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Decentralized Lean Business Model Canvas for Blockchain-Based Enterprises

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Abstract: A generic decentralized lean business model canvas was developed using the principles of business process management and lean six sigma for blockchain-based systems presented in this study. Based on the literature review, it was found that business model canvas and lean canvas are some of the most widely used management tools. Business Model Canvas can be used for selling a specific product and lean canvas can be used for solving a specific problem. Based on Business Model Canvas, a Decentralized Business Model canvas for decentralized space was developed in which the key parameters such as Problem definition, Key resources, Key activities, and learning were missing. As the Learn Parameter is missing, there is no mechanism for rectification of error/problems and it does not take into account the principles of Business Process Management and Lean Six Sigma. As many companies who have already implemented the principles of Business Process Management and Lean Six Sigma are now moving to establish blockchain in their business. Also, several startups use blockchain ideals in their business model. This motivated us to develop a novel decentralized lean business model canvas template. This can be made suitable for any blockchain-based use cases to make strategic management plans. It uses 13 key parameters and overcomes the limitations posed by other canvases. Validation of the decentralized lean business model canvas was done by considering a use case scenario for scholarly communication and scientific publishing. The proposed system competes on time, cost, quality, security, and trust.

Keywords: Business Process Management, Lean Six Sigma, Blockchain, Decentralized Lean Business Model Canvas, Scientific Publishing, Scholarly Communication

Introduction

Over the next 10 years, blockchain technology has the potential to increase global GDP by US$1.76 trillion as per the Price Water Coopers (PWC) Report and is illustrated in Fig. 1. Blockchain, like the internet, will become an infrastructure technology. Nobody cares how the internet works, yet it has become an indispensable part of our life. The same may be said for blockchain. Blockchain is a disruptive technology that impacts every industry throughout the world. Organizations are reconsidering their operations as they deal with the effects of COVID-19 and how the pandemic has expedited several disruptive trends, such as the transition to more digital modes of operating, connecting, and interacting with consumers.

Business Model Canvas is a strategic management and visualization template for structured discussions and its building blocks are great for developing a portfolio of ideas. A strong business model fetches a good reputation and encourages the investors to stay put with the company. From the literature review, we found lean canvas and decentralized business model canvas were developed based on business model canvas. The purpose of a Business Model Canvas is to sell a specific product, a Lean Canvas is for solving a problem and a decentralized business model canvas is for decentralized space.

Based on Business Model Canvas, a Decentralized Business Model canvas for decentralized space was developed in which the key parameters such as Problem definition, Key resources, Key activities, and learning were missing. As the Learn Parameter is missing, there is no mechanism for rectification of errors/problems and it does not take into account the principles of Business Process Management and Lean Six Sigma. Business Process Management and Lean Six Sigma are organization specific.

There has not been any study/canvas to integrate BPM and LSS in Blockchain technology.

To define a model canvas template for industries and startups that implement blockchains/distributed ledgers. A use case scenario for the developed "Decentralized Lean Business Model Canvas" for validation.

The decentralized Lean Business Model Canvas is developed to overcome the limitations of the present model canvases. Based on the principles of BPM and LSS, thirteen key elements were formulated for industries and startups that implement blockchains/distributed ledgers. Validation of decentralized lean business model canvas is done by considering a use case scenario for scholarly communication and scientific publishing.

As many companies are moving toward blockchain in their business, the developed template can be made suitable to make strategic management plans. It will act as a one-page visualization tool and attract investors. The developed system competes on time, cost, quality, security, and trust.

Blockchain Technology, Business Process Management, and Various Canvases: Definitions and Concepts

Blockchain

Blockchain is based on distributed ledger technology. The important features of Blockchain Technology are Consensus, Provenance, Immutability, and Finality. In addition to the above functional characteristics trust, transparency, traceability, large capacity, security, anonymity and faster transaction settlements, and reduced transaction cost (Blockchain, 2022).

Databases are used when the application does not want to provide shared write access. Blockchains are used when the writers are unknown, untrusted, interests are not unified and the system does not want to go through a trusted third party.

Characteristics of Blockchain

The important characteristics of a blockchain network are Consensus, Provenance, Immutability, and Finality (Blockchain, 2022).

Consensus

Each transaction is accepted by all participants in the chain. For example, in a supply chain blockchain consensus is from payment, warehousing, and logistics. There are different consensus algorithms such as Proof of Work for Bitcoin, Tangle for IOTA Platform, Proof of Stake for Ethereum 2.0

Provenance

The origin of the assets is known to all the participants. For example, in a supply chain blockchain, it could be food products, cash, machinery, IPR, etc.

Immutability

It is impossible to tamper with an entry in the distributed ledger by any of the participants. For example, in a supply chain blockchain, it is not possible to alter/falsify any transaction, inventory data, delivery time, dates, etc.

Finality

Finality is confirmation after the transaction. The transaction entered in the blockchain cannot be reversed. This state is called finality. Finality time is different for different blockchain platforms. For example, it is 60 min in the case of Bitcoin and 2 sec in the case of EOS.

Business Process Management

Business Process Management involves process modeling, analysis, measurement, design/redesign, and management. The business Process Management lifecycle consists of identification, discovery, analysis, redesign, implementation, execution, monitoring, adaptation, and evolution (Agrawal, 2021).

Lean Six Sigma

Lean-Flawless Execution, impact the top and bottom line, enhance customer experience, eliminate waste, and shorten cycle time (Smith and Harry, 1986).

Six Sigma-Flawless Execution, impact top and bottom line, enhance customer experience, eliminate process variation, and improve process capability (Smith and Harry, 1986).

Lean Six Sigma-Flawless Execution, impact top and bottom line, enhance customer experience, eliminate waste, shorten cycle time, eliminate process variation, and improve process capability (George, 2002).

