BLOCKCHAIN DRIVEN BUSINESS PROCESS REDESIGN

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ABSTRACT

Blockchain technology has been widely portrayed as a catalyst for organizational transformation, yet its adoption delivers value only when the underlying business processes are deliberately redesigned rather than merely automated. This paper aims to develop a theoretical foundation for blockchain-driven business process redesign by integrating the classical business process reengineering (BPR) paradigm with innovative blockchain technology. From methodology standpoint the paper is based on contextual interviews with key stakeholders, process analysis (Value Stream Mapping – VSM) and Business Process Model and Notation (BPMN).

The paper argues that blockchain extends the BPR agenda from the intra-organizational workflow to the inter-organizational processes. Four enabling characteristics—decentralisation, immutability, shared transparency, and programmable enforcement through smart contracts—are identified as the mechanisms through which blockchain expands the space of feasible process redesigns, mainly by eliminating redundant record-keeping, reconciliation overhead, and dependence on intermediaries. Moreover, it illustrates, that transformative potential of blockchain is contingent on the concurrent redesign of process models, governance arrangements, and platform choices. The findings illustrate positive impact of blockchain incorporation on specific company process performance through the comparison of the process "as is" and "to-be".

Key words: blockchain, business process management, business process redesign, business process reengineering, smart contracts

JEL Code: D23, L23, M15, O3

Introduction

Business Process Redesign (BPR) is the concept that represents "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed.". This term was coined by Hammer & Champy (1993).

The theoretical core of BPR was consolidated by two seminal contributions. Davenport and Short (1990) framed process redesign as "the new industrial engineering," arguing that business should be viewed not as a collection of individual or functional tasks but as a set of processes that can be deliberately designed for maximum effectiveness, and that IT and BPR share a recursive relationship in which each shapes the other. They proposed a five-step methodology—developing a business vision and process objectives, identifying processes to be redesigned, understanding and measuring existing processes, identifying IT levers, and designing and prototyping the new process—that became a reference model for redesign initiatives (Davenport & Short, 1990).

1 Blockchain as a Driving Force of Business Process Redesign

1.1 Blockchain Technology as a Process Enabler

Expert´s debate on BPR has been reshaped by the emergence of blockchain and distributed ledger technology (DLT). Iansiti and Lakhani (2017) described blockchain as an open, distributed ledger that can record transactions between parties efficiently and in a verifiable and permanent way, and that can itself be programmed to trigger transactions automatically.

Four technical properties are consistently identified in the literature as the source of blockchain's transformative potential for business processes: decentralization, immutability, transparency, and programmability through smart contracts (Taherdoost & Madanchian, 2024). Decentralization removes the reliance on a single controlling authority, distributing the maintenance and validation of records across a network of participants (Iansiti & Lakhani, 2017). Immutability, achieved through cryptographic chaining and consensus, renders recorded transactions practically tamper-proof, so that altering historical data would require compromising a majority of the network. Transparency arises from the shared visibility of the ledger among the relevant parties, while preserving pseudonymity of the transacting identities (Iansiti & Lakhani, 2017). Smart contracts represent self-executing programs deployed on the ledger that automatically enforce agreed rules when specified conditions are met—transform the blockchain from a passive record into an active coordination mechanism (Iansiti & Lakhani, 2017; Mendling et al., 2018).

The most theoretically significant contribution of blockchain to process thinking, however, concerns the nature of trust. Whereas traditional inter-organizational processes depend on intermediaries and central institutions to guarantee the reliability of shared information,

blockchain substitutes cryptographic proof for institutional trust, enabling coordination among mutually distrustful parties (Beck, Müller-Bloch, & King, 2018). This capacity for "trust-free" or, more precisely, differently trusted transacting has direct implications for how value chains and collaborative processes can be structured, because it relaxes the assumption that a costly, centralized point of trust must sit at the heart of every inter-firm interaction (Beck et al., 2018).

1.2 The Convergence of Blockchain and Business Process Redesign

Blockchain technology holds significant potential to transform business operations and generate business value (Rahman, Yeoh & Pal, 2026). Additional analyses referring to the BPM lifecycle allowed Mendling et al. (2018) to identify how blockchain reshapes each successive phase of process work. In the identification and discovery phases, the difficulty shifts toward recognizing which cross-organizational interactions are candidates for decentralized coordination and toward reconstructing process knowledge from on-chain transaction data. In the analysis and redesign phases, new trade-offs arise between on-chain and off-chain execution, between transparency and the confidentiality of commercially sensitive data, and between the immutability of deployed logic and the flexibility that evolving processes require. In the implementation phase, process models must be translated into smart-contract code whose correctness and cost are critical, while in the monitoring and controlling phase the tamper-proof ledger offers an authoritative, shared audit trail but also raises questions about scalability and privacy (Mendling et al., 2018). Crucially, the authors cautioned that realizing blockchain's potential is not a matter of simply substituting a new technology for an old one; rather, it demands the deliberate rethinking of process design, execution, monitoring, and governance—an argument that echoes the original BPR insight that technology enables value only when it is accompanied by fundamental process change (Mendling et al., 2018).

