)	L	13	379
40	Rupali Bank Ltd.	Intellect Core Banking System	J	125	563
41	Shahjalal Islami Bank Ltd.	Bank Ultimus	L	35	110
42	Social Islami Bank Ltd.	Ababil	L	53	135
43	Sonali Bank Ltd.	Intellect Core Banking System	J	367	1211
44	South Bangla Agriculture & Commerce Bank Ltd.	Flora Bank	L	14	62
45	Southeast Bank Ltd.	Bank Ultimus	L	63	131
46	Standard Bank Ltd.	i-stelar	J	23	120
47	Standard Chartered Bank	Electronic Basic Banking System(eBBS)	I	30	26
48	State Bank of India	Finacle	F	6	4
49	The City Bank Ltd.	Finacle	F	88	120
50	The Farmers Bank Ltd.	Temenos T24	F	35	56
51	The Hong Kong and Shanghai Banking Corporation. Ltd.	HSBC Universal Banking	I	17	10
52	Trust Bank Ltd.	Flora Bank	L	35	110
53	Union Bank Ltd.	Ababil	L	28	68
54	United Commercial Bank Ltd.	Flexcube	F	75	170
55	Uttara Bank Ltd.	Bank Ultimus	L	51	230
56	WOORI BANK (Korea)	Win FOS	I	3	5

Source: BIBM Research
Note: *F: Foreign L: Local I: In-House J: Joint Venture

2.3 Life Length of CBSs

Table 6: Life Length of CBSs being Used in Banks (% of Banks)

CBS Type	CBS being Used (in Years)		
	0-5	6-10	11-15
Foreign	17.2%	17.2%	-
In-House	10.3%	-	-
Joint Venture	6.9%	3.4%	3.4%
Local	20.7%	13.8%	6.9%

Source: BIBM Research

Maturity level of different types of CBS is shown in the above table. It is marked that Joint Venture and Local CBS are used in banks for longer period than Foreign CBS. Both Joint Venture and local CBS are used in banks for the last 15 years. In-house CBS is the newest addition in this genre. No In-House CBS has crossed the 5 year boundary.

2.4 CBS Implementation Time

Table 7: CBS Implementation Time

CBS Type	Implementation Time (Years)				Total	Chi-Square	Sig. (2-sided)
	1	2	3	4			
Foreign	6	6	0	0	12	22.095 (9 df)	0.009
In-House	0	0	0	1	1		
Joint Venture	2	0	1	1	4		
Local	7	2	1	0	10		
Total	15	8	2	2	27		

Source: BIBM Research

CBS implementation is a critical task. In Bangladesh minimum, maximum and average implementation time is recorded at 1 month, 48 months and 15.3 months, respectively. The above table examines the relationship between Implementation Time and Types of CBS. Table-7 shows that Foreign CBS takes less time compared to In-House and Joint Venture CBS. Chi-Square value of 22.095 with 9 degrees of freedom is significant at 5% level of significance. So, we can say that implementation time and CBS types have a statistically significant relationship.

2.5 Number of Software Used by Banks

Table 8: Number of Software Used by Banks (Up to 2017)

Total Software Handled (CBS + Legacy)	Percentage of Banks
1	10.3
2	37.9
3	37.9
4	10.3
7	3.40

Source: BIBM Research

Percentage of banks that handle several software is shown in the above table. It is found that, around 38% banks handled 3 different software, which indicates that they are not happy with the previously used software at all. More interestingly, 3.4% banks handled 7 different software.

2.6 Replacement of CBS

Table 9: Replacement of CBS

Number of Times CBS Changed	Percentage of Banks
No Change	28.0
1 Time	37.9
2 Times	41.4
3 Times	20.7

Source: BIBM Research

Percentage of banks that changed their CBS is shown in the above table. It is found that, 41.4% banks replaced their CBS for 2 times, which indicates that they are totally unhappy with the previously used CBSs. More remarkably, 20.7% banks switched to new CBS for more than 2 times. By observing this changing habit of CBS in our banking community, we can say that our software market is not stable at all. It may be noted that 28% banks who do not change their CBS for a single time are either 3rd or 4th generation banks who are using world class CBS from the very beginning or they don't feel the need to change their CBS because they are new entrant in the market.

Table 10: Willingness to Change CBS

Willingness	% of Banks
Local to Foreign	29.4
Local to Local	47.1
Local to In-House	2.9
Foreign to Foreign	5.9
Local to Joint Venture	11.8
Foreign to Local	11.8

Source: BIBM Research

Mostly users of Local CBS are opting for a new CBS, as seen from table 10. 47.1% banks have decided to change their existing Local CBS for a new local one. 29.4% banks state that they will replace their Local CBS with a Foreign CBS. And 11.8% banks will go for a Joint Venture CBS by replacing their Local CBS.

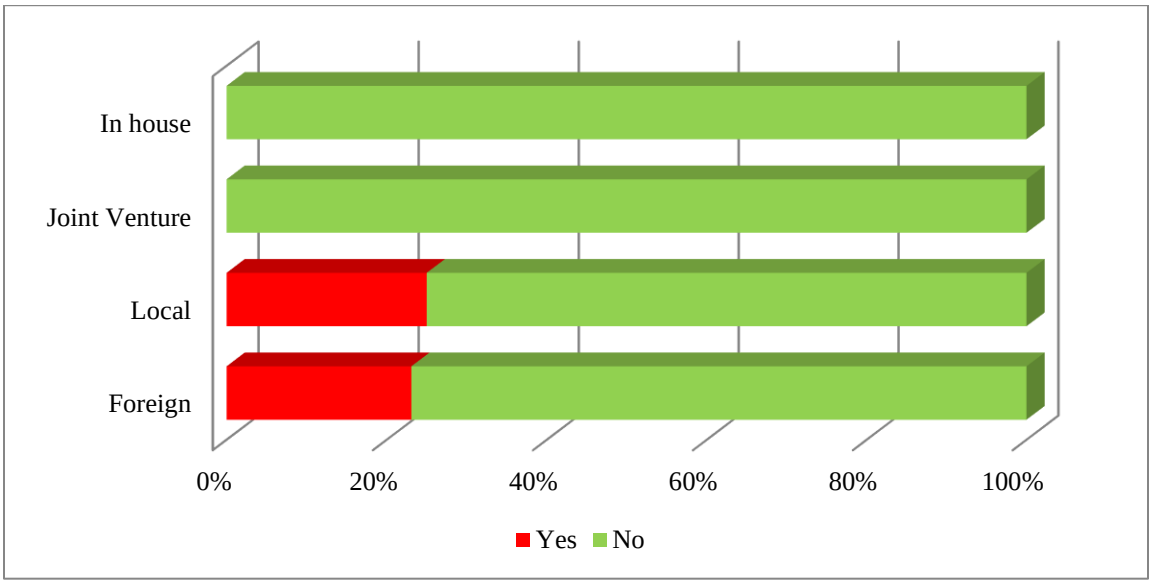
The most significant reasons for replacing/changing CBS are described in the table below. A major portion of the banks (45%) changed their software because it was not centralized. Then 12% banks stated that they have changed their software due to poor functionality. Database, hardware and operating system dependency also compelled 9% banks to change their software.

Table 11: Reasons behind Replacing CBS

Reasons to Replace CBS	% of Banks
Transferring from Old to New Architecture	12
Poor Functionality	12
Less Flexibility	9
Legacy/Distributed System/Not Centralized	45
Poor Operational Performance	7
DB, HW and OS Dependency	9
Poor Security	6

Source: BIBM Research

Figure 5: Would you Change the CBS Soon?



Source: BIBM Research

About 18% total banks that are using Local or Foreign CBS, decide to change their CBS soon. But the scenario is totally different in case of In-House and Joint Venture CBS users'. They are not willing to change their CBS, which depicts that they are satisfied with their used CBS.

Table 12: Factors that Influence Banks to Replace CBS

Comments of HOITs using Foreign CBS
• Functionality does not support business innovation and expansion. • Re-engineered business process required. • Functionality does not support rapid development and launch of new products, with business agility to respond quickly to market and customer demand. • New and improved performance monitoring tools and consoles are not present. • Operational risks are higher and more customizations needed.

• Existing version of CBS is not fully supported by vendor. • Already running for more than 5 years. Product life cycle is almost finished. Support will become an issue if the product is declared "End of life" by the vendor. • To cope up with on-going Fin-Tech trend of Banking industry and cater customer digital requirements, existing system is either required to be upgraded or platform to be changed.
Comments of HOITs using Local CBS
• Absence of detail log of activities. • Controlling of the system is not up to the mark. • Integration with other system is costly. • Support and service of vendor is not satisfactory. • Absence of standard features of CBS.

Source: BIBM Research

2.7 Human Resources in CBS Operations

In the banking sector minimum, maximum and average number of IT employees are 3, 367 and 58.2, respectively. The following table represents the ratio of IT Employees and Number of Branches based on the type of CBS. In case of banks using Local CBSs, one IT employee serves on an average 4.8 branches, whereas for banks using In-House software an IT employee on an average manages 1.8 branches. It is a clear indication that number of IT employees in banks who are using Local CBSs are not adequate compared to banks using other CBSs.

Table 13: IT Employee: Number of Branches w.r.t. CBS Type

CBS Type	IT Employee: Number of Branches		
	Minimum	Maximum	Average
Local	1:0.9	1:29.2	1: 4.8
Foreign	1: 0.5	1: 8.8	1: 2.3
In-House	1: 0.6	1: 3.8	1:1.8
Joint Venture	1:2.2	1:4.5	1:3.2

Source: BIBM Research

Table 14: IT Employee: Business Employees w.r.t. CBS Type

CBS Type	IT Employee: Business Employees		
	Minimum	Maximum	Average
Local	1:16.3	1:276.8	1:59.6
Foreign	1:15.1	1:119.5	1:46.1
In-House	1:28	1:2713	1:925.4
Joint Venture	1:43.5	1:62.7	1:51.7

Source: BIBM Research

The above table shows the ratio of IT and business employees of banks using different types of CBSs. The average number of business employees per IT employee in banks using Local, Foreign and Joint Venture CBSs are approximately same. In case of banks using In-House CBSs, the number of business employees per IT employee is extremely high. As a result, these banks face severe difficulties to provide technical support to their large number of business employees resulting poor quality of services by IT employees.

Table 15: Number of IT Employees w.r.t. CBS Type

CBS Type	IT Employees			IT Employees (% of Total Employees)	Business Employees (% of Total Employees)
	Minimum	Maximum	Average		
Local	3	66	36.1	2.23	97.77
Foreign	3	156	61.7	1.87	98.13
In-House	120	210	165	1.75	98.25
Joint Venture	17	367	98.1	1.89	98.11

Source: BIBM Research

The above table shows the Minimum, Maximum and Average number of IT employees with respect to banks that are using different types of CBS. Also the percentage of IT employee compared to business employees are shown in the above table. Internationally, it is seen that usually 5 to 10 percentage of total employees of a banks work in the IT Department but in our context we found that highest 2.23% of total employees work in the IT Department of those banks which are using Local CBSs. For better operation this ratio should be maintained by following international standards.

Table 16: Number of IT Employees w.r.t. Type of Banks

Type of Banks	IT Employees			IT Employees (% of Total Employees)	Business Employees (% of Total Employees)
	Minimum	Maximum	Average		
FCB	3	17	7.4	0.56	99.44
PCB	12	210	56.9	2.48	97.52
SB	13	57	35.0	1.91	98.09
SOCB	17	367	132.6	1.44	98.56

Source: BIBM Research

Table-16 shows the Minimum, Maximum and Average number of IT employees with respect to different types of banks. Also the percentage of IT employee compared to business employees is shown in the above table. In our context we see that highest 2.48 percent of employees are working in the IT Department of Private Commercial Banks. Banks of other categories should increase the number of IT employees for smooth and better performance.

Table 17: Relationship between CBS Types and Number of Employees in CBS Operations

CBS Types	Employees in CBS Operations			Total Banks	Chi-Square	Sig. (2-sided)
	0-10	21-30	30-100			
Foreign	4	7	1	12	13.762 (6 df)	0.032
In-House	0	0	2	2		
Joint Venture	2	1	1	4		
Local	8	2	2	12		
Total Banks	14	10	6	30		

Source: BIBM Research

The above table represents the relationship between the Number of IT employees in CBS operation of banks and Types of CBS. It is notable from the data that Foreign CBS required less employees to operate compared to other CBS types. The Chi-Square value of 13.762 with 6 degrees of freedom is significant at 5% level of significance. So, we can say that there is statistically significant relationship between Employees in CBS Operations and Types of CBS.

Table 18: Relationship between CBS Types and Total Employees of Banks

CBS Types	Total Employees				Total Banks	Chi-Square	Sig. (2-sided)
	0-1000	1001-2000	2001-3000	3001-21000			
Foreign	6	2	9	6	23	4.43 (9 df)	0.881
In-House	1	0	0	2	3		
Joint Venture	1	1	1	2	5		
Local	5	2	5	4	16		
Total Banks	13	5	15	14	47		

Source: BIBM Research

The above table represents the relationship between Total Employees of Banks and Types of CBS. Chi-Square value of 4.43 with 9 degrees of freedom is insignificant at 5% level of significance. So, we can say that there is statistically no significant relationship between Total Number of Employees in banks and Types of CBS. That is, the capacity to provide services to a large number of terminal users does not depend on CBS type.

Table 19: Relationship between Types of Banks and Total IT Employees

Type of Banks	No. of IT Employees							Total Banks	Chi-Square	Sig. (2-sided)
	0-10	11-25	26-50	51-100	101-200	201-300	301-400			
FCB	5	2	0	0	0	0	0	7	57.492 (18 df)	0.000
PCB	0	8	13	12	4	1	0	38		
SB	0	1	0	1	0	0	0	2		
SOCB	0	1	1	0	3	0	1	6		
Total Banks	5	12	14	13	7	1	1	53		

Source: BIBM Research

The above table represents that the Foreign Commercial Banks are operating with comparatively lower number of IT employees than that of PCBs, SBs and SOCBs. The Chi-Square value 57.492 with 18 degrees of freedom is highly significant (p-value 0.000). This indicates that there is a statistically high level of significant relationship between Number of IT Employees and Different Types of Banks.

2.8 Impact of Types of CBSs on Banking Operations

The table below shows the relationship between Types of Software and Employees per Branch. We see from the data that Foreign and In-House CBSs have the capacity to support more people in branches compared to the banks that are using either Local or Joint-Venture CBSs. This relationship is supported by the calculated Chi-Square value which is 16.789 with 9 degrees of freedom and is significant at 5% level of significance. So, we can conclude that there is statistically significant relationship between Employee per Branch and Types of CBS.

Table 20: Impact of CBS Type on Employee per Branch

CBS Type	Employees Per Branch				Total Banks	Chi-Square	Sig. (2-sided)
	0-10	11-20	21-30	31-60			
Foreign	0	9	9	5	23	16.789 (9 df)	.052
In-House	0	0	1	1	2		
Joint Venture	1	4	0	0	5		
Local	1	10	2	0	13		
Total Banks	2	23	12	6	43		

Source: BIBM Research

Table 21: Impact of CBS Type on No. of IT Employees

CBS Type	No. of IT Employees				Total Banks	Chi-Square	Sig. (2-sided)
	0-25	26-50	51-75	76-400			
Foreign	5	7	5	6	23	16.90 (9 df)	0.051
In-House	3	1	0	2	6		
Joint Venture	3	1	0	2	6		
Local	7	6	7	0	20		
Total Banks	18	15	12	10	55		

Source: BIBM Research

As the coverage of a CBS increases, total number of IT employees in operation increases to support the banking business. The above table shows that Foreign and In-House CBSs required more people in the IT department compared to banks those are using either Local or Joint Venture software. The statistical analysis clearly support this relationship with a high level of significance.

Table 22: Relationship between CBS Type and No. of Branches

CBS Type	No. of Branches						Total Banks	Chi-Square	Sig. (2-sided)
	0-25	26-50	51-100	101-200	201-300	300+			
Foreign	4	2	5	10	0	2	23	156 (15 df)	0.408
In-House	2	0	0	0	0	2	4		
Joint Venture	0	1	1	2	0	2	6		
Local	2	2	3	10	1	2	20		
Total Banks	8	5	9	22	1	8	53		

Source: BIBM Research

The above table represents the Number of Branches covered by Foreign, In House, Join Venture, and Local CBS. Though there is a tendency in the data that there is an association between No. of Branches and types of CBS, Chi-Square value 156 with 15 degrees of freedom is insignificant at 5% level of significance. So, we can conclude that there is no statistically significant relationship between No. of Branches and CBS.

Table 23: Relationship between CBS Type and Generation of Banks

CBS Type	Generation of Banks				Total Banks	Chi-Square	Sig. (2-sided)
	1st	2nd	3rd	4th			
Foreign	9	4	4	2	19	18.57 (9 df)	0.023
In-House	2	0	0	0	2		
Joint Venture	2	0	3	1	6		
Local	3	4	6	6	19		
Total Banks	16	8	13	9	46		

Source: BIBM Research

The above table examines the relationship between Generation of Banks and types of CBS. Though there is a tendency in the data that there are some relations between Generation of Banks and types of CBS, Chi-Square value 18.57 with 9 degrees of freedom is significant at 5% level of significance. It is also seen that first generation banks are widely using Foreign CBS whereas 4th generation Banks are focusing on Local CBS. So, we can say that Generation of Banks and CBS types have a statistically significant relationship.

Table 24: Relationship between CBS Type and Number of Operational Modules

CBS Type	Number of Modules					Total Banks	Chi-Square	Sig. (2-sided)
	3	4	5	6	7			
Foreign	1	3	4	0	5	13	12.46 (12 df)	0.409
In-House	0	0	1	1	1	3		
Joint Venture	0	0	0	2	2	4		
Local	0	1	1	2	7	11		
Total Banks	1	4	6	5	15	31		

Source: BIBM Research

The above table shows the relationship between Type of Software and Number of Modules. As all types of banks almost do the same operations, it is expected that all types of CBSs have almost same number of modules. Chi-Square value of 12.46 with 12 degrees of freedom is insignificant at 5% level of significance. So, we can conclude that Number of Modules and Types of CBS are independent to each other and they have no relationship.

Table 25: Relationship between CBS Type and Categories of Banks

CBS Type	Categories of Banks				Total Banks	Chi-Square	Sig. (2-sided)
	FCB	PCB	SB	SOCB			
Foreign	4	15	0	3	22	16.02 (9 df)	0.06
In-House	1	2	0	0	3		
Joint Venture	0	3	0	3	6		
Local	1	17	1	0	19		
Total Banks	6	37	1	6	50		

Source: BIBM Research

The above table shows the relationship between categories of Banks and Types of CBS. Foreign Commercial Banks have general tendency to use Foreign CBS. But in Bangladesh Private Commercial Banks mainly use either Foreign or Local CBSs. State Owned Commercial Banks also use Foreign CBS as well as Joint Venture and Local CBS. Chi-Square value 16.02 with 9 degrees of freedom is not significant at 5% level of significance. So, it can be said that there is no statistically significant relationship between Categories of Banks and Types of CBS.

Table 26: Relationship between CBS Type and Total Asset per Branch

CBS Type	Total Assets (Crore Taka) Per Branch				Total Banks	Chi-Square	Sig. (2-sided)
	0-100	100-200	200-300	300+			
Foreign	3	9	6	5	23	24.72 (9 df)	0.003
In-House	1	0	1	4	6		
Joint Venture	3	2	1	0	6		
Local	8	11	1	0	20		
Total Banks	15	22	9	9	55		

Source: BIBM Research

The above table examines the relationship between Total Assets (Crore Taka) Per Branch and Types of CBS. It is clear from the data that banks having higher asset per branch is using either Foreign or In-House banking software, whereas banks with less assets per branch installed either Local or Joint Venture CBS. Chi-Square value 24.72 with 9 degrees of freedom is significant at 5% level of significance. So, we can say that Total Assets (Crore Taka) Per Branch and CBS types have a statistically significant relationship.

Table 27: Relationship between CBS Type and Database

CBS Type	Database			Total Banks	Chi-Square	Sig. (2-sided)
	DB2	Oracle	SQL Server			
Foreign	3	18	1	22	16.66 (6 df)	0.011
In-House	1	2	0	3		
Joint Venture	0	6	0	6		
Local	0	11	8	19		
Total Banks	4	37	9	50		

Source: BIBM Research

The above table shows that different types of CBS use different Database. From the table we see that Foreign CBS have a higher tendency to use either DB2 or Oracle database but Local and Joint Venture software use either Oracle or SQL server database. Chi-Square value 16.66 with 6 degree of freedom is significant at 5% level of significance supports the relationship between CBS Type and Database.

2.9 Impact of CBS Type on Banking Business (Profitability)

The table below shows the relationship between Cost to Income Ratio and Types of CBS. There is a tendency in the data that Cost to Income Ratio is less in case of those banks that are using either Foreign or Local software but other banks have a higher Cost to Income Ratio those are using either In-House or Joint Venture CBS. The relationship between Cost to Income Ratio and Types of CBS is statistically significant as Chi-Square value 17.2 with 9 degrees of freedom is significant at 5% level of significance.

Table 28: Impact of CBS Type on Cost to Income Ratio

CBS Type	Cost to Income Ratio				Total Banks	Chi-Square	Sig. (2-sided)
	0-0.40	0.41-0.60	0.61-0.80	0.81-1.05			
Foreign	1	9	2	2	14	17.2 (9 df)	0.044
In-House	0	0	1	0	1		
Joint Venture	0	1	1	3	5		
Local	3	6	1	0	10		
Total Banks	4	16	5	5	30		

Source: BIBM Research

Table 29: Impact of CBS Type on Net Profit (Crore Taka) Per Branch

CBS Type	Net Profit (Crore Taka) Per Branch					Total Banks	Chi-Square	Sig. (2-sided)
	-0.8-0*	0-1	1-2	2-3	3-40			
Foreign	3	3	7	4	6	23	24.083 (12 df)	0.020
In-House	0	1	1	0	4	6		
Joint Venture	2	3	1	0	0	6		
Local	3	3	12	1	1	20		
Total Banks	8	10	21	5	11	55		

Source: BIBM Research
Note: *Negative values indicates Net Loss per branch

The above table represents the relationship between Net Profit (Crore Taka) Per Branch and Types of CBS in use. It is seen from the table that banks that are using Foreign CBS or developed their own banking software have a higher net profit per branch compared to those banks that are using either Local or Joint Venture CBS. This relationship is statistically significant at 5% level of significance and supported by Chi-Square value of 24.083 with 12 degrees of freedom.

Table 30: Impact of CBS Type on Operational Expense (Crore Taka) Per Branch

CBS Type	Operational Expense (Crore Taka) Per Branch				Total Banks	Chi-Square	Sig. (2-sided)
	0-2.5	2.5-5.0	5.0-10.0	10.0-35.0			
Foreign	4	11	7	1	23	24.85 9 df	0.003
In-House	1	0	3	2	6		
Joint Venture	4	2	0	0	6		
Local	7	12	0	1	20		
Total Banks	16	25	10	4	55		

Source: BIBM Research

It is expected that quality and coverage of a CBS will reduce the operational expenses in branches with lower administrative cost. The above table represents the relationship between Operational Expenses (Crore Taka) Per Branch and CBS Types. It is seen from the data that Operational Expenses (Crore Taka) Per Branch is higher for the banks who developed their own CBS. But banks using Foreign, Local or Joint Venture CBS have much lower Operational Expenses (Crore Taka) Per Branch. The Chi-Square value of 24.85 with 9 degrees of freedom at 5% level of significance justifies this relationship between Operational Expense (Crore Taka) Per Branch and Types of CBS.

Table 31: Impact of CBS Type on Stationary Expense per Branch (Lac Taka)

CBS Type	Stationary Expense per Branch (Lac Taka)					Total Banks	Chi-Square	Sig. (2-sided)
	0-5	5-10	10-15	15-20	20-120			
Foreign	4	4	5	5	5	23	25.97 (12 df)	0.011
In-House	1	1	1	0	3	6		
Joint Venture	4	2	0	0	0	6		
Local	6	9	5	0	0	20		
Total Banks	15	16	11	5	8	55		

Source: BIBM Research

Stationary expense per branch mainly depends on the services provided by the branch, number of employees working and total number of customers of that branch. The above table shows the relationship between Stationary Expenses per Branch (Lac Taka) and Types of CBS. Chi-Square value of 25.97 with 12 degrees of freedom is significant at 5% level of significance. So, we can draw the conclusion that Stationary Expenses per Branch and CBS types have a statistically significant relationship. It is clear from the data that banks using Local or Joint Venture CBS have lower Stationary Expenses per Branch compared to the banks using other categories of software.

2.10 Technical Evaluation of CBSs

2.10.1 Functionality

A bank's main target is to meet its goals. So, all banks want to deploy modern and up-to-date software that will support them to achieve their business aims and provide them the expected outcome. The structure of the software determines its functionality. The foremost purpose to purchase a particular software is the scope of features that it offers. In any core banking system, the most delicate process is to integrate the current business practice with the functionality of applications. Another challenge is to line up the core application's capability with forthcoming marketing and industry initiatives. CBS's competency to provide efficiency and effectiveness is also a vital issue which can endow business process enhancement all through the organization. The functionality scores (out of 10) are given in the following table w.r.t. different functionality parameters.

Table 32: Functionality (Average Score: Out of 10)

Sl. No.	Description	Local	Foreign	In-House	Joint Venture
a)	Meeting Business Objectives and Coverage of Business	7.3	8.4	9	7.4
b)	Capacity to Align with Future Business	6.3	8.1	9	7.8
c)	Business Process Improvements	6.4	8.2	8	7.6
d)	Back-Office Support (Reporting, MIS, Reconciliation, SMS, etc.)	6.8	7	9	6.6

Source: BIBM Research
Note: Scale: Very Low '0' Very High '10'

2.10.2 Flexibility

Table 33: Flexibility (Average Score: Out of 10)

Sl. No.	Description	Local	Foreign	In-House	Joint Venture
a)	Capability to react rapidly to changing business/market situations	6.0	7.2	8.5	7.0
b)	Ability to respond quickly with changing regulations of the Central Bank	6.6	6.5	9.5	7.6
c)	Application Connectivity and Data Integration (CRM, ATM, POST, MFS, Internet, KIOSK, BACH, BEFTN, RTGS, SWIFT, etc.)	7.2	8.0	9.5	7.0
d)	Integration with Other Software/Organization	6.1	7.3	9.5	7.0
e)	Event-Driven Technology	5.7	7.0	8.0	6.6
f)	Service Oriented Architecture (SOA)	5.8	8.1	8.0	6.4
g)	Ease of Customization	6.5	6.8	9.5	7.0

Source: BIBM Research
Note: Scale: Very Low '0' Very High '10'

A bank can react swiftly to varying market situations (including compliance with changing guidelines) through the use of flexible core banking system. Particularly, a CBS should offer flexibility that includes application connectivity and data integration, workflow, and component-based architectures. In today's world innovation is the key thing. This dynamic feature influences a bank to purchase the product. The flexibility scores (out of 10) are given in the table 33 w.r.t. different parameters of flexibility.

