



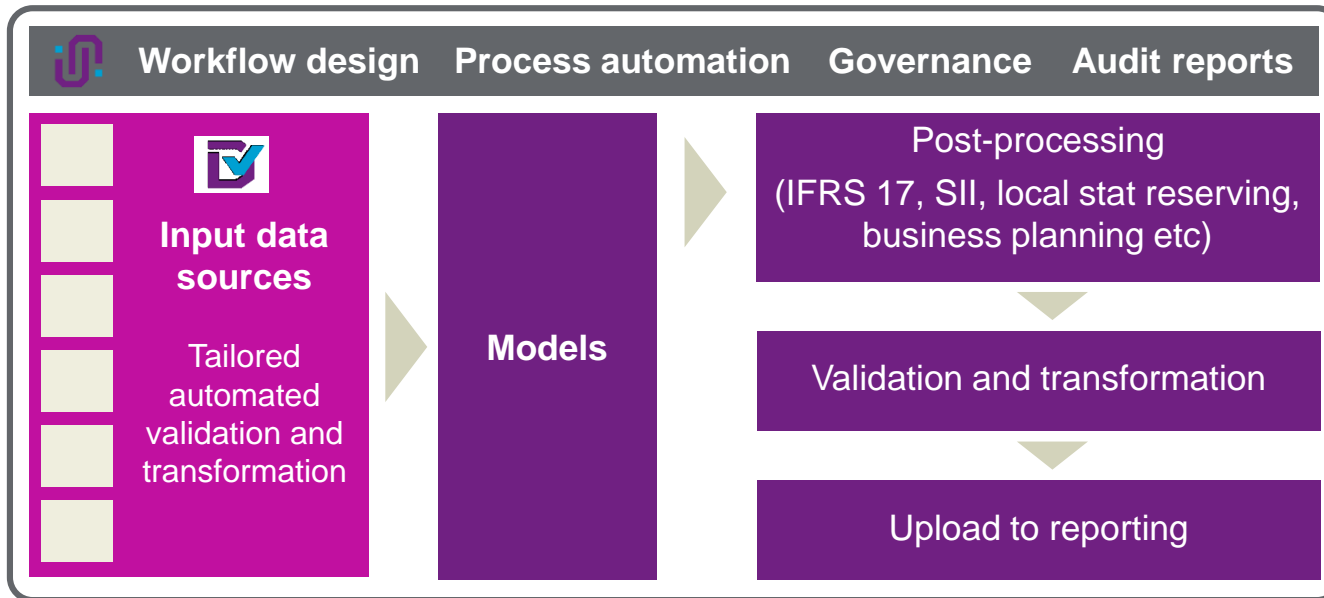
Financial Reporting & Insights Platform (FRIP)






The reporting framework you rent!

Faster. Better. Cheaper. Automated. Improved business insights. And fewer operational, design and project risks.

Don't invent it all yourself: focus on business instead!

The FRIP framework: an off-the-shelf target operating model (TOM) and reporting framework