Model Canvas

Model Canvas is a strategic management template. From the model canvas we can describe, design, visualize, analyze and assess to depict the idea and plan of action for development and execution.

The purpose of Business Model Canvas (Osterwalder and Pigneur, 2010) is to sell a specific product. Lean Canvas (AILC, 2016) is for solving a problem. Decentralized Business Model Canvas (DBMC, 2021) is for decentralized space. The key elements, advantages, and disadvantages are tabulated and given in Table 1.

Literature Review on Blockchain Technology, Business Process Management, and Various Canvases

Blockchain is a disruptive technology with huge venture capital investment in blockchain-based start-ups. Research is done on scientific literature with the objective of how the concepts of business process management, Lean Six Sigma, and various canvases can be applied to blockchain-based business problems. It is important and

there is a growing need for an appropriate business model for a decentralized lean start-up.

Blockchain foundation, their need, concepts, history, network view, terminologies, the structure of the block, cryptography in blockchain, formation of chain in blockchain, consensus algorithms, blockchain versions, applications, advantages, various platforms, challenges, and strengths are detailed by (Komalavalli *et al*., 2020) in the book chapter "Overview of Blockchain Technology Concepts". Mohammad Jabed Morshed (Chowdhury *et al*., 2019) reviewed and compared various DLT platforms focused on quantitative and qualitative metrics. The paper aims to assist developers and architects in their quest for the most appropriate DLT frameworks. Dai *et al*. (2017) performed a thorough study of the present state of blockchain technology's usage in cybersecurity. To address security issues, this article analyses the benefits of blockchain in security and highlights blockchain research and application in security-related areas. Golosova and Romanovs (2018) analyses the blockchain advantages and disadvantages of implementation in various fields of modern industry.

Table 1: Comparison of business model canvas, lean canvas, and decentralized business model canvas

Criteria	Business model canvas	Lean canvas	Decentralized business model canvas
Purpose	For selling a specific product	For solving a problem	For Decentralized Space
Elements	Key Partners, Key Activities, Key Resources, Value Propositions, Customer Relationships, Customer Segments, Channels, Cost Structure, Revenue Streams	Problem, Solution, Key Metrics, Unique Value Proposition, Unfair Advantage, Channels, Customer Segments, Cost Structure, Revenue Streams	User/Customer Segments, Value Proposition, Proposed Solution, Reaching Trust, Validator Incentive, Cost Structure, Network Governance, Interaction Channels, Revenue Streams
Advantages	Defines key activities that generate value and revenue for the business. Encourages strategic relationships with clients and partners. Enables testing of an existing business model against the market.	It focuses on understanding the problem that the business is trying to solve. Restrains the "solutions" box, encouraging simple and easily testable ideas. Proposes key metrics to evaluate whether the business is moving in the right direction. Accounts for uncertain conditions, assumptions, and incomplete data.	It is a simple business model for decentralized space Enables to work and adapt fast Ensures answering the key questions
Disadvantages	It doesn't accommodate businesses in very early stages of development. Enables risky assumptions within the business model, without offering a clear way to verify them. Focuses on the end-shape of the business without defining the strategy to get there.	Overemphasizes the internal focus without accounting for the surrounding ecosystem. Limits strategic thinking (as Ethan Mollick put it, by "focusing on what customers want today, rather than trying to see ahead into the future."). Lacks the "Resources" box which may lead to unrealistic product ideas.	The key parameters problem definition, key resources, key activities and learn are missing in the canvas. Lacks closing the loop as learn phase is absent. There is no mechanism for rectification of the problem.

Table 2: Process modeling for core value chain processes

Process Modeling for Core Value Chain Processes	
Define	Outcome of this process
	Service provided to customers
	Satisfaction Criteria
Scope	Starting point of this process
	End point of this process
	Measuring success
Resources	Human resources in this process
	Straightforwardness of human resources
	Knowledge level of day-to-day execution
Control	Quality check, timeline
Revise	Review with stakeholders
	Review with customers

Table 3: Differences between DMAIC and DMADV

DMAIC	DMADV
Similarities	
Both use statistical tools	
Solutions are based on hard facts and are data intensive	
Differences	
DMAIC defines business process and its applicability.	DMADV defines customer requirements and relate to service/product
The performance of processes are measured by DMAIC	Customer specification and needs are measured by DMADV
Control systems are established	The business model should undergo simulation tests
Improvements are made to a business process	Develops an appropriate business model
Reduces/remove defects	Meets customer requirements

Table 4: Comparison of proposed decentralized lean business model canvas with existing model canvases

Criteria	Business model canvas	Lean canvas	Decentralized business model canvas	Decentralized lean business model canvas
Purpose	For selling a specific product	For solving a problem	For decentralized space	To amalgamate blockchain with BPM and LSS for blockchain based businesses
Number of elements	9	9	9	13
Elements	Key partners, key activities, key resources, value propositions, customer relationships, customer segments, channels, cost structure, revenue streams	Problem, solution, key metrics, unique value proposition, unfair advantage, channels, customer segments, cost structure, revenue streams	User/customer segments, value proposition, proposed solution, reaching trust, validator incentive, cost structure, network governance, interaction channels, revenue streams	Problem, solution, value propositions, channels, user segments, key partners, key resources, key activities, reaching trust, validator incentive, cost structure, revenue streams, learn
Advantages	Defines key activities that generate value and revenue for the business. Encourages strategic relationships with clients and partners. Enables testing of an existing business model against the market.	It focuses on understanding the problem that the business is trying to solve. Restrains the "solutions" box, encouraging simple and easily testable ideas. Proposes key metrics to evaluate whether the business is moving in the right direction. Accounts for uncertain conditions, assumptions, and incomplete data.	It is a simple business model for decentralized space Enables to work and adapt fast Ensures answering the key questions	Appropriate business model for decentralized lean startup and business moving to blockchain implementation. Improves the productivity and quality with the help of BPM and LSS. The learn parameter helps to understand the problem and rectify it. Does not limit strategic thinking. It accommodates business ever in very early stage of development. It focuses on value propositions, solving the problem while maintaining trust among all stakeholders.
Disadvantages	It doesn't accommodate businesses in very early stages of development. Enables risky assumptions within the business model, without offering a clear way to verify them. Focuses on the end-shape of the business without defining the strategy to get there.	Overemphasizes the internal focus without accounting for the surrounding ecosystem. Limits strategic thinking (as Ethan Mollick put it, by "focusing on what customers want today, rather than trying to see ahead into the future."). Lacks the "resources" box which may lead to unrealistic product ideas.	The key parameters problem definition, key resources, key activities and learn are missing in the canvas. Lacks closing the loop as learn phase is absent. There is no mechanism for rectification of The problem.	It does not accommodate business models with no decentralization

Li *et al*. (2017) proposed Proof of Vote (PoV), a new consensus algorithm. Consensus shall be organized by distributed nodes managed by partner organizations, which shall lead to decentralized arbitration by vote. The primary objective is to provide a distinct identity for network users, allowing authorities to specify the submission and validity of blocks. Bach *et al*. (2018) compared various consensus algorithms that are presently in use in blockchains. The analysis mainly focuses on scalability, methods of rewarding validators based on time spent, and security risks. This study also presents the future trends in consensus algorithms. Puthal *et al*. (2018) discussed several consensus algorithms for various applications. They also concluded with some challenges of the blockchain-scalability, higher latency, fake block generation, and energy consumption. Nakamoto (2008) introduces bitcoin and a consensus algorithm called Proof of Work (PoW). The author gave a solution for the double-spending problem using peer-to-peer networks. The network is robust and the nodes work with coordination. The rules and incentive mechanism could be enforced with proof of work consensus mechanism. Kumar *et al*. (2020) developed Prodchain, a generic blockchain framework. It uses lattice-based cryptography to reduce the complexity of tracing e-commerce products. Proof of Accomplishment (PoA) is a new consensus process developed. Zhu *et al*. (2020) presented an Improved Proof of Trust consensus algorithm. IPoT is based on a subjective logical reputation algorithm. This uses game theory and the results show that Improved Proof of Trust performs better concerning the validity, fairness, and security. King and Nadal (2012) proposed Proof of Stake (PoS), a new consensus algorithm that replaces proof of work consensus. It solves the problem of network security and energy consumption.

Mechkaroska *et al*. (2018) analyzed the possibilities for scalability in blockchain technology. The verification process in the blockchain is the biggest challenge because it reduces the speed of transactions. The authors have analyzed the possible solutions for improvement without comprising the security. Kim *et al*. (2018) compared the scalability issues – throughput cost, capacity, the advantages and disadvantages of the solutions covered by on-chain, off-chain, child-chain, and interchain. Distributed Ledger Technology Blockchain Interoperability standards (DLT, 2019) are required for creating, consolidating, and interconnection of multi-DLT blockchain technologies.

Gupta and Sadoghi (2018) discuss the EasyCommit protocol for implementation in ExpoDB. ExpoDB offers a framework for distributed ledger technology. Gupta and Sadoghi (2020) reviews blockchain topologies, consensus, and blockchain systems such as bitcoin, Ethereum, hyper ledger, and ExpoDB. Wood (2014) has provided the formal definition of the Ethereum protocol. We can implement a node in this network and others can be joined in a decentralized secure way. Contracts can be written to enforce policies.

López-Pintado *et al*. (2019) present the integration of BPM with blockchain technology. The authors developed a BPMN engine built on a blockchain system called Caterpillar. Perboli *et al*. (2018) discuss how business strategies can be integrated with blockchain technology. Also, they have brought out how this integration helps the business economically. Sturm *et al*. (2018) developed a novel lean framework for a blockchain-based process

execution mechanism with Smart Contracts that eliminates the need for a trustworthy third party in inter-organizational partnerships. Viriyasitavat *et al*. (2020) developed a BPM framework to demonstrate how blockchain technology can improve reliability, quality of service, and cost. Mendling *et al*. (2018) describe the potential and problems associated with integrating blockchain and business process management. The paper summarizes several research problems for applying blockchain technology to business process management. Carminati *et al*. (2018) explained how a business process could be implemented in a blockchain system. In an inter-organizational system security issues should be addressed properly. Di Ciccio *et al*. (2019) demonstrate how to design and execute blockchain in inter-organizational business processes. They provided structured specifications to Business Process Automation on blockchains. Falazi *et al*. (2019) extended BPMN to capture the semantics, and assisted modeling for decision making in blockchain transactions. They also designed a middleware to facilitate external application communication. Viriyasitavat and Hoonsopon (2019) proposed an architecture in which the system increases the consensus's flexibility and reliability, allowing it to more effectively respond to customer needs in the field of business process interoperability. (Agrawal, 2021) in her whitepaper mentioned that blockchain has the potential to revolutionize business process management. It can optimize systems where various actors adopt different regulations. Joyce and Paquin (2016) have developed a triple-layered business model canvas and contributed to innovation, that can handle sustainability issues. Further, they have created two new dynamics – horizontal and vertical coherence. Hong and Fauvel (2013) in their paper concluded that the business model canvas could be adopted initially as it is and different variations could be tried such that it fits better for their business. Variation in the business model canvas is believed to bring holistic understanding to the entrepreneurs. Ojasalo and Ojasalo (2018) used empirical qualitative research for adopting service logic in the business model canvas. The developed canvas also has nine key parameters-customers worlds and desires for ideal value, value proposition, value creation, interaction and co-production, revenue streams and metrics, key resources, key partners, mobilizing resources and partners, cost structure. Hornáčková *et al*. (2018) proposed a model to implement the mortgage process in smart contracts. They have used the enterprise engineering concept with smart contracts. Two research problems for further research were also proposed-Automatic the creation of smart contracts by business process management using enterprise engineering and optimization of smart contract code for better efficiency.

Six Sigma (Smith and Harry, 1986) was developed for making improvements to the manufacturing unit. MAIC (Measure, Analyze, Improve, Control) was proposed by them, and later on "Define" was also added. Michael (George, 2002) introduced the term "Lean Six Sigma" in the book titled Lean Six Sigma: Combining Six SIGMA Quality with Lean Production Speed. For sustained value creation, both lean and Six Sigma has to be combined. This combination is required as lean alone cannot bring a process under statistical control and Six Sigma alone cannot improve process speed or reduce capital investment.

Sparviero (2019) presented the social enterprise model canvas with fourteen parameters-governance, non-targeted stakeholders, key resources, key activities, channels, customer and beneficiaries' engagement, customers and beneficiaries, mission values, objectives, cost structure, social value proposition, impact measures, output measures, income. Frick and Ali (2013) investigated the business model canvas on two SMEs-Sekal AS and 2K Tools AS based in Norway. The canvas was appropriate for present operations but not for future plans. Ecocanvas for circular business design was proposed by (Daou *et al*., 2020). This canvas had twelve key parameters-need/problem/challenge, customer segments, key resources, circular value chain, foresight, and environmental impact, structure cost, foresight, and social impact, stakeholder's relationship, communication and sales, unique circular value proposition, revenue streams, and circular business model and innovation. Rodrigues and Lopes (2018) hypothesized BMC as a static framework. They detected that the dynamism depends on the user and not based on its structure. They contributed by integrating tools, indicators, and methodologies to make them dynamic.

Szopinski *et al*. (2020) synthesized software-based business model development tools by identifying 43 characteristic functions, classified the existing software tools, and derived future research directions on software tools for business model canvas. (García-Muiña *et al*., 2020) used triple-layered BMC for a ceramic tile producer in Italy. Environmental sustainability, economic sustainability, and social sustainability in manufacturing companies are important for the top management. This was carefully assessed using the value proposition of the organization moving towards a sustainable business model. Muhtaroğlu *et al*. (2013) applied business model canvas to big data applications. They have considered two application areas – smart routing and healthcare. They concluded that big data applications add value by increasing profit. Lean Canvas is explained in (Maurya, 2012). The author provided a step-by-step approach to becoming a successful entrepreneur from ideation to action. This book describes the process of documentation in a one-page format called Lean Canvas. This canvas is a blueprint of a product. Further, it also explains how to

identify the risk involved in the plan, how to prioritize work, and the process of evaluation.

Erlyana and Hartono (2017) conducted a case study of an online shopping company. It was evaluated using SWOT (Strengths, Weakness, Opportunities, Threats) analysis, and suggestions for improvement were given to the management. Keane *et al.* (2018) conducted an exploratory analysis of how entrepreneurs and managers perceive key business models. It was found that the two groups represented the key parameters differently.

Star Optimization Model was proposed by (Eashwar and Geetha, 2016). They conducted a case study on the manufacturing industry and provided a solution for time, cost, quality, safety, and environmental trade-off problem. Malu (Castellanos *et al*., 2004) laid the foundation for business process execution through intelligent information processing and analysis. This will enable us to identify the problem areas and find solutions for improvement. Zott and Amit (2007) have shown that across industries and countries, novel unique business models are always associated with better performance of both incumbents and startups.

Link (2016) combines design thinking with lean start-up and proposed a smart-up lean canvas. It consists of a problem, customer segments, unique value proposition, solution, existing alternatives, channels, sources of revenues and cost structure, unfair advantage, key metrics, and short concept. In their study, (Bocken and Snihur, 2020) highlighted that the canvas is not a tool for ideation but rather promotes experimentation as an iterative approach to avoid risk and should not be associated with incrementalism.

Integration of BPM and Lean Six Sigma

The Fig. 2 explains how business process management and Lean Six Sigma are interrelated. In the BPM lifecycle, there are four different phases - document, assess, improve and manage. The improvement phase of BPM gives the handle to Lean Six Sigma DMAIC.

Document Phase of BPM

In the process modeling phase, value chain processes are identified. This is followed by developing a system-level map that represents the sequence of work in a graphical way which is shown in Fig. 3 and Table 2.

The processes should be classified into the core, support, and management processes. Core processes are identified based on the following attributes.

1. Whether the process has a major impact and is vital to the overall success of the organization
2. Whether the process is related to the vision, mission, and goals of the organization
3. Whether the process can provide a competitive advantage when implemented effectively and efficiently
4. Whether it impacts the customers directly
5. Whether the process is cross-functional, i.e., it cuts across multiple departments/divisions

Assessment Phase of BPM

Efficiency, effectiveness, and outcome are to be measured. To ensure efficiency and transparency most of the core processes could be automated and the effectiveness could be measured. Lower Cost, Higher Quality, and Shorter Delivery Time is the need of the customers in any industry. The service quality is determined by accessibility, credibility, security and reliability, communication, competence, understanding of stakeholders, and tangibles.

Improve Phase of BPM

The improvement phase consists of:

- Process Improvement
- Process Redesign
- Process Re-Engineering

Here the improvement phase is implemented through Lean Six Sigma (LSS) as explained in the following subsections.

Process Improvement

In process improvement, incremental modifications are made. This can be implemented through the principles of Lean and Six Sigma DMAIC.

DMAIC

DMAIC is a Six Sigma process enhancement paradigm for defining, measuring, analyzing, improving, and controlling processes. It was designed to help producers, reduce wastage and increase the efficiency of current business processes.

Process Redesign

Whenever there is a need for fundamental change to the process, redesigning is essential. This can be implemented through the principles of Six Sigma DMADV and automation.

DMADV

To meet consumer demands innovative systems evolve by utilizing the Six-Sigma DMADV approach. The DMADV stands for defining, measuring, analyzing, designing, and verifying.

The difference between DMAIC and DMADV is given in Table 3.

Process Re-Engineering

Whenever there is a radical change, new process development is required.

Manage Phase of BPM

Tracking and monitoring the core value process is important and key process indicators are reviewed in a specific time interval. This is followed by appropriate actions and corrections. The process manager's role is critical and they are accountable for effectiveness, efficiency, outcomes, and stakeholder satisfaction. The performance of process managers is evaluated based on their leadership quality, documentation including audit compliance, implementing and achieving KPI's and improving the overall performance by analyzing planning, benchmarking, executing process improvement projects, fostering new ideas, etc.

In the improvement phase, it is shown how LSS could be integrated with BPM. The control from LSS is given to the management phase of BPM, thus the cycle is complete.

Mapping of Lean Six Sigma and BPM with Blockchain

Amalgamating Blockchain with Business Process Management (BPM) and Lean Six Sigma will transform industries and businesses. The way in which the integration is feasible is given in Fig. 4.

In the following sections, we describe how blockchain is integrated with business process management and Lean Six Sigma.

Blockchain Integration with Business Process Management

Business Process Management lifecycle consists of identification, discovery, analysis, redesign, implementation, execution, monitoring, adaptation, and evolution (Agrawal, 2021).

Identification

A process identification focuses on a business's overall process, enabling strategic positioning. This phase is generally approached with a monochrome view. With the help of Blockchain technology, high-level systems are assessed based on their advantages, disadvantages, opportunities, and risks.

Discovery

The approach to process discovery currently relies heavily on walkthroughs and interviews but includes process-aware applications in conjunction with unencrypted event logs from systems. With the advent of blockchain in the discovery phase, the information is fragmented and encrypted.

Analysis

At the moment, analysis is built on internal and external process data or insights. Through blockchain, valuable information can be obtained for assessment. Process tracking, Process detection, and root cause analysis are possible using this information on both small and large scales.

Redesign

At present, methods like heuristics are implemented assuming that there are predictable improvements for processes in terms of how frequently a procedure or model can be modified. The incorporation of blockchain shall provide new ways to improve particular business processes or resolve challenges. For example, smart contracts come in handy.

Implementation

As of now, the business processes are implemented through information systems that are mostly based on a single entity. In inter-organization situations where a complete process cannot be controlled and monitored centrally due to the organization's borders, blockchain is the way forward and can assist in trust relationships.

Execution

The word "execution" refers to the creation of cases and their processing by BPMs. By integrating blockchain technology the messages are stored as blocks based on transactions executed.

Monitoring

Process monitoring refers to event-driven applications and is verified by systems. For monitoring the process blockchain technology could be exploited for the verification process coupled with off-chain information.

Adaptation and Evolution

During runtime, the members can change the model in the process. Unlike the traditional approach, blockchain can impose conformity and bring trust.

Blockchain Integration with Lean Six Sigma

- Blockchain helps in data tracking, traceability, and traceability with integrity. All these properties of blockchain make it apt to use in the definition phase of Lean Six Sigma
- Blockchain's Provenance feature is often closely related to the potential to measure a process by showing the path of the asset and how it evolved over time
- Consensus is critical to the control component of lean since it is the mechanism by which the legality of all transactions is proven
- Immutability is linked with Improvement Phase. The transaction history records past data as well as improvements implemented

Integrating Business Process Management with Lean Six Sigma is possible by applying Lean Six Sigma in the design and redesign stage of BPM (BLSS, 2020).

Decentralized Lean Business Model Canvas (DLBMC)

We have developed a novel decentralized lean business model canvas. In business model canvas and lean canvas, there are nine key elements. In the business model canvas, the key elements are Key Partners, Key Activities, Key Resources, Value Propositions, Customer Relationships, Customer Segments, Channels, Cost Structure, and Revenue Streams. In the lean model canvas, the key elements are Problem, Solution, Key Metrics, Unique Value Proposition, Unfair Advantage, Channels, Customer Segments, Cost Structure, and Revenue Streams. In decentralized business model canvas User/Customer Segments, Value Proposition, Proposed Solution, Reaching Trust, Validator Incentive, Cost Structure, Network Governance, Interaction Channels, and Revenue Streams.

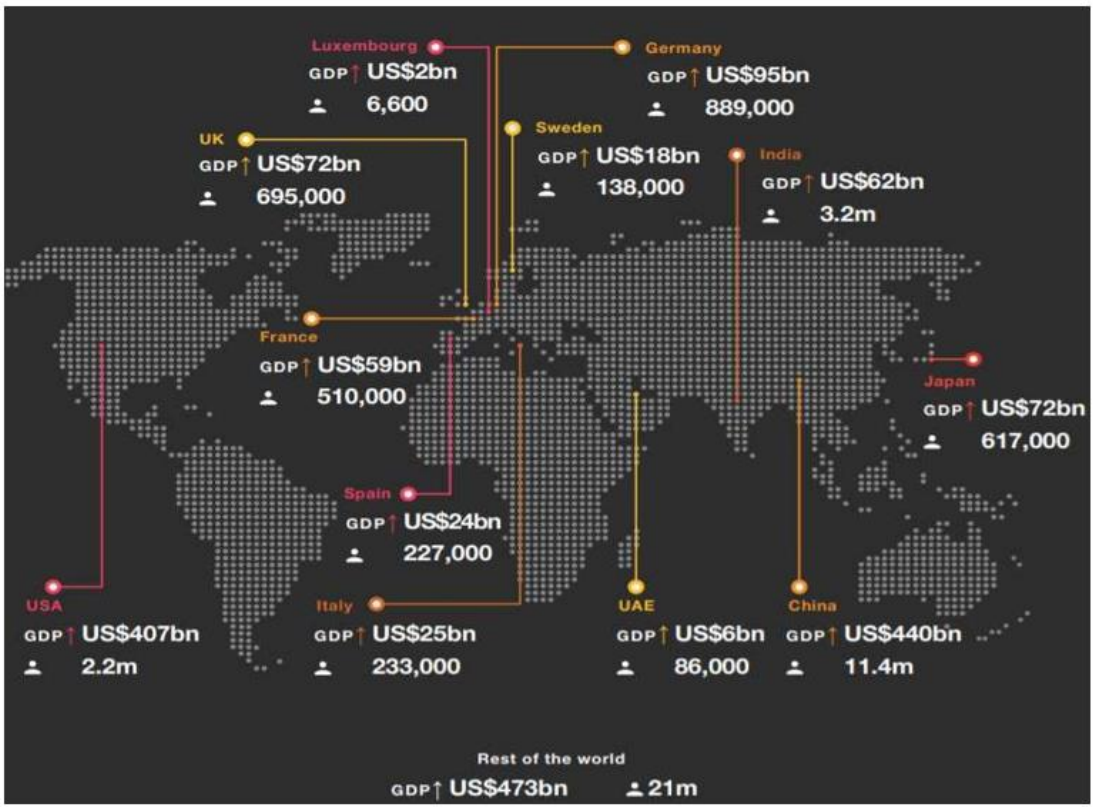

Fig. 1: Global Impact of blockchain GDP boost and jobs enhanced by 2030 (TT, 2020)

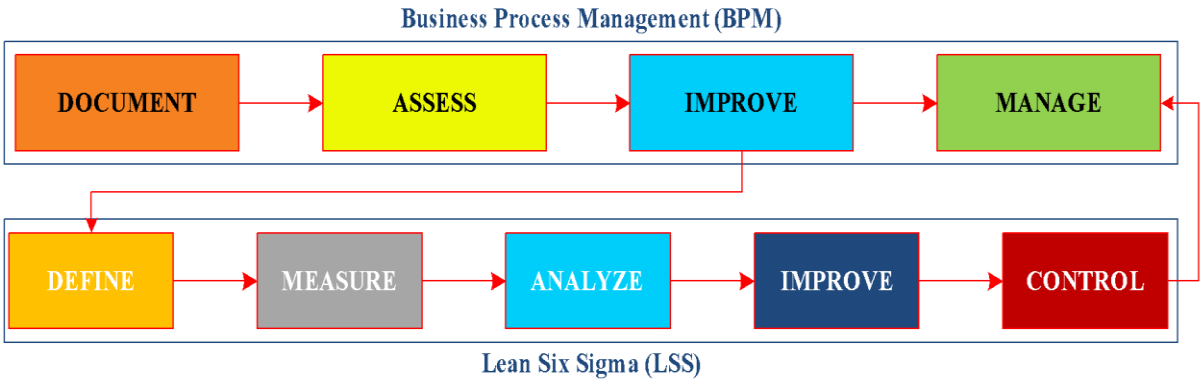

Fig. 2: BPM and Lean Six Sigma Integration (Maurya, 2012)

