

# Framework of Interaction Design Method Based on Blockchain System

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## Abstract

As the fifth subversive and innovative technology for computing paradigm after the mainframe computer, personal computer, internet and mobile/social network, blockchain technology has entered into a new phase of development. Nevertheless, more intrinsic issues remain to be explored. With the usage of cryptography and a distributed database, once a block is recorded, it can no longer be changed. To defeat these issues, more existing techniques have emerged. The blockchain system mainly features decentralization, but as the existing architectures of the blockchain system are mixed up, it is hard to determine whether they are centralized or decentralized. Such hybrid feature is derived from the impact of uncertainty of human demands. In this study, we intend to explore the scientific perception of the blockchain technology after its integration with human activities by adopting the method of interaction design. Furthermore, we plan to establish a set of mechanisms on the method of blockchain system-based interaction design, so as to identify the impact of human uncertainty factors on the design of the blockchain system. In addition, we aim to provide theoretical guidance for establishing the decentralized blockchain systems in both standardized and mixed categories and the centralized blockchain system with decentralization as central node. Through the methods of the observational results, the article is summarized and assessed the methods of the interaction design based on blockchain system. Moreover, the evaluation process consists of the analysis of expert evaluation, practical evaluation and participatory evaluation ferments an efficient outcome.

**Keywords:** Block chain, Mobile network, Social network, Internet

## 1 Introduction

It is widely recognized that the essence of the blockchain technology lies in decentralization. The architecture of the decentralized system is totally different from the centralized one just like the south and north poles of the earth.

Nevertheless, it is hard to define the nature of the current blockchain systems. Here the interaction design is defined as the pattern collection which helps to solve the large problems in the blockchain system. It is a visual structure that used to combine the ideas which make the work very fast. The

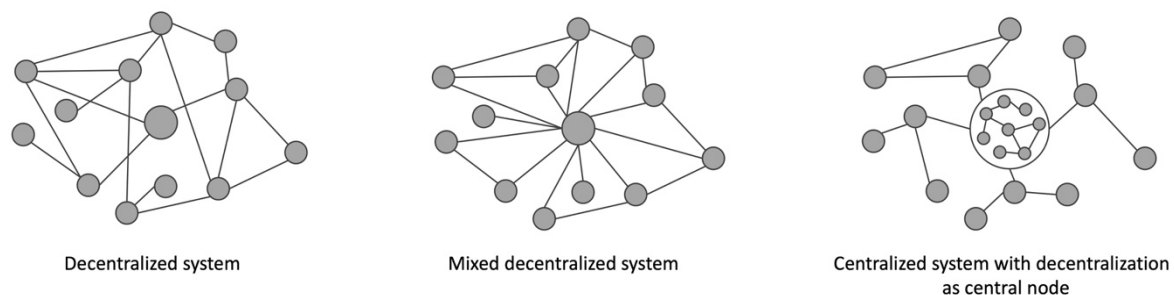
interactive design contains five classifications like image, word, time, space also behavior needs more information. The study of the focus between the people and the technology. Here the blockchain is used as a transaction ledger. It is the type called DLT and helps to record the signature which is known as the hash. The main purpose is information sharing via the application. Blockchain doesn't save any of its data in a single region. Rather, a group of machines copies and spreads the blockchain. Each device on the system upgrades its blockchain to incorporate the addition of a novel component to the network. It is defined as an electronically conventional banking economy that uses a common platform. Traditional banking activities including financing, selling, and dealing are available in this environment, but they function on a wireless site, which means that anybody with a broadband connection can use them. Influenced by both of the two technologies of completely different sorts during the practical application and R & D, system engineers would oftentimes create mixed systems (Figure 1) of three categories, namely: 1) standard decentralized system, where not all nodes are connected to the center; 2) seemingly decentralized system, but with each node connected to the center; 3) seemingly centralized system, but with the decentralized operational model existing in the center of the system. Therefore, it is hard to determine whether the mixed decentralized system or the centralized system with decentralization as central node runs contrary to the core feature of the blockchain technology

Interaction design is a discipline that has integrated multiple sorts of capabilities. From the perspective of those who spare no efforts to improve their status-quo are engaged in the work of design [1]. As a specialized discipline, the interaction design has fully extended its boundary and enriched its content in the era of information explosion, thus laying an interdisciplinary foundation of knowledge such as cognitive psychology, behavioral science, and information science. Due to the influence imposed by information technologies of various sorts, numerous blockchain services and products are generated, which are never seen before. The interactive system layout demonstrates how each step is interdependent in order to achieve the goal of innovation strategy production. It's a never-ending effort since and so much to learn as well as people change constantly. This variability must be recognized by an interaction system developer. For instance, the interaction design has an indispensable role to play in such blockchain applications as cross-border transfer of accounts, PBC legal digital currency and products offered by

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Ant Financial. With its progressive microfinance and micro-investing, it incorporates this business model in anything from communications and financing to investments. This combination system incorporates a complementary interface as well as conventional support to improve an unrivaled financial advisory environment. An interaction designer must be the expert capable of explaining the interaction among human beings, between human beings and the world, and between human beings and the constant evolution of technology and business [2]. The extremely intricate systems and services are catalyzed by the scientific and technological development, and consequently the interaction design has become especially vital for the in-depth understanding of human behaviors. Therefore, it will be of great significance to integrate the discipline of interaction design into new fields to cope with the issues that we encounter. To distribute the data for improving the data efficiency for the reliability in the data transmission. And the reliability data's will be transferred in the management information system. It delivers the solution to store the data and the type of data. Here the study is used to solve the problem facing by the data transferring and the studying also it improves the services fairness and the service request. As the large number of the information things is used in the entire world the data

storage plays a significant role in the interaction between the sites, low communication efficiency, and also in poor reliability. The entire amount of data elements (that is, bytes in the signal provided by the user) divided by the entire quantity of elements in transportation is known as signal quality. A wireless networking service's performance can be determined by four main traits: transmission, precision, reliability, and jitter. The data transfer efficiency will be done in the interaction factor of the communication algorithm, and the multi-link multifactor weighted communication tree algorithm is used to transfer the data in the solving techniques. Identifying criteria, developing options that fit those needs, developing the solutions such that they could be conveyed and evaluated, and assessing them are the four core actions of the interface construction phase. This study proves that the communication and the data transfer will be done in this interaction design by involving the above-mentioned functions. Within the Double Diamond concept, this event's aim is to discover and contextualize the real issue or problem. Consider it a reconnaissance mission to lay out the level field. According to the findings, it's critical to keep workers' thoughts accessible to all conceivable answers in order to achieve optimum programming problems.



**Figure 1.** Classification of the blockchain system

### 1.1 Article Contribution

Hybrid feature is derived for the framework of interactive design which is optimal for improving the blockchain system.

