Basic Risk Information Components (BRIC) for Insurance

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Abstract
Information isolation in insurance industry has hampered the development of InsureTech, as heavy redundant duplication of data entry and poor resolution in auto recognition of risk exposures with insurance coverage have not been resolved. By reviewing major lines of re/insurance products for their morphological structure, we propose a concept of Basic Risk Information Components (BRIC or RIC for short), a standard EDI aimed to be the building blocks of a structure capable of organizing information in a same data format from a basic rating unit to a contract then entire portfolio. With well-defined operational rules, we can simulate the whole insurance process from risk aggregation to distribution for reinsurance placement. Extending the concept to insurable interests, Device RIC (DRIC) is installed in Operating Systems on IoT, similar to mobile phone OS on IoP (Internet of People), providing required information for insurance. While full automation can be achieved with further standardization of risk exposures and coverages, immediate implementation of BRIC will be a solid foundation for innovation in new product design, operation efficiency and new business model of insurance.

1. Introduction

The application of information technology to insurance industry has been widely discussed and many scenarios have been prophesied that Big Data, Block Chain, Smart Contract etc. will dramatically change the application of insurance and therefore daily life of human being. However, the practical roadmap is still not clear as lacking of EDI standard within insurance industry or with external insured parties. Observations of the phenomena are:

- Intra-organization: Standard data format may exist in a company to a limited use. Usually kernel system handles policy issuance, booking and finance, and reinsurance and claims are separate systems requiring data conversion with extra input or adjustment for correct reports. Except motor or personal line products, terms and conditions of coverage normally are only kept in system as scanned copy for manual review. In consequence, automatic verification of coverage for settlement decision in claims handling is not possible.
- Inter-organization: No well-defined data standard format exists so that information exchange is mainly by emails, PDF and Excel files. Some companies are setting up email platforms, but

each still have to manage its own data entry repeatedly. Policy or treaty wording is prepared and sent by email and requiring manual review and interpretation, and numeric information requires human attending by both senders and receivers.

- Between insurer and insured: Required information for insurance is provided by insured on manual basis. From time to time only estimated figures at inception of insurance period can be available and therefore need for adjustments afterwards. Inaccurate valuation of insurance interests is causing higher buffer in risk pricing and therefore higher cost of capital deployment.

To sum up, the information platform of risks, policy terms and claims settlements are not integrated which results to higher operation cost and not supporting the implementation of modern technology.

By reviewing morphological structure of major lines of insurance and reinsurance products (Annex 1) and the definition of Underwriting, we propose a standard EDI called Basic Risk Information Component (BRIC) which is aimed to be the building blocks of a data structure capable of organizing information in a same data format from a basic unit to entire portfolio. We also extend the concept to insurable interests by Device Risk Information Component (DRIC) which is installed in Operating Systems on IoT, similar to mobile phone OS on IoP (Internet of People), to retrieve information from covered risk units then transferring to insurance operation.

The concept of BRIC is to be a standard language to describe the various coverage structures of insurance/reinsurance arrangements to support innovation in areas of new product design, improvement in efficiency, and new risk transfer model.

2. Literature

In last few years, many papers are from both academic field and business world discussing about InsurTech, the insurance-specific branch of FinTech initiatives. Following reviews are grouped into: (1) needs for changes, (2) opportunities for changes, (3) technology adoption, and (4) challenges.

(1) Needs for changes – Several studies discuss the needs and impact of changes in general. Johansson and Vogelgesang (2016) study the impact of automation on insurance industry and they conclude probably 25 percent of full-time positions in the insurance industry may be consolidated or replaced. Catlin et al. (2017) point out the main threat for insurance industry is not from InsurTechs, but the upending traditional business model of insurers destroys value in the process. Yan et al. (2018) survey the landscape of insurance technology and its potential from the perspective of enablement for financial and insurance services.

Some studies focuses on how to do changes. Bernardo Nicoletti (2017) describes a business model for InsurTech initiatives. Ivan Gruer (2018) proposes a four-step practical guide to build InsurTech value chain ecosystems. Ring et al. (2016) explain three major ingredients of the “winning recipe to keep pace in today’s fast-moving competitive environment and meet customers’ changing needs, namely ”- simplified, compelling product design, a streamlined cost base, and delightful customer

journeys.
A recent Chinese publish of White Paper for Reinsurance Blockchain by China Reinsurance Group at al. described the issues of information imbalance in risk transferring and low level of digitalization in reinsurance transactions. In McKinsey's publish of June 2018 also indicates assets must be able to be digitalized as the most critical Blockchain feasibility in insurance industry.