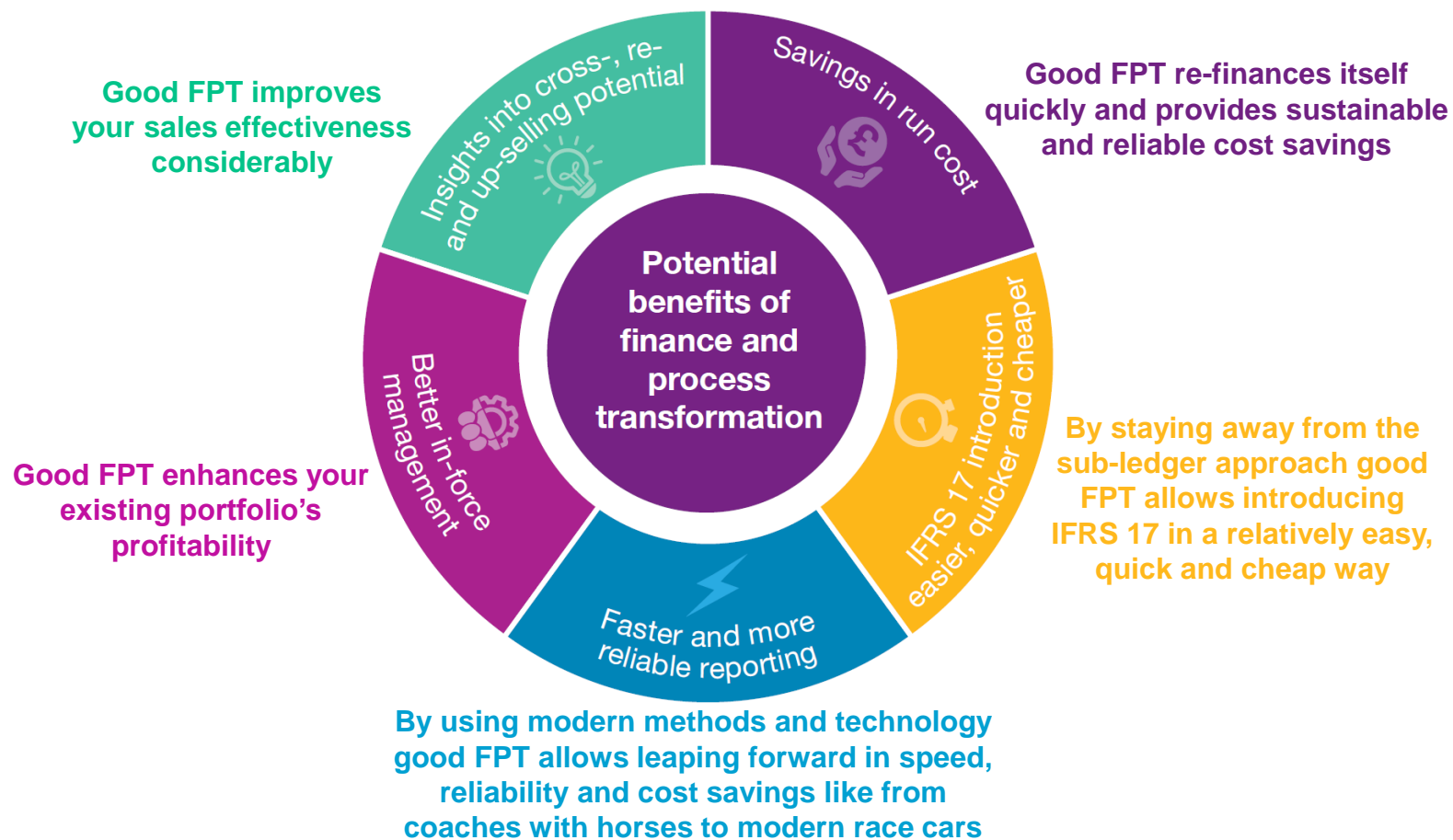


-  Tailored to reflect YOUR business
-  Low-risk and low-cost
-  Plug-and-play
-  Fully automated
-  Updated automatically with latest software releases

You benefit from:

-  Comprehensive audit trails and governance
-  Simple maintenance
-  Rapid implementation
-  Actuarial reporting team consolidation
-  Group-wide consistency
-  End-to-end reporting processes
-  Resources released for value-adding work
-  Bottom line P&L cost savings

Finance and Process Transformation (FPT)



The car analogy: the chassis and body are your TOM and reporting framework; and the engine is the actuarial model. So like changing a car, with FPT you should also think holistically about the chassis, body and engine.

The FRIP framework philosophy

Building on the car analogy...

If you need of a new car you have two basic options: buy one or build one (of course there are shades of grey between the extremes)

Home-grown unique new invention

- Invent your own car, develop the parts yourself and solve all methodology and technology issues yourself
- It is uniquely made for your needs
- No guarantees, no easy maintenance, no off-the-shelf parts

The result could be:

- Really impressive and useful in practice
- Impressive, but not very good in practice
- Or really terrible!

Standard off-the-shelf car

- Buy a factory-built, standardised car using platform technology
- Guarantees included for safety, maintenance, minimal usage time/distance and others
- Many options are available, such as colour, seat material, wheel rim, suspension and engine
- Cars are available at all prices and for various purposes from a single manufacturer. That provides a high level of synergy and effective knowledge sharing
- Maintenance is easy and typically relatively cheap
- Exchange parts available off the shelf

Finance and Process Transformation – our broad range of solutions

Car = TOM + solution: Build your own or buy a standardised car?

Build your own solution

Buy a standardized solution

What you get – pros & cons

- It is home grown and unique
- It is maintained by you
- It is developed just for you for a perfect fit
- Development & maintenance is financed up front
- You pay the entire development & maintenance costs
- Your in-house actuaries not only have to be model experts, but IT and programming specialists, as well as process and solution designers

- Rent a standardised framework; an off-the-shelf solution adapted to fit your specific needs
- Maintenance and updates outsourced (scale advantage)
- Massive efficiency gains from sharing basic technology
- Development & maintenance financed by 'rent' over time
- Sharing technology significantly reduces cost to you
- Actuaries can focus on value-adding activities

- Keep your existing framework
- Buy new IFRS 17 functionality
- Adapt existing framework

- Replace existing framework
- We support you in developing a new, technology-driven framework

- You produce results & analyse, but don't worry about maintenance and development
- Actuaries can focus on value-adding activities

- We perform the entire reporting for you
- We also offer the value-adding activities
- You don't need any actuaries

Our solutions



Keep and adapt existing reporting framework



Completely redesign the reporting framework



FRIP – rent a ready-to-use, plug-and-play reporting framework



Outsource your entire actuarial reporting work to WTW

Which option is the right one for you depends on your specific situation. Digitisation drives need for finance and process transformation and first of all requires a culture change. Technology change is just an enabler. Decisions on which solution is right needs to be based on objective, rational arguments, rather than on emotional arguments like tradition.

Our cutting edge technology suite underpins all our solutions



Unify

Workflow process streamlining

- End-to-end process automation
- Governance framework and audit features
- Integrates with Willis Towers Watson and third party software

Automation, governance and integration through Unify can extend beyond Willis Towers Watson tools to third-party software tools and all types of financial modelling and reporting systems.



DataValidator

Data cleansing, transformation and validation

- Easy integration into processes
- Automatic reporting of data quality assessment results

Flexