

**Implementation of Cloud ERP in a Collaborative Smart Value Chain
Network: A Proposed Framework for Small and Medium Enterprise
(SME) Collaboration Ecosystem in Bangladesh.**

BY

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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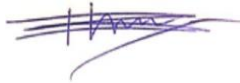
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APPROVAL

This Thesis/Project titled “Implementation of Cloud ERP in a Collaborative Smart Value Chain Network: A Proposed Framework for Small and Medium Enterprise (SME) Collaboration Ecosystem in Bangladesh.”, submitted by Nayeemul Huda Khan to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of MS in Management Information System and approved as to its style and contents. The presentation was held on 24th January 2023.

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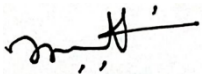
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I hereby declare that, this project has been done by me under the supervision of **Md Zahid Hasan, Assistant professor, Department of CSE**, Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

ERPs provide crucial informational management capabilities to businesses of all kind. Cloud based ERPs are now seeing increasing adoption along with emerging industry 4.0 technologies which are maturing and becoming increasingly integrated within such environments. SMEs face the crucial task of adopting innovative technologies, especially ERPs cost effectively and reliably within their resource limitations. Thus, based on these contexts, the study aims to explore SMEs in relation to ERPs and how they would interact collaboratively within such a network and further investigate the importance of SME interorganizational cooperation. Research is based on a qualitative approach, where through literature review of similar ideas and relationships have been done, with a historical case study of authors professional experience in the field. Upon such review and experience, two frameworks are proposed where one, a micro perspective of an ERP through a businesses point of view and secondly, of a macro perspective of a collaborative network where SMEs can interact through it across geographic and industry limitations.

Key words: Cloud ERP, Collaboration Network, SME, Digital Transformation, Industry 4.0.

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CHAPTER 1

Introduction

1.1 Introduction

The increase in adoption of Industry 4.0 technologies, coupled with the ever-higher integration of digital economy, current businesses face the challenges of business process transformations. Whereas, large enterprises with established global footprint, investments in IT capacity and capabilities are expected continually and varies annually, digital transformation of old legacy systems and methods of operation is a constant.[1] This however is not the case with small and medium enterprises.

One of the fundamental areas of business operations that is currently experiencing its own digital transformation is the Enterprise Resource Planning Systems (ERP). ERPs embodies the most important aspects of a management information systems (MIS) within an organization, given that such systems have been in widespread use across industries and have faced continuous evolution throughout the last five decades.[2] The current phase of ERP transition is utilizing the cloud infrastructure where vendor determined cloud solution is usually the preferred method of deployment. This however have opened new opportunities of its own where additional service integration is now a possibility.

Previous ERP systems which were siloed within departments and isolated within individual organizations have become a reality of the past. New possibilities of Industry 4.0 (I4.0) technologies are playing a larger role in information management which include but is not limited to capabilities such as Big Data analytics, Artificial Intelligence (AI) based automation workflow and most importantly Collaboration Networks (CN). However as mentioned before, individual attainment, development and implementation of such technologies require significant investments which for SMEs in most cases are not financially viable, unless policy initiative and regulatory changes make access to such financing less costly. [3]

SMEs getting priced out and losing accessibility of such key generational technologies is a particular concern, although due to the scalable nature of cloud infrastructure, multi-tenant Software-as-a-Service (SaaS) or Infrastructure-as-a-Service (IaaS) distribution models have

made such accessibility issues much more palatable though a pay-as-you-go or pay-per-use subscription payment tiers. [4]

This is currently an area of business transformation in the making and is seen as a much more equitable and sustainable path for SME participation as such pricing plans eliminate upfront costs, reduce implementation and integration time, as well as accommodates for organizations with limited IT expertise. Such ERPs are now transitioning into a whole new category of systems called an Extended ERP system or ERP II. ERP II is a relatively new concept and is the next evolutionary step of current ERP systems as they are not just solely just another system, rather its “A network of organizations who exchange values, share data and automate cross country processes.” [5]

For SMEs, benefits of such systems will not solely aid in better use and organizational efficiency of its existing resources, a cloud deployed system will allow for increased collaboration with an industry value chain. This will in effect create a smart manufacturing and service delivery mechanism within an eco-system allowing for incentivization of local specialization and inter-connectivity between regional hubs of SMEs throughout a country. In this regard, SMEs primarily benefit if such a knowledge sharing and information exchange ecosystem leads to pooling of resources and sharing of risks. [6]

1.2 Problem Statement

This report attempts to address one of the fundamental problems that SMEs face, which is primarily their lack of connectedness, awareness and struggle for business lead generation. SMEs lack of use of proper information systems to manage information both internally and externally is a point of concern. Moreover, a lack of collaboration, inefficiencies in supply chain coordination and partnership discovery are other areas of where SMEs still lack behind. Thus secondarily, a lack of through undertakings of conceptual theories regarding SME collaboration challenges and their interactions is still to brought under a framework.

Further questions about the practicalities and challenges of such collaborative ecosystem implementation are explored in the face of higher ERP and Information System (IS) usage. Since no other such system has been implemented within Bangladesh’s context, this report aims to explore how a conceptual framework for such a system that is applicable for collaboration.

1.3 Research Objectives

The aim of this paper is contributed towards the limited literature of such a CN system within the Bangladesh's developing economy context. Research is conducted with a qualitative method with thorough Content Analysis of existing literature and is done with the identified key words. Based on the exploratory review of existing literature 2 frameworks are proposed exploring the micro and macro level views of businesses ERP system with a framework of a collaborative platform ecosystem. Further addition to implementation architecture is proposed. This report builds on secondary sources of literature upon which frameworks are adapted from.

1.4 Research Questions

- 1) How can a collaborative network help small and medium enterprises achieve greater efficiency of their limited resources?
- 2) How such a system may look like conceptually and be implemented contextually within a Bangladesh SME setting?

1.5 Report Layout

The report is structured as follows.

In Chapter 1 introduces the concepts of interest and explores the problems to be addressed in the paper.

In Chapter 2, the literature review and the historical background is elaborated. This chapter will further discuss on the nature of the previous works and the context of current system.

Chapter 3 will be on the research methodology and two proposed frameworks of the proposed system presented from secondary data analysis findings along with a historical case study of a SME in context with the material.

Chapter 4 will be about discussion of research findings and comparative analysis done from secondary data. Concerns will be addressed.

Chapter 5 will conclude the report and further suggestions are made.

CHAPTER 2

Literature Review

2.1 Related works

Industry 4.0 was first termed in 2011 by a German government industrial policy initiative where the interconnectedness of cyber and physical systems through a network of sensors, systems and machines would help create a “smart value chain” that would go beyond an individual firm’s purview. [2] According to author Rüßmann et al. Industry 4.0 comprises of technologies which are predicted to transform the nature of various industrial operations.[6]

Authors Kazemargi et al. [1] explored the implication of Industry 4.0 technologies in context of SMEs and these frontier technologies and how the growing gap between said SMEs and large corporations can be closed through policy driven initiatives and greater and easier access to financing. Further conclusions were drawn on the importance of cloud infrastructure and its implications for SMEs for effective IT resource scaling as referred by a study done by authors Marston et al. (2011) [7]

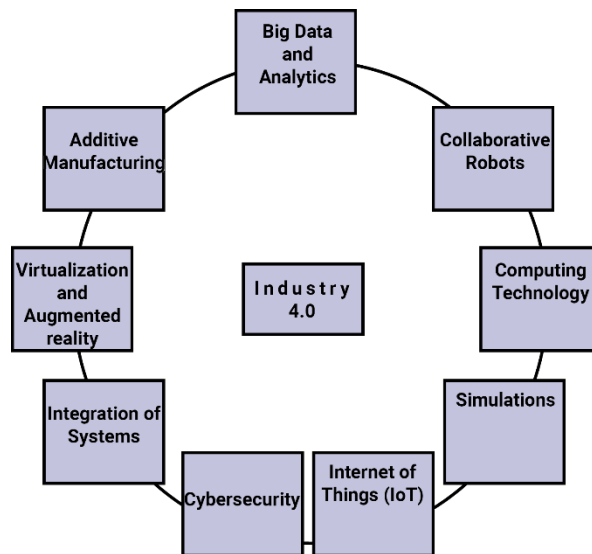


Figure 1: Industry 4.0 comprises varying technologies. Adapted from Kazemargi et al. [1]

SMEs are widely recognized as the economic growth drivers of an economy. Together, the various categories of SMEs are reported to contribute between 80 to 85 per cent of industrial employment and 23 per cent of total civilian employment according to [8].

Food and textile units including garments account for over 60% of the registered SMEs with one study based on a SMEs in Bangladesh key identified factors that affected the performance of such businesses with one of the major issues inhibiting growth was lack of modern technology accessibility both in terms of hardware and software. [9]

ERP systems constitute of an amalgamation of software and hardware system elements with a focus on supporting the core essential processes of a business operation. The configuration of such systems to fit the custom needs of varying businesses require an extensive implementation phase and expertise. [10]

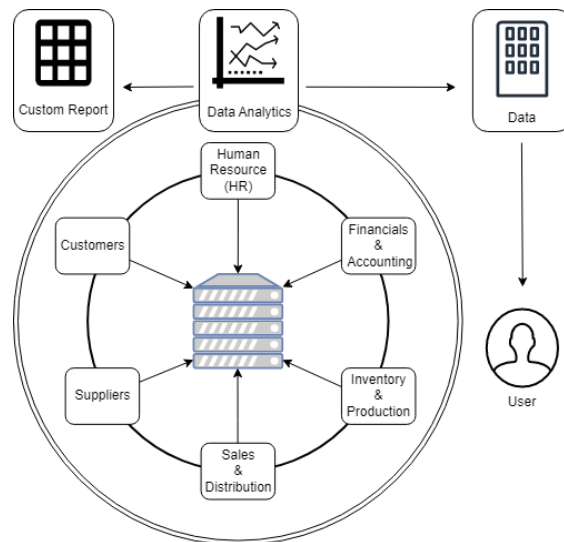


Figure 2. Overview of an ERP system based on Powell et. al. (2013) [14]

According to a study [11], authors have studied the difficulties SMEs face in implementing ERP software as implementing such complicated softwares for customized business requirements itself needs a significant knowledge in Information Systems (IS). Similar studies have mentioned how the investment deficiency to up keep IT systems with latest technology is increasingly difficult for SMEs due to factors such as “limited IS Skills of Workforce, lack of financial resources, and IT infrastructure” [12] Furthermore, studies have been done on cloud service deployment models such Software-as-a-Service (SaaS) as a way to deliver technologies in a more accessible and cost-effective way where reduction in implementation time, and limited IT/IS expertise would suffice. [13] Softwares in general are seeing increasing

deployment via the cloud where a web-based user interface is becoming the primary interaction menu for customer facing service delivery in contrast to the traditional deployment model of on-premise manual installation per use case. Benefits of better accessibility is particularly a area of concerns of these studies.

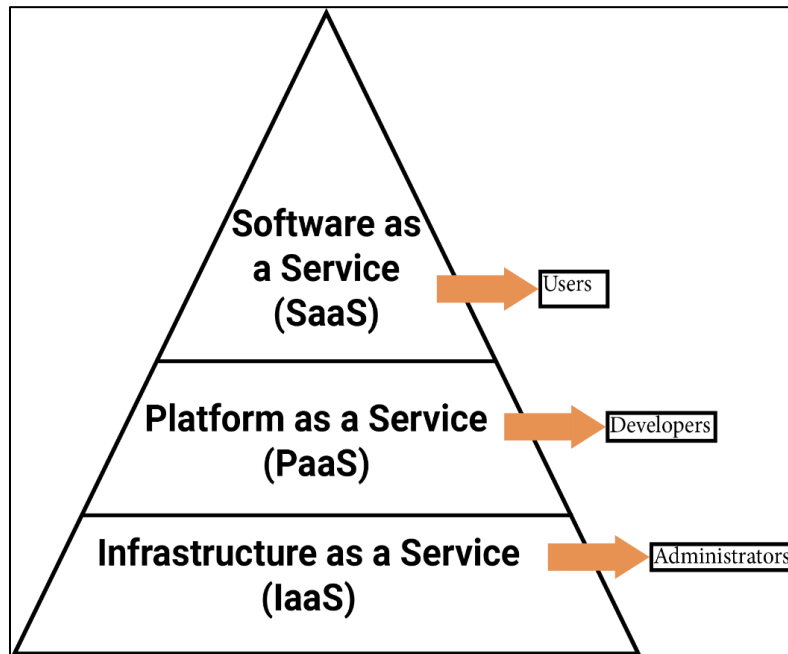


Figure 3. Cloud Deployment Models currently most used. [15]

Cloud adoption among SMEs is increasing according to the authors Radziwon et. al (2014). [16] where the study was done on SMEs in manufacturing sector setting and it was observed that, greater access to technologies via a cloud platform reduces operation costs. However, concerns were raised regarding security of a multi-tenant cloud infrastructure which may hosts important enterprise operational data and thus may be prone to higher chance of cyber interference by rouge actors. Cloud based application and implementation have seen its own dedicated research with focus on security and data privacy by authors on the paper [17].