2.10.3 Cost

While considering buying software packages a prime aspect is the cost of the product. Banks have to detect whether the would-be system fits their financial plan. Business case justification using only Return on Investment (ROI) is an increasingly infrequent method. Though it is a significant condition, but it does not exclusively express the accurate assessment of IT investments. Rather than an additional hands-on measure would be the commercial value of IT, which considers ROI including other vital features, such as architecture, tactical placement, effect of business procedure and risk. Usually, costs of

CBS can cover a wide range of pricing methods. This depends on bank size, area, total clients or accounts, customization necessities, vendor inspiration etc. While banks target license fee as initial point of negotiation, but maintenance fees (that ranges from 18%-22%) can be a major area for gaining savings over long period.

Table 34: Cost (Average Score: Out of 10)

Sl. No.	Description	Local	Foreign	In-House	Joint Venture
a)	Fixed Cost/Licensing Cost	6.0	6.8	4.0	6.8
b)	Annual Maintenance Cost	6.3	7.2	6.0	7.0
c)	Customization Cost	5.2	6.4	5.0	6.4
d)	Training Cost	5.3	5.2	5.5	6.4
e)	Hardware Requirement Cost	6.3	6.4	8.0	7.0
f)	Implementation Cost	5.7	6.6	5.5	6.4

Source: BIBM Research
Note: Scale: Very Low '0' Very High '10'

Also, banks should consider customization prerequisite that are related to regulatory requirements or are relevant to local necessities. Banks can share these types of improvement efforts with the vendor by up to 50%. As implementation, training and other resource-related costs usually are not worthy features for negotiation, banks should overlook these factors because they are related to time and resources. The scores (out of 10) regarding costs are given in the table 34 w.r.t. different cost parameters.

Table 35: CBS Market Value in Crore Taka

CBS Type	Licensing/Fixed Cost	Implementation	AMC
Local	295	22.5	38
Foreign	495	446	130
Joint Venture	325	235	107
In-House	583	124	

Source: BIBM Research

The above table shows the current market value of CBS in Crore Taka. We have about 9400 bank branches in Bangladesh. Market value is shown considering different types of CBS implementation in all branches of all banks. For example, if we implement foreign software in all banks of Bangladesh, we need 495 crore taka as licensing cost (fixed, one time) and 446 crore taka as implementation cost. Moreover, in each year we need additional 130 crore taka for AMC. Other hidden cost are not shown here.

Table 36: Cost per Branch (Taka in Lac)

Source of Cost	Local			Foreign			In-House			Joint Venture		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
License	0.86	5.5	3.13	3.86	6.8	5.25	2.35	10.0	6.2	1.0	5.95	3.45
AMC	0.06	0.85	0.41	0.72	1.98	1.38	0.47	2.17	1.32	0.62	1.6	1.14
Customization	0.65	2.0	1.09	0.75	3.00	1.55				-	-	-
Implementation	0.06	0.51	0.24	1.5	5.00	4.75				-	-	2.5
Training*	10.0	20.0	15.0	15	30.0	25.0				13.0	23	20

Source: BIBM Research
Note: *Overall Training Cost (not per branch).

Table 37: Cost per User (In Lac)

Source of Cost	Local			Foreign			Joint Venture		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
License	0.25	0.40	0.32	0.52	2.0c	1.01	-	-	0.39
AMC	14%	23%	17.5%	18%	20%	19%	-	-	18%

Source: BIBM Research

2.10.4 Operational Performance

Sometimes banks overlook some imprecise design features of CBS that are frequently labeled as purely technical elements. But in fact, design elements which are related to scalability, flexibility, date centralization and real-time enablement have real business value and need special consideration.

Table 38: Operational Performance (Average Score: Out of 10)

Sl. No.	Description	Local	Foreign	In-House	Joint Venture
a)	Scalability	6.5	8.0	9.5	7.6
b)	Resilience	6.1	8.5	9.0	7.0
c)	Operational Process Simplifications	6.5	8.0	9.0	7.2
d)	Centralize data irrespective of time zone or country of origin	7.5	8.6	9.0	8.8
e)	Multicurrency and Multilingual Support	5.3	8.7	7.5	6.6
f)	EOD, EOM, EOQ , EOY, etc. (Day, Month, Quarter, Year-end operations)	8.3	9.3	9.5	8.4.
g)	Ease of Program Management and Operations	6.4	7.7	9.5	7.4
h)	Reporting Capability	6.8	7.4	9.5	6.8
i)	Convenience (Easy to use by the end users)	7.5	8.1	9.5	7.2
j)	Vendor Dependency on CBS Operations	5.3	5.3	4.0	7.0
k)	Resource Utilization	7.0	6.7	8.0	7.0
l)	Bandwidth Consumption	7.2	5.9	7.5	6.2

Source: BIBM Research
Note: Scale: Very Low '0' Very High '10'

CBSs' scalability can be defined as an obscure amount because of the unusual nature of database characterization like; the number of customers, transactions and advance & fixed-term accounts. Other features are concurrent users, and the type and number of online and batch transactions associated with the vendor's benchmark. Banks should always create a tailored benchmark based on current customer base and growth estimates (usually five-year). The level of certainty that an initiated transaction will be effected in CBS is defined as resilience. CBSs that have premium features will support multithreaded messaging with failover characteristics, leading to higher transaction assurance rates and minimum interruption. The scores (out of 10) regarding operational performance are given in the above table w.r.t. different parameters.

2.10.5 Business Return/Value on Investment

The most significant concern for any business is time. The software used by the bank should not be time –consuming neither for the employees nor for the customers. Ease of use should be another important criterion for core banking software. Any layman or novice user should not face any problem in using it. The software should be customer-sensitive. A business lies on its returns. A company invests in order to get returns. So the ultimate question is 'How much revenue will the software generate?' If returns are less than anticipated, the bank will not be interested to buy the software. The CBS should support customers' needs and at the same time have the capability to draw more customers. The return will escalate, only when the customer base is greater than before. The scores (out of 10) regarding Business Return are given in the following table w.r.t. different parameters.

Table 39: Business Return/Value on Investment (Average Score: Out of 10)

Sl. No.	Description	Local	Foreign	In-House	Joint Venture
a)	Financial Return on Investment (ROI) by the CBS	6.4	8.1.	9.0	7.0
b)	Increased Productivity by the CBS	6.6	8.3	9.0	7.6
c)	Increased Efficiency by the CBS	6.8	8.4	9.0	7.6
d)	Increased Profitability by the CBS	6.3	8.4	9.5	7.0
e)	Financial Inclusion by the CBS	6.2	6.6	7.5	7.4
f)	Improvement of Service Quality by the CBS	6.5	8.3	8.5	7.6
g)	Reduction of Operational Time of Employees by the CBS	7.3	8.1	9.5	7.4
h)	Reduction of Customers' Waiting Time due to the Implementation of CBS	7.4	7.3	8.5	7.6
i)	Reduction of Number of Employees by the CBS	6.5	6.2	7.5	6.6
j)	Goodwill Increment by the CBS	6.7	8.2	9.0	8.2
k)	Business Enhancement by the CBS	6.7	8.2	8.5	7.8
l)	Administrative and Transaction Cost Reduction by the CBS	6.8	7.6	8.5	7.0
m)	Diversification of Banking Business by the CBS	6.1	7.9	8.0	7.8

Source: BIBM Research

Note: Scale: Very Low '0' Very High '10'

2.10.6 Security

Procedures that are associated with the controls and measurements of an organization's software applications due to manage the jeopardy of using them is known as 'Application Security'. Controls and measurements can be applied to the application itself (its processes, modules, software and outcomes), to its data (configuration data, consumer data, business data), and to all technology, processes and players engaged with the application's life cycle. There may be security flaws in the software that are 'insufficiency of quality' of the particular software vendor. Application that holds grievous security weaknesses has a high possibility to utterly damage the CIA triad (Confidentiality, Availability and Integrity) of its owner can be termed as 'Toxic Software'.

One of the main prerequisite of a robust CBS is the state-of-the-art application protection security. Nowadays the hackers infiltrate software using high-tech skills, tools and knowledge. In order to protect an organization against these dangers a CBS must make sure that its application security is the highest and near to the international standard. Such type of security vulnerabilities needs special attention because lacking of these requirements put CBS at danger not only from fraudsters but also from legal censure. A hacker can directly access the database through a loophole in CBS and therefore bypasses the security feature of role-based access rules.

All users of a software that is released and already shipped to a business environment may be at risk due to the errors and bugs in the particular software product. The process of correcting these errors increases the costs and is therefore not only an unsafe but also unproductive approach. In addition, many security loopholes that are resulted from poor less secured design or incorrect security necessities are more challenging to patch-up. Consequently the simple elimination of a single bug is not adequate. It is essential to redesign or refactoring the whole application which surpasses a simple security hot fix for the application.

Software designers must realize how to develop all features of the application with special concentration to security. Integration of security is necessary into all aspects of the software development process. This involves a organized, combined practice for reliable software development during regular development work. Software security is vital to all parts of the SDLC (Software Development Life Cycle) from requirement to architecture, design, coding, testing, deployment and maintenance. In order to create a firm base for software security vendors must increase their methodology in these areas. Information from back office and core systems as well as consumer statements, transactions, account balances data are mostly targeted in banking atmosphere. The majority of successful attacks is not reported because they are either untraceable or due to the fear of being infamy on the part of the victim. The most severe risks that a bank faces include, In-House sabotage, covert

espionage or sneaky attacks by reliable employees, contractors and vendors. Global security experts are in unanimity that the vast majority of security weaknesses are originated from the software themselves. The scores (out of 10) regarding CBS Security are given in the following table w.r.t. different parameters.

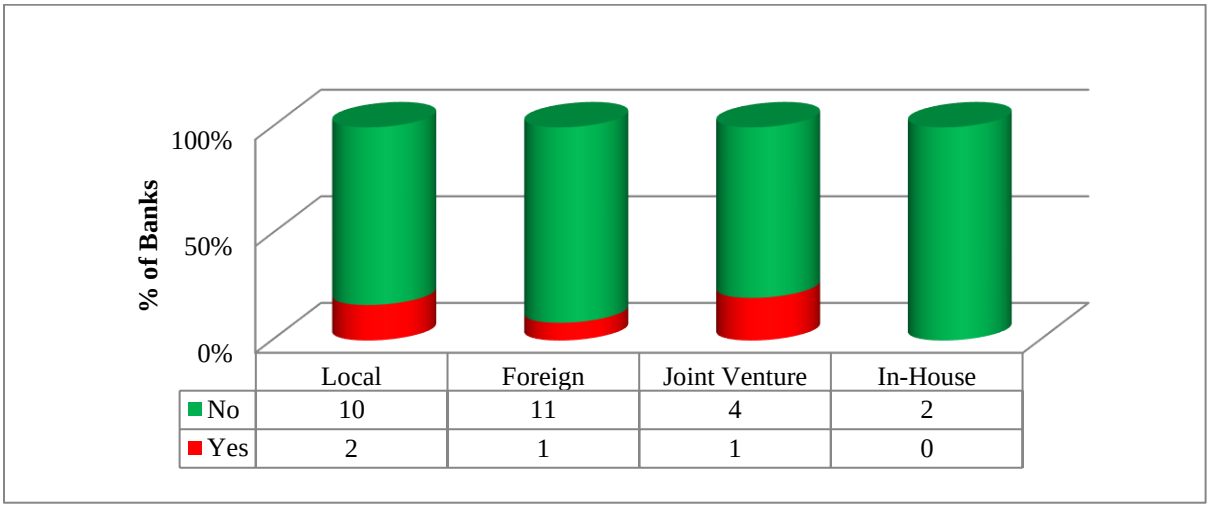
Table 40: Security (Average Score: Out of 10)

Sl. No.	Description	Local	Foreign	In-House	Joint Venture
a)	Number of Errors Found	4.8	4.5	4.5	5.2
b)	Number of Bugs Identified	5.3	4.1	4.5	5.0
c)	Access Control/Segregation of Duties (Role Based)	7.1	9.0	9.0	7.8
d)	Confidentiality	6.8	9.1	9.0	7.2
e)	Integrity	7.4	8.8	9.5	7.8
f)	Alert, Audit, Monitoring, Exception Handling	6.8	8.5	8.0	6.8
g)	Fraud Prevention Techniques	5.5	7.9	7.5	6.8
h)	Data Handle Capacity	7.1	8.7	9.5	7.4
i)	Virtualization Capacity	6.2	6.4	8.0	7.4
j)	Prevention of Money Laundering Activities	6.9	6.1	9.0	7.2

Source: BIBM Research

Note: Scale: Very Low '0' Very High '10'

Figure 6: Experience of Fraud due to the Poor Security of the CBS



Source: BIBM Research

From the graph, we have seen that 17%, 9% and 20% banks that are using Local, foreign and Joint Venture CBS, respectively, have experience of fraudulent activities due to bug/error of the software. But users of In-House CBSs have no such experience.

2.10.7 Viability and Longevity of CBS and Performance of Vendor

No business in the world would finance for a short term software package. They need a software that will assist them for a long time. They want to relax once they have taken on board. Any system that requires quick substitutes fails miserably in the marketplace. A bank must think through vendor's financial health and stability as well as implementation and integration support, training, maintenance arrangements, upgrade and, possibly some of the most important factors, enhancement policies, customer service reputation and the understandable cost concerns.

Opting for a core banking product should be completely tactical and vital to the long-term well-being of the bank. So, vendor's sustainability is a key element. In this consolidating CBS market, banks must evaluate the probability that a given software will survive an acquisition – how likely the new vendor will keep assisting and financing that certain package?

How a bank can identify that a software has weak viability? Some possible indications are poorer sales, worse design/architecture, OS, hardware and database dependency and declined customer contentment. In addition, bank officials must scrutinize a vendor's sustainability through considering its financial stability, as well as by examining its technical skill, development aptitude, excellence in support, promoting and sales reach, alliances and partnerships, and management performance.

Another factor that a bank must analyze is implementation practice of the vendor. Failure to implement due diligence regarding vendor project management competences can give rise to implementation costs exponentially and dampen the spirits of bank staff.

It may happen that capable manpower is becoming scarce on vendor's side when the speed of core banking system replacement upsurges. As a result, sellers are gradually dependent on system integrators or other associates to set up their applications. Bank management should be very vigilant about this type of reliance.

Customer references are also considered as an important parameter to assess "real world" experiences of a vendor. What is the vendor's reputation in the market? How well the vendor proceeded in its earlier contracts? Does it have any big achievement which will draw new customers? When eyeing for a prospective vendor, a bank must examine these factors**.**

Is the vendor proficient enough to face any challenge? If the bank falls into distress, can they trust their vendor for a way out? The vendor should be trustworthy during such difficult times. The vendor should provide well-timed up-gradation capacity. It is no wonder that with the change of times, market demands varies and rules are reformed. Therefore, consistent and systematic analysis and system modernizations are essential.

Banks do not need tailor-made solutions. They want that the vendor should realize their business needs and provide custom-built solutions for them, regardless of what it delivers others.

The scores (out of 10) regarding Viability and Longevity of CBS and Performance of Vendors are given in the following table w.r.t. different parameters.

Table 41: Viability and Longevity of CBS and Performance of Vendors (Average Score: Out of 10)

Sl. No.	Description	Local	Foreign	In-House	Joint Venture
a)	Maturity of CBS	6.0	8.4	9.5	6.8
b)	Possibility of Going Down of CBS Sales	5.1	3.7	-	5.4
c)	Quality of Design or Architecture	5.5	8.2	9.0	7.2
d)	Operating System Dependency	6.8	5.6	6.5	5.8
e)	Database Dependency	6.4	7.3	10.0	4.6
f)	Hardware Dependency	5.8	6.0	7.5	6.4
g)	Financial Stability/Capacity of the Vendor	6.8	8.6	7.5	7.6
h)	Technical Competence of the Vendor	6.3	8.3	8.5	8.0
i)	Development Capability of the Vendor	6.6	8.3	-	7.6
j)	Quality of Support of the Vendor	6.1	7.5	-	7.8
k)	Marketing and Sales Reach of the Vendor	6.1	7.0	-	6.8
l)	Alliances Vendor on Other Vendors/Partners)/Partner Management and Partnerships	5.6	6.3	-	6.0
m)	Management Performance of the Vendor	6.3	7.3	-	7.8
n)	Customer Reference of the CBS	6.1	6.6	-	7.6
o)	Support Mechanism/After Deployment Support of the Vendor	6.5	7.8	9.5	8.0
p)	Customization Capability of the Vendor	6.7	8.1	9.0	7.8
q)	Up-gradation Facilities/ Timely Up-gradation by the Vendor	6.3	7.3	9.0	7.2
r)	Global Ranking of the Vendor	4.6	8.3	-	6.6
s)	Implementation Quality/Program Management by the Vendor	5.5	7.9	8.5	6.8
t)	Quality of Documentation (User Manual)	5.0	8.7	9.5	6.4
u)	Training Provided and Quality of Training Provided by Vendor	5.7	7.3	9.0	6.8

Source: BIBM Research

Note: Scale: Very Low '0' Very High '10'

2.10.8 Rating of CBS Considering All Parameters

2.10.8.1 Rating of CBS by HOIT

Table 42: Rating of CBS Considering All Parameters by HOIT (Out of 100) *

Sl. No.	Parameters	Local	Foreign	In-House	Joint Venture
1.	Functionality	65.6	79.16	87.5	73.5
2.	Flexibility	62.5	65.48	89.3	69.43
3.	Architecture, Technical Quality and Operational Performance	63.8	75.08	84.5	71.5
4.	Security	62.7	69.2	78.5	68.6
5.	Cost	42.1	59.7	53.3	66.67
6.	Business Return and Benefit	66.3	76.79	86.15	74.31
7.	Vendor's Reputation and Support	59.2	72.38	-	69.05
8.	**Overall Rating of CBS**	**61.3**	**69.5**	**77.39**	**67.4**

Source: BIBM Research

Note: *Scale: Very Poor '0' Excellent '100'

The overall satisfaction score of Local, foreign, In-House and Joint Venture CBS is shown in the above table. We measure the overall satisfaction score by calculating seven parameters as shown in the table. In case of 'Functionality', 'Flexibility', 'Architecture, Technical Quality and Operational Performance', 'Security' and 'Business Return and Benefit' parameters, In-House CBS is superior to foreign, Local and Joint Venture CBS. It is seen from the table that, Joint Venture CBS is far more costly than other types of CBS. As In-House CBS is developed and maintained by internal team of a bank, the parameter 'Vendor's Reputation and Support' is not applicable for In-House CBS, rather performance of internal software development team is considered. Finally, if we look at the overall satisfaction of different types of CBS, it is clearly noticeable that performance of In-House CBS (77.39) is better than Local (61.3), Foreign (69.5) and Joint Venture CBS (67.4).