(2) Opportunities for changes – Many studies points out opportunities of insurance industry to explore for changes. Agrawal et al. (2014) point out US life-insurance industry should seize the opportunity for a huge market and conclude the challenge is in the execution to best weather the inevitable storms while continuing toward their ultimate goals. Godsall et al. (2017) point out to focus on mass-market and middle-market in slow economy and propose four strategies to spur growth. Passler (2018) discusses the key differences that are potential to deeply change, or even disrupt, the insurance industry.
Many studies emphasis the opportunities of technology adoption in insurance industry. Wilson (2017) describes the future of insurance from viewpoint of technology trend and concludes if forward-thinking banks that are able to leverage InsurTech appropriately, it may enhance profitability and valuation over long term. Gandhi et al. (2017) urge the insurance to embrace digital change quickly. Balasubramanian et al. (2017) emphasize the importance of analytics initiatives in insurance industry. Hagan (2018) emphasizes the importance of collaboration in development of InsurTech.
Zheng ZhenLiang (2015) considered morphological structures of reinsurance, this may lead to a standardization of different types of arrangements in insurance coverage.

(3) Technology adoption – Many papers focus on the track of technology adoption in insurance industry. Jans (2018) discusses the general concept about InsurTech. Nicoletti (2017) discusses the drivers of disruption for insurance industry and analyzes InsurTech actively leveraging technology in support of insurance businesses. Catlin et al. (2018) focus on ecosystems and platforms as the main chance for new development in insurance industry.
Some studies explain what can be done. Kaniyar et al. (2017) moderate a panel discussion to discuss automation (by using Advances in robotics, cognition, artificial intelligence, and machine learning) at scale in insurance. Balasubramanian et al. (2018) explore the impact of AI on insurance in 2030 from AI-related trends shaping insurance, the state of insurance in 2030, and how insurers can prepare for accelerating changes. Cappiello (2018) highlights the loss of the interpersonal relationship due to the direct consequence of the adoption of digital distributive forms and imperative calls for a correct setting of the market relationship.
Some papers further explain how to achieve the goal in high level. Gaar and Hupfeld (2017) examines how Insurtechs are categorized and what potential impact they could have on the insurer's value chain. Löffler et al. (2016) give an example that Insurance companies investing in new technologies in the smart-car environment to deliver enhanced products and services. Chester et al

(2016) advocate insurance carriers and actuaries should adopt the advanced analytics on top of the existing analytics in practice and explain the four-stage journey for adopting advanced analytics. Clarke and Ari Libarikian (2014) propose the five-component framework to success in advanced analytics - the source of business value, the data ecosystem, modeling insights,transformation for workflow integration and adoption for transformation.

(4) Challenges – Some papers highlight the challenges and risks issues. Catlin et al. (2016) explain the challenging digital transformation in insurance industry needs to ensure the continuity of the flow of daily business. Collins (2018) points out the penetration rate for insurance in China remains low compared to Western measures and there is plenty of headroom for growth in the China market. Bloemers (2018) concludes insurers need to evolve into organizations offering a much broader set of risk management solutions.
In the above most of the studies concentrate on the future trend, conceptual framework, and impact study. The challenges also reveal risk issue is till the focal point. In this paper, we propose a framework of risk information in detail which is not only important for the operations and decisions in insurance industry and but also crucial for standardization in realization of insurtech.

3. Preliminary – Insurance Information Requirement

Insurance operation, in current or future technical environment, shall suffice following:

- To provide sufficient information for underwriting consideration /risk assessment;
- To maintain records of 1) Loss experience; 2) Coverages by Contract; and 3) Premium Payment;
- To provide information for actuarial review during: 1) Risk Aggregation; 2) Risk Distribution.