Scientific perception of the blockchain technology after its integration with human activities by adopting the method of interaction design is fermented.

The theoretical guidance for the blockchain systems in both standardized and mixed categories and the centralized blockchain system with decentralization is established.

The Double Diamond theory was introduced into the discipline of interaction design and developed to design in the framework of interaction method.

### 1.2 Article Sectional Discussion

In Section 1, the Introduction is elucidated, in section 2, the literature review is done, in section 3 the Methodology,

In section 4, the discussion of results is elaborated and in section 5, the Conclusion is discussed.

## 2 Background of Blockchain Technology and Integration with Interaction Design

### 2.1 Progress Made from Overseas Perspective

At present, the blockchain systems are typically mixed up. The current blockchain system architectures are mixed up, which makes it hard for scholars to determine whether they are centralized or decentralized in nature. Such hybrid feature is derived from the impact of uncertainty of human demands [3]. For categorization in data sparsity large datasets, a composite component selecting a strategy is given. The filtering is founded on incident filtering, which takes advantage of the information's limited sample because the quantity of occurrences matches the variety of feasible extracted features, and several are created. Consequently, it becomes equally intricate to distinguish the evident of feature decentralization typical for a blockchain system. Nevertheless, the discipline of interaction design is optimal for improving the blockchain systems that feature strong

technical nature, evident characteristics of processes, and complicated holistic issues. A holistic approach entails providing assistance that considers the entire individual, not always individual psychological problems. Their economic, intellectual, interpersonal, and religious well-being must all be taken into account. During interaction design, the non-technical information such as behaviors and mentality of blockchain users is taken into account. A feasible approach is one that can be completed successfully in a decent length of time while accounting for financial, ecological, societal, as well as technical concerns. In addition, this discipline proves to be an efficient and feasible method in the field of blockchain technology, which is still in the phase of theoretical design and preliminary exploration, by virtue of its forecasting and testing ability in light of the future.

What are the reasons behind the necessity of introducing the discipline of interaction design? Pioneer of the software world, indicated that one shall take into account the surrounding environments as a whole during the design of the interaction system and adopt a well-organized methodology so as to facilitate the building of a holistic perspective, which is indispensable for creating useful and attractive products [4]. Holistic decision-making helps us to be conscious of the activities as well as their whole influence; it makes sure that individuals are accountable and share liability for the issues we face, and it enables us to participate in the continuing transformation process. The design shall center around users, and the key to the interaction lies in understanding what the system could do for us and how to process information. In other words, we ought to spend more time on human instead of technology [5]. Thanks to the methodology of interaction design, we are able to form the scientific understanding after our integration of human activities with technologies. By adopting this method, we lay particular emphasis on the innovative thinking and scientific analysis of the pattern during our design, thus making it possible achieve breakthroughs in tackling the issues typical in this sector.

There is the possibility of integrating blockchain system with interaction design. Overseas studies on the methodology of interaction design related to blockchain can be divided into two categories in general. First, by carrying out case studies, western scholars have put forward operable design methods. Provided overview and guidance for the blockchain sector, and elaborated on numerous issues of application with specific cases in his study entitled *Commitments of Blockchain Technology to Interaction Design* [6]. Second, as the studies on blockchain systems and interaction design method go deeper, researchers have initiated the systematic thinking of the design methods in the blockchain sector, and carried out researches from the perspectives besides market, management and technology. It is necessary to build more extensive infrastructures for blockchain services and applications [7]. He elaborated on the applications in blockchain design, and further put forward a feasible design method. The Istanbul school of CIID integrated the interaction design with the key principles of blockchain during the design of curriculum. However, there is still room for improvement given that the overseas cognition of the methodology in the blockchain sector is not yet comprehensive, not to mention the absence of systematic researches.

## 2.2 Progress Made in Domestic Studies

It is necessary to review and study the blockchain system in a holistic manner. By virtue of its unique mechanisms of trust transmission and data sharing, the blockchain system has gradually become a popular technology with massive potential for growth. However, the current theories on blockchain are not complete yet to provide further guidance, so we need to conduct more comprehensive and systematic studies. In his study entitled *Blockchain: The State of the Art and Future Trends* [8], pointed out that in comparison with the thriving blockchain system of commercial use, both fundamental theories and technical researches on blockchain were still in a preliminary phase, and numerous scientific issues key to the development of the blockchain industry remained to be studied and closely followed up. In his study entitled *Overview of Research on Typical Application of Domestic Block Chain*, the expert indicated that most of the blockchain studies were still in the phase of theoretical design, and thus numerous problems like security loopholes, technical constraints, and lack of supervision would still restrict the development of blockchain applications.

Integration needs to be enhanced between human and the blockchain system. The key to the interaction design lies in the methodology of integrating the five levels of the user-centered design method with the practical procedures of producing applicable products [9]. User-centered design is based on a number of ideas. Design is founded on a clear knowledge of customers, activities, and surroundings, and it is guided and enhanced by user-centered assessment. It also considers the entire user engagement. Transparency, availability, intelligibility, and communication are generally the most important aspects of a website's UCD. It is hard for us obtain an insight into the specific demands of one person (or one group of people) amid a specific environment in one place at one time. This is the reason behind the complexity of design and the core difficulty existing in the methodology of design. As the medium of interaction between insiders and outsiders, design constitutes the bridge of communication and the bond of connection, and moreover, it is a way of human-system integration [10].

The interaction design has been lifted to national level in the application of blockchain technology. In his study entitled *Development and Management of Blockchain Technology* [11], the expert from the blockchain research group in PBC Digital Currency Research Institute stated that the interaction issue between different blockchain systems was a key problem left to be solved. Therefore, the academia has already attached importance to the study on interaction, justifying the necessity of the research in this paper.

Whenever technology is included in the program, intellectual development is transformed. According to a wealth of evidence, integrating technologies into the classroom improves learners' cognitive performance and effectiveness. Teachers that use software to solve issues change their instructional practices. To sum up, domestic and overseas scholars have conducted their studies from different perspectives to elaborate on the status-quo of the blockchain sector, human-technology integration in design activity, and operable design methods based on the blockchain system. They have achieved fruitful results in their respective

studies, which could provide us with guidance and reference. Nevertheless, some deficiencies exist in the current studies. First, the existing studies have not taken the complex, changeable and mixing properties of the blockchain systems into comprehensive consideration with the nature of interaction design activities. Second, the existing studies have failed to explore the essence of blockchain design activities from the perspective of blockchain users, including uncertainty of humanity, human demands and human behaviors, etc. Third, researchers of the aforementioned studies have only put forward individual schemes and methods for specific design activities in specific sectors. However, few studies have been conducted on the mechanism of design methodology based on blockchain system, nor have these studies been elevated to theoretical height. In addition, since the design objects have become increasingly complicated, and there are unbridgeable technical principles in the blockchain sector to be accurately mastered. Therefore, in the future, researchers shall carry out studies on blockchain systems from the perspective of design as a discipline, so as to establish a complete research system and to provide more applicable methods of design for professionals engaged in

relevant fields, such as engineering technicians and designers. It is necessary to innovate the conventional methods involves in the process of analyzing and modifying initial concept repeatedly until it reach the satisfactory state, the properties of the design will be evaluated with the requirements and tools of design to cope with these complexities and the increasingly intricate design objects [12].

### 3 Formation of the Methodology of Double Diamond Design

Figure 2 shows the basic working components of block chain, the areas in which the existing block chain system lacks, working contribution of block chain system, and a new method to sort out problems faced in block chain system. The newly developed system setting scalability of the system, reduces latency, enhanced operational activity and automation. Theories are needed to provide guidance for practice

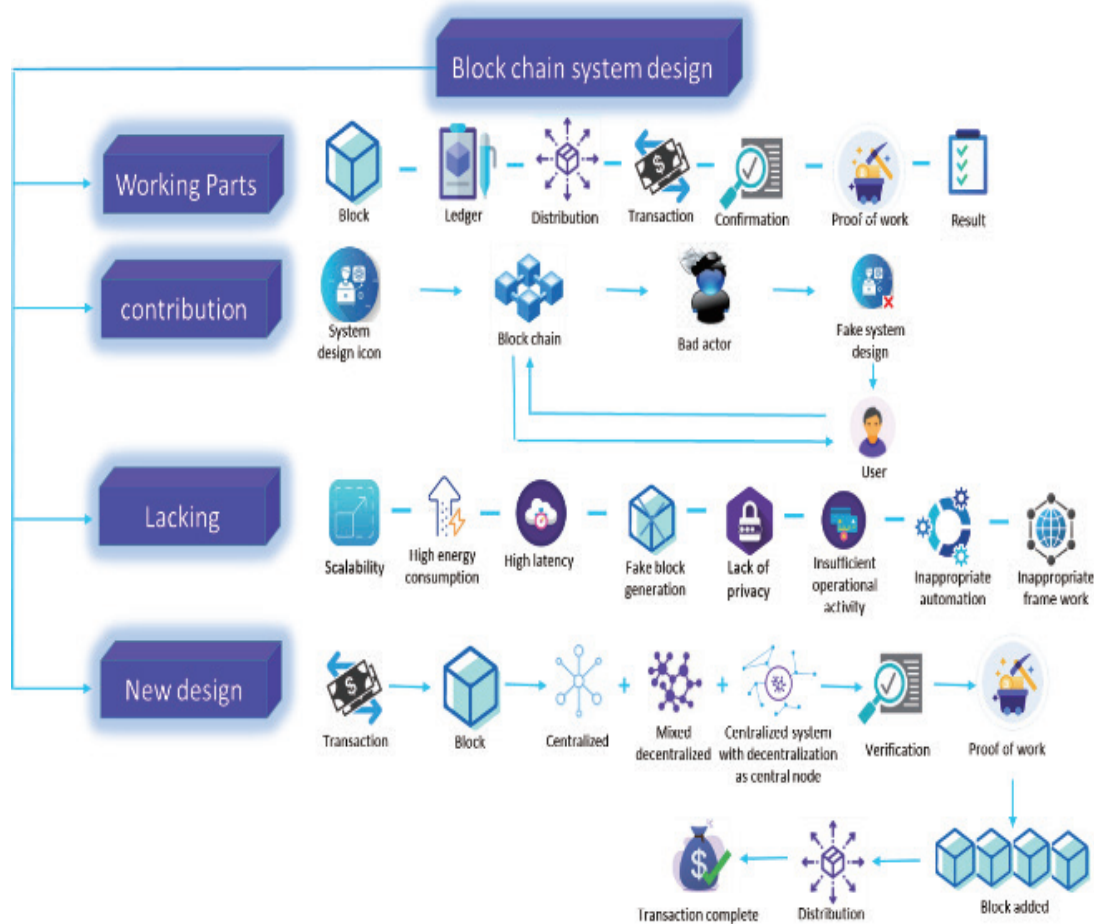


Figure 2. New blockchain system design



It is hard to identify the essential feature of blockchain systems given that they are mixed up. From the perspective of human-oriented design thinking, people study and design systems for the purpose of serving people. In the absence of people's desire, no demands will be generated. The working parts consist of several processes and are given as the targeted block has been analyzed initially, then the ledger has to be maintained for evaluating the similarities between the users. However, the samples have been distributed and the transaction process has been done. Finally, after receiving the confirmation from the user, the proof of work was carried out for obtaining the outcome. Consequently, it will become unnecessary for people to design systems. Therefore, to study the current issues existing in the blockchain system, we need to address the fundamental issue by centering on human. In the discipline of interaction design, human is not only defined as those who use the system, i.e., users, but also stakeholders, which may include users, employees, designers, technicians, entrepreneurs, government, and other representative members related to usability. These people have their respective conceptions, budgets, plans as well as diversified demands and expectations. Therefore, systems naturally emerge under the influence of all these people who have permeated into all procedures of the system design. Hence, we need a set of theories to guide our design of blockchain system in such intricate environment, and to explore the relationship between human and system during this process. The most essential features of a specific project must be evaluated up-front since it dictates the objectives to develop and modify throughout initial iterations. To put it another way, determine the potential threat first rather than plan for solutions. The double diamond model can effectively liberate designers from unnecessary restrictions [13], which makes it easier to analyze and sort out complex problems by mapping the two states of the design namely the convergent state and divergent state, before entering into the production of final solution, the significant up-front design is incorporated and so the solutions produced after the working process were seems to be perfect. Aside from establishing structure prior to software testing, upfront designs limit the frequency of extreme situation-related issues. Developers may consider focusing on all the information that is related throughout execution because the general design has been developed.

### 3.1 Introduction of Double Diamond Theory

Design is a process of identifying issues encountered by numerous people and attempting to address them. The core issue for almost all research projects of design is the transition from uncertain possibilities into unpredictable results [14]. This process seems to be simple and straightforward, but it is an endless process in effect. The structured design thinking resembles a beacon indicating the direction of efforts to be made during design. The model of Double Diamond (as illustrated in Figure 3) was put forward by the UK Design Council in 2005, and is introduced into the discipline of interaction design and developed into one of the vital methods of design in this discipline. Categorized as a structured design method, the Double Diamond system is divided into four phases, namely, discovery, definition, development and delivery. This model illustrates the varying

integration phases of the design process, and reveal the different modes of thinking of designers during multiple phases. However, LIU Guanzhong (2018) pointed out that the research design theories ought to be developed on a perceptual basis and derived from practice. The original design method of Double Diamond is mostly applied to projects related to R & D. It includes the activities that is taken by some companies to introduce new services and products. Enterprises and design companies will promptly tackle the problems once identified, but fail to go deeper into the root causes. Due to the constraints of funding and duration of research, this method is not applicable to in-depth studies on the issues, and nor will the companies attempt to establish a set of theories to guide their next practice of application. The impact on R&D might be a reduction in R&D resources, results, and efficiency. Limited abilities to acquire from the objective, significant internal opposition to M&A, and delayed decision-making might all stifle the M&A's ability to innovate. The research link is added into the R & D process in the new Double Diamond Model. The problems can be identified during the building of the system only if we could figure out the root causes behind the research problems during R & D.

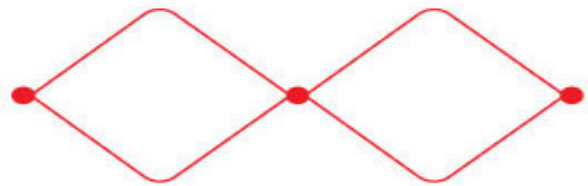


Figure 3. Model of double diamond design by UK Design Council

### 3.2 New Double Diamond Model: discovery-definition-guidance-refinement

The Double Diamond Model is a method of design based on blockchain system. It is regarded as a structured design thinking, and categorized as a methodology guiding the development of methods, which involves the dimensions of discovery-definition-guidance-refinement (Figure 4). Thanks to the model, the R & D process is renewed subsequent to the reverse structural decomposition of a mature commercial system of applying blockchain technologies. The variation in a combination of matrix and arrays as predictors or factors—is explained by structured deconstruction assessment (SDA) of input-output information in accordance with changes in every one of these components. The multitude of variables in the deconstruction thus, as a result, the difficulty of calculations grows dramatically when elements are disaggregated into manufacturing elements. We have elaborated on the relationship between human and system during the design process of R & D, and provided our reflections and lessons learned from our experience and practice. Furthermore, through the model, we aim to construe the desires, demands and appetites of blockchain stakeholders, define the design goals, and clarify both the internal and external factors. Internal blockchains are a database management system that may assist any business

institution’s performance improvements and are a terrific initial move to a stronger secure destiny. When opposed to database systems, the most significant benefit of deploying a private blockchain is that it allows for digital audits. The model also features the integration of the mixing issues of blockchain system with the uncertainty of humanity.

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**Algorithm 1.** For process of Double Diamond model

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input: demands and appetites,  $T_a = 0.30$  sec
phase1: for each (thinkingTime $T_a$ )
    discoverymarks  $\Rightarrow$  insightintoproblem
phase2: if (collected  $\rightarrow$  projects of R&D)
    notfind  $\Rightarrow$  root for problem
    not applicable  $\Rightarrow$  R&D blockchainlogistics
else
    recollect  $\rightarrow$  projects of R&D
    scopedownthefocus  $\rightarrow$  simpleideafound
phase3: if (guidanceperiod = iteration)
    collaboration  $\rightarrow$  empirical research
else
    codesign  $\rightarrow$  differentsolution
phase4: observed  $\rightarrow$  R & D of the blockchain system
    theoreticalenlightment  $\rightarrow$  blockchain interaction design and evaluation
    reject  $\rightarrow$  willnotimprovedesign
    
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The contents of the four phases of the model are hereby illustrated, and we have also pointed out the adjustments made compared to the previous model.

Discovery refers to the phase of identifying the desires, demands and appetites of stakeholders during the design process of the blockchain system, in addition to the causes behind the formation of these factors. In the original Double Diamond Model, the discovery phase is illustrated as follows. Discovery is the first dimension, where diversified thinking takes place within limited time, and discovery marks the beginning of a project, in the discovery phase the method

of beginning the research with the processing of identified challenges and problems which is need to be solved by the process of learning or understanding about the problem. User demands and market researchers used to be collected and applied to projects of R & D. However, researchers generally did not seek for the root causes behind. For instance, information related to the demands of blockchain financial users are not applicable to the R & D of the blockchain logistics system. Though companies will re-collect demands of users, they fail to explore the in-depth reasons behind such demands. The assessment of an interaction design scheme shall be based on the correlation between final users of its products [15]. The object-oriented analytical model’s operational viewpoint, as well as an understanding of how much the technology is expected to achieve, are provided by key strengths. It uses Data Flow Diagrams (DFDs) to determine the purpose of the program’s manufacturing resources. The key to this perception is that designers must accept the simple idea that The User Is Not Like Me. However, due to budget constraints, companies tend not to further explore why the users have generated their respective demands under most circumstances, because design budget plays an important role to estimate the preliminary design and cost of construction for the project which is fixed after the completion of design report and also before working on the final design. For some companies, they already stand out if they are willing to conduct surveys on user demands, let alone to carry out a deeper analysis of the reasons behind user demands. Imagine a scenario when a man is thirsty and is offered a bottle of water. Thirst is a physiological sign in essence, and desire to drink is his demand. In addition, while giving him a bottle of water, one is attempting to meet his needs. However, one will never ask why the thirsty man becomes thirsty and whether his thirst results from excess water loss due to previous exercise, or simply from having had a salty meal. Designers will obtain a deeper understanding of user demands if they go deeper into the motivations behind user demands.

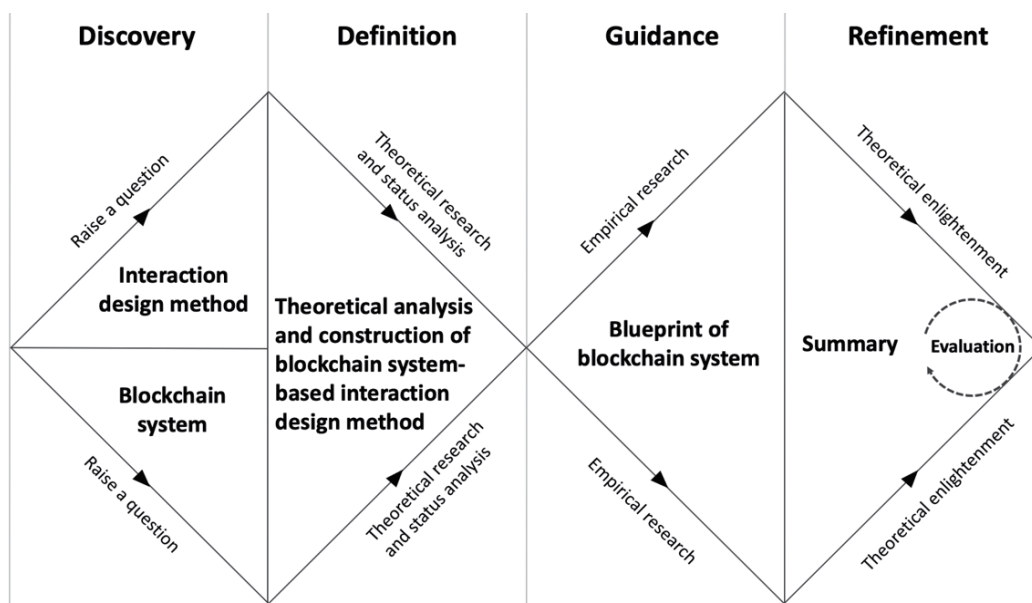


Figure 4. Double Diamond model, a model of interaction design based on blockchain system