2.10.8.2 Rating of CBS by Branch Employees

Table 43: Rating of CBS by Branch Employees (Out of 100) *

Sl. No.	Parameters	Local	Foreign	In-House	Joint Venture
1.	Functionality	57.4	82.8	91.6	89.5
2.	Flexibility	57.5	78.1	93.3	82.8
3.	Architecture, Technical Quality and Operational Performance	53.9	77.6	90.4	82.6
4.	Security	61.6	87.6	93.8	84.6
5.	Business Return and Benefit	60.2	78.4	90.3	83.3
6.	Vendor's Reputation and Support	56.9	75.2	84.6	42.0
7.	Customers' Happiness/Service	63.3	77.5	92.7	79.2
8.	Support of the IT Department	58.5	82.7	90.8	78.4
9.	**Overall Rating of CBS**	**58.5**	**79.1**	**88.7**	**79.9**

Source: BIBM Research

Note: *Scale: Very Poor '0' Excellent '100'

Branch employees are highly satisfied by the performance of In-House CBS, as seen from the above table. In all eight parameters, In-House CBS (88.7) clearly outranks the other types of CBS. The next position is held by Joint Venture CBS (79.9). Foreign CBSs is in the third position by achieving overall rating of 79.1 by bank employees.

2.10.8.3 Overall Rating of CBSs (Jointly by HOITs and Branch Employees)

Table 44: Topmost CBSs in Bangladesh by Banks' Ratings in 2017 (Out of 100) *

Sl. No.	Name of the CBS	Average Satisfaction Score by HOITs (100)	Average Satisfaction Score by Branch Employees (100)	Weighted Average Score (100) (60% HOITs + 40% Br. Employees)
Local CBSs by Ranks				
1.	Bank Ultimas	61.84	83.0	70.3
2.	Flora bank	58.74	72.4	64.2
3.	Ababil	48.77	78.5	60.7
Foreign CBSs by Ranks				
1.	Temenos T24	77.77	75.9	77.0
2.	Finacle	74.62	75.1	74.8
3.	Flexcube	69.21	81.4	74.1
4.	Misys	71.14	73.9	72.2
In-House CBSs by Ranks				
1.	eIBS	80.22	93.9	85.7
2.	PIBS	74.57	83.6	78.2
Joint Venture CBS by Ranks				
1.	Intellect CBS	74.89	84.9	78.9
2.	i-stelar	62.39	75.0	67.4

Source: BIBM Research

Note: *Scale: Very Poor '0' Excellent '100'

From the above table, we have found that among Local CBSs the most popular is 'Bank Ultimas'. It's performance is highly praised by both HOITs and branch employees. Weighted average score of Ultimus is 70.3. The second most popular Local CBS is 'Flora Bank' ('64.2). In Foreign CBS category, 'Temenos T24' is the highest ranking CBS (77), followed by 'Finacle' (74.8). Among In-House CBS group, 'eIBS' ranks the highest score (85.7). In Joint Venture category, 'Intellect CBS' (78.9) is more popular than 'i-stelar' (67.4).

2.10.8.4 Statistical Justification of Ratings among Categories of CBSs

Table 45: Kruskal-Wallis Test

CBS Type	Number of Banks Using	Mean Rank	Chi-Square	Sig.
Local	12	12.50	11.34 (3 d.f.)	0.011
Foreign	12	18.33		
In-House	2	24.00		
Joint Venture	5	15.60		

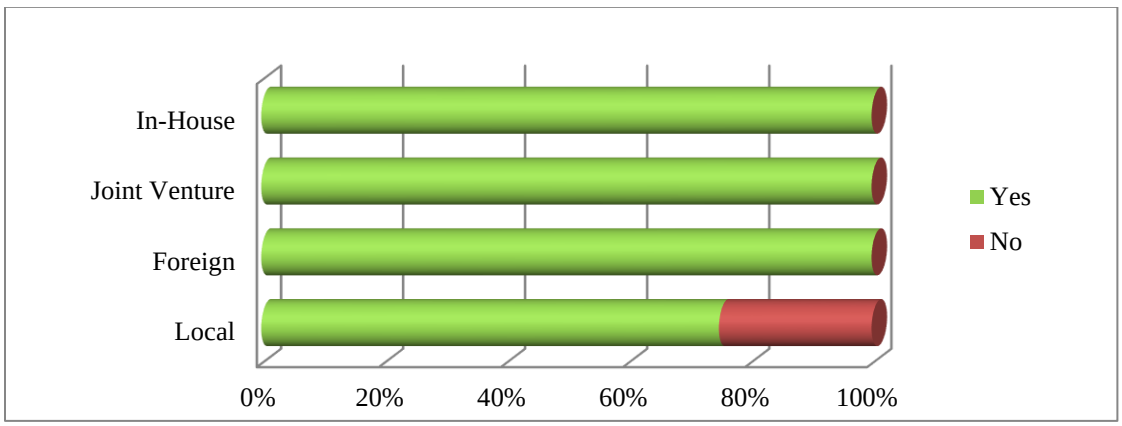
Source: BIBM Research

Table-42 and 43 clearly shows the deviation of overall ratings of the CBSs with respect to CBS types assigned by the HOITs and end users of the CBSs (employees). To test whether there is a statistical significant difference among the ratings of different types of CBSs, the Kruskal Wallis test is performed. For that reason, calculated weighted score for the CBSs being used by each bank is considered for ranking. After assigning ranks to the scores obtained by each CBS of different banks, ranks are then grouped together with respect to CBS Types. Finally, mean rank for each group of CBS is calculated for the Kruskal Wallis test.

The Kruskal Wallis test is used to see whether there is a significant difference among the quality of Local, Foreign, In-House and Joint Venture CBSs. Chi- Square value of 11.344 with 3 degrees of freedom is significant at 5% level of significance. That indicates a significant difference of quality among different types of CBSs.

2.11 Reference of Banks about Their CBS to Other Banks

Figure 7: Do you Recommend Your CBS for Other Banks?



Source: BIBM Research

Users of In-House, Foreign and Joint Venture CBS are more satisfied than the users of Local CBS, which is clear from the above graph. All banks that use In-House, Foreign and Joint Venture CBS praise the performance of the software and recommend other banks to use it. But only 70% users who use Local CBS are happy with the performance of the CBS.

2.12 Major Challenges/Problems of CBSs Identified by HOIT of Banks

The Major challenges at a glance are identified by HOITs of banks and summarized in the following tables.

Table 46: Major Challenges of CBSs Identified by Banks

Sl. No.	Major Challenges	% of Banks
1.	Functionality	74
2.	Flexibility	79
3.	Cost	54
4.	Ability of the business to adjust to the new system	68
5.	Operational performance	72
6.	Availability of skilled personnel	64
7.	Vendor capabilities and credentials	69
8.	Security	45
9.	Data handling and migration	39
10.	User friendliness of user interface	41
11.	Upcoming FintTech competition	34
12.	Report Generation	82

Source: BIBM Research

It is seen from the above table that a major portion (82%) of our banking industry facing difficulty in preparing proper/customized report. After that, the banks encounter the problem of less flexibility of their CBSs. Next, 74% banks inform that their CBSs are not functional up to the mark. Less quality of operational performance is another problem faced by banks (72%). 68% banks report that, their business cannot be fine-tuned with the new system. Selection of reputed/renowned vendor is another massive problem for banks. 64% banks feel that their In-House capability/skill is not enough to get the full benefit of the system. High cost of the system is another huge problematic area for banks. Many banks (54%) cannot afford the price due to budget constraint. 45% banks notice that less security of the system poses a great problem for them. Also, 41% banks complain that, the user interface of the system is not user friendly. Data handling and migration is another problem, which is faced by 39% banks. Lastly, 34% banks sense that, their system is not state of the art standard that can handle upcoming business requirements.

Table 47: Major Problems of Foreign CBSs Identified by HOITs of Banks

- Congestion problem occurred when reached user limit.
- Desktop based. Browser based version required.
- Business requirements are not covered.
- Country specific business practices can't be accommodated.
- Many reports of central bank can't be generated directly from CBS.
- For enhancement/customization vendor demands unexpected time and big amount of money.
- Lack of required API on demand.
- Existing CBS version is not fully supported by vendor.
- Unable to cope up with ongoing Fin-Tech banking industry trend.