Firstly, a common morphological structure of insurance and reinsurance products can be observed through major lines of insurance products including direct insurance and reinsurance, said structure should include: 1) Risk Scale; 2) Limit of Liability; and 3) Premium Base, which is also sufficient for underwriting consideration, as seen through our review of the definition of underwriting:

> Insurance underwriters evaluate the risk and exposures of potential clients. They decide how much coverage the client should receive, how much they should pay for it, or whether even to accept the risk and insure them. Underwriting involves measuring risk exposure and determining the premium that needs to be charged to insure that risk. The function of the underwriter is to protect the company's book of business from risks that they feel will make a loss and issue insurance policies at a premium that is commensurate with the exposure presented by a risk. -https://en.wikipedia.org/wiki/Underwriting#Insurance_underwriting-

Reviewed re/insurance products are attached in Annex 1.

Records for process of insurance is therefore classified and organized as:

1) Risk Scale for evaluation of risk exposures, supported by loss experiences from this particular risk, similar risks or engineering estimation. Loss experience records from this particular risk are

important records especially if occurred to existing risk carriers as settled claims or in process.

2) Limit of Liability as decision of scope of coverages, supported by the potential exposures and coverages provided by the contract. Not all potential exposures of this particular risk is covered by full limit or even not covered at all, coverages provided by the insurance product against the potential exposures shall be addressed clearly in records.
3) Premium Base with rate and formula to calculate premium, supported by client's premium payment records, to review whether the premium base is properly reflecting the covered risks. Selection of Premium Base shall properly reflect the risk scale and vary by different lines of insurance or design of products.

To include basic information, all required information are therefore in seven components which will be elaborated in Chapter 4.

Furthermore, BRIC is introduced as building blocks to organize the above information in a uniform format during insurance process including risk aggregation and distribution for easy actuarial review.

4. Basic Risk Information Components (BRIC) as Building Block

From previous chapter, the observed seven components of the required information are:

- Basic Information: Information of Risk/ Portfolio/ Placement, Coverage Period etc.;
- Coverages: Coverages or exclusion of this unit or contract;
- Cover Limit: Cover Limit, Sublimit and Deductible if any;
- Premium Base: Selected item and its value for premium calculation;
- Risk Scale: Sum Insured, Bordereaux or Profile, and by Exposures when necessary;
- Loss Records: Cause of Loss/ Paid Losses/ Outstanding Losses;
- Premium: Estimated Premium from Formula on Premium Base/Actual Premium.

Basic Risk Information Components (BRIC) is defined as one piece of risk information structured as the above, and can be combined or grouped to form different types for operational stages:

- Technical RIC : TRIC, a basic type for rating calculation
- Contract RIC : CRIC, combination of TRICs to form a re/insurance contract
- Group RIC : GRIC, group of selected CRICs to form an insured portfolio
- Placement RIC : PRIC, a set of PRICs to represent RI placements of a CRIC
- Side RIC : SRIC, annex to BRICs for additional details of non-profile information

We use *BRIC-information item (-SRIC)* to present the above items. For example, *TRIC-Risk Scale* for the item in TRIC structure, while *TRIC-Risk Scale-SRIC* is its further detail information by SRIC.

Rules of operation applied to the above types can perform all process of insurance, such as Information Forwarding, Total/Sub-total, Selection of Premium Base, Field Combination, Filtering/

Mapping, Portfolio Management for risk aggregation and Placement Management for risk distribution. Examples are: 1) Quarterly Statements of Accounts/ QSOA are *CRIC-Premium/Loss-QSOA* while *CRIC-Premium/Loss* is summation of all QSOA; 2) Accumulation of Risks are by Portfolio Management of *GRIC-Risk Scale,* which is to calculate sub-totals by pre-set classifications, usually sum insured band or regions; and 3) Mapping of *CRIC-Coverages* and G*RIC-Coverages* to decide a contract can be in a portfolio. Illustrations are given in later chapters.

Numeric data of required information can be maintained in uniform format during process as biometrics carried in a gene. However, narrative data is not fully digitalized and still requires human reading to decide a (potential) loss is covered or not. Possible improvements include the design of more digitalized insurance contracts, the development of AI capable to comprehend insurance coverages, or combination of both.

5. Device Risk Information Component (DRIC) as Information Source

BRIC as standard EDI is sufficient for insurance operation to reduce multiple entry of same information, except external source of information still has to be entered.