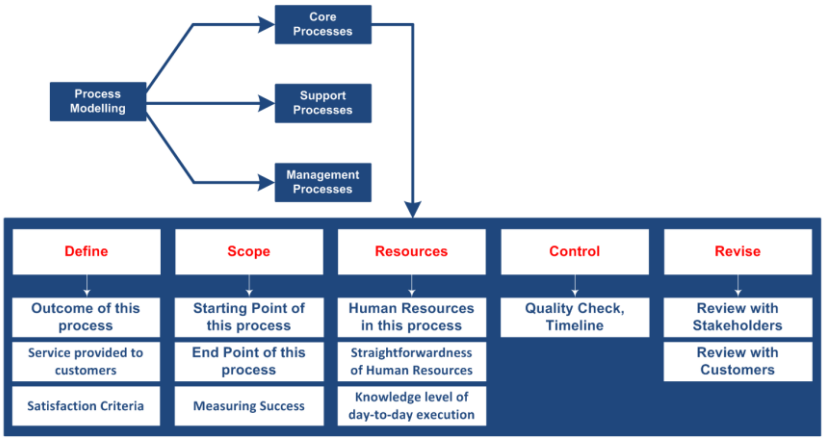

Fig. 3: Process modeling phase

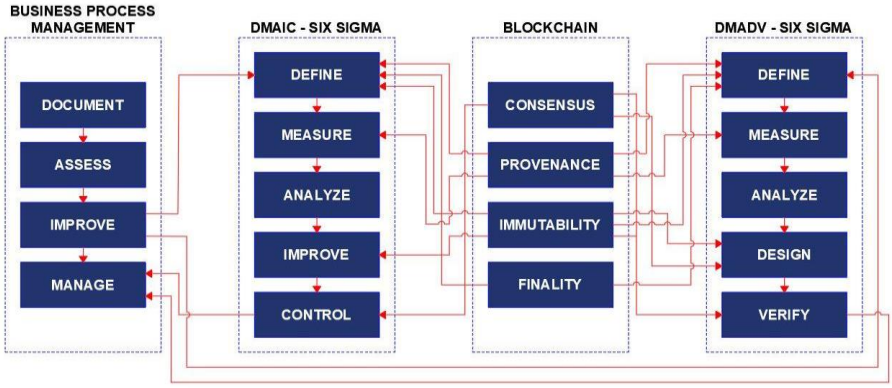

Fig. 4: Mapping of lean six sigma and BPM with blockchain

Fig. 5: Decentralized lean business model canvas

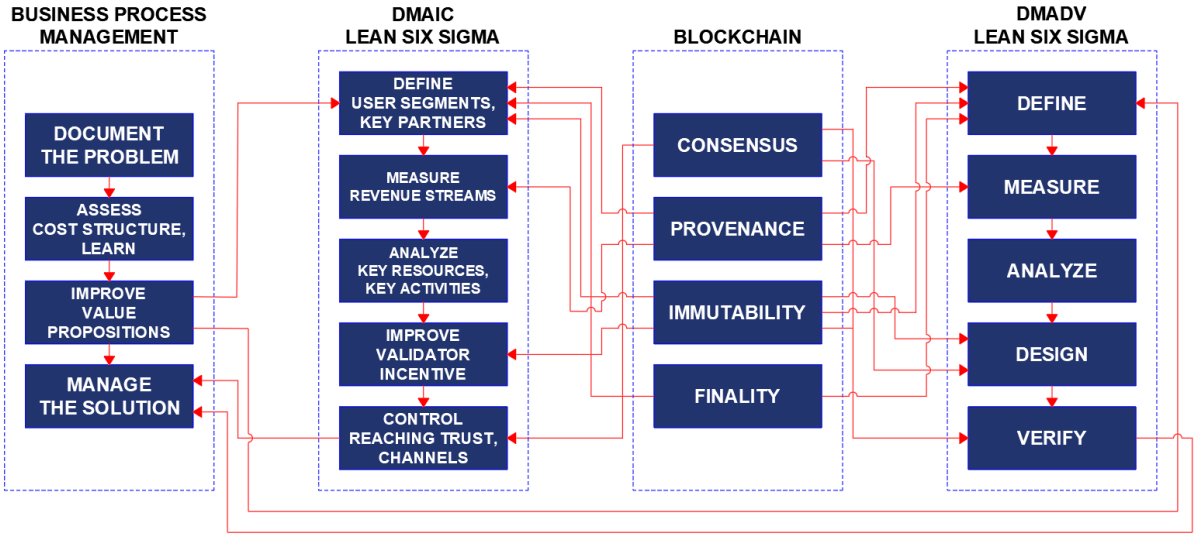

Fig. 6: Mapping of key elements of DLBMC with BPM and LSS

Fig. 7: Decentralized lean business model canvas for scholarly communication

The decentralized lean business model canvas aims to amalgamate blockchain with the principles of Business Process Management (BPM) and Lean Six Sigma (LSS). The problem, Solution, Value Propositions, Channels, User Segments, Key Partners, Key Resources, Key Activities, reaching trust, Validator Incentive, Cost Structure, Revenue Streams, and Learning are the 13 Key parameters for DLBMC. These 13 key parameters are mapped with Business Process Management (BPM) and Lean Six Sigma (LSS) principles which is shown in Fig. 5.

This template can be used for any blockchain use cases to make strategic management plans. For each key element, questions were formulated. The template for a decentralized lean business model canvas is given below:

The document phase identifies the important process and is attributed to the problem definition. Lowering the cost is the key to the success of any organization. Cost structures are assessed in the assessment phase of BPM. Closing the feedback loop and acting on the learning outcomes is important for growth. In the assessment phase, the learnings are assessed and the actionable points are transferred to the improvement phase. Based on the close interaction and feedback from stakeholders, value propositions are worked upon in the improvement phase of BPM. User segments and key partners are the building blocks and their relationship to the organization is vital. These are well defined in the definition phase of Lean Six Sigma. Identification of the source of revenue and its measurement is inevitable for business success. Here it is mapped with the measurement phase of LSS. Key activities are important for the business model to work. Key resources are required for creating the value proposition. It may be physical, intellectual, financial, and human resources. Key activities and key resources are associated with the analysis phase of LSS. In a blockchain system, the validator receives reward points when blocks are proposed and attested. The validator incentive is mapped with the improvement phase of LSS. The transaction history in a distributed ledger records past data and improvements thereon, which are immutable. The communication channels are to be controlled and further, for reaching trust, transparency of data is required. Hence, channels and reaching trust are associated with control in LSS. The following Fig. 6 represents the mapping of key elements of DLBMC with BPM and LSS.

Validation of Decentralized Lean Business Model Canvas

The decentralized lean business model canvas is validated by considering a use case for scholarly communication and scientific publication. There are three steps to validate: Delivering, creating, and capturing value.

Deliver

We surveyed to identify the challenges of scholarly communication and scientific publication. The survey results revealed that:

- Time: Slow review process-sometimes it takes more than a year to get the initial screening done
- Cost: Researchers want to publish in open access journals, but due to lack of funding they are unable to publish in open access journals. Some researchers include researchers from other organizations just to pay open access charges
- Quality: Predatory journals compromise on the quality of publications and act as a paper mill without a peer-review process
- Security: Some of the genuine journals are hijacked/cloned and create forged replicas exploiting the title and International Standard Serial Number (ISSN)
- Trust: Reviewer biasedness, backdated publishing of certain journals, and misleading journal metrics by certain journals lead to distrust.
- Reviewer Motivation: From the reviewer's point of view, it was expressed that some kind of recognition will motivate them
- Copyright Violation: Intellectual property management is one of the greatest challenges.
- Communication: Timely and relevant information through an appropriate communication medium.
- Integrity: Submission of the
- same manuscript to multiple journals simultaneously leading to wastage of time and resources. Academic integrity should be enforced
- Innovation: The review process and publication process should adopt innovative practices to satisfy the key stakeholders-authors, indexing agencies, research foundations, etc.