Source: BIBM Research

Table 48: Major Problems of Local CBSs Identified by HOITs of Banks

- Unexpected lock of transaction/table/row.
- Database security problem.
- Lack of many features.
- MIS report is not available as per bank's desire.
- No standard interfacing software is available.
- Not innovative.
- Implementation of regulatory changes.
- No test environment is maintained at developer side. IT Professionals are very poor in knowledge.
- Unskilled manpower in IT Departments in banks.
- During patch/release/version update banks need to stop delivery channel services for the time being.
- Absence of generic API for plug-in with any third party vendor.

Source: BIBM Research

Table 49: Major Problems of In-House CBSs Identified by HOITs of Banks

- Frequent change request.
- Instant requirement from regulator.
- Human resource migration.
- Insufficient training.
- Lack of employee motivation.
- Poor process management and policy.

Source: BIBM Research

Table 50: Major Problems of Joint Venture CBSs Identified by HOITs of Banks

▪ Legacy Data. ▪ Browser Dependency. ▪ Problems arise when new release installed.

Source: BIBM Research

2.13 Major Challenges/Problems of CBSs Identified by Terminal Users/Bank Employees

The major challenges at a glance are identified by terminal users of CBS and summarized in the following tables.

Table 51: Problems of Foreign CBSs Identified by Bank Employees

Sl. No.	Major Problems	% of Banks
1.	Inadequate reports and generation of reports and statements is very slow.	91
2.	No quality training on software.	35
3.	Often slow network and data transfer rate hampers operations.	100
4.	All modules are not introduced.	28
5.	More time consuming operation. Sometimes it hangs up and customers become angry.	77
6.	Not user friendly.	56
7.	Old and Rigid system.	25
8.	Not flexible. Lots of unnecessary steps for a single task	36
9.	Statements and reports are not easy to understand.	36
10.	Not Graphical User Interface based.	22

Source: BIBM Research

Table 52: Problems of In-House CBSs Identified by Bank Employees

Sl. No.	Major Problems	% of Banks
1.	Automated log-out/ time-out problem	36
2.	Slow network and data transfer rate.	89
3.	Cooperation and IT support is not adequate.	75
4.	Sometimes customers become unhappy because of delay in providing service	65

Source: BIBM Research

Table 53: Problems of Joint Venture CBSs Identified by Bank Employees

Sl. No.	Major Problems	% of Banks
1.	Operational Problem. All kinds of activities cannot be done.	55
2.	Sometimes network get slow.	89
3.	IT support is low from IT Department.	78
4.	Transaction monitoring is not easy, specifically for suspicious or unusual transaction.	65
5.	Operational training is required for end users.	39

Source: BIBM Research

Table 54: Problems of Local CBS Identified by Bank Employees

Sl. No.	Major Problems	% of Banks
1.	Sometime slow network.	94
2.	Report generation problem. All the necessary functions are not available. All sorts of report can't be generated.	81
3.	Limited user access.	39
4.	More time consuming operations.	32
5.	Unskilled manpower. Training needed.	51
6.	Less capability.	39
7.	No alert system is provided by the software.	21
8.	Transaction monitoring is not easy, specifically for suspicious or unusual transaction.	34
9.	IT department doesn't respond quickly in case of problems.	69

Source: BIBM Research

2.14 Barriers to Implement the State of the Art Banking Software in Bangladesh

We asked the experienced executives to identify the major barriers to implement the state of the art banking software in Bangladeshi banks. The suggestions are summarized below.

Table 55: Major Barriers to Implement the State of the Art Banking Software

Barriers Identified by the Heads of IT
▪ Functionality (ability of software to meet business needs and expectations) ▪ Cost and Financial Terms (costs of information systems project also include the cost of hardware, software and workspace) ▪ Vendor capabilities and credentials. ▪ System flexibility (whether the new system has the capacity to deliver business requirements required by bank). ▪ Data migration from old system to new system is painful. ▪ Deviation of standard banking practice. ▪ Lack of Technical know-how and mindset of end users for adapting new technology. ▪ Difficult to customize. ▪ Experienced resource is not available both in bank's side and vendor's side. ▪ Less availability of support in case of foreign vendor. ▪ Lack of high technical expertise, dedication and patience. ▪ Inadequately researched or defined requirements. ▪ Understanding of the Technology Gap. ▪ Lack of qualified and experienced ICT professionals. ▪ Unwillingness to business process re-engineering. ▪ Lack of IT Governance.

Source: BIBM Research

2.15 Roles of Bangladesh Bank to Implement a Sustainable CBS

We asked the experienced executives about the major roles that might be played by Bangladesh Bank to implement a sustainable state of the art banking software in the banks. The suggestions are summarized below.

Table 56: Roles of Bangladesh Bank to Implement a Sustainable State of the Art Banking Software

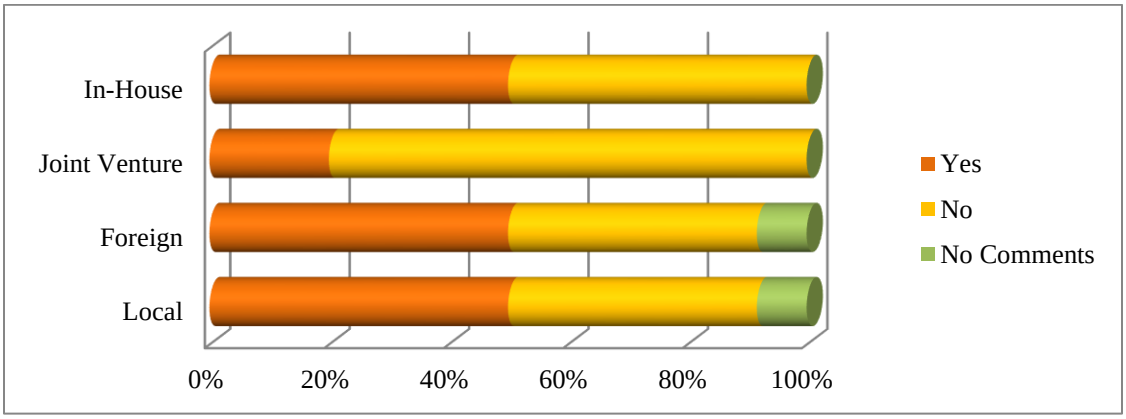
Suggestions by Heads of IT
▪ If Bangladesh Bank (BB) patronize local software engineers as well as vendors and give long term policy support then local software vendors could flourish. ▪ Need to develop and implement a detailed security guidelines by BB with tight Monitoring. ▪ BB may fix a chart of Account to be maintained by all banks. This will ensure uniform practice and procedure. BB may form a committee to analyze various types of banking business to bring all the banks under the same CBS. Ensuring security will be easier as every bank will be on the same platform. ▪ Strict compliance should be ensured by BB. ▪ BB may ensure full time involvement of the Top-Level Management in this regard. ▪ BB may help to ensure the arrangement of knowledge sharing sessions in home and abroad for the top and mid-level executives of the banks. Separate IT training budget must be ensured for this purpose. ▪ Bangladesh bank may strengthen the supervision on banking software. Risk focused approach might be improved. ▪ BB may develop a detail long-term plan for IT infrastructure that will help to support a huge domestic growth of banking sector in near future.

Source: BIBM Research

2.16 Unique CBS Development

For many reasons, demand of a unique CBS for all banks is increasing day by day. From the figure below, we see that, 22% banks that use Joint Venture CBS want a unique CBS for whole banking industry, this figure rise to 42%, 42%, and 43% for In-House, Foreign and Local CBS users', respectively. Entire banking community unanimously agrees to develop an exclusive CBS with the help of Bangladesh Bank, local vendors and foreign experts.

Figure 8: Do you think that Banking Sector should have a Unique CBS?



Source: BIBM Research

We asked the authorities about the development of a unique CBS under public private partnership (including all banks, Bangladesh Bank and Local CBS vendors). The suggestions are summarized below.

Table 57: Development of a Unique CBS

Suggestions by the Heads of IT
▪ Central bank has taken positive initiatives earlier. If Bangladesh Bank takes a long term (a period of 8-10 years) initiative to implement a common CBS, it seems to be achievable and the acceptability of the software will be very high. BB may form a common platform (consortium type) for this project. Bangladesh Bank needs to take the leading role under public private partnership for planning, designing, developing and implementing (with state of the art security features) a highly customizable CBS to cater all categories of banks. Government may help in this regard. ▪ A central CBS developing authority may be built up under the control of the Central Bank. The facilities of Islamic, Conventional, Micro-Finance etc. have to be engaged in the CBS differently. ▪ A consortium including all banks, BB and Local CBS vendors may be formed. A revenue sharing model might be designed. An ordinary body might be formed including experts for standardization, approval etc. ▪ First of all a company may be formed subsidized by Bangladesh Bank and all commercial banks. Then adequate numbers of banking software developers may be recruited in that company. Thereafter, some banking software functional specialists might be deputed in that company from Bangladesh Bank and some commercial banks. Under the guidance of the functional specialist the developers will develop the software. It would be better if the proposed software is cloud based where banks' own custom module can be integrated. ▪ A separate company may be formed with shares of major financial institutes and leading vendors. Some experts from different banks and vendors may be employed as team lead and project managers. Then a new team can be formed under supervision and training of experts. Using this expertise, the team can develop the CBS; consultants can be hired from abroad, if needed.

Source: BIBM Research

2.17 Overall Major Roles of Bangladesh Bank for Smooth CBS Operations in Banks

Bangladesh Bank has been working proactively for a long period to develop the overall ICT infrastructure of banking sector. Proper guidelines and monitoring of Bangladesh Bank has also been helping the ICT departments of different banks to expand in right way. As a result, expectation from Bangladesh Bank has been increasing day by day. Besides, due to rapid growing of state-of-the-art e-banking products and services, banking community expects more contributions from BB. Opinions and expectations of banks regarding the role of BB are summarized and presented in the following table.

Table 58: Role of BB

S. No.	Major Roles that Can be Played by BB	% of Banks
1.	Unique CBS can be developed under the supervision of BB	94
2.	Regular update of guidelines is required ensuring its implementation	65
3.	Continuous research to find out problems and solutions	51
4.	BB may rank existing CBSs in the market and approve CBS before purchase by any bank.	21
5.	A software testing institute may be formed like BSTI in Bangladesh.	34
6.	A specialized training institute required only for IT training.	79

Source: BIBM Research

3.0 Challenges and Recommendations

Impact on Business: The benefit of using CBS should target both cost and income levers. The actual value can be measured in terms of direct enhancement in operating margins; curtailed cost–to–income ratio; improved operating leverage and overall return on equity. In this study it is found that a high-quality CBS has positive impact on reduction of cost–to–income ratio, operational cost and stationary cost. Also, it helps to maximize profit.

Market Share: The overall scenario of CBS has changed considerably in Bangladesh since 2000. Conversely, we do believe that banks will deploy such type of solutions that deliver functionality, flexibility and connectivity. According to our survey results, banks want to buy core banking system that include technology, regulation, security, compliance and control. No single software vendor dominates the Bangladeshi market. It is remarkable that foreign software vendors hold a comparatively resilient position in Bangladeshi market; Temenos T24, Flexcube, Finacle and Misys are good examples. Among Local CBSs, Bank Ultimus holds the topmost position in the market.

Change of CBS: About 10% banks pointed out that they intended for upgradation or substitutes of their banking systems to start within a year. The nature of the planned changes varies: for Local CBS users mainly want to change the whole systems, whereas for Foreign CBS, users' changes are mostly limited to enhancements of existing systems. In our viewpoint, changes in CBS are required for banks in order to lessen their cost-to-

income ratios and remain competitive with new players in the industry. If this trend prevails, in the coming years Local CBS might be replaced by Foreign CBS, harming the local software market and national economy. However, we have found that many banks want to change their local and legacy systems with foreign systems. According to our survey, a large majority of banks (5 banks) showed their interest to buy foreign software. The question of 'why banks have a strategy towards Foreign CBS when there is a number of Local CBSs operating in the market for a relatively long time and their market share is also good' revealed that though a little bit cost-effective bank management have found local packages are less well-designed and flexible to meet up bank's particular business demands, and therefore as less suitable.

CBS Satisfaction: From our study we have found that, banks increasingly purchase core banking systems and banking solutions from foreign software vendors. Subsequently banks do not feel the necessity to develop their own banking systems. Still in the market there is a crying need for a good CBS. That means to achieve client requirements vendors have to further develop their banking solutions. In our survey we observe that banks indeed are normally pleased with the performance of their existing CBS. Though Foreign CBS dominating the market, highest satisfaction is found for In-House CBS followed by Joint Venture, Foreign and Local CBS.

Right Selection of CBS: It is seen that, worldwide 20% of IT projects worth $500 billion actually fail to attain corporate objectives. Sometimes it may happen that the bank's strategic direction is imprecise or unclear. Bank management must have the vision to understand the overall long term strategic goals of the bank (i.e., progress, branching, new products and services, etc.) in order to find and select a perfect technology solutions that may fulfill their necessities both at present and more significantly, in the upcoming days. Otherwise, the bank will face the hazard of installing a wrong software that doesn't match with the bank's vision or line of strategy. Also, if the bank wants to change the technology platform, the cost may be two to five times higher of its annual technology expenditure amount. The price includes not only money, but time and frustration, misused training and maintenance charges, and declined productivities and prospects. Most of all, one may find his bank in a perplexed situation having to work around the erroneous system and vendor for the next five to ten years. In Bangladesh, 18% banks failed to select right CBS due to the lack of knowledge and vision and wrong suggestions by theoretical consultants. Bank management should keep in mind that, not all CBSs are similar. Each system will have its own distinctive features and functionality, so they have to concentrate on what's vital to their bank.

Often in the bank there are expert persons who have the ability to choose a correct technology vendor. This effort must be originated from the business requirements of the

bank rather than driven from an information technology perception. High-ranking managers and employees that represent each of the most important business functions of the bank can convey comprehensive understanding of a bank's business, operations and present technologies to the process. This team will be in charge of defining business and technical requirements, opting for prospective solutions and vendors, formulating the necessary requests for vendor proposals, assessing the resulting proposals and suggesting a technology vendor and solution to senior management. In some cases, a bank may consider the quality of service and SLA is more significant than feature/functions. The RFP should focus on the high priority criteria and should be related to the bank's total strategic direction.

Make or Buy: Banks' IT systems strategy should decide whether to make or buy a technology solution. According to our survey, in Bangladesh about 10% (both local and foreign) of the banks presently use In-House developed banking platforms. We queried the banks to know their IT system strategies, as well as the decision to 'make' or 'buy' core banking systems and about their opinions buying core banking systems still is the core strategy in all of these business domains. The use of In-House CBS remains low among Bangladeshi banks, and banks continue to be very contented with these systems. According to our survey, two banks informed that they will carry on the developments of new applications on their In-House build platforms. This states that how satisfied these two banks are with the process of persistent improvement on In-House build platform. But no banks reported to start a new application development for their banks. Rather, 85% banks suggested to develop a unique CBS under PPP project where experts (local and foreign), local vendors, banks, central bank and government can take part.

Reputation of Vendors: In our survey we enquired about software suppliers of banks; the results indicate that there are no leading software vendors in our market. The market of CBS in Bangladesh is characterized by the existence of several vendors, all contending for the attention of banks. There are more than 10 vendors with an installed base in the market. We found that, private banks particularly prefer foreign software vendors for some business actions because of their offerings that include functionality and flexibility. Foreign CBS does not match completely with our local banking practices. Always a lot of changes required. Local software giants may come forward to develop an international standard CBS which will be based on Bangladesh's practices including international standards.

Cost: The biggest challenge faced by the banks is the increasing requisite for the digitalization of banking procedures and client interactions. The second most significant driver is cost-effectiveness. According to our findings, one in four surveyed banks mentions cost effectiveness as the key driver. In banks, business observes the costs of IT as high. The systems often function on pricey hardware and making modifications in this

multifaceted atmosphere is also a costly journey. Though the service quality, training, and integration with current technology are vital and potentially more important but banks have to consider price also. Cost structures not only include software license and implementation but also investments in hardware, networking, third party software, database and operating systems are necessary. Also added investment may be needed for training and data cleansing and migration. All these cost components make up the Total Cost of Ownership (TCO).

New Technology Challenges: Banks pointed out that for information gathering and increased transactions mobile channel is becoming the desired channel. Fintech developments are gaining momentum at a fast pace. It gives a sign that newer and newer technological innovation can create a pressure on traditional institutions' business models. BlockChain technology that is used for BitCoin currency could be very powerful. Technology giants such as IBM and Microsoft as well as many banks have joined consortia to invest in BlockChain pilots together.

The use of Data Analytics is much neglected on banks' IT agendas. According to the survey a minority (6%) of banks are investing in data analytics to improve risk and fraud management and enhance the customer experience and new product design. Till now their initiatives are in initial phase. No visible outcomes are seen so far. Again, rest of the banks does not formulate any concrete plan to start using advanced analytics.

In the coming years growing technologies, new opponents and ever more regulatory requirements will create pressure on the banking sector. All these have an impact on their business and cost models. In order to respond to this drift a modification of the banking system landscape and coping up with new technologies will be essential components of any strategy.

Security concerns about the execution of unlawful doings towards a business using digital means. In order to defend these cybercrime an appropriate understanding of the nature of these attacks is crucial. Both large and small banks are subject to cybercrime hits. As a result, banks acknowledged the significance of cybercrime and investing incessantly to detect and prevent it.

Regulatory Challenges: Struggles to accomplish a string of new regulatory requirements consume a large portion of banks' IT budgets and resources. From our experience and regular interactions with many of the banks in our survey we have found that new regulations put a real burden on IT resources of banks. On the regulatory agenda we come to know that banks will have to face a wave of requirements coming from the Central Bank and other national regulators/agencies. How rigorously the effect of regulatory developments will be on banks' IT systems, processes and data management varies

between banks? Obviously, it will be determined by their size and complexity of actions and their existing knowledge and resources. Another challenge the banks are facing is the readiness and quality of data according to the regulators' requirement, and the level of detail at which banks have to deliver data to them. Success factors of banks crucially depend on data quality and reporting efficacy. Vendors of CBS must fine-tune their products to expedite this change.

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