To fill in the gap, an extension called Device RIC (DRIC) is designed for source of information in BRIC format with contents adjusted as following:

- Basic Information: Device name, Manufacturing, Relation with other DRIC in same group, etc.
- Coverages change to Exposures: Exposures information of the device.
- Cover Limit: Not in use, or link with records of insurance arrangement.
- Premium Base change to Operation Information: as candidate of premium base.
- Risk Scale: Value of the item and potential financial impacts.
- Loss: Actual Developing Losses/ Outstanding Losses
- Premium: Not in use, or link with records of premium information.

DRIC in Operating System on IoT like Android or iOS used on IoP (Internet of People), can be a real device such as a set of machinery, or a virtual device such as a financial model or business plan in a computer system. In addition to BRIC functions, functions of a DRIC node are as following:

- Calculation of topological/spatial relations of DRICs in the same group;
- Higher level node access information of subordinate nodes provides complete and non-redundant information;
- Calculation of annual turnover, progress of project by planned DRIC setting on schedule;
- Information update for exposures, value, potential financial loss, market losses etc.;
- Collection of environment or production information;
- Communication with other cooperative devices;
- External communication via human interface or internet etc.

Example of DRIC design is in Annex 2.

Being the source of insurance information, OS on IoT is a platform for coordination of devices in a factory, a construction project, or a financial model. Once popular implementation like IoP, more applications will be developed to assist industrial and managerial usages.

6. Complete Information Flow in Insurance Operation

The uniform data structure of BRIC/DRIC maintains same during complete information flow, as exemplified by following cases of lines of insurance (section 6.1 to 6.3), and of risk aggregation to risk distribution (section 6.4 & 6.5).

In these cases estimated or real figures are not distinguished, as current practice is to process on estimation with adjustment afterwards, while new technology may change to real time practice.

6.1 Property Insurance

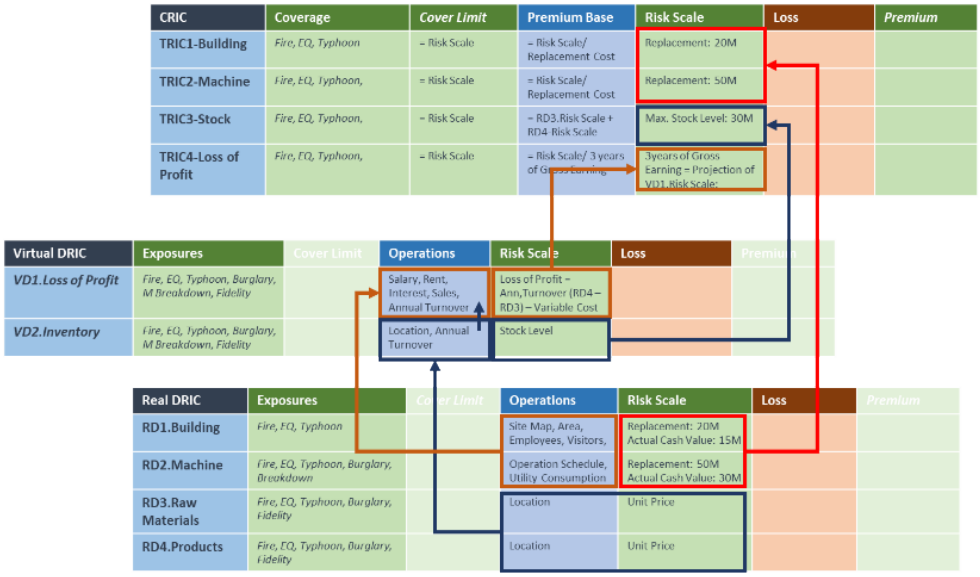

Fig 6-1. Operations of BRIC – Property Insurance

- Risk Scales of RD1 and RD2 to TRIC1 and TRIC2 for insured items, as illustrated in red.
- Operations and Risk Scales of RD3 and RD4 to VD2 for Inventory, then to Stock Level for Stock Declaration and to VD1 for calculation of Loss of Profit, as illustrated in blue.
- Operations of VD1 after calculation generates Loss of Profit as Risk Scale then to TRIC4 for Loss of Profit Cover, as illustrated in orange.

6.2 Construction All Risk Insurance

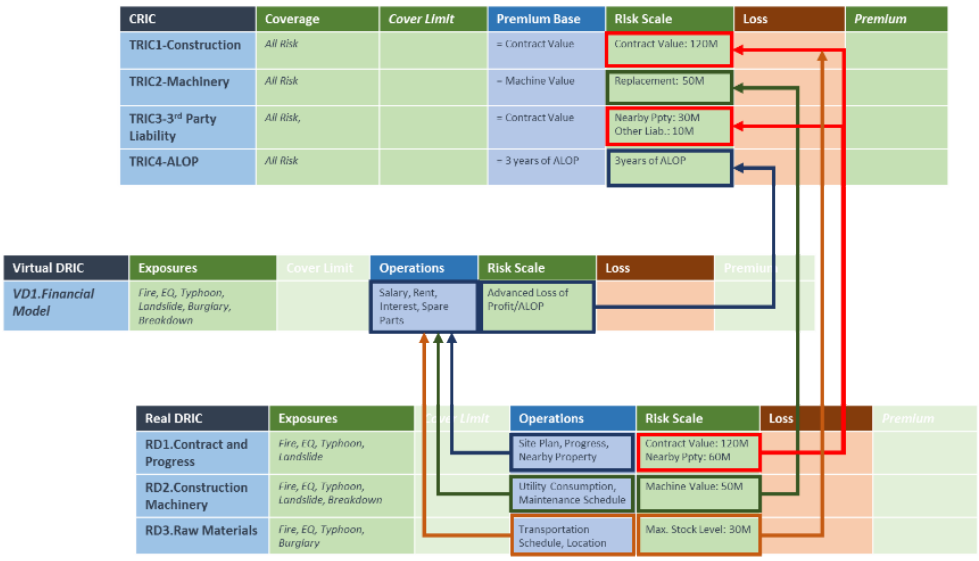

Fig 6-2. Operations of BRIC – Construction All Risks Insurance

- RD1 is the main for nodes installed along with the construction progress. Risk Scale for value of contract at site is then transferred to TRIC1, and Operation information to VD1.
- The value of construction machinery in RD2 is transferred to TRIC2 and information such as maintenance transferred to VD1.
- RD3 is arrived raw material for construction to TRIC1 while shipping schedule to VD1.
- VD1 is financial model analyzing the possibility of project delay and financial impact, then calculates the Risk Scale of Advanced Loss of Profit to the project and transferred to TRIC4.

6.3 Products Liability Insurance

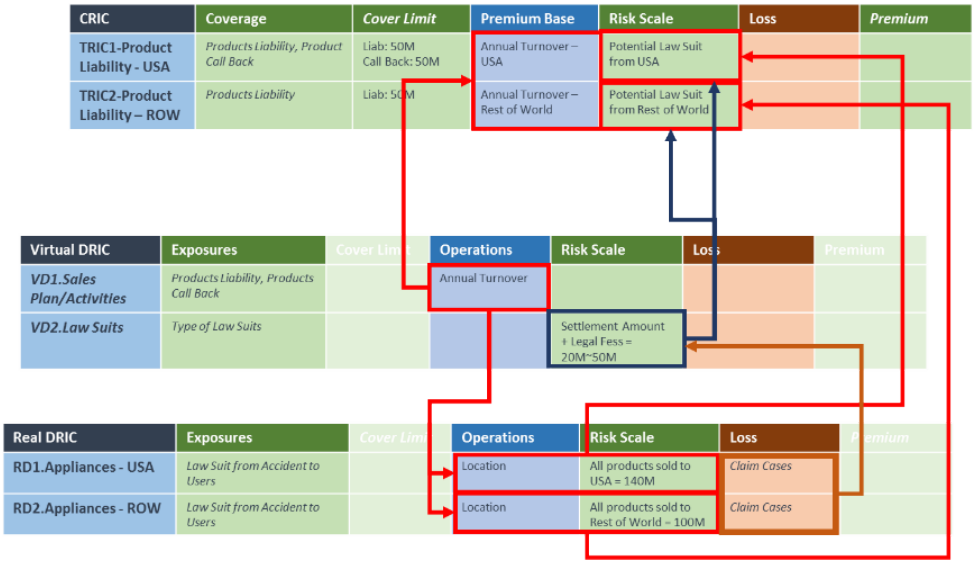

Fig 6-3. Operations of BRIC – Products Liability Insurance

- Assuming IoT Nodes installed in all sold products are providing items' conditions and grouped by USA and Rest of the World, as RD1 to TRIC1 and RD2 to TRIC2.
- If projected annual turnover is Premium Base, VD1 provides Sales Plan/Activity information.