Definition refers to the phase when the status-quo is analyzed, theoretical research is conducted and research framework is proposed. In the original Double Diamond Model, definition is illustrated as it is the process of thinking with the problem and finding solution to it with different prototyping solutions, it done by exploring different direction to select one finest idea. Definition refers to the phase when user demands and business goals are explained and matched with each other. The new phase of definition includes two aspects: first, to collect mathematical statistics and conduct analysis of various fields in the blockchain industry; second, to conduct selective analysis of internal factors and finite analysis of external factors. The influence factors of design activity are divided into two types, i.e., internal and external factors, where the latter include human, time, place and event, and the former include technological structure and principle [16]. Last but not least, a theoretical research framework is established for the blockchain interaction design, so as to provide theoretical guidance for the subsequent phases.

Theoretical framework can provide guidance for the empirical research it is the structure that provides support to the research study, it explores and describe about the theoretical explanation why the research problem is considered under the study. The author has altered the original third phase termed as development into guidance. The original development phase is illustrated as follows: a period of development for the design-based solutions, which is characterized by frequent iterations and tests under multidisciplinary collaboration. One may manage the full individual as well as offer adequate care by collaborating with an interdisciplinary approach. Specialists are even more inclined to express regions of demand as well as then control those requirements when every practitioner is focusing on a device of the person’s health. Subsequent to adjustment, the phase of guidance phase refers to the establishment of the blockchain system blueprint under the guidance of the theoretical framework set up in the previous phase. Moreover, the phase of guidance is the period when the system building, iterations and tests take place. The phase of research unfolded by the theoretical assumption has been verified. In addition, the design process of the R & D of the blockchain system is observed through data analysis and experiments, so as to summarize the essential properties and development laws of the blockchain system.

Summary is made and model is refined based on practice and theory. The original term delivery is adjusted into refinement. In the original Double Diamond Model, the phase of delivery is illustrated as the product should be readily available for the market, after the product delivery process, the team will begin to collect the feedback of the product for the evaluation. The period when products or services are finalized and promoted in related market. Subsequent to adjustment, the phase of refinement includes two aspects: first, summary of the results of practical design; and second, summary of theoretical methods. It is worth mentioning that the author has extended the original model by adding the part of evaluation, which consists of the assessment of both design output and theoretical studies. This part of evaluation is a small but reciprocating phase. The delivery is considered as the conversion step where the ideas are changed to end

product.

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**Algorithm 2.** For interaction pair design

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input; Iteration I (i0...in), coverage requirement R= (r0...rm)
initialize; interactions→interaction pair IE ()
for (each interaction in rm)
    for (combination of parameter interaction rm)
        if (iteration=interaction element)
            generate→interaction pair
        else
            non interacting elements
            store the interaction into IE (i)
return IE;
end for
    
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To sum up, in the Double Diamond Model, a method of interaction design based on blockchain system, the thinking is divergent and focuses within limited time of research. The model includes constantly iterating processes, where different phases are continuously reciprocating and blending, solutions are figured out during analysis, and analysis is conducted during problem-solving. This process of R & D resembles a continuous spiral rise, in which researchers will explore the relationship between human and system.

Process of Studying the Method of Interaction Design Based on Blockchain System

Blueprint: Framework of the method of interaction design based on blockchain system

The framework of the method of interaction design based on blockchain system is the blueprint and route of the research process. As stated by Engels, for a nation that wishes to stand at the peak of science, it cannot do without the theoretical thinking for a moment. Therefore, in this study, we have taken the Double Diamond Model, a method of interaction design based on blockchain system, as the guiding thought. In addition, we have taken the framework of the method of interaction design based on blockchain system as the blueprint (Figure 4), and the basic research thinking on the method of interaction design based on blockchain system as the basic steps of implementation (Figure 5). Specifically, the guiding thought helps to define the structured design activity, the blueprint summarizes the scope of design activity, and the basic steps indicate the details for the actual implementation details.

The structured design converts the conceptual problem into well-organized element for solution, it is mostly based on the concept of divide and conquer in which the problems were break down into small chunk of problem and each chunk will be solved individually till the entire problem get rectified. The blueprint is considered as the reproduction process of technical diagrams will be printed in the sheet which is sensitive to light, this process allowed the accurate production of a number of copies it contains the details about the process of activity, the person who knows about the activity and the milestones in which the activities are performed. Markle trees are a distributed database commonly utilized in machine learning. Markle trees are used to encapsulate network information more easily and safely in blockchain as well as related commodities. “Binary hash

trees” is another name for them. Blockchain holds valid information into blocks that are hashed into the Markle tree of each block and the data are usually digitalized. The iterative process confirms the integrity of the previous block and the way to another block.

```

Algorithm 3. For data hashed into blocks
input; self= blocks
initialization; hashes→self. Hash, L=Len(hash), accum=
hashes [L-1]
if Len (selfhash  $\Phi$ )
    return empty hash( $\Phi$ )
for (each iteration)
    accum=hashchild(hashes[j], accum)
return accum
    
```

Thanks to the framework of the method of interaction design based on blockchain system, we are able to achieve overall planning of the research process and thinking, including the research subjects, focus, process, and the relationships between varying links. The research subjects are mature systems of blockchain application, and the research focus is place in the influence imposed by internal and external factors in the research process. First, we have conducted the systematic analysis of the selected mature

system of blockchain applications, followed by an in-depth analysis of internal and external factors in the entire phase of life cycle of system applications. Subsequently, we have set up a target system according to the design requirements, rebuilt the user behavioral model and functional model, thereby building a new framework of blockchain system.

Basic thinking and content of the framework of the method of interaction design based on blockchain system

The specific steps of implementing the framework constitute the basic thinking of the framework of the method of interaction design based on blockchain system, and this process is divided into five phases. The research contents are organized by following the logical thinking of literature review-theory formulation-data preparation-status analysis-empirical research-summary and evaluation.

Phase I: Question raising. We have raised questions and proposed theoretical assumptions to cope with the mixing property of blockchain. A bitcoin blender is a system that provides theoretically recognizable else adulterated cryptocurrencies assets with each other in order to disguise the firm’s actual provenance. It is otherwise known as a cryptocurrency blending program. In addition, we have reviewed the related literature, and collected the related academic studies on blockchain and interaction design, so as to lay a foundation for theory formulation.

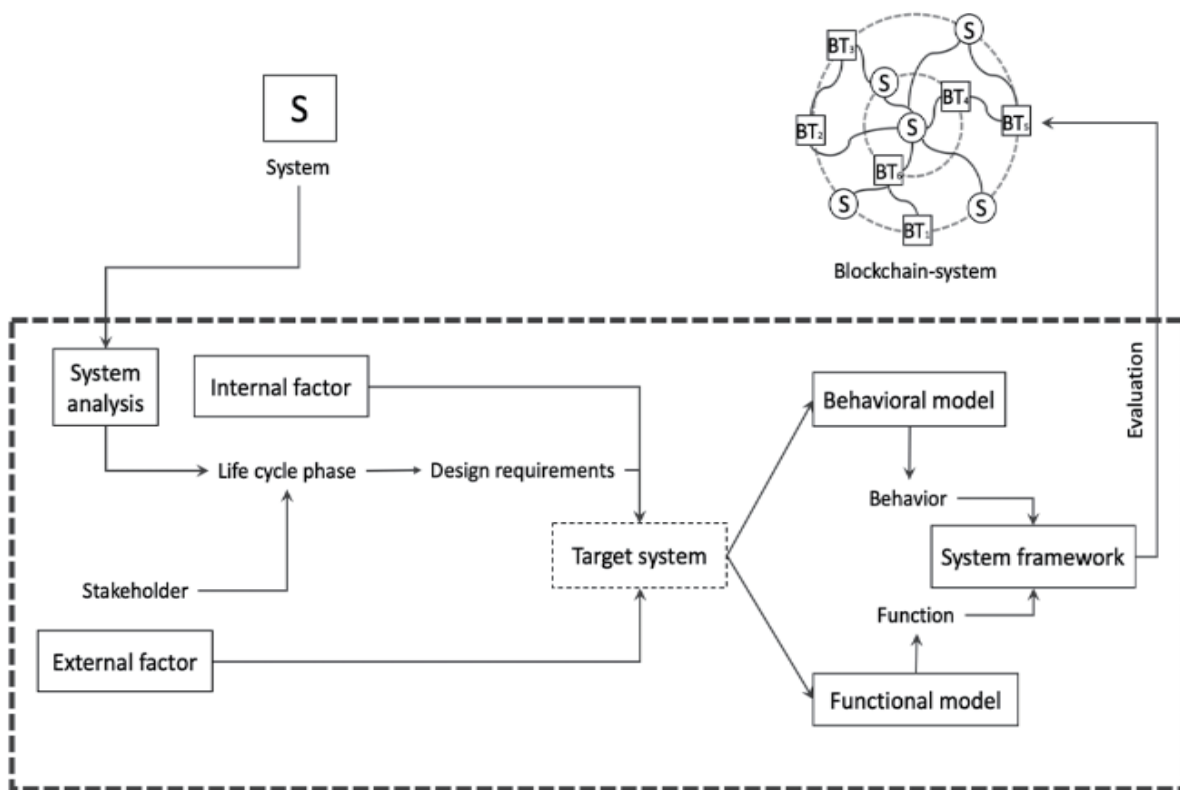


Figure 5. Framework of the method of interaction design based on blockchain system



Phase II: Theoretical research. Through the methods of theoretical analysis and logical analysis, we have reviewed the research theories and elaborated on the connotations for the method of interaction design based on blockchain system. During our review of theories, we have identified the influence factors of the method of interaction design and determined the contents of design activity. Cyber security refers to the collection of methodologies, techniques, and procedures used to safeguard the privacy, authenticity, and accessibility of software applications, networking, as well as information to cyber-attacks or illegal users. On a scale ranging from + 1 to - 1, the correlation rate is determined. Either a + 1 or a -1 includes a comprehensive connection between two factors. Whenever one factor rises in tandem with another, the relationship is positive; when one falls in tandem with another, the relationship is negative. This research method will contain the definition of how a cyber-system and its environment behaves and then exploring out the implication of how it is defined, its definition is something which is based on once assumption or opinion. Furthermore, we have defined the objectives of the design activity and figured out the methods of design while illustrating the connotations.

Phase III: Status analysis. We have analyzed the status-quo of the target system through comparison and induction. First, we have collected information related to the policies, laws and regulations of blockchain-related fields, industry background, technological status, user model and application classification through the field research. In addition, we have calculated and classified the data by regional industries so as to master the status-quo of the development of the blockchain sector. Second, we have conducted finite analysis of external factors and selective analysis of internal factors. During our analysis, the external factors include possibilities and limitations of the principles, system structure and technological implementation, whereas the internal factors include demands, desires and appetites of stakeholders, user behaviors, environmental possibilities and restrict, impact and constraints of the dimensions of time and place. This is a manifestation of the target organic relationship established between the internal factor, i.e., mixing property of blockchain system, and the external factor, i.e., human uncertainty.

Phase IV: Empirical research. Through logical deduction by reasoning and system analysis, we have set up the target blockchain system. It is normally conducted based on the observed data and gain knowledge from the experience in spite of from the theoretical study or belief. The two types of data were considered quantitative and qualitative, but the quantitative data is effective when compared to the qualitative data. Quantitative research is concerned with facts and data, whereas qualitative research is concerned with ideas and their interpretations. Quantitative approaches help to evaluate factors and make predictions in a methodical manner. Qualitative approaches enable users to delve deeper into thoughts and ideas. First, we have initiated the reverse deconstruction of the blockchain system, including but not limited to the analysis of processes, behaviors, stakeholders' desires, demands and appetites, and system framework. Second, we have commenced the formulation of the

framework for the blockchain system, including the reshaping of the user model, behavioral model, and system functional model, so as to establish the blueprint for the blockchain system. What comes next is the phase of application, which consists of prototype construction, testing, and inspection of the usability issue. In basic words, blockchain operates through a multistep method of changing like this: A payment is entered by an authorized user and should be validated by the system. This operation generates a block that reflects the activity or information in question. Each computing intermediate node receives the message.