Author of the study based on the Nordic setting [18] the author mentions a theoretical framework where fundamental functionalities of an ERP system that are identified they which can broadly be categorized into 3 contexts: They are 1) Technology 2) Organizations 3) Environments.

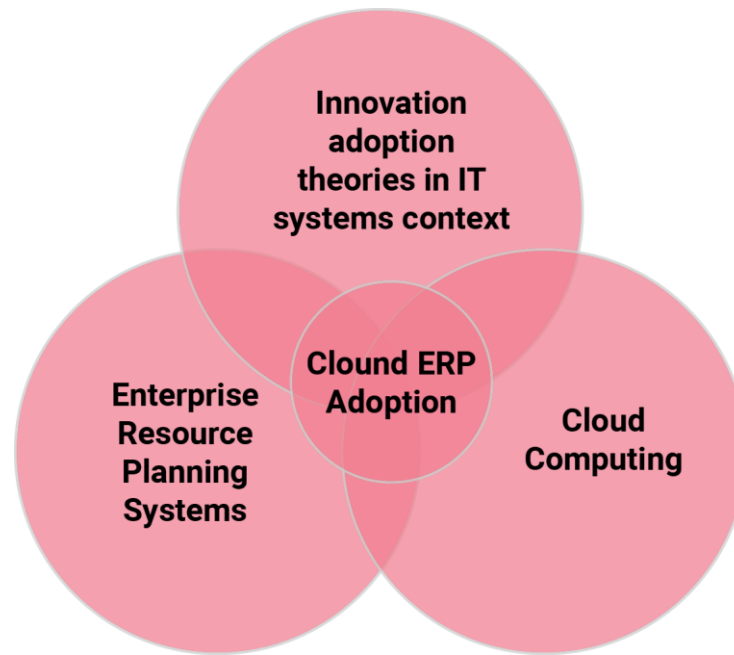


Figure 4. Theoretical framework for cloud ERP adoption. [18]

Beyond the challenges of adoption and maintenance of new technologies SMEs with ERPs face new challenges with existing on-premise ERP systems.

While such ERP systems themselves have solved previous problems of internal informational silos through better integration, standardization and cost effectiveness of cross departmental information interactions via a central database, [19] digital transformation across various business operational domains along with greater internet connectivity have still yet to fully utilize a smart value chain ecosystem where dynamic communication and improved integration for supply chain management, procurement and risk sharing is easily accomplished.

Supply chain subject matter in relation to ERP system is thoroughly investigated in the study. [20] Future of ERPs according to [21] will build upon the cloud-based deployment into an ecosystem where Networked enterprises or Enterprise 2.0 use I4.0 tools through the web and achieving greater collaboration, generation of content and boost in performance. Other mentioned integration of social networks which would lower implementation time, and greater Return on Investment (ROI).

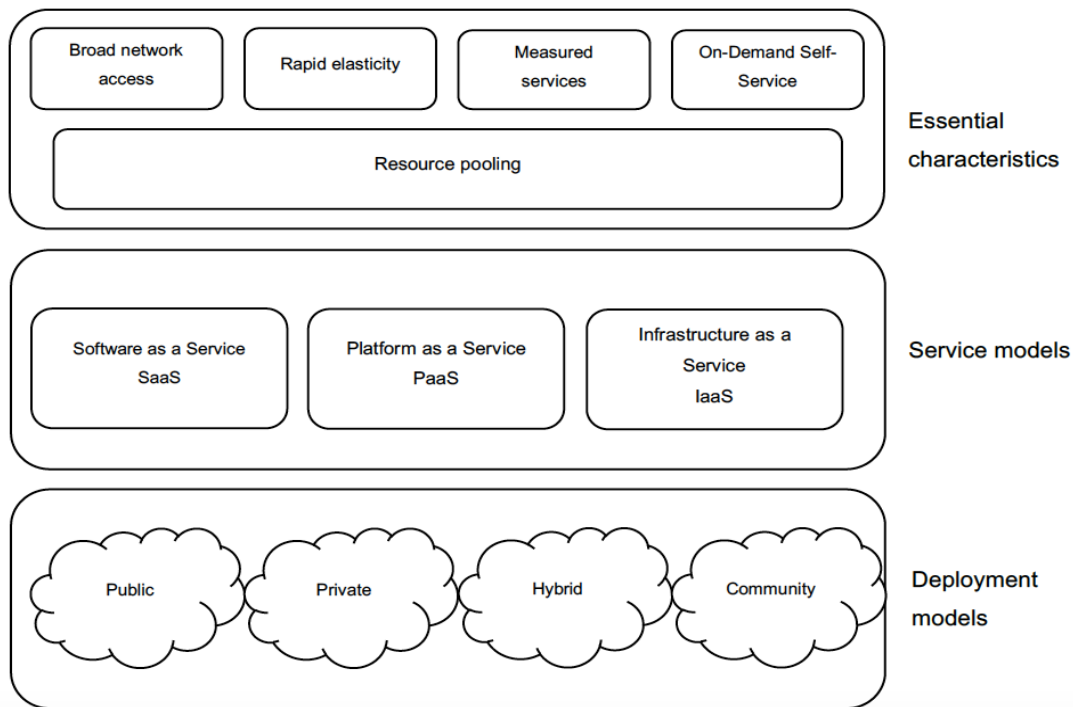


Figure 5. Visual depiction of a “Cloud” according to NIST. [22]

ERP systems for internal resource organization are not sufficient for modern businesses anymore. Major firms are increasingly adopting Cloud ERP (CERP) systems to better position themselves to be more aligned with external business process transformations with their internal IT strategy. [23] Benefits of ERP deployment via the cloud has further seen the prospect of a networked enterprise system i.e., a Collaborative Network (CN) which can transform value chain within an industry through an effective knowledge sharing and collaboration platform. According to authors of [24], collaboration is defined as a shared discovery or creation process where two or more entities having synergistic complementary skills interacting with each other, working towards a similar goal which neither could have previously been capable of achieving on their own. In a collaborative network platform, enterprises form independent coalition of organizations benefiting from each other’s competencies and specialization advantages. This has been theorized to derive advantages such as resource sharing and innovation collaboration. [25]

Authors of the paper [3] also explored collaborative networks on Italian SME context and how such a platform may affect labor divisions and models of production where SME clusters can use the network to discover existing supply channels and optimize towards a global production

process by enabling management of ‘multilocalized and interconnected’ enterprises. The derived benefits of such a network are deemed to allow for greater flexibility for SMEs particularly in ‘Collaborative Manufacturing [26]. Another study has mentioned the benefits of CN as it can help reduce management with increased organizational agility and improvement in utilization of IT usage and individual enterprise capability. [27]

Further studies have shown how such a collaborative platform can help firms, especially SMEs in volatile market conditions though either risk sharing or improved agility to capture market demands with strategic partnerships with suppliers and even peers [28]. In the paper, the author defines a collaborative networked organization (CNO) as unique participants who share a common objective, and therefore such a network provides an alignment framework for SMEs to achieve those prementioned goals. This essentially such a platform’s first greatest impact will be in supply chain management where such a network will replace the linear models of production.

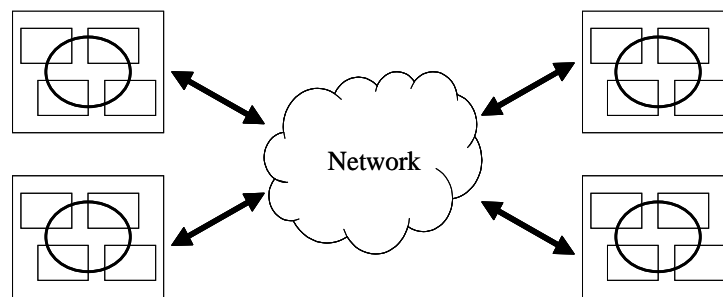


Figure 6. Linear Supply Chain Model. [24]

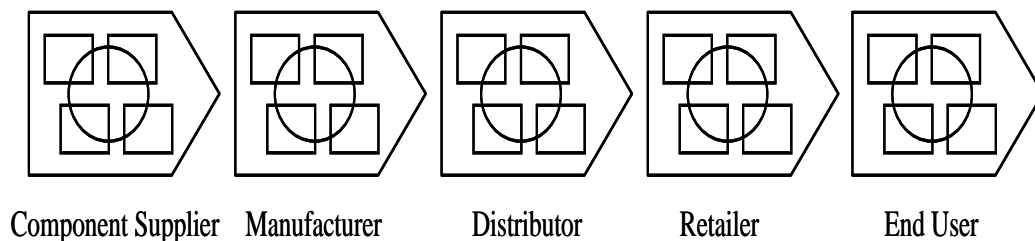


Figure 7. Networked Enterprise. [24]

2.2 Collaborative Network Challenges for SME.

CNs prime objective is to help organizations optimize their own competencies. However, such is not always the case. Previous studies on the subject have shown knowledge sharing is not as simple as it may seem at first and this poses a significant barrier to collaboration [29] Personal or organizational conflict of interest, have shown people to not share information due to an environment of secrecy and competition, where trust in peers is not yet earned [30]. Other studies have shown that many organizations did not have the correct platform, incentive and time to engage in such a sharing activity and therefore failed to understand the overarching benefit of such a system. [31] Trust and information sharing within a collaborative network have also been studied in by [32], where for organizations to cooperate smoothly, accountability and trust worthiness must be established first.

Beyond this, further challenges have been identified and listed in the Table 2 from the study where key dimensions that was studied were individual enterprise's motivation, the size and complexity of the network, cognitive distance, Trust, Skills, Time and Communication. The paper acknowledges that SMEs experience problems integrating due to lack of technology expertise which larger firms with greater sophistications do not.

Table 1: Challenges for SMEs in a Collaborative Network. [24]

Dimension	Description
Motivation	<ul style="list-style-type: none"> • Members are unclear about the rationale and associated benefits of working in the network. • Participants are uncertain about the drivers, goals, advantages, rewards and returns for sharing information and knowledge with others. • Feelings of isolation and decreased interpersonal contact experienced by virtual team members can lead to motivational challenges. • It is more difficult to implement and maintain common goals when team members are divided by time zones and geographical locations. • Lack of face-to-face interaction can lead to feelings of anonymity and low social control, which in turn can cause social loafing • It is more difficult to receive positive feedback in a virtual setting
Size	<ul style="list-style-type: none"> • Large groups increase the levels of complexity in the network. Work tasks and communication channels are then divided which causes problems with co-ordination. • As size increases there are more problems with cultural diversity, trust, and information security. • Security becomes particularly problematic as size increases.
Cognitive distance	<ul style="list-style-type: none"> • Different mindsets of individuals and organisations can result in misunderstanding and disagreement since their behaviour is grounded on different values and beliefs. • Members from separate organizations have different motivations and incentives. • Members prioritise the work they must deliver for their “home organisation” over what they must deliverable for the network.
Trust	<ul style="list-style-type: none"> • It is difficult to establish trust when members come from different educational and cultural backgrounds and have different professional loyalties. • Members are afraid to share propriety information with other organisations. They often fear that competitors may gain access to proprietary data if they share information such as sales forecasts, proprietary intellectual property or promotional plans with collaborating partners.
Skills	<ul style="list-style-type: none"> • Members do not know how to share information and knowledge. • They do not know what information and knowledge to share and the format in which it should be transferred.
Time	<ul style="list-style-type: none"> • Members cite the lack of sufficient time to capture and transfer critical knowledge. • They do not have sufficient time to rethink and redesign their knowledge processes.
Communication	<ul style="list-style-type: none"> • There is too much unimportant information transferred between members. • It is more difficult for information to flow in a virtual environment. • People often do not know what information to share, where critical information can be found and how to transfer it to others. • Information is often incorrectly formatted in documents and files and people are unable to communicate effectively. • There is a lack of a common language between representatives from different organisations and consequently information is often misinterpreted between its creation and its application.