- Using loss information of similar products to estimate Risk Scale and Cover Limit as in VD2.

6.4 Risk Aggregation

- Information of covered risks transferred from DRIC to TRIC, to form policy contract CRIC.
- Profile Management to group CRICs filtered by conditions fulfilling reinsurance requirements.
- Filtered CRICs to form a fool for reinsurance arrangement.
- Depending on the design of reinsurance contract to decide premium base for this reinsurance. In this example, total premium of grouped risks is the premium base for TRIC.

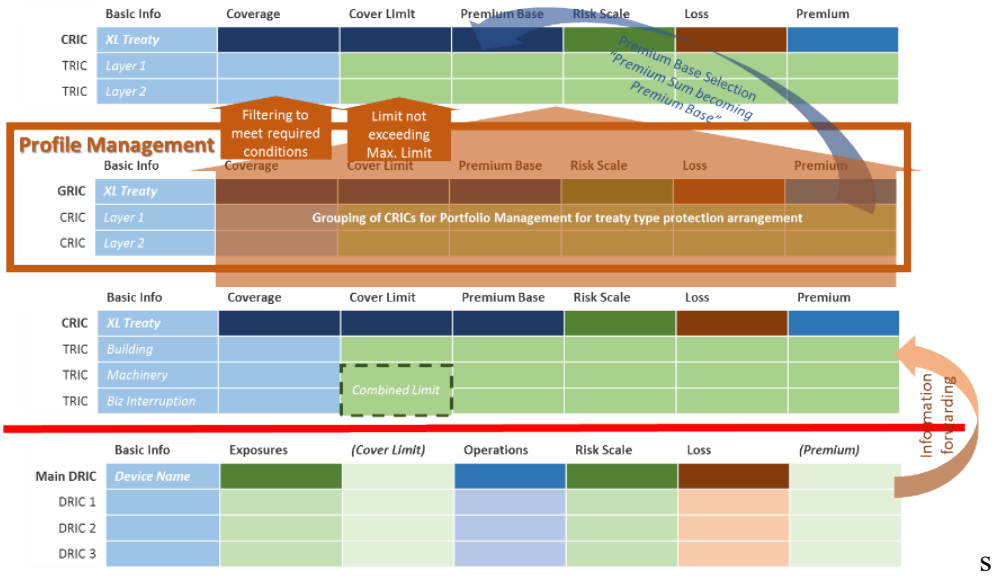

Fig 6-4. Operations of BRIC – Risk Aggregation Process

6.5 Risk Distribution

- CRIC of reinsurance going through Placement Management to supporting reinsurers.
- Reinsurers indicate their desired share and whether to follow exact the same terms or not.
- Once the share and terms are agreed, a reinsurance contract CRIC is created from PRIC.

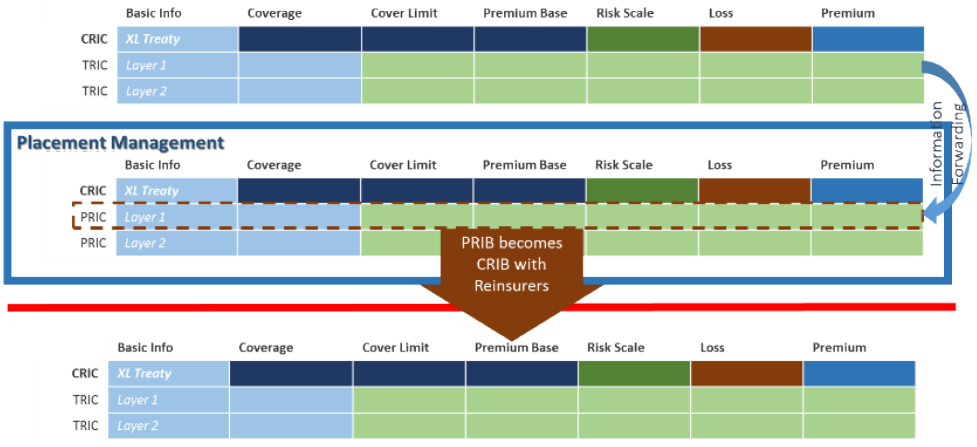

Fig 6-5. Operations of BRIC – Risk Distribution Process

7. BRIC based Innovation in Insurance

BRIC based innovation in insurance are discussed in three areas: 1) application of new technology for better efficiency in existing operation and services; 2) design of new insurance product; and 3) re-consideration of insurance model in new technology environment.