Phase V: Refinement and evaluation. Through the methods of expert consultation and experience extraction, we have summarized and assessed the methods of the interaction design based on blockchain system [17]. Specifically, the evaluation process consists of analysis of expert evaluation, practical evaluation and participatory evaluation. Last but not least, we have summarized refined the established systems and methods. (Figure 6)

The purpose of the blockchain is to share information amongst all parties that access it via an application [18-20]. Access to this ledger in terms of reading and writing may be unrestricted or restricted. Interaction design, often abbreviated as IxD, is the practice of designing interactive digital products and services. Interaction designers focus on the way users interact with products and they use principles of good communication to create desired user experiences. A hybrid app is designed to work on multiple platforms. It's written using a single standard code language and then compiled to be executed on each platform. By securely encrypted as well as other information on a distributed platform rather than a local element, blockchain technologies can deliver increased protection. Furthermore, because a cryptocurrency is basically unchangeable, it gives safety against documentation. Device specific interactions will normally be managed by the use of plugins for that operating system. Data sources, backends, and processing are the three major plugin sorts very typically utilized for modifications.

The impact of human Uncertainty factors on the design can be present in the characterization of the exposure scenario, the parameter estimates, and model predictions Table 1 [21-22].

**Table 1.** Status-quo of the target system

Positive value	Reference point	Losses	Outcome
0.34	0.28	0.89	2.47
4.5	3.45	3.67	5.85
7.34	6.62	6.45	9.23
11.37	9.79	9.23	12.61
17.34	12.96	12.01	15.99
20.439	16.13	14.79	19.37
24.526	19.3	17.57	22.75
28.613	22.47	20.35	26.13
32.7	25.64	23.13	29.51
36.787	28.81	25.91	32.89
40.874	31.98	28.69	36.27

Table 1 shows, status-quo of the target system, in this system based on positive value, reference point, losses and outcome. This table approximate result is 56.8%. Figure 7

Table 2 shows, digital currency, in this table based on cumulative node and estimated interaction coefficient. This table approximate result is 92% efficient. Figure 8

Table 3 shows, cross border-transfer, in this table based on year and estimate border transfer. This table approximate

result is 56.89% efficient (Figure 9).

Table 4 shows, decentralization ecosystem, in this table based on quarter of data and target system. This approximate result is 62.78% efficient (Figure 10).

Table 5 shows, data transfer efficiency, in this table based on frequency and transfer efficiency. This table approximate result is 56.78% efficient (Figure 11).

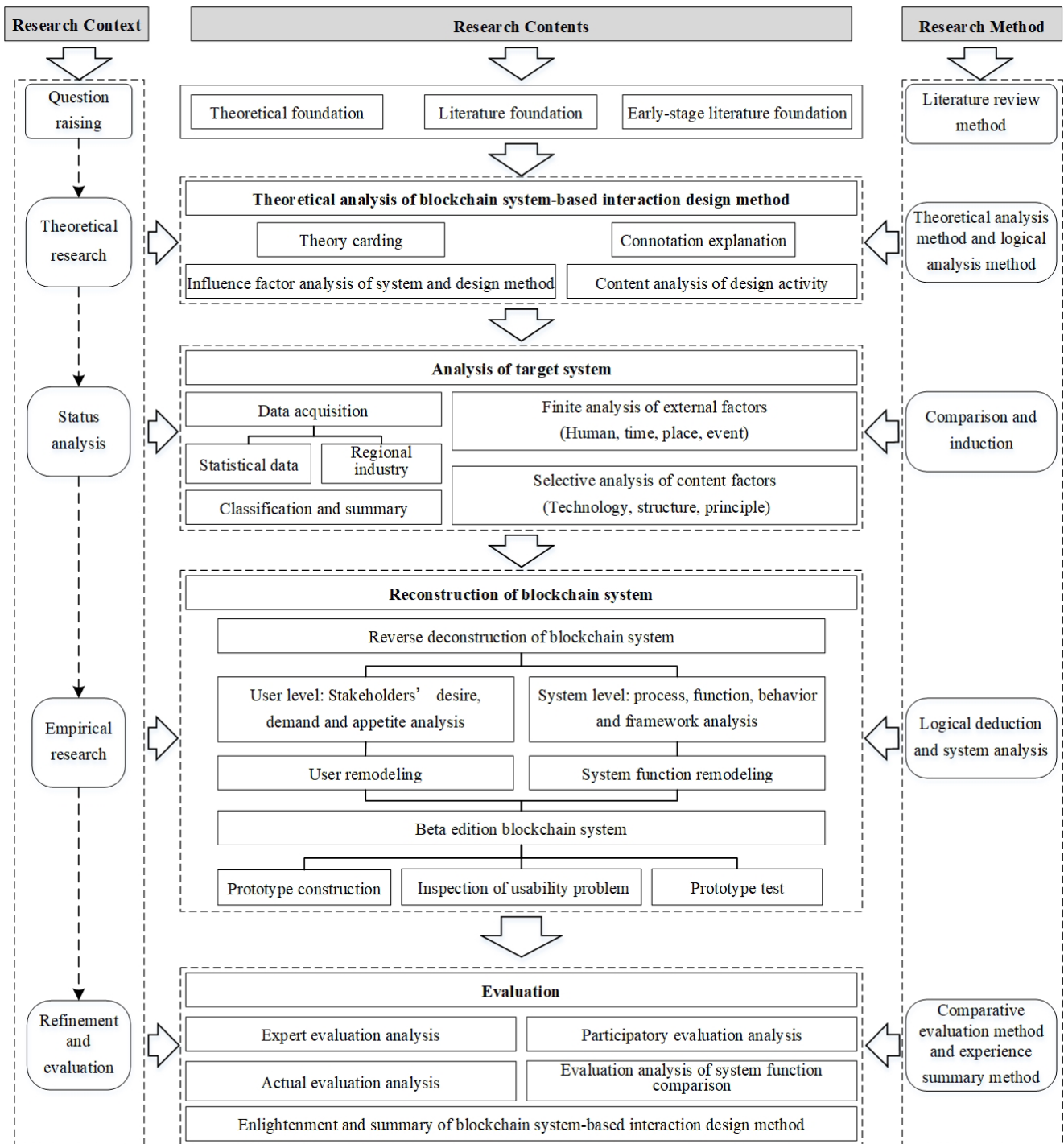


Figure 6. Basic thinking on the framework of the method of interaction design based on blockchain system

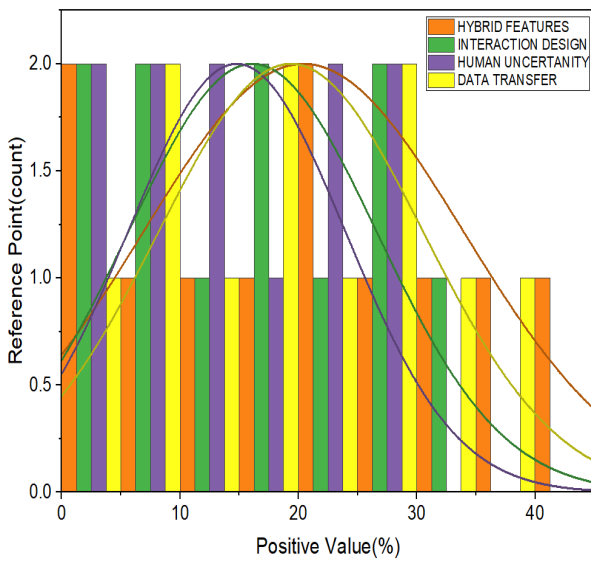


Figure 7. Status-quo of the target system

Table 2. Digital currency based on cumulative node and estimated interaction coefficient

Cumulative node	Estimated interaction coefficient
0.586	0.98
1.867	4.78
2.486	8.58
3.85	12.38
13.09	16.18
23.26	19.98
36.39	23.78
45.49	27.58
51.56	31.38
59.63	35.18
62.68	38.98
67.73	42.78
72.7	46.58
87.8	50.38
91.83	54.18

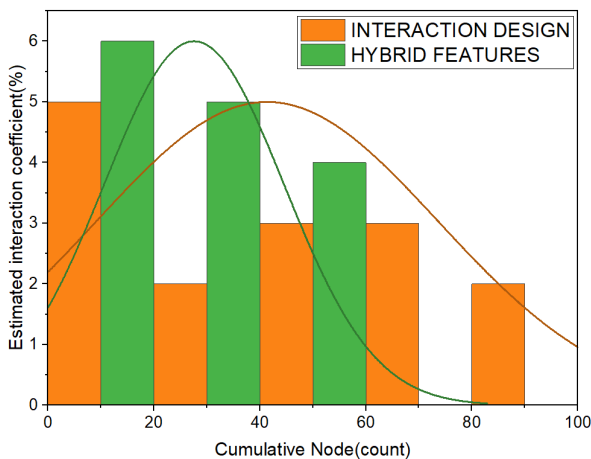


Figure 8. Digital currency based on cumulative node and estimated interaction coefficient

Table 3. Cross border-transfer

Year	Estimate border transfer
2008	1109
2009	1156
2010	1203
2011	1250
2012	1297
2013	1344
2014	1391
2015	1438
2016	1485
2017	1532
2018	1579

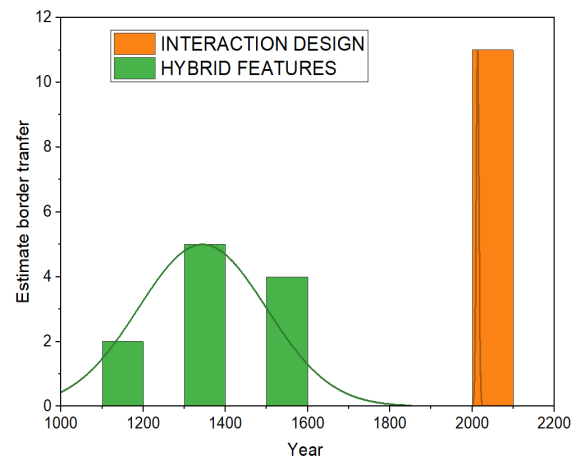


Figure 9. Cross border-transfer

Table 4. Decentralization ecosystem

Quarter of data	Target system
10	5.67
20	23.56
30	41.45
40	59.34
50	77.23
60	95.12
70	113.01

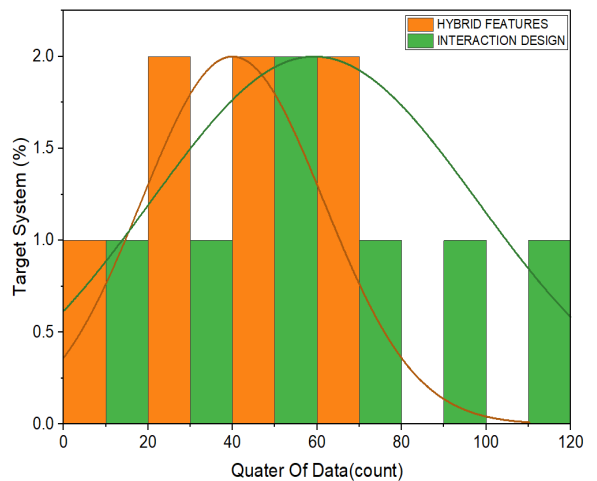
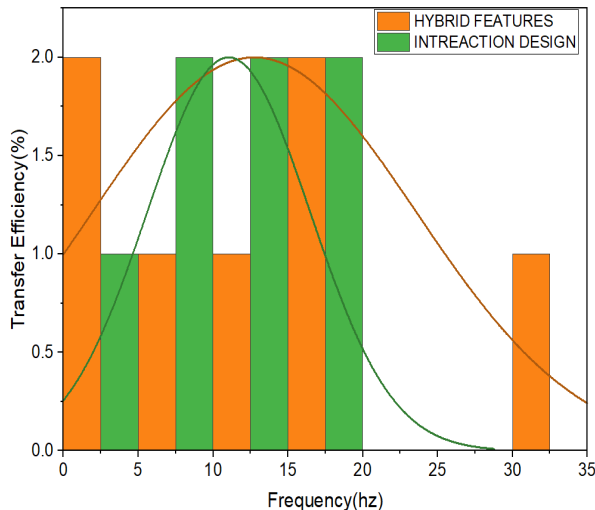


Figure 10. Decentralization ecosystem

**Table 5.** Data transfer efficiency

Frequency	Transfer efficiency
0.335	2.98
2.34	5.6
6.015	8.22
14.24	13.46
16.66	13.94
18.375	16.08
31.36	17.04

**Figure 11.** Data transfer efficiency

## 4 Conclusion

With the progress made in social development, new technologies have been constantly invented. As a novel technology, the blockchain technology has been used in human society with massive potential for growth. However, this technology has come into existence generally in the form of system, and numerous problems and obstacles take place in practice. Therefore, it is necessary to develop a set of feasible and effective theories for the methodology to guide the practice. As the existing blockchain systems are mixed up, it is hard to define whether a blockchain system is centralized or not, which runs contrary to the advantage that the blockchain technology is supposed to possess. The blockchain system is established as a carrier of functions and user behaviors. Hence, we may conclude that the difficulty that lies in distinguishing the decentralized trait of blockchain system is caused by the influence of human desires, demands and appetites. Based on the above analysis, we have introduced the design concept of the Double Diamond. It is expected that this study could provide reference for blockchain engineering technicians and designers in the R & D in practice.

## Acknowledgement

This research was supported by 1. The K. C. Wong Magna Fund in Ningbo University. 2. General scientific research

projects of Zhejiang Provincial Education Department (Y202044135). 3. Achievements of social science planning in Zhejiang Province (22NDQN222YB). 4. The Fundamental Research Funds for the Provincial Universities of Zhejiang (SJWY2022003).

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