2.3 Collaborative Network Critical Success Factors

Cormican, K. (2011) [24] also identified a number of success factors necessary within such a network that may be conducive to SME collaborations. They were identified as follows:

- 1) **Goals:** Entities within a network must share a goal where work schedule, cost, and technical requirements are common and well understood.
- 2) **Leadership:** Participants within the network who display leadership characteristics inhibit a partnership mindset and facilitate collaboration with more entities.
- 3) **Size:** Networks that are small, have higher likelihood of succeeding as larger size reduces individual performance.
- 4) **Composition:** Successful networks have participants who possess the experience and skills for delivering requirements in time.
- 5) **Ownership:** Mutual benefits must be present for all participants and it should be communicated well ahead of collaboration.
- 6) **Accountability:** Participants must display self-discipline and accountability when collaborating. Here commitment and trust among two critical aspects for mutual collaboration success.
- 7) **Trust:** Participants must be able to trust each other in a CN and to be able to rely on each other.
- 8) **Empowerment:** Individual participants must be able to make independent decisions to decide how to achieve the best outcomes within their responsibilities.
- 9) **Resources:** Each member of the network should have the tools, skills, time and knowledge for other members of the network.
- 10) **Communication:** Participants can avoid reinventing the wheel by providing accurate knowledge and information for solved problems to the right person within time and format.

Table 2: Success Factors for SMEs in a Collaborative Network. [24]

Challenge	Critical Success Factor
Motivation	<ul style="list-style-type: none"> • Member must take ownership of the network and be willing to contribute to its development. • Members must have a stake both in the process and outcome. • A strong leader who is able to clearly define the vision and set with obtainable goals is needed. • Goals must reflect the needs of the participating organisations. • Goals must be communicated to all so that everyone can work towards a similar end. • Clear performance measures should be developed to keep the vision and strategy focussed. • Clear roles and policy guidelines should be developed to minimize resistance.
Size and Composition	<ul style="list-style-type: none"> • The network should comprise four to seven members. • Members must have the functional background, skills, and experience necessary to implement the project deliverables. • Members must also possess problem solving, decision making and interpersonal skills.
Cognitive distance	<ul style="list-style-type: none"> • Mutual benefits must be defined and communicated. • Intellectual property issues should be agreed in advance. • Mutual accountability is necessary. • Members must know what they are responsible for. • Initiative, commitment, self discipline and pro-activity are essential. • Members should be encouraged to share ideas, take risks, and initiate change.
Trust	<ul style="list-style-type: none"> • Flexibility should be afforded to members at the early stages of development. • Members must be empowered to improve processes and respond to changing customer demands. • Workers should be given a certain degree of autonomy. • Failure should not be punished. • Members should be involved in the decision making process. • Communication channels should be open.
Skills	<ul style="list-style-type: none"> • Members must have access to relevant skills, methods and tools to perform their jobs well. • Tools must align with actual work processes. • Members must be equipped with the appropriate skills for sharing knowledge. • Specific budgets must be allocated to the network.
Time	<ul style="list-style-type: none"> • Time must be allocated at the early stages of the lifecycle to define goals and develop supportive environments. • Time must be afforded to redesign work processes.
Communication	<ul style="list-style-type: none"> • The right information must be available to the right people, in the right format, at the right time. • Information is reliable, accurate, complete and up to date. • Training should be provided to ensure that members understand the constraints of working in a virtual environment. • Face-to-face meetings should be scheduled where possible.

2.4 Previous literature of CNs and implementations

Authors of the paper [33] discuss a collaboration platform called DIGICOR – Decentralized Agile Coordination Across Supply Chains; a project funded by the European Union which aims to facilitate collaboration among SMEs by directly addressing the barriers that prohibit such cooperation. The study implements an architectural design of a platform in aiding supply chain management through EDSOA (Event Driven Service Oriented Architecture) which facilitates collaboration through published trigger events i.e., tender contracts within the network that different clusters of SMEs can bid against, where the original equipment manufacturers (OEM) publish their requirements within those bids.

Authors of the paper [34] have investigated on how a CN may help SMEs improve business performance in an Indonesian setting and concludes that such a network significantly improves business collaboration through leveraging innovation capability and competitive advantage. In one of its hypotheses the author mentions the importance of elements key for a network such as suppliers, clients, competitors, research organizations. CNs are described as being capable of serving specific organizations that can be built vertically where clients, suppliers and competitors involved or horizontally where research institutions, government organizations and universities are involved.

In the paper [35], collaboration is distinguished from cooperation. Terms that are components of collaboration such as networking, communication and coordination emphasized. The authors define a collaborative network as one where different participants which may be individual person or an organization who are independent, dispersed over a geographic area and unique in how they operate, their cultural values, social capital and end goals and all of whose interaction is done through a computer aided system. A goal-oriented network is defined in the paper as one where “continuous production/ service provision activities or driven by the aim of grasping a single (collaboration) opportunity.”

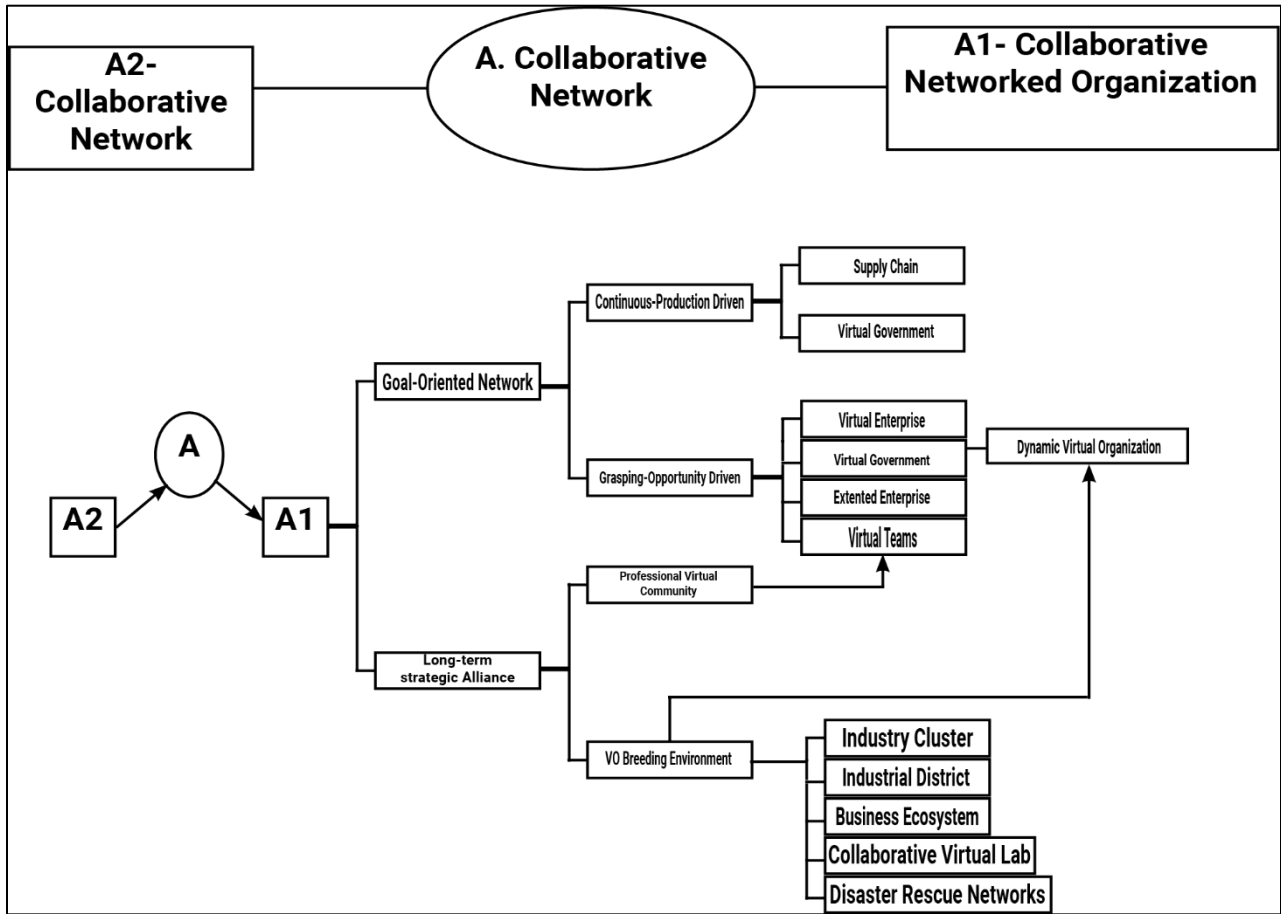


Figure 8. Example of a Collaborative Network based on [35]

2.5 Types of Collaborative Networks

Figure 8 shows a visualized depiction of collaborative network. Previously CNs were researched on the supply and manufacturing areas of business, application areas of CNs have increase in potential due to maturation of emerging technologies through which implementations of such ideas in practical areas is now a possibility. According to author, of the paper [36] CNs can broadly be categorized into 2 forms:

- 1) **Goal-Oriented Network:** In such a network, collaboration is temporary among organizations who share a similar object and require complementary skill and specializations to effectively achieve the identified goal using an underlying digital network system.

- 2) **Long-Term Strategic Network:** This sort of network is also known as Virtual Breeding Environments (VBE) which can take form among organizations with similar industry characteristics, such as industrial districts, clusters or ecosystem. Entities within such a network adopt a shared set of principles and interoperable support infrastructure for smooth collaboration.

2.6 Scope of the Problem

Research has been done on collaborative Networks on SMEs, however one done on SMEs on a developing context i.e., Bangladesh, has not yet been done. Understanding the implication of CERP on SMEs and effectiveness of a collaborative network for a smart value chain ecosystem within Bangladesh's business environment is still elusive. Similar projects for a collaborative ecosystem connecting supplier across regions has been tested and observed in other parts of the world with mixed results although it holds promise if proper conceptualization and implementation is executed. Researchers on implications of such network have focused on individual industries, like the Italian SME and Fashion supply chains in Indonesia, where studies focused on the accessibility, culture and attitudes towards innovations.

2.7 Challenges

Some challenges faced during the research are as follows:

- 1) **Data Collection:** Most research in this field have been qualitative in nature and therefore collection of data has been mostly based on secondary data and anecdotes.
- 2) **Conceptual Framework Creation:** Designing a conceptual framework based on secondary data for Bangladesh SMEs, the relevance is purely hypothetical. Implication of such a system's implementation is not yet known until pilot tested.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

On the previous chapter, a comprehensive literature review was done to establish the different facets of ERP and its current trajectory. Qualitative and Quantitative studies have been done to explore the implications of a collaborative ERP system of informational ecosystem where industry 4.0 technology's integration within a cloud infrastructure. This along with business model transformations where subscription of SaaS platforms has promulgated accessibility options for businesses of all kind. This is an important aspect of digital transformations of various business processes in general where complicated and hard to implement technologies have simply become a sort of plug and play feature into business transactions.

Many researchers have looked into the SME space in the digital transformation wave taking place where many Industry4.0 technologies have seen implementation due to a better time to market fit and businesses progressively using more digital tools for their daily operations, thus the academic interests in understanding further business implications of the use of such novel technologies is a current aspect being noticed. However, research into next generation of ERPs based on these underlying technologies in a developing country context i.e., Bangladesh is still limited therefore, data collection was time consuming and challenging.

For the purpose of this this chapter, a qualitative research methodology has been used based on a number of selected previous papers where data collection of has been done as its source. Based on content and thematic analysis, subjective conclusions have been drawn on prevailing themes of importance for use case of SMEs within Bangladesh and ultimately a conceptual framework/ design is formulated for implementation.

3.2 Research Design

Data for this paper has been collected primarily through a thorough review of literature of existing research where the content was analyzed using a systematic approach of reading

the literature, identifying the keywords and summarizing it under a subjective theme for knowledge representation.

Content Analysis is used to evaluate patterns within one or more pieces of information. Themes of each research are categorized each grasp a view of paper’s details for developing a conceptual design/framework. Lastly a case study of the proposed model’s hypothesized effects will be discussed as evaluation of the model.

3.3 Data Collection

Firstly, a broad level search was conducted using Google Scholar search engine, where using keywords and phares such as “Cloud ERP”, “Cloud ERP adoption in SMEs”, “SMEs” AND “INDUSTRY4.0”, “SMEs” AND “Bangladesh”, “COLLABORATIVE NETWORKS” AND “SMEs”, “DIGITAL TRANSFORMATION” AND “SMEs” AND “SUPPLY CHAIN”.

Journals, conference papers, article have been reviewed with such key words and narrowed down by looking though its relevance and reading its abstract and conclusion. The list of studies selected for our conceptual model creation are described in the next section.

3.4 Thematic Summary of Literature and Interpretations.

Table 3: Literature themes and interpretations.

SL.	Title	Key words	Content Themes	Interpretation
1.	Toward a Method to Foster the Digital Transformation in SME Networks. [37]	Digital Transformation, SME Network, Value Co-Creation	SME impact by digital transformation and potential for Value creation by a proposed Network.	Value Co-Creation by SMEs is possible through a SME Network where potential risks can be pooled and key competencies of individual firms be efficient utilized.

2.	COLLABORATIVE NETWORKS: Value creation in a knowledge society. [35]	Collaborative networks, collaborative networks taxonomy, value creation	Value creation and synergy through a Collaborative Network.	Collaborations by virtual organizations within a network result in a higher utilization of knowledge and increase business competitiveness and stability in business uncertainties.
3.	The architectural design and implementation of a digital platform for Industry 4.0 SME collaboration [33]	Digital platforms Industry 4.0 Digitalization Enterprise systems SMEs	Implementation design of a collaborative platform to address supply chain requests.	A collaborative platform will be beneficial for SMEs specialization and incentivize collaborative production, logistics and risk management.
4.	Design and Implementation of Cloud-Based Collaborative Manufacturing Execution System in the Korean Fashion Industry. [38]	smart manufacturing; collaborative manufacturing execution system; collaboration; value chain; Industry 4.0	Implementation design of collaborative Cloud deployed information system.	Focuses on manufacturing industry where collaboration maybe used improve supply chain executions. Smart value chain system is discussed in the context of Manufacturing Execution System (MES).
5.	The Improvement of Collaborative Networks to increase Small and Medium Enterprise (SME) Performance. [34]	collaborative networks, innovation capabilities, competitive advantage, business performance	Effectiveness of Collaborative Network in Developing Country Context	Collaborative Networks help SMEs be more innovative, competitive and effective in business operations. SMEs can better judge market corrections and adapt better for fluctuations.

6.	Enterprise resource Planning (ERP): Past, Present and future. [5]	enterprise resource planning (ERP); ERP II; future of enterprise resource planning; materials requirement planning (MRP).	Evolution of ERP.	ERPs are changing in accordance with changing business environments. Integration of E-commerce and M-Commerce within an interconnect infrastructure is expected.
7.	Benefits and challenges of cloud ERP systems - A systematic literature Review. [15]	Cloud ERP; SaaS ERP; SLR; Cloud ERP benefits; Cloud ERP challenges.	Cloud ERP: Strengths and Opportunities.	Cloud ERPs have significant benefits and is expected to be increasingly adopted by businesses of all sizes. Key benefits are lower costs, scalability, fast implementation and better accessibility.
8.	Benefits and Challenges of Cloud ERP Adoption by SMES. [41]	Cloud Computing, Enterprise Resource Planning, SMEs.	Cloud ERP adoption benefits and challenges for SMEs in Bangladesh.	SME adoption of cloud ERP is not high due to lack of awareness of its benefits. Discussions on Cloud technology to lower accessibility barriers is made which include a SaaS model to help SMEs in this regard.
9.	Collaborative Networks: Challenges for SMEs [42]	SME, Collaboration, Networks, Knowledge Sharing,	Critical Success Factors for collaboration among SMEs in a network	Critical success and failure factors were pointed out and emphasis on knowledge sharing and building trust within a network can help

		Challenges, Critical Success Factors		SMEs reduce risk of business failures.
10.	ERP II -Next-generation Extended Enterprise Resource Planning [37]	Enterprise Resource Planning; Supply Chain Management; Extended Enterprise; E-business	Connected ERPs within cloud environment enabling collaborations	Inter-Organizational collaboration is termed as ERP II where organizations become virtual and share data to mutual goals.

3.5 Proposed Collaborations Network Features

3.5.1 Network Framework Choice

A Long-Term Strategic Network is chosen for this model where through the help of a cloud ERP system, SMEs can form Virtual Organization (VO) for long term engagement. This Virtual Breeding Environment (VBE) will aid SMEs connect through network enabled smart phones that where business to business secure communication can be coordinated which is essential for such breeding environment. This network will originate from a central collaborative platform where virtual organizations will have tools to form negotiated terms for collaborations.

3.5.1.1 Critical Success Factors

Based on secondary research, success factors have been identified that will form an integral part of our system. [24] where the 10 networks success factors for enabling cooperation are identified. These factors are essential to develop our framework for collaboration among SMEs as these factors have been shown to improve a network's cohesion and cooperation for goals that are aligned for each entity within a network.

3.5.1.2 ERP Cloud Infrastructure

Individual ERP instances that organizations will use to access this network, will relay on a cloud infrastructure which will be central and foundational for the collaborative platform to operate on. Essentially, each ERP will have the capacity to interact within clusters of

organizations or cluster ad hoc network, which may choose to interact with external clusters or large enterprises who may be the solely using the platform to publish tenders.

3.5.1.3 SME Collaborative Platform

Hosted in the cloud, and only accessible through an ERP instance, businesses can access the platform where 7 initial features will be available for utilization. They are:

- 1) **Workflow management:** This will involve coordination of logistics among participants. Delivery dates, route updates and other information may be viewed here.
- 2) **Scheduling:** Through the ERP system, the schedule businesses can schedule individual operation with projected time and delivery dates. This coordination will have live feed updates when changed and communication is enabled both ways.
- 3) **Market Place:** A marketplace where businesses can publish subcontracts or tenders for larger work orders. SMEs can view and access the platform and initiate communication for possible collaboration.
- 4) **Rules:** Networks of clusters of collaboration can have their own principles or shared conventions that they may define individually. However, the platform will have its own strict policies to ensure trust and engagement rules are maintained. This may be done by the overseeing organization who is managing the network.
- 5) **Project planning:** Along with scheduling, a project planning module in the platform will aid in dynamic cooperation for the length of an entire project execution with additional project management tools.
- 6) **Third Party Integration:** Additional feature implementation of features will be allowed through a third-party application integration with the platform, creating a sort of its own application market place that individual ERP instances or clusters can use to fill gaps that is not made readily available by the platform initially.
- 7) **Risk Management:** Risk evaluation is another feature within the platform where SMEs can coordinate responsibilities or evaluate tender success probability through algorithms for forecasting using historical records.

3.5.2 Participants in the Network

The network will host multiple categories of participants who may be using the ERP instance for their own individual objectives. Moreover, since the ERP is cloud based, such organizations can establish itself virtually within the network to fulfill their informational requirements. Initially there will be 4 kinds of participants in the network. They are:

- 1) **Small and Medium Enterprises (SMEs):** The network primary participants will be SMEs who within their clusters will collaborate or access the platform for further market information need. SMEs can visualize their local and other regional peers within the industry.
- 2) **Large Organizations:** Larger enterprises who have significant assets but not individual market specialization can seek cost effective outsourcing and tender on orders they may fit specific SMEs of required ranking can undertake. These enterprises can Original Equipment Manufacturer (OEM) in manufacturing or Service industry seeking external expertise.
- 3) **Governmental and non-governmental organizations:** Governmental departments can use a customized version of the ERP instance through which e-governance applications such as taxation, regulatory updates and guidelines, informational needs that businesses may seek. Additionally, ERPs can connect with automated tax filing system in the future when such opportunity through governments own initiatives. Other Non-Governmental Organizations (NGOs) can have their own ERP instance through which they may seek information for their areas of focus within the network where direct business collaboration is a possibility.
- 4) **Universities and Research Institutions:** Universities and think-tanks can collaborate for their research problems that may require direct business interaction. Through the network, research institutions can see active clusters of SMEs and initiate communication for further definition of market problems.

3.6 Proposed collaborative network Diagram

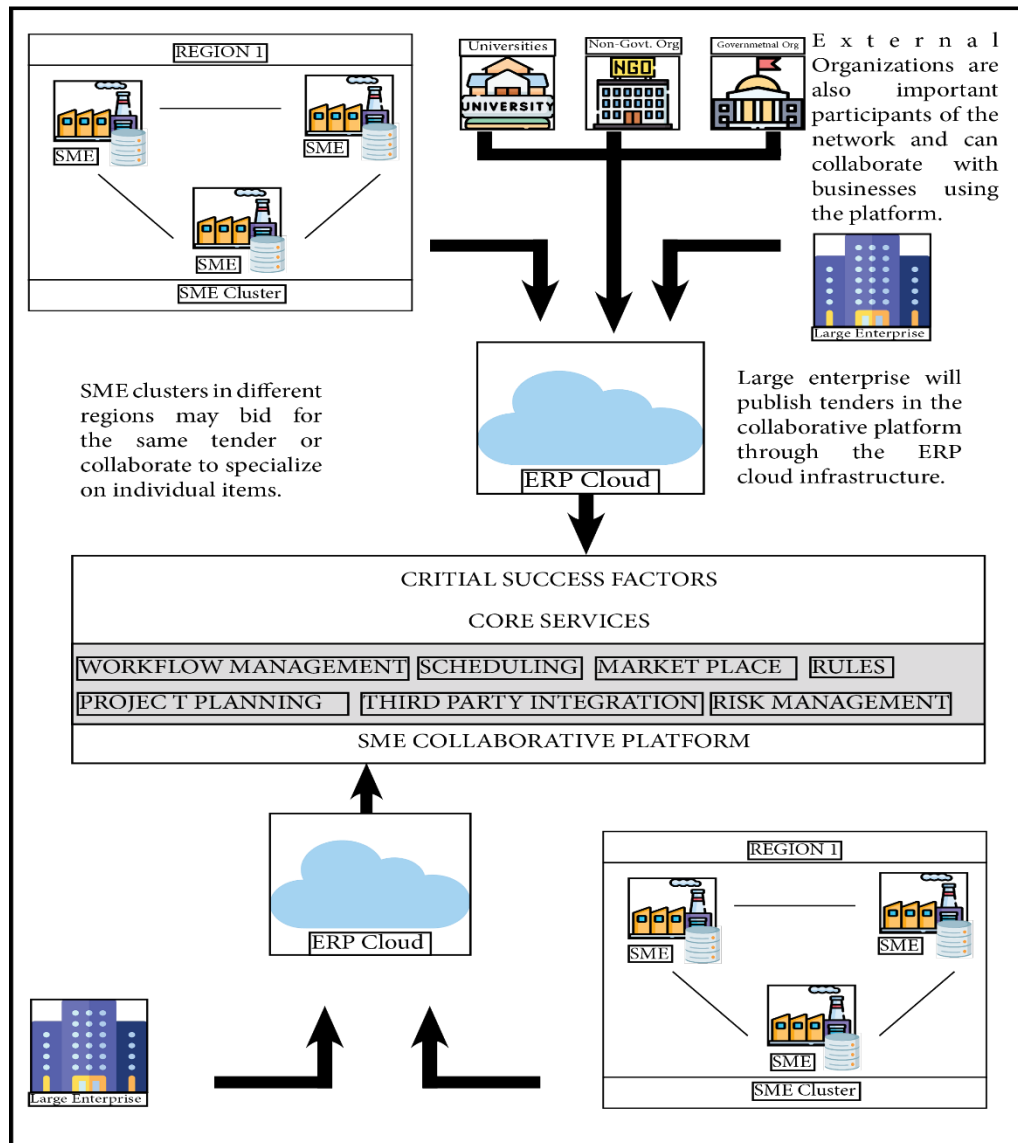


Figure 9. Proposed Collaborative Network

Figure 9 Shows a proposed collaborative network where SME clusters based on geographic regions can collaborate using an ERP that facilitates information sharing within organizations. Additionally, the ERP will connect to a collaborative platform which ensures greater collaboration across industries and regions where different services such as a market place for services, scheduling and project management is aided through the use of Industry 4.0 technologies. Large Enterprises who may require additional production capacity or submit tenders in the market place for SMEs to bid on raising market awareness and specialization.

3.7 Proposed Cloud ERP features

For collaboration within a network using an ERP system, 4 areas of cooperation of synergistic end goals have been identified into 2 categories. They are:

Horizontal Integration:

- 1) **Supply Chain Collaboration:** This is the ERP point where prospective suppliers within industry supply chain communicate and therefore collaborate giving a sense of awareness for SMEs. This is done through the electronic procurement module within the system, where suppliers and other value chain partners can collaborate, coordinate and communicate details of a project. The ERP will aid in tracking and managing supplier relationships and communications.
- 2) **Customer Collaboration:** Customers interact within the network through a e-commerce integration module where customer service is coordinated and prospective client inquiries are addressed. The ERP will aid in tracking and managing customer relationships and communication information, as well as providing automated information for prospective client queries all in one system.

Vertical Integration:

- 3) **Research Collaboration:** SMEs can now collaborate within the network using their ERP terminal with other entities such as Governmental and Non-Governmental Organizations. Research has been identified as important point for SMEs as it would give valuable pool of shared concerns for researchers to address together cooperatively. As the system is integrated with an ERP in a cloud, all data is within the businesses purview to share selectively for research contribution for improved industry issue awareness. Similar to customer information management, the ERP will have a module where research inquiries from external organizations be organized and accessed by the businesses. Requested information or data can be directly shared as required.
- 4) **Management Collaboration:** This is the internal section of the ERP that a business will use for internal collaboration within the organization for idea generation. This is also the module through which an organization can have up to date information of markets of global and local ongoings along with regulation awareness for SMEs to be

aware of, all of which the business management. This module will connect to the central platform along with industry cluster networks for organizing and categorizing the latest up to date information for SMEs to have improved market awareness.

As previously mentioned, the ERP will work within a cloud environment with integration of all Industry 4.0 technologies that business will be able to integrate in a SaaS deployment model. Overtime, greater features of matured technologies will be available in a easy to understand manner for SMEs to incorporate within their businesses.

3.8 Proposed Cloud ERP for Collaboration

The proposed Framework is one where a singular ERP instance of an individual business is shown. This next generation ERP will many facets where it will be able to connect to multiple instances of ERP of different businesses within a particular industry which is at full discretion of the licensed business owner/ management.

Figure 10 shows visualization of the concept of a single instance of an ERP that a participant may use through which they will be able to interact with others collaboratively. Since the ERP is cloud based, it will be by default connected to the network. Individual organizations can choose to customize the software for their own cluster configuration as required. Furthermore, as more and more emerging technology matures, SMEs can easily access such features through the ERP over time.

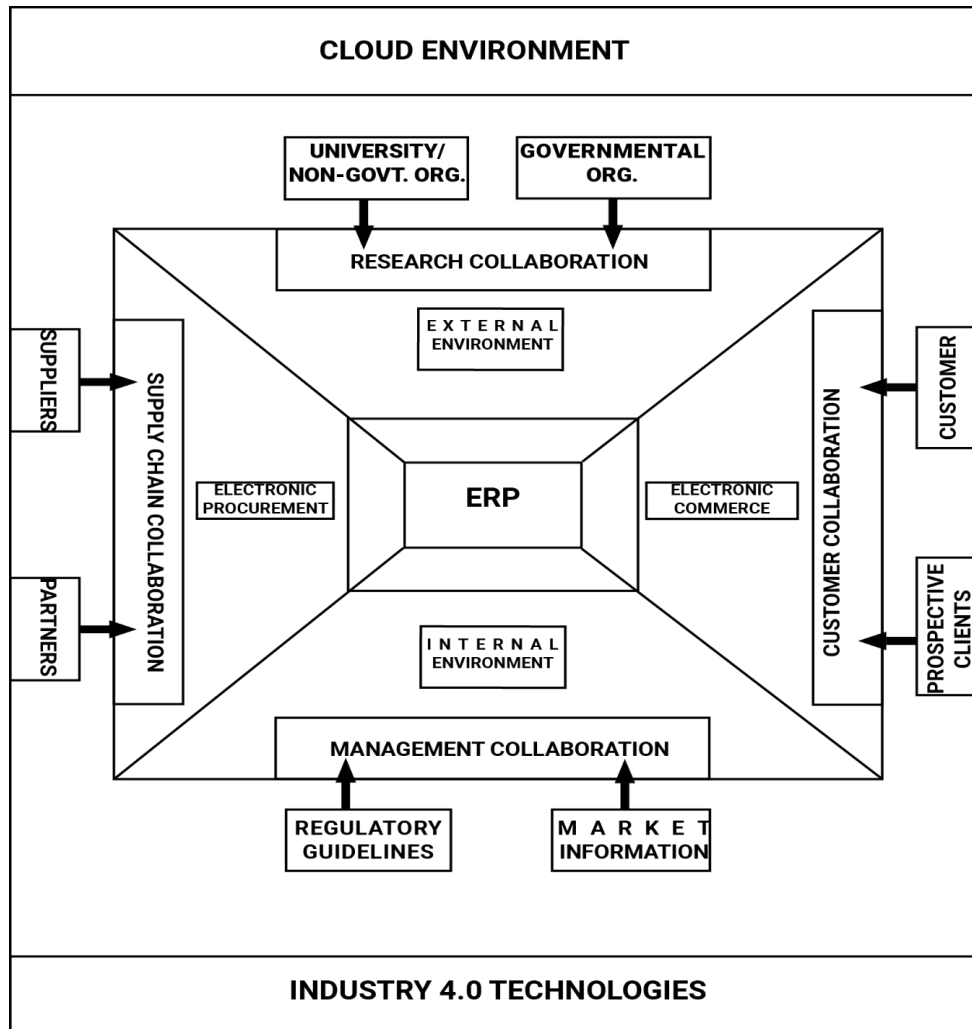


Figure 10. Proposed Cloud ERP for a Collaborative Network

3.9 Proposed Architecture of the collaborative platform

The proposed architecture of the platform will be in 4 layers. They are as follows:

- 1) **Technology Layer:** In the technology layer, Industry 4.0 technologies will be selectively added to form the core of the foundation for the entire system. Technologies such as advanced data analytics enabled by AI to find patterns for optimization along with blockchain supported tracking mechanism will be in the background working seamlessly to aid SMEs with the technology know how to just plug and play once subscribed to.

- 2) **Application Layer:** In this layer, the ERP software and other software-based tools developed on top of the technology layer. This layer is where the UI interactions happens for generating actions to create the data for the next layer.
- 3) **Data Layer:** In the data built on top of the application layer, this is where all the data will be analyzed, categorized and stored according for future collaboration. Data privacy is utmost importance and will be at the discretion of individual organizations.
- 4) **Business layer:** Here based on the all the tools and data at its disposal, a business can choose to perform on long- or short-term strategy where collaboration be mixed to into its operations with other businesses in the network to take advantage of specialization and limited resources. Further risk pooling will be done be able to adjust to market risks here.

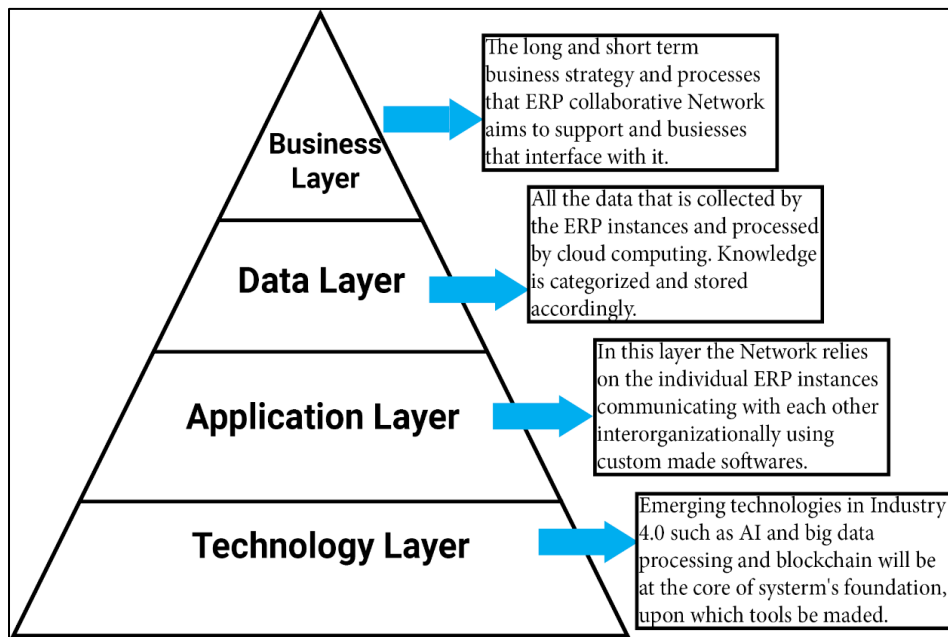


Figure 11: Platform Architecture for implementation

3.10 Historical Case Study

3.10.1 Case Background

An exploratory case study based on the secondary data collected will be tested, where such proposed concepts will be hypothetically implemented on a trading firm in Dhaka, Bangladesh. The firm in question is a small enterprise with around 30 full time employees under its payroll and its operations involves handicraft items manufacturing for export purposes. For the purpose of this study, the firm will be designated the name Alpha Trading Ltd. The author's engagement as an operation executive with this enterprise on professional capacity for 2 and half years are this case study's observables and upon which the conceptual ideas proposed are inspired from.

3.10.2 Case Setting: Statement of the problem

At Alpha Handicrafts Ltd. one of the major issues as a small enterprise was that due to limited resources, and due to increasing growth of the business, was selecting a proper ERP system which not only aided in managing internal information of the business but also gave active feedback of the industry. Since the ERP was primary used by the accounts department, it was limited in use and isolated from the other operations of the business. Thus, the limited use of ERP provided skewed informational awareness where only internal information organization was mostly done. Lack of any collaborative network or industry information, did not aid in achieving awareness of industry supply chain or any sort of concentrated business knowledge, but rather the use of manual and slow word of mouth promotion tactics was used to find networks for collaboration among peers who specialized in manufacturing different components of an item within the network.

3.10.3 Defining the problem into Research questions

Therefore, the problems faced can be summed up into 2 focal questions of the study:

- 1) What would an ideal information management system look like those aids for both internal and external business operations?

- 2) How would such a system aid in external collaborations for improved business interconnectedness?

3.10.4 Theory development

The underlying hypothesis for the proposed frameworks is that if such a system were to be implemented, SMEs like Alpha Trading Ltd. would benefit through not just having an appropriate ERP for its size that can scale along with its operations, but also allow interconnection with other SMEs in the same industry to collaborate across the supply chain aiding in better utilization of the limited resources.

Therefore, based on this hypothesis, 2 implementations are required regarding the scope of engagement.

- 1) Micro level ERP framework which becomes a component of the overall network.
- 2) Macro level Collaborative network framework which constitutes a platform different ERPs can communicate with.

3.10.5 Proposed framework application

The proposed conceptual frameworks describe a system which will work in tandem for Alpha Trading Ltd. to give a better control of information management internally as well allow for external collaborations.

Through the ERP, the business can choose to collaborate further in a supply chain network along with customers through the ERPs inquiry management module. With this, the business will have better customer engagement and have a historical track record of customer needs and demands. Horizontally, the ERP will connect business from the supply side to the demand affectively maintaining secure data connection and storage via the cloud.

The ERP will also allow vertical collaboration with research and non-governmental institutions for research collaborations. This also includes governmental organizations who may also have access through a similar ERP exchange information. Research is important as universities may be in the collaborative network. This is also allowed enterprises to organize valuable information for research requests attempting to solve pressing business problems.

CHAPTER 4

Findings and Comparative Analysis

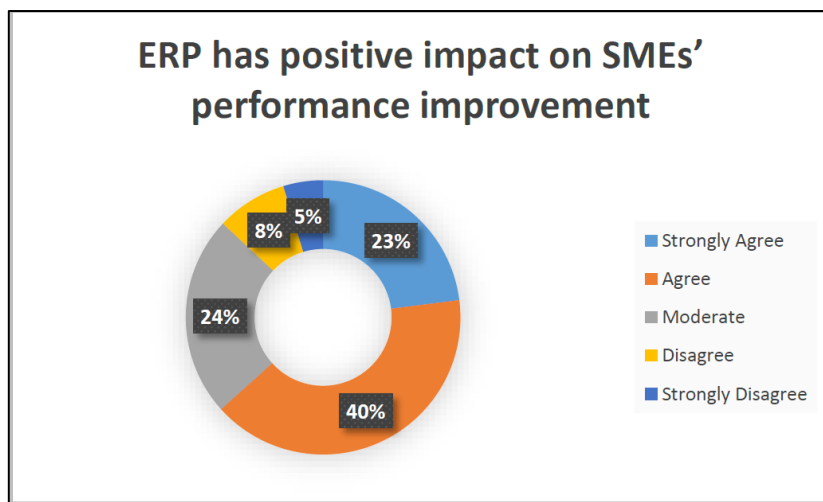
4.1 Research Findings

Through the research in this area, few findings have been highlighted in this chapter. Although the findings are of secondary nature, relationships are drawn among information throughout the research of different concepts to derive the frameworks proposed.