7.1 Innovation for better efficiency

BRIC centered information flow is illustrated below:

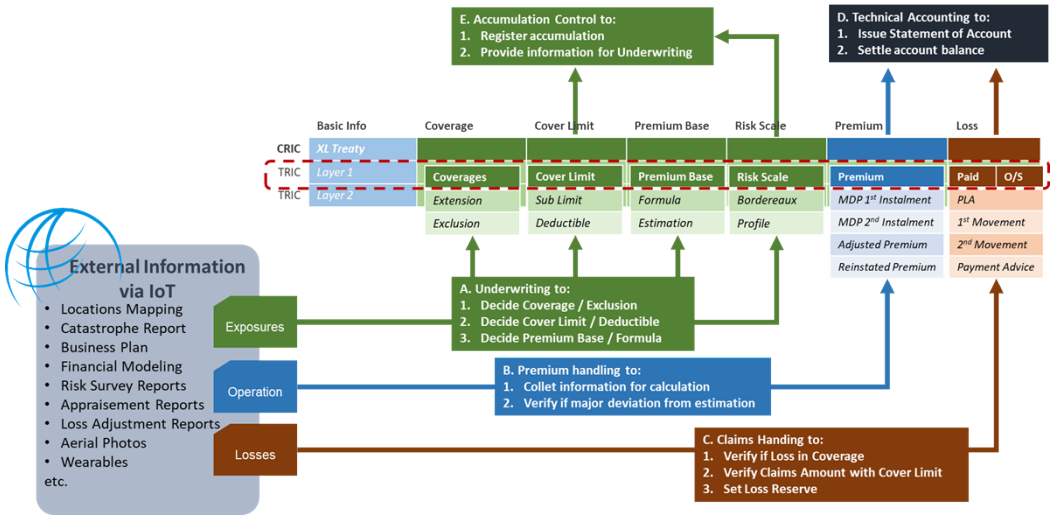

Fig 7-1. Insurance Process – Improvements for Better Efficiency

Activities marked with alphabets are where efficiency can be improved:

A. Underwriting: Automated Underwriting Engine
B. Premium Handling: Usage Based Insurance
C. Claims Handling: Auto Adjudication System
D. Premium Collection and Claims Payment: Smart Contract
E. Risk Accumulation: Real Time Alert
F. Operating System of IoT: For both real and virtual devices

BRIC as organized universal data format is to integrate entire information flow for better efficiency.

7.2 Innovation of New Insurance Product

The concept of BRIC can help insurance product design as the essential elements are well defined and organized. With implementation of DRIC to operation and environment, more measurements of insured interests will be available, and therefore new type of insurance products can be considered. Examples are wearables devices for life insurance with premium factors of health indices.

Directions of new insurance products from BRIC are:

- Better understanding of Scale of Risk, as precise number and locations of products for Product

Liability Insurance, real time progress update of construction project for Construction All Risks Insurance, actual number of visitors in a covered area for Third Party Liability Insurance etc.

- Better selection of Premium Base, as Scale of Risk is accurate and more indices collected by DRIC, for more reasonable premium calculation to both insured and insurer.
- Better application of Cover Limit & Deductible from the understanding of risk exposures and insured's requirements, will lead to better deployment of insurance capital, therefore result in more cost effective operation of insurance.

7.3 Innovation of Insurance Model

Assumption is made that BRIC/DRIC based IoT OS including real and virtual nodes are installed sufficient enough and adequate database provides real time information:

- Insurance change to demand driven from supply driven: Currently products are designed by insurance company then sold to risk owners. In new environment, risk owners' exposures cluster globally with automatic actuarial pricing for potential risk carriers to provide coverage.
- Re-defining segments of insurance industry: Current demarcation of facultative, treaty and retrocession reinsurance will be restructured as AI and Big Data will progress to make micro-management of large portfolio technically possible then before.
- Re-positioning of insurance company and intermediary: Currently pooled risks are covered by risk carriers' capital, while risk-transferring platforms with shared services as catastrophe modelling analysis are provided by insurance intermediary. With an integrated platform emerged, new method of specialization is going to provide a more efficient services to clients.
- New financing platform to reduce the transactional cost: The current business model of risk transfer is by a non-cost-effective chain involving multiple parties of multiple levels, while risk information is not transparent and many similar functions are repeated.