The Problem - List the top Problems to be Solved

In a traditional scientific publishing industry, the following are the problems identified: The Centralized Review process, manually appointing reviewers for a manuscript leading to a biased approach, Expensive, lack of transparency, Cloned and hijacked Journals, and Sluggish process.

The Solution - Outline the Possible Solution to Each Problem

A decentralized system is a solution for the problems identified. The proposed automated system shall improve the quality of the peer-review process, avoid publication bias, reduce the cost of publication in open access journals, eliminate back-dated publication, verify the genuinity of publication, and rapid publication.

Value Proposition-what is the Value we Promise to Deliver to our Users

The proposed system competes on quality, time, cost, security and trust.

Channels-what are the Best Channels for Communicating with End-Users

Email, social media, Conferences, and Workshops.

User Segments-Whom are we Building the Product for

Authors of the scientific community, publishers, indexing agencies, science foundations, and other research grant organizations.

Validator Incentive-what are the Incentives for Validators to Take Part in the Network and Work in its Best Interest

Reviewer Reputation Token to acknowledge and appreciate the service provided by the reviewers on time.

Create

To create value, we need to focus on resources, partnerships, and activities. For this purpose, a minimum viable product is developed. Feedback from stakeholders is collected.

Key Partners - who are our Key Partners

Indexing agencies, Committee on publication ethics, Crossruff, ORCID, ISSN Network.

Key Resources - What Key Resources do our Value Propositions Require

Editorial Board, Managing Editor, Publisher, Hardware, and software.

Key Activities-what Key Activities do our Value Propositions Require

- Paper Submission: Usage of Smart Contract enforces academic integrity
- Communication Process: All communications in the system are cryptographically secure
- Review Process: Usage of Smart Contract and consortium-based volunteer peer review system enforces quality and time
- IPM: Usage of Smart Contract saves time during Copyright Transfer
- Publication Process: Automated systems using blockchain enables rapid publication with reduced cost
- Verification Process: Manuscripts are verified for their Genuity which builds trust among all stakeholders

Reaching Trust-what Mechanisms do we use to Reach Trust

90% of the system is on-chain. This makes it trustworthy due to its characteristics such as Transparency, Immutability, Decentralization, and Security.

Capturing Value

This is the most important aspect of any business organization. The right approach in identifying and calculating cost structure and revenue streams enables the business to run profitably.

The stakeholders were interviewed on their views on open access charges. Considering the value proposition and trustworthiness of the system, the authors felt satisfied.

Cost Structure-what Are the Major Drivers of Cost

Research and Development, Software Development, Hardware, Softwares, Talent, and office.

Revenue Streams-what are the Key Ways to Generate Revenue

Article Processing Fee/Open Access Fee

Learn

Lean Six Sigma - DMADV (Define, Measure, Analyze, Design, Verify).

Comparison of Proposed Decentralized Lean Business Model Canvas (DLBMC) with Existing Model Canvases

The advantages of the proposed DLBMC are: Appropriate business model for decentralized lean startups and businesses moving to blockchain implementation, Improves the productivity and quality with the help of BPM and LSS, the learn parameter helps to understand the problem and rectify it, does not limit strategic thinking. It accommodates business ever in the very early stage of development, it focuses on value propositions and solving the problem while maintaining trust among all stakeholders.

The comparison of proposed Decentralized Lean Business Model Canvas (DLBMC) with existing model canvases is shown in Table 4.

Use Case Scenario

From the above discussion, a decentralized lean business model canvas for scholarly communication is developed and is shown in Fig. 7. The problem in the scientific publishing industry such as centralized review, lacking transparency, and the sluggish process is mapped to the document phase of BPM. The major drivers of cost and the learnings are mapped to the assessment phase of BPM. The value proposition such as quality, time, cost, security, and trust are mapped to the improvement phase

of BPM. The key partners such as indexing agencies and user segments such as funding organizations are mapped to the definition phase of LSS. The revenue streams such as article processing fees are mapped to the measure phase of LSS. The key resources for successful publication are a strong editorial board and supporting hardware and software resources. Also, the key activities such as intellectual property management, communication process, etc. are mapped to the analysis phase of LSS. The validator incentives such as tokens to acknowledge the service provided by the editorial board are mapped to the improvement phase of LSS. Reaching trust and establishing strong communication channels in scholarly communication is vital to the reputation of the publishing industry. They are mapped to the control phase of LSS. The decentralized system could aid as a solution to solve the problems identified in scholarly communication and scientific publication. This is mapped to the management phase of BPM.

Conclusion

Business Process Management and Lean Six Sigma are organization specific. There has not been any study/canvas to integrate BPM and LSS in blockchain technology. Many companies are trying to establish blockchain in their business and are already using the principles of BPM and or LSS. This motivated us to develop a framework for the same. They developed a novel decentralized canvas that uses the principles of Business Process Management (BPM) and Lean Six Sigma (LSS). DLBMC is the result of the amalgamation of BPM and LSS. The decentralized lean business model canvas template developed can be made suitable for any blockchain-based use cases to make a strategic management plan. It will act as a one-page visualization tool and we believe that blockchain-based startups will benefit from it. Based on the template, the use case scenario was developed for scholarly communication and scientific publishing. The decentralized lean business model canvas for scholarly communication and scientific publication will help all researchers and organizations for developing blockchain-based scientific communication systems. The proposed system competes on time, cost, quality, security, and trust. Furthermore, with the help of a decentralized lean business model canvas, a blockchain system can be developed for scholarly communication and scientific publishing.

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Author's Contributions

Eashwar Sivakumar: Conceiving the idea, contribution to planning, designing and drafting of the article and approving the article.

Paras Chawla: Planning and supervising of the article and Critical revision of the article.

Ethics

This article is original and contains unpublished material. The authors have read and approved the manuscript and no ethical issues are involved.

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