Milani and Garcia-Bañuelos (2018) revisited the seven principles of business process reengineering that were originally formulated by Hammer (1993) for an intra-organizational, IT-enabled setting and examined their applicability to blockchain-based solutions. They concluded that these principles remain relevant and helpful for understanding how blockchain and smart contracts can enable transformational, rather than merely incremental, process innovation, but that the analytical viewpoint must be expanded from the intra-organizational process to an ecosystem of separate organizational entities. Within such a blockchain-powered ecosystem, smart contracts assume a pivotal dual role, functioning simultaneously as repositories of shared data and as executioners of activities (Milani & Garcia-Bañuelos, 2018). Building on this conceptual foundation, Milani, García-Bañuelos, Reijers, and Stepanyan (2020) translated established BPR best practices into concrete redesign heuristics for processes

intended to execute on a blockchain, and validated them through a case study. They identified four major elements of blockchain-oriented redesign: (1) shifting the analytical perspective from intra- to inter-organizational processes by exploiting the shared data ledger; (2) using smart contracts both as performers of tasks and as connectors between processes; (3) using the blockchain as a means of trustworthy data communication; and (4) using tokens to manage digitally represented assets (Milani et al., 2020). Each element targets a characteristic source of inefficiency in traditional inter-firm processes. The shared ledger eliminates the redundant, siloed record-keeping that each participant would otherwise maintain and reconcile; smart contracts automate the coordination and hand-off logic that would otherwise rely on manual checks and trusted intermediaries; ledger-based communication removes the reconciliation overhead that accompanies message-based data exchange between independent systems; and tokenization enables the direct, auditable transfer of value and ownership within the process itself.

García-Bañuelos, Ponomarev, Dumas, and Weber (2016) demonstrated how a process model expressed in a standard notation such as BPMN can be compiled into smart contracts that enforce the correct order of task execution, while minimizing the cost of running the process on a commodity blockchain through space-optimized data structures. This line of research, later extended in execution engines such as Caterpillar (López-Pintado, García-Bañuelos, Dumas, Weber, & Ponomarev, 2019), shows that blockchain does not merely support the documentation of redesigned processes but can serve as their runtime: because the process logic is deployed on the ledger, the consensus mechanism itself guarantees that every participating party adheres to the agreed model, so that conformance is enforced by construction rather than by after-the-fact auditing. This property gives blockchain-driven redesign a distinctive character, since the redesigned "to-be" process and the system that executes it are, in effect, the same artefact.

Beyond these process-native contributions, integrative reviews have positioned blockchain within the broader landscape of digital transformation. Rather than acting in isolation, blockchain is increasingly combined with adjacent digital levers—such as the Internet of Things, robotic process automation, and artificial intelligence—each of which addresses a different facet of process performance, with blockchain contributing the distinctive capabilities of transparency, immutability, and decentralized verification (Al-Rakhami & Al-Mashari, 2020).

1.3 Synthesis and Research Positioning

As a matter of fact, the blockchain-driven business process redesign should be understood as the extension of the classical BPR paradigm into a decentralized, inter-organizational, and

cryptographically trusted setting. Blockchain adds a specific set of enabling properties as disintermediation, immutability, shared transparency, and programmable enforcement through smart contracts—that expand the space of feasible redesigns beyond the boundaries of a single organization (Mendling et al., 2018; Milani et al., 2020). Where the first generation of BPR concentrated on collapsing internal functional silos, blockchain-driven redesign directs attention to the seams between organizations, where duplicated record-keeping, reconciliation overhead, and dependence on intermediaries have traditionally accumulated the greatest inefficiency (Milani & Garcia-Bañuelos, 2018; Beck et al., 2018).

It became evident that the transformative potential of blockchain can be exploited only when process models, governance arrangements, and organizational responsibilities are redesigned in concert with the technology, and when the choice of platform and consensus mechanism is aligned with the specific coordination problem being addressed (Mendling et al., 2018; Taherdoost & Madanchian, 2024). This contingency provides the conceptual justification for the present study, which applies the redesign heuristics developed for blockchain contexts (Milani et al., 2020) to a concrete process, thereby contributing to the still-maturing empirical evidence base on how the enduring principles of business process redesign are operationalized when a distributed ledger becomes the shared infrastructure of an inter-organizational process.

2 Methodology

Research design is based on triangulation approach obeying by the principles demonstrated by Bryman & Bell (2015, p. 47). It combines qualitative content analysis, contextual interviews, business process analysis, business process modelling (BPMN) and single case study approach.

2.1 Qualitative Content Analysis

In principle, databases as WoS and Scopus were searched. The principal search logic used following search term: business model innovation" AND "blockchain" AND "business process*". In total, 300 scientific papers were collected that were further shortlisted as per relevance of their abstracts. 47 references were selected to properly address the topic. Eventually, 15 of them were applied in this paper.

2.2 Contextual interviews

Semi-structured interviews were chosen as the method of choice. Purposive sampling was chosen an the most appropriate approach to reflect proportional representation of stakeholders. There were two interview guidelines for aimed at sales persons and blockchain experts. The former interview guidelines consisted of three questions; the latter consisted of eight questions.

These contextual interviews were conducted with eight company sales managers, sales and controlling executives and external blockchain experts that were familiar with the business process under examination. Individual interviews lasted from 30-60 minutes. The interviews were recorded manually and consequently codified and interpreted. All the respondents yielded a consent to record and use the outcomes of interviews for scientific purposes. The interview guide was split into following thematic blocks: description of the current process flow, roles and responsibilities of involved actors, data exchange and validation mechanisms, bottlenecks and approval delays, manual reconciliation activities, trust and transparency challenges, and perceived openness toward digital automation. Contextual interview coding process paid respect to established three-stage coding logic (Strauss & Corbin, 1990). In the first phase, known as open coding, the interview notes were sequentially examined and broken down into descriptive tags that captured specific observations regarding the sales incentive management process, such as repeated data verification, manual reconciliation, fragmented data sources, or rule-based calculations. In the second phase, known as axial coding, these open codes were compared and grouped into broader categories that linked related concepts. This step yielded four categories: fragmented coordination, manual verification and reconciliation, rule-based incentive logic, and the need for a shared data infrastructure. In the third phase, known as selective coding, the categories were integrated around a central theme that links the empirical findings to the research objective of the study, namely the innovation of a blockchain-based business model in the process of managing incentives for sellers.

2.3 Business Process Analysis (Value Stream Mapping – VSM)

The analysis examines "Dealer Incentive Management Process - DIMP" to be found to operate with lower efficiency. Value Stream Mapping (VSM) was purposefully conducted to reveal non- value-adding activities that compose the main building blocks of the process in question. The main performance metric to be observed in VSM was time, particularly lead time spanning start and finish points of the process or time losses referring prevalently to redundant or recurring activities (Setiawan et al., 2021).

2.4 Business Process Model and Notation – BPMN

To illustrate and understand the process structure as a sequence of activities Business Process Model and Notation (BPMN) is preferably applied (Nivon & Salaün, 2024). Two BPMN models have been developed. The first one represented an "as-is" model, that represents the current configuration and activities sequence of DIMP as derived from contextual interviews and company document analysis; and a "to-be" model, incorporating blockchain-based elements such as a distributed ledger with restricted access for verifying performance data and

smart contract logic for the automated execution of incentives. The prospective "to-be" model integrates blockchain as a coordination and validation layer rather than as a standalone tool, with smart contracts placed at specific decision points where manual, rule-based validation is currently performed.