A new business model shall combine effects of both Law of Large Number and Network Effect to center at best benefit of risk owners so as to drastically improve effectiveness.

8. Conclusion and Discussion

By understanding of the morphological structure and essential elements of information, BRIC is designed as building blocks to organize the required information for complete information flow from risk to contract then insurance process of aggregation and distribution. Benefit of implementation is to reduce redundancy and improve efficiency in many ways especially for numeric data, and further enhancement of the application will be:

- Operating System on IoT, so that DRIC will be able to assist both insurance and management requirements;
- Standardization of the information of risk exposures and insurance coverage, so as to achieve full automation of profiling and claims handling.

An integrated information environment of insurance will change many familiar practices, from supply driven product design, segmentation of insurance industry to risk financing platform.

This frictionless world of information exchange and risk transferring will trigger further discussions and renovations in:

- Product design, to consider both demand driving and new available factors from DRIC;
- Operation model, to center at clients' benefit for best effectiveness and efficiency.

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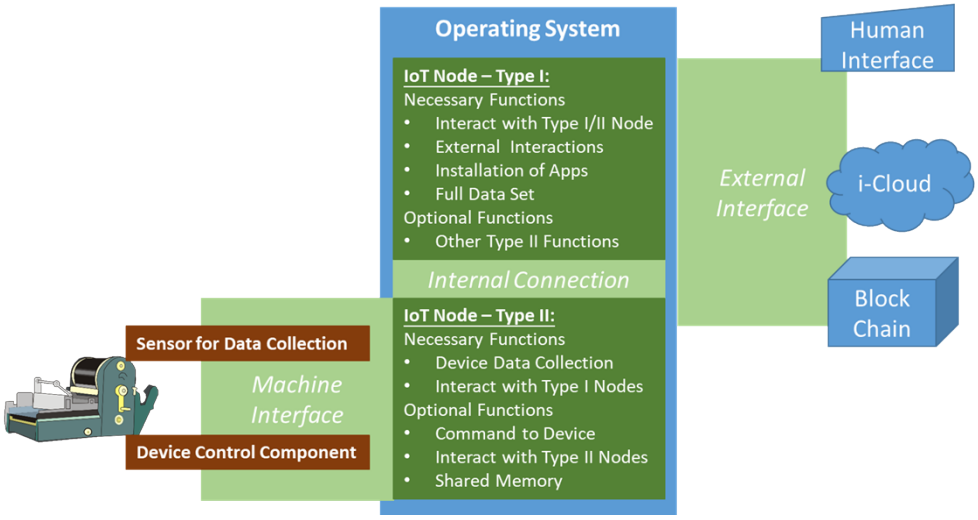
Appendix 1.

Reviewed Re/insurance products:

Line of Insurance	Risk Scale	Premium Base	Limit& Deductible
Property	Property Value	Property Value	Property Value/Policy Limit
Public Liability	Accident to Third Party	Turnover/Areas/No. of visitors	Policy Limit
Products Liability	Accident to Product Users	Turnover	Policy Limit
Warehouse Storage	Highest Stock Value	Turnover	Stock Value/Policy Limit
Engineering Project	Progress of Project	Contract Value	Contract Value/Policy Limit
Proportional Treaty	Risk Profile/Accumulation	Premium Income	Surplus Lines/Event Limit
Excess of Loss Treaty	Risk Profile/Accumulation	Gross Net Premium Income	Limit in excess of Deductible
Stop Loss Cover	Risk of covered business	Premium of covered business	Range of Loss Ratio
UBI Motor Cover	Own Damage, TPL	Mileage	Policy Limit
Index Product	Insured Value	Operation/ Environment index	Policy Limit

Appendix 2.

Example of Operating System in IoT



The above examples shows possible design of Operating System in IoT that Type I Node for functions as Hand Phones in IoP, while Type II for functions as extended wearables to collect operational and environmental data.