4.1.1 ERP Performance

ERP having a positive impact on SME performance in Bangladesh which according to a study by author of the paper [43] 23% strongly agreed and 40% agreed with the statement of ERPs benefit to SME overall performance. However, SMEs could not fully utilize ERPs as according to the authors of the paper, constraints to informational management through software tools is still present.

Figure 12: ERP impact on SME's Performance adapted from [43]



ERP market is forecasted to grow globally as shown by the chart to \$117.68 billion dollars in market size.

4.1.2 ERP Market Growth

The global ERP software market is forecasted to grow from USD 50.45 Billion in 2021 to more than USD 117.6 Billion by the year 2030 with a compounded annual growth rate of 9.88%. Significant part of that growth will come from SMEs adopting ERPs of some kind and one primary reason is due to higher technical literacy and computing technology usage. This is shown in Figure 13 [45].

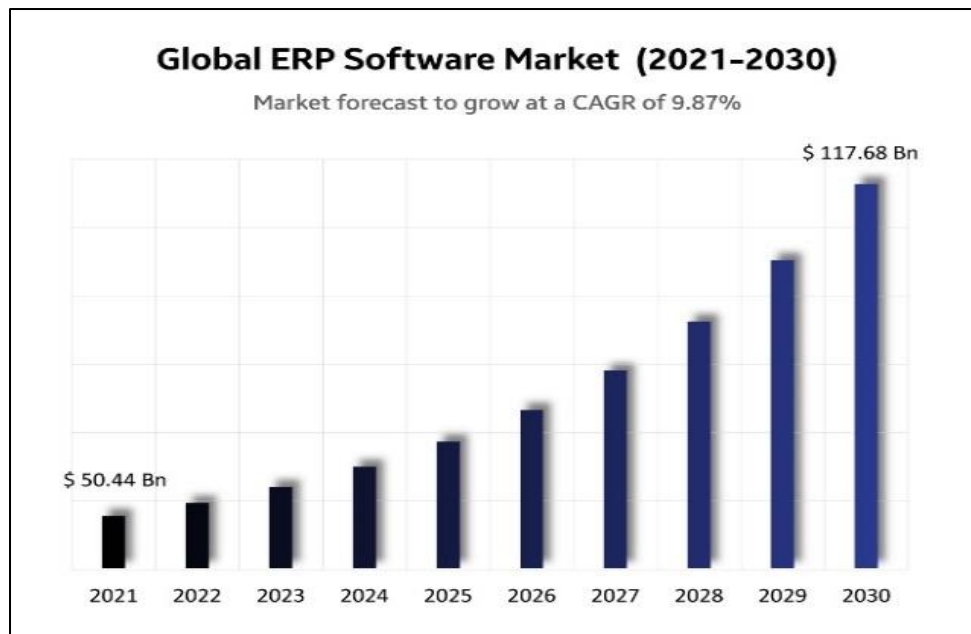


Figure 13: Global ERP Market Growth Forecast till 2030

Other market research reports show that by 2025 ERP market size is expected to be around \$ 70.3 Billion with on average increase of all ERP functionalities seeing growth. [46]

Figure 14 from KBV Research, shows that finance and human resource modules of an ERP will see greater usage. Supply Chain usage of ERP modules will see the most growth, indicating greater interconnected of external logistics with businesses information systems.

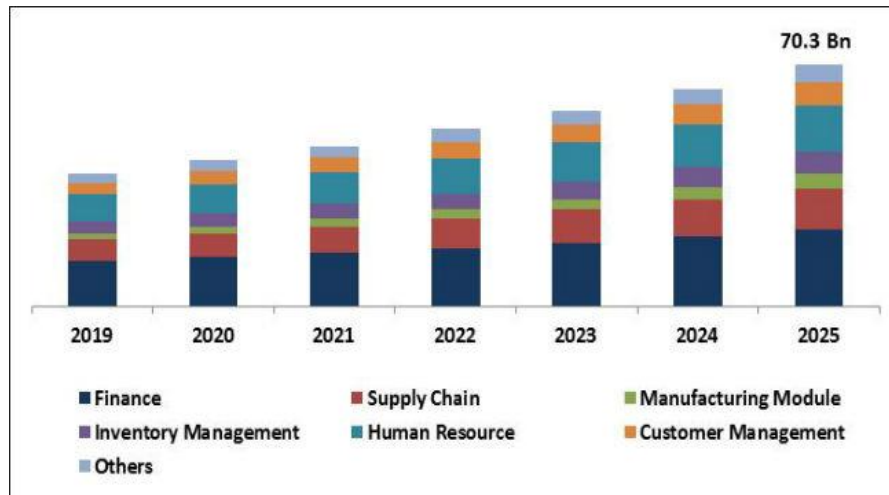


Figure 14: ERP market growth rate till 2025 separated by modules. [46]

4.1.3 On premise ERP adoption challenges for SMEs

It has been found that ERP adoption in general face few challenges. On-premise ERPs primarily face the hurdle of limited awareness of ERP benefits and limited technical expertise. Secondly, on premise ERPs are not inexpensive and require significant capital expenditure which for an SMEs is a deciding factor when choosing software solutions. Thirdly, ERP softwares with steep learning curve is another area of concern for SMEs who aren't willing to invest resources for a time duration of a long time.

4.1.4 Cloud ERP adoption challenges for SMEs

Cloud deployed ERPs in general have been found to have lesser acknowledgement due to the nature of its deployment and although hesitation for its adoption is decreasing with time, concerns remain primarily regarding data privacy and of security. Secondly, concerns regarding constant accessibility and server downtimes are other issues for adoption. Thirdly, government regulations for data storage are another policy concern which may be industry specific to where certain data are stored and can pose market challenge for vendors where such regulations are imposed. Although all such concerns are addressed especially regarding cloud deployments, it is well expected and forecasted within the industry that cloud adoption rates will be the dominant form of ERP execution for business of all kinds for time to come. ERP

adoption challenges within a developing country context can be categorized into 6 areas. They are illustrated within the diagram below.

Table 4: Cloud ERP adoption challenges.

Basic Infrastructural Issues
<ul style="list-style-type: none"> • Remote areas may not have adequate support for systems requirement such as fast internet connectivity or trouble shooting expertise.
Design Complexity
<ul style="list-style-type: none"> • ERPs can be complicated and industry specific requiring specialized training and knowledge to begin with.
ERP usage in Developing Countries
<ul style="list-style-type: none"> • A country maybe too poor economically to support the use of ERPs and promote its usage, leading to further aversion in general for its adoption.
Habitual Complexity
<ul style="list-style-type: none"> • Certain practices may be already too entrenched and difficult to change, thus a new ERP system adoption and implementation would be difficult.
Economic Issues
<ul style="list-style-type: none"> • Cost factors with purchase, maintainance and upgrading without considerable ROI will be an issue for businesses to justify ERP adoption for themselves leading to less usage overall.
Cultural Issues
<ul style="list-style-type: none"> • ERPs change how business transactions happen which may be something that is not culturally fit. Corporate culture for informational governance can vary and rules of such can depend on the country context.

4.1.5 Comparison: Cloud ERP vs On-Premise ERP systems

Comparison between Cloud ERP and On-Premise ERP is tabulated below. From table 5 it can be seen that cloud ERP provides a general greater accessibility option for SMEs over a hefty On-premise ERP installation and implementation fee.

Table 5: Comparison of Cloud and On-Premise ERP.

Cloud ERP System	On- Premise ERP System
The main ERP software suit is hosted on a vendor determined server, and accessed through a web browser.	The software is directly installed into the organization's computer or server systems.
SaaS model is used for pricing where a recurring fee per month or annual is incurred.	A one-time perpetual license fee is incurred which may depend on a company's size or its user base size.
Since cost is based on a subscription, operating expenditure for a business is usually more.	The cost of an ERP purchase is considered an investment and categorized as capital expenditure.
Low initial cost of use, with easy to use and predictable pricing over time.	Since it's a one-time investment, significant amount of money is spent upfront.
Switching from one provider to another is lower.	Switching is time and money expensive.

4.1.6 Cloud ERP Potential for SMEs.

According finding by [44], SMEs can benefit significantly if cloud-based ERPs can be properly executed.

They are:

- 1) **Lower Initial investment:** Cloud ERPs significantly reduce upfront costs for businesses as costs relating to purchasing hardware, license and implementation is minimized.
- 2) **Lower Operating Costs:** Since ERP is cloud based, updates are automatic meaning downtimes for maintenance, upgradation, and other related costs are much lower.
- 3) **Faster Implementation:** As the ERP is primarily based on the cloud, it can be easily deployed with fewer required customizations while implementing.
- 4) **Highly Scalable:** Cloud Based ERPs promise better flexibility and adaptability with usage, with more devices and location of use for a business without investing more into hardware. This enables SMEs to be more competitive in respect to larger rivals.
- 5) **Fast Upgradation:** ERPs require a lot of updates to stay relevant, and upgrading on cloud-based ERP is a major advantage as it is fast and on time with minimal input.
- 6) **Better Mobility and accessibility:** Cloud ERPs are generally more user friendly and more efficient as it uses the web interface, improving access to information for SMEs.
- 7) **Greater Specialization:** SMEs can benefit from more specialization as using a cloud ERP frees up resources otherwise would have been used to maintain a traditional ERP, requiring specialized expertise. Moving to a Cloud ERP can allow SMEs to focus on their core business functionalities improving productiveness.
- 8) **Lower system ownership cost:** Due to cloud deployments of the ERP, businesses normally pay on per use basis giving them wider control of the ERP operating costs and in the long term this leads to a more predictable trend of capital expenditure that is usually within expectations.
- 9) **Improved data and information security:** For SMEs a SaaS based cloud ERP system is seen as a safer and cost-effective alternative, compared to SMEs ensuring their own data security as these small-scale firms are more themselves more prone to wider security breaches that maybe exploited from gaps in hardware or software environments, bad implementations and configuration, or poor data security policies. A cloud deployed environment is best suited to handle all such maintenance issues regarding upgradations out of an SME's daily operations.

4.2 Collaborative Networks

4.2.1 Collaborative Networks and SME Performance

Studies have shown that a proper collaborative network can significantly improve SMEs [34], where collaboration have shown to innovation capability, competitiveness, and business performance.

Such networks can help SMEs with strengthening business fundamentals such as supporting customers, interacting with suppliers and cooperate with external institutions. Evidence have been found that SMEs are best positioned for growth when much of the resource draining unrelated activities are well understood and within an expectation framework, where much of volatility is mitigated through such a network where heightened market awareness is deemed essential for long term business prosperity.

Some of the benefits of collaboration between organizations have been synthesized by research [47] which identified 10 variables of collaboration that if SMEs can cooperate successfully within the network, it will result in shared benefits the participants.

Table 6 below, shows the adapted concepts from the study and examples of the theorized benefits.

Tables 6: Collaboration Advantages affecting business performance for SMEs [47]

SL.	Collaboration Variable	Description of Advantages for Collaboration.
1.	Shared Costs.	<ol style="list-style-type: none">1. SMEs will have greater access to new markets and opportunities at lower investment requirements.2. SMEs can share costs of R&D among peers jointly.3. Lowers costs make SMEs more competitive against competitors.
2.	Shared Risks.	<ol style="list-style-type: none">1. SMEs usually operate in dynamically changing markets with imperfect information and knowledge. This risk of market uncertainty affects a firm's decision-making ability. This can be mediated if a collaboration allows for knowledge sharing among partners to reduce uncertainty.

		<ol style="list-style-type: none"> 2. Sharing of responsibilities among several partners in a collaborative project allows for better defined assignment of such responsibility and higher task execution rate. 3. Lower risks allow for SMEs to focus and invest in profit maximizing processes more.
3.	Reduction of transaction costs.	<ol style="list-style-type: none"> 1. Since companies depend on each other for resources, materials, products, services and skills; collaboration can aid in establishing privileged links and reduced transaction costs when market uncertainty rises. 2. This also improves an SMEs ability compete in a globalized market.
4.	Improved Innovation Capacity.	<ol style="list-style-type: none"> 1. Collaboration improves capacity of SMEs to generate new ideas where current resources are combined to produce something new. This also allows SMEs to exchange interorganizational culture, values and experiences. 2. Improves SMEs ability to produce innovative products that fits the customer's needs and expectation, contributing to improved quality.
5.	Defending market position	<ol style="list-style-type: none"> 1. In a globalized world, achieving economies of scale is utmost importance. SMEs can achieve this easily if resource sharing can be done smoothly. 2. SMEs can form defensive coalition to make large foreign firm's entry into local market challenging. 3. SMEs can form offensive coalition where due to collaboration they can attain unique competitive advantages.

		<ol style="list-style-type: none"> 4. SMEs can have higher negotiation power against suppliers or customers who are external to the collaborative network.
6.	Improved Flexibility	<ol style="list-style-type: none"> 1. SMEs can share critical skills and expertise to create final product. 2. SMEs can specialize in core tasks where they have achieved special knowhow. 3. SMEs have improved adaptability to demand or supply shocks simultaneously. 4. They can conceptualize and produce a product faster than competitors outside the network or foreign firms. 5. SMEs can grow into greater segments as they will have greater market awareness.
7.	Greater Agility	<ol style="list-style-type: none"> 1. SMEs can react much faster to emergence of business opportunities due to collaboration. 2. As they collaborate SMEs will eventually have greater interoperability between the processes as operability norms would be well established among peers.
8.	Improved Specialization	<ol style="list-style-type: none"> 1. SMEs can focus more their core competencies and tasks, achieving economies of scale much faster. 2. Focusing more on core competencies will allow for directed investment on critical activities, giving opportunities for research and development in these areas.
9.	Establishing required regulations.	<ol style="list-style-type: none"> 1. Participants of a collaborative network, will communicate more frequently thus establishing rules to avoid unnecessary opportunistic behaviors to avoid conflicts. 2. Proper rules and regulations will ensure a common culture among SMEs to foster trust.

10.	Shared Social Responsibilities.	<ol style="list-style-type: none"> 1. SMEs have a higher chance for recognition driving greater external investments to the sector. 2. Development of altruism and social responsibility derived from collaboration of organizations as each will influence other. 3. Reinforcement of shared values will allow for organizations to spend more on social initiative that require greater attention.
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4.2.2 Cloud ERPs within a Collaborative Network

Advancement in ERP technology have given rise to ERPs which are now termed as “Extended ERP” or “ERP II” which are all similar concepts that focus on interorganizational cooperation, based on web 2.0 and industry 4.0 technologies.

Table 7: Comparisons of 5 market leaders in ERP systems.

CLOUD ERP	Deployment	Platform	Client Size
Oracle ERP Cloud	Cloud and Terminal	Windows, Linux, MacOS.	Small, Medium, Large.
SAP S/4 HANA	Cloud and Terminal	Windows, Linux, MacOS.	Small, Medium, Large.
NetSuite	Cloud and Terminal	Windows, Linux, MacOS.	Small, Medium, Large.
Acumatica	Cloud and Terminal	Windows, Linux, MacOS.	Small and Medium
BizAutomation	Cloud	Windows, Linux, MacOS	Small and Medium.

From secondary research that this paper is based on, the current trend in ERP industry is one where on-premise ERP systems are migrating towards the cloud.

Top Cloud based ERPs in the market are namely top choices are SAP S/4 HANA, NetSuite, Oracle ERP Cloud, Acumatica and BizAutomation. They are compared side by side based on their deployment, platform of installation and clients they serve. As it can be seen from the table 6 most of the cloud-based platforms serve customers based on various sizes with only the last 2 focusing on SMEs.

However, ERPs deployed in the cloud is not enough as such ERPs are solely focused on internal information management. For SMEs that is not enough, as internal information management along with external collaboration is crucial for smooth market operation within for long term business survivability. Although, for a developing country context, ease of access of such capability is ranked highly among businesses due to lower entry cost and less of business commitment for ERP engagement.

4.2.3 Similar Collaborative Network Platform Proposed

DIGICOR is European Union (EU) based project that aimed to implement a proposed architecture for collaboration platform for SMEs and Original Equipment Manufacturers (OEM) which would integrate industry 4.0 technologies upon which a smart value chain system would exist enabling joint manufacturing and bidding. The proposed platform would help SMEs bid for projects and coordinate manufacturing and supply chain requests efficiently all in one platform. Other services to aid in collaboration would be available to improve the systems engagement and viability along with a marketplace for companies to interact among themselves. Concepts from this paper was vital for the further study into the matter and explore further into how such a system's implications be for in Bangladesh's concept.

4.2.4 Proposed framework's implications

Both the micro and macro level proposed frameworks for an ERP system and a collaborative network and platform, have potential to bring improved vitalization to SMEs who are isolated and unaware of market opportunities. Given with time ERPs are seeing improved utilization and adoption regardless of a country's development trajectory, importance of ERPs for business use case is well established. In fact, SMEs are prime potential users of cloud-based ERPs where all its benefits make it so attractive but simple ERPs don't solve the market

problems of SME interorganizational connectedness. For that to happen, the next level beyond ERP usage would be an extension of such ERPs to facilitate collaboration across industries, geography and institutions. Therefore, collaborative networks in essence hold the potential for impact on:

- 1) **Supply Chain Management:** SMEs would directly benefit within a collaborative network in addition to improved management of information flow to and from entities. Supply chain coordination is one of the external risk factors that businesses always aim to control but in a globalized world, such tracking have become increasing complicated and inaccessible. Entities within the network using the same tool sets have equal participation of information sharing and active keep track of important supply chain issues in liaison with external logistics developments. This also streamlines supply volatility and help businesses communicate more effectively within one system that they can update in accordance to E-commerce integrated market demand information.
- 2) **Innovation and Partnership:** Collaboration among businesses will lead to higher innovation of products and research have shown higher trust in a system with similar goals lead to partnerships. SMEs benefit from this arrangement particularly is due to the fact that they can share risks and pool resources. Innovative SMEs can be more competitive both locally and globally and form joint ventures of successful cooperations. Peer discovery is another within a cluster is another benefit that SMEs will benefit from, as this will improve businesses market awareness.
- 3) **Specialization:** SMEs can specialize on core business functionalities and focus on their competitive advantages instead of pursuing vertically integration. Specializing on what they do best, will allow for SMEs to invest more on building infrastructure for further research and development.
- 4) **Market Awareness:** Given the interconnected of the organizations with the network, businesses in general will have greater awareness of what is currently in discussion and communicated within the network. Due to e-commerce integration, business can get direct customer feedback within one platform and perform data analytics to further predict future market potential. This not only provided businesses to better judge demand shocks but also understand its supply chain much better. Businesses can have heightened awareness of supply shocks through the network communication channels.

This readiness for supply crunches or gloat will give SMEs better protection within the industry value chain fluctuations.

- 5) **Future proofing:** Accessibility of an important software tool within an easy-to-understand payment structure with little upfront commitment incentivizes SMEs to start adopting an ERP system to manage their internal business dealings. Costs aside, SMEs can focus more on their core business functionality rather than spending more on systems maintenance and upgradation. Furthermore, SMEs can easily access next generational technology through the cloud platform without needing to invest more on hardware requirements.

4.3 Research Opportunities

The need for such a network and its validity is still unknown in terms of empirical evidence. Given the trajectory of technological progress and evolving nature of business interactions, the actual need for collaboration is expected to be more relevant. However, collaborative networks and its use through an ERP-like system has not yet been studied and real-world applications is unknown. Research pursuit in this area of collaboration dynamics among businesses is becoming more evident and its importance is bound to be emergent.

Empirical evidence-based pilot research maybe done to test how such a network be utilized in real scenarios. In terms of Bangladesh or a developing country context, it makes sense that there is room for such experimentation and pilot testing these concepts targeted for SMEs to see interaction and interoperability of actors within a such network.

Despite the funding and research done in Europe, actual system or real working example of such a network is still to be found executed successfully. Although the outcome of this study was purely conceptual, quantitative approach to verification of the concepts for further refinement is an area of research that may further carried out.

CHAPTER 5

Conclusion and Future Work

5.1 Conclusion

Findings from the research have shown that conception of similar ideas and its applications are still researched and is primed for application in varied applicable areas where collaboration is the next informational leap for greater productive outcome. The case for SMEs in Bangladesh holds promise as government initiative for digitalization has spurred investments in mobile banking and finance and other areas of digital usage. ERPs are in this case special, as they are the heart of a business's information management.

ERPs are an integral part of a modern business ecosystem, and SMEs themselves represent, a significant contributor to any particular economy. Changing environmental factors is showing how such businesses are evolving which impact their mode of interaction and influence in operations. SMEs are evolving and Industry 4.0 technologies are becoming more evident as use cases of Big Data Analytics and AI are becoming more common place all of which is also being facilitated through cloud deployments. Cloud Computing in itself has seen incredible usage and maturity among businesses, giving way for ERPs to finally migrate from an On-Premise only system to one which is a SaaS based cloud integrated one due to practical feasibilities of computing cost and economies of scale in this regard. Collaborative networks represent the next frontier for digitalized economy where inter business operations and inter organizational coordination becomes the new norm and information systems evolving to serve that need. Much research in this area is needed, especially in Bangladesh's use case where SMEs can benefit tremendously if collaborative networked organizations can find profitable collaboration incentive to work together. This is set to define majority of the business's informational challenges for the time to come.

However, the problem that SMEs and businesses in general face is still not much addressed and internal information management solutions or micro level solutions is not enough for industries that are experiencing revolutions and changes in business interactions.

SMEs are at a risk of being left out of much of the potential benefits of such innovations, and most importantly a route to collaboration among peer, competitors, suppliers and research organizations. The paper explored the idea of general collaboration of SMEs in a network with a proposed ERP system that can more open to integration within such a network that will enable such level of cooperation. Theorized potential benefits of collaboration among SMEs and its impact on business performance is immense and such use case of B2B network of private collaboration is the next exciting frontier that will revolutionize how business operate.

5.2 Limitation of study and future work.

This paper did an exploratory qualitative study of existing literature, based up which a proposed idea was presented, although such systems field impact and long-term viability is still a question that needs to be answered. One of the issues of understanding SMEs collaboration behavior within a network need to further emphasized. Establishing differences and conflict resolution are other areas of research that can be examined along with contract negotiation and data privacy and protection mechanism within such a system.