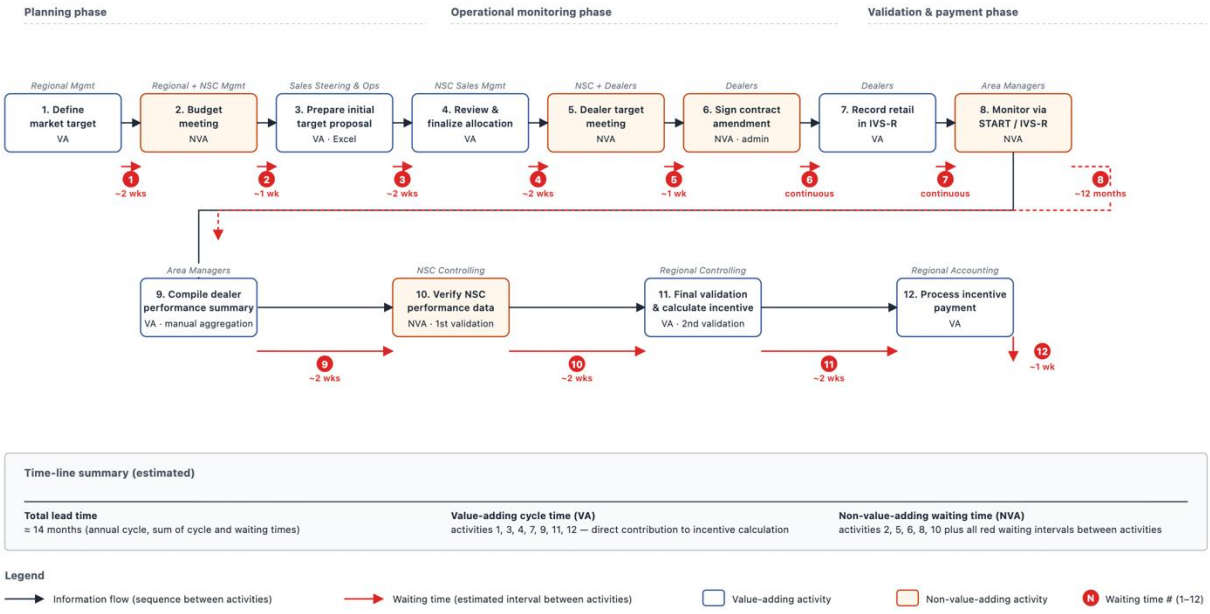
2.5 Single Case Study

As a supporting method single Case Study dealing with the development and execution of blockchain-driven BPR was selected to exemplify business case in a global automotive company. The feasibility of the blockchain driven approach was demonstrated on the example of DIMP.

3 Results

In principle, three outcomes bear relation to three steps that became fundamental for BPR (VSM mapping of AS-IS process and modelling newly developed TO-BE process).

Fig. 1: VSM visualization



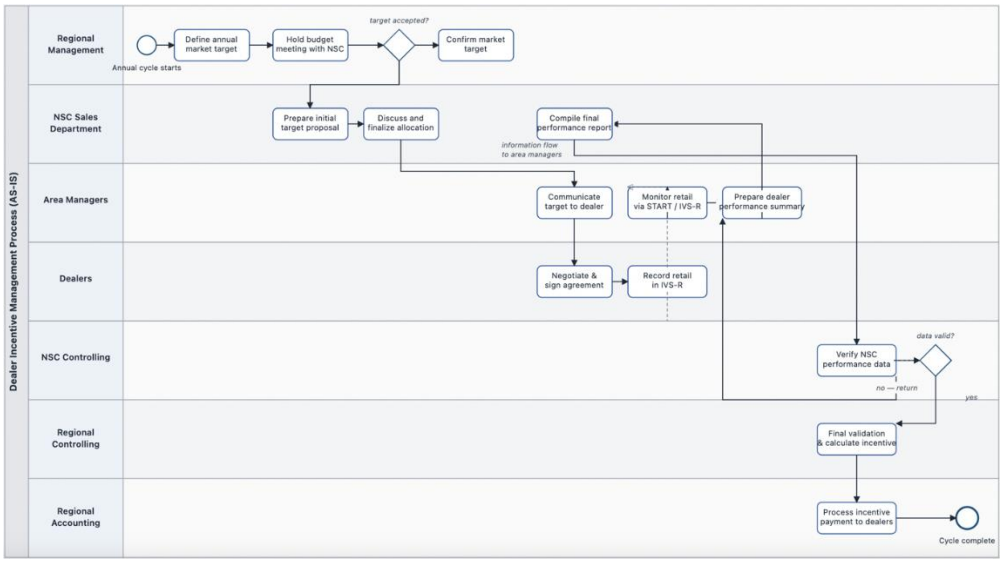
Source: own elaboration

VSM indicated wasting value in six out of twelve steps of company business life-cycle. It evidenced that 50 % of activities operate in suboptimal way and require immediate improvement. The outcomes of VSM became key starting points for the execution of BPR.

As pointed out two version of the same process (DIMP) were subjected to modelling. Basically, these versions illustrate the configuration of DIMP before and after BPR.

Fig. 2 illustrates the configuration of DIMP before the execution of BPR.

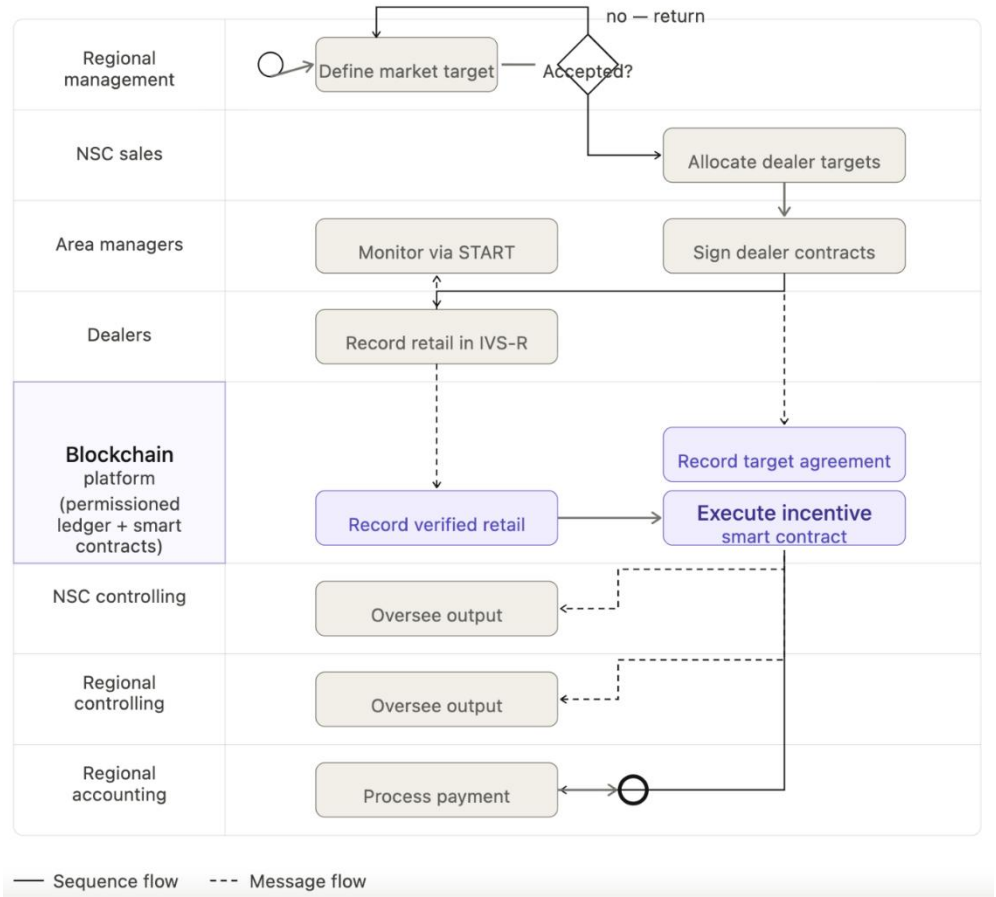
Fig. 2: DIMP „as is “



Source: own elaboration

Fig. 3 illustrates the configuration of DIMP after the execution of BPR.

Fig. 3: DIMP „as to be “



Source: own elaboration

The analysis showed that there were several meaningful ineffectivenesses within AS-IS process that were further rectified by the introduction of blockchain element to develop advanced TO-BE process. For the AS-IS process it was typical the presence of multiple validation layers performed sequentially by parent controlling and regional controlling executives at the end of the reporting period. In the TO-BE process composition, this sequence is replaced by automated execution of the incentive smart contract. Another ineffectiveness relates to the manual handling and aggregation of performance data by area managers at the end of the reporting period. In the AS-IS process, area managers consolidate retail data from multiple reporting tools, often using spreadsheet as an intermediate step, before forwarding the consolidated data to NSC controlling. In the TO-BE process, retail events validated in IVS-R are transferred directly to the blockchain ledger through the integration layer, which removes the need for manual aggregation as a precondition for incentive calculation. Finally, the ineffectiveness was found in the fragmentation of information systems used at different stages of the process. The TO-BE configuration the redesign reduces the operational consequences of system fragmentation by providing a shared layer on which the outputs of these systems are recorded in a consistent format. As a result, employees and controlling functions no longer need to reconcile data across systems before incentive calculation, because the relevant validated events are already available in a unified form on the ledger.

4 Discussion

A critical comparison of current (AS-IS) and prospective (TO-BE) models illustratively showed the main benefits of the incorporation of the blockchain into process structure. This new arrangement enabled the reduction in the number of manual validation steps, the redistribution of responsibilities among stakeholders, the elimination of redundant data reconciliation, and the resulting improvements in transparency and coordination The introduction of the blockchain helps company eliminate redundant workload, shortens lead time, decrease or even eliminates excessive company spending.

5 Conclusion

The study makes evident that the blockchain technology can be leveraged as a routine element of business processes

The study concludes that that the incorporation of blockchain into existing process structure can enhance the performance of the process. It evidenced that blockchain is effective especially in situation when it is framed as a coordination level rather than standalone process element. The involvement of blockchain into dealer incentive management process (DIMP) helped restructure activities, streamline the process, made it more effective and cost beneficial.

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