Further implementation of emerging technologies could see smart contracts through a blockchain be incorporated within future ERP and collaborative networks. This will eliminate middlemen for authentication or verification of contract completion. Future research in use of AI for automation for data analytics applicable for SMEs with limited technical expertise is another area of focus that can be looked into. ERPs becoming networked leading to network of organizations is theorized the next evolution of ERPs becoming “Network Resource Planning” systems, with a focus on external information integration for globalized business needs. [48]

REFERENCES

- [1] N. Kazemargi and P. Spagnoletti, "IT Investment Decisions in Industry 4.0: Evidences from SMEs," in *Digital Business Transformation*, Cham, 2020, pp. 77–92. doi: 10.1007/978-3-030-47355-6_6.
- [2] M. E. Porter and J. E. Heppelmann, "How Smart, Connected Products Are Transforming Competition," *Harvard Business Review*, Nov. 01, 2014. Accessed: Jan. 12, 2023. [Online]. Available:<https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition>.
- [3] G. Morelli, C. Pozzi, and A. R. Gurrieri, "Industry 4.0 and the Global Digitalised Production. Structural Changes in Manufacturing," in *Digital Business Transformation*, Cham, 2020, pp. 187–204. doi: 10.1007/978-3-030-47355-6_13.
- [4] M. Bamiah, TRUSTED CLOUD COMPUTING FRAMEWORK IN CRITICAL INDUSTRIAL APPLICATION. 2015. doi: 10.13140/RG.2.1.4126.6729.
- [5] R. E. McGaughey and A. Gunasekaran, "Enterprise Resource Planning (ERP): Past, Present and Future," *Int. J. Enterp. Inf. Syst. IJEIS*, vol. 3, no. 3, pp. 23–35, Jul. 2007, doi: 10.4018/jeis.2007070102.
- [6] G. Morelli, C. Pozzi, and A. R. Gurrieri, "Industry 4.0 and the Global Digitalised Production. Structural Changes in Manufacturing," in *Digital Business Transformation*, Cham, 2020, pp. 187–204. doi: 10.1007/978-3-030-47355-6_13.
- [7] S. Marston, Z. Li, S. Bandyopadhyay, J. Zhang, and A. Ghalsasi, "Cloud computing — The business perspective," *Decis. Support Syst.*, vol. 51, no. 1, pp. 176–189, Apr. 2011, doi: 10.1016/j.dss.2010.12.006.
- [8] S. Parvez, "The Small and Medium Enterprises (SME) in Bangladesh: An Overview of the Current Status," *Pap. State Univ. Bangladesh ...*, Jan. 2006, Accessed: Jan. 13, 2023. [Online]. Available: https://www.academia.edu/2089486/The_Small_and_Medium_Enterprises_SME_in_Bangladesh_An_Overview_of_the_Current_Status
- [9] R. Islam, S. R. Khan, and K. A. Siddiqua, "PRESENT SCENARIO AND STRATAGEM TO SMES DEVELOPMENT IN BANGLADESH".
- [10] P. Schubert, "Cloud Computing for Standard ERP Systems: Reference Framework and Research Agenda", Accessed: Jan. 13, 2023. [Online]. Available:https://www.academia.edu/897279/Cloud_Computing_for_Standard_ERP_Systems_Reference_Framework_and_Research_Agenda

- [11] A. Deep, P. Guttridge, S. Dani, and N. Burns, "Investigating factors affecting ERP selection in made-to-order SME sector," *J. Manuf. Technol. Manag.*, vol. 19, no. 4, pp. 430–446, Jan. 2008, doi: 10.1108/17410380810869905.
- [12] S. Bridge, K. O'Neill, and S. Cromie, "Understanding Enterprise, Entrepreneurship and Small Business," London, 1998. doi: 10.1007/978-1-349-26171-0.
- [13] S. Schneider and A. Sunyaev, "Determinant factors of cloud-sourcing decisions: reflecting on the IT outsourcing literature in the era of cloud computing," *J. Inf. Technol.*, vol. 31, no. 1, pp. 1–31, Mar. 2016, doi: 10.1057/jit.2014.25.
- [14] D. Powell, J. Riezebos, and J. O. Strandhagen, "Lean production and ERP systems in small- and medium-sized enterprises: ERP support for pull production," *Int. J. Prod. Res.*, vol. 51, no. 2, pp. 395–409, 2013, doi: 10.1080/00207543.2011.645954.
- [15] M. Ali, E. Nasr, and M. Gheith, "Benefits and Challenges of Cloud ERP Systems - A Systematic Literature Review," *Future Comput. Inform. J.*, vol. 1, Mar. 2017, doi: 10.1016/j.fcij.2017.03.003.
- [16] A. Radziwon, A. Bilberg, M. Bogers, and E. S. Madsen, "The Smart Factory: Exploring Adaptive and Flexible Manufacturing Solutions," *Procedia Eng.*, vol. 69, pp. 1184–1190, Jan. 2014, doi: 10.1016/j.proeng.2014.03.108.
- [17] T. August, M. F. Niculescu, and H. Shin, "Cloud Implications on Software Network Structure and Security Risks," *Inf. Syst. Res.*, vol. 25, no. 3, pp. 489–510, Sep. 2014, doi: 10.1287/isre.2014.0527.
- [18] E. Räsänen, "Adoption of cloud ERP systems in the Nordics - benefits and drawbacks," *Pilvipohjaisten ERP-järjestelmien omaksuminen Pohjoismaissa - hyödyt ja haitat*, 2018, Accessed: Jan. 13, 2023. [Online]. Available: <https://lutpub.lut.fi/handle/10024/149493>
- [19] G. Shanks, P. Seddon, and L. Willcocks, *Second-wave enterprise resource planning systems : implementing for effectiveness*. Cambridge University Press, 2003. Accessed: Jan. 13, 2023. [Online]. Available: <https://research.monash.edu/en/publications/second-wave-enterprise-resource-planning-systems-implementing-for>
- [20] S. de Búrca, B. Fynes, and D. Marshall, "Strategic technology adoption: extending ERP across the supply chain," *J. Enterp. Inf. Manag.*, vol. 18, no. 4, pp. 427–440, Jan. 2005, doi: 10.1108/17410390510609581.
- [21] A. Elragal and M. Haddara, "The Future of ERP Systems: look backward before moving forward," *Procedia Technol.*, vol. 5, pp. 21–30, 2012, doi: 10.1016/j.protcy.2012.09.003.
- [22] P. Mell and T. Grance, "The NIST Definition of Cloud Computing," National Institute of Standards and Technology, NIST Special Publication (SP) 800-145, Sep. 2011. doi: 10.6028/NIST.SP.800-145.

- [23] A. Bharadwaj, O. A. El Sawy, P. A. Pavlou, and N. V. Venkatraman, "Digital Business Strategy: Toward a Next Generation of Insights." Rochester, NY, Jun. 01, 2013. Accessed: Jan. 14, 2023. [Online]. Available: <https://papers.ssrn.com/abstract=2742300>
- [24] K. Cormican, "Collaborative Networks: Challenges for SMEs," *Small and Medium Enterprises: Concepts, Methodologies, Tools, and Applications*, 2013. <https://www.igi-global.com/chapter/collaborative-networks-challenges-smes/www.igi-global.com/chapter/collaborative-networks-challenges-smes/76037> (accessed Jan. 14, 2023).
- [25] R. S. Achrol and P. Kotler, "Marketing in the Network Economy," *J. Mark.*, vol. 63, no. 4_suppl1, pp. 146–163, Oct. 1999, doi: 10.1177/00222429990634s114.
- [26] H. W. Lin, S. V. Nagalingam, S. S. Kuik, and T. Murata, "Design of a Global Decision Support System for a manufacturing SME: Towards participating in Collaborative Manufacturing," *Int. J. Prod. Econ.*, vol. 136, no. 1, pp. 1–12, Mar. 2012, doi: 10.1016/j.ijpe.2011.07.001.
- [27] H. Correa, "Changes in The Role of Production and Operations Management in the New Economy," *J. Oper. Supply Chain Manag.*, vol. 1, Jun. 2008, doi: 10.12660/joscmv1n1p1-11.
- [28] P. Grefen, N. Mehandjiev, G. Kouvas, G. Weichhart, and R. Eshuis, "Dynamic business network process management in instant virtual enterprises," *Comput. Ind.*, vol. 60, no. 2, pp. 86–103, Feb. 2009, doi: 10.1016/j.compind.2008.06.006.
- [29] P. Hendriks, "Why share knowledge? The influence of ICT on the motivation for knowledge sharing," *Knowl. Process Manag.*, vol. 6, no. 2, pp. 91–100, 1999, doi: 10.1002/(SICI)1099-1441(199906)6:2<91::AID-KPM54>3.0.CO;2-M.
- [30] T. Mooradian, B. Renzl, and K. Matzler, "Who Trusts? Personality, Trust and Knowledge Sharing," *Manag. Learn.*, vol. 37, no. 4, pp. 523–540, Dec. 2006, doi: 10.1177/1350507606073424.
- [31] A. Cabrera and E. F. Cabrera, "Knowledge-Sharing Dilemmas," *Organ. Stud.*, vol. 23, no. 5, pp. 687–710, Sep. 2002, doi: 10.1177/0170840602235001.
- [32] S. Msanjila and H. Afsarmanesh, "Trust analysis and assessment in virtual organization breeding environments," *Int. J. Prod. Res. - INT J PROD RES*, vol. 46, pp. 1253–1295, Mar. 2008, doi: 10.1080/00207540701224350.
- [33] Z. Liu et al., "The architectural design and implementation of a digital platform for Industry 4.0 SME collaboration," *Comput. Ind.*, vol. 138, p. 103623, Jun. 2022, doi: 10.1016/j.compind.2022.103623.

- [34] M. Mulyana and W. Wasitowati, "The improvement of collaborative networks to increase small and medium enterprises (SMEs) performance," *Serbian J. Manag.*, vol. 16, no. 1, pp. 213–229, 2021, doi: 10.5937/sjm16-24369.
- [35] L. Camarinha-Matos and H. Afsarmanesh, "Collaborative networks: Value creation in a knowledge society, (invited keynote paper)," Jun. 2006. Accessed: Jan. 14, 2023. [Online]. Available: <https://www.semanticscholar.org/paper/Collaborative-networks%3A-Value-creation-in-a-keynote-Camarinha-Matos-Afsarmanesh/2adb671e66b8af37d8d2ce7cda07c4f06c7bfb29>
- [36] L. M. Camarinha-Matos, "Collaborative smart grids – A survey on trends," *Renew. Sustain. Energy Rev.*, vol. 65, pp. 283–294, Nov. 2016, doi: 10.1016/j.rser.2016.06.093.
- [37] S. Hönigsberg and B. Dinter, "Toward a Method to Foster the Digital Transformation in SME Networks," presented at the International Conference on Interaction Sciences, 2019. Accessed: Jan. 14, 2023. [Online]. Available: <https://www.semanticscholar.org/paper/Toward-a-Method-to-Foster-the-Digital-in-SME-H%3%B6nigsberg-Dinter/ab9fff4e5f840c89a9279b89b76a6cb4ba50e81c>
- [38] M. Ko, C. Lee, and Y. Cho, "Design and Implementation of Cloud-Based Collaborative Manufacturing Execution System in the Korean Fashion Industry," *Appl. Sci.*, vol. 12, no. 18, Art. no. 18, Jan. 2022, doi: 10.3390/app12189381.
- [40] C. Møller, "ERP II -Next-generation Extended Enterprise Resource Planning," 2004. https://www.researchgate.net/publication/268289563_ERP_II_-Next-generation_Extended_Enterprise_Resource_Planning?enrichId=rgreq-9621ef4cb5e14939db4c5c8a343f0b77-XXX&enrichSource=Y292ZXJQYWdlOzI2ODI4OTU2MztBUzoyMTg4NzE1MjE5MTA3ODZAMTQyOTE5NDQ0NTY1Nw%3D%3D&el=1_x_3&_esc=publicationCoverPdf (accessed Jan. 14, 2023).
- [41] I. Rahman and M. R. Kabir, "Benefits and Challenges of Cloud ERP Adoption by SMEs," *J. Bus. Adm.*, vol. 41, no. 1, Art. no. 1, 2020.
- [42] M. Haddara, S. Gøthesen, and M. Langseth, "Challenges of Cloud-ERP Adoptions in SMEs," *Procedia Comput. Sci.*, vol. 196, pp. 973–981, Jan. 2022, doi: 10.1016/j.procs.2021.12.099.
- [43] S. Rahman, "ERP Adoption in Small and Medium Sized Enterprises in Bangladesh", Accessed: Jan. 14, 2023. [Online]. Available: https://www.academia.edu/19853402/ERP_Adoption_in_Small_and_Medium_Sized_Enterprises_in_Bangladesh

- [44] A. H. Zadeh, B. A. Akinyemi, A. Jeyaraj, and H. M. Zolbanin, "Cloud ERP Systems for Small-and-Medium Enterprises: A Case Study in the Food Industry," *J. Cases Inf. Technol. JCIT*, vol. 20, no. 4, pp. 53–70, Oct. 2018, doi: 10.4018/JCIT.2018100104.
- [45] "ERP Software Market to Hit \$117.69 Billion by 2030, Growing." <https://www.globenewswire.com/en/news-release/2022/09/09/2513471/0/en/ERP-Software-Market-to-Hit-117-69-Billion-by-2030-Growing-at-a-CAGR-of-9-88.html> (accessed Jan. 14, 2023).
- [46] "ERP Software Market Size, Demand & Top Market Players 2025," KBV Research. <https://www.kbvresearch.com/erp-software-market/> (accessed Jan. 14, 2023).
- [47] L. M. Camarinha-Matos and A. Abreu, "A Contribution to Understand Collaboration Benefits," in *Emerging Solutions for Future Manufacturing Systems*, Boston, MA, 2005, pp. 287–298. doi: 10.1007/0-387-22829-2_30.
- [48] P. Bendor-Samuel, "The Shift From ERP To NRP For Ecosystem Value Creation," *Forbes*. <https://www.forbes.com/sites/peterbendorsamuel/2020/09/21/the-shift-from-erp-to-nrp-for-ecosystem-value-creation/> (accessed Jan. 14, 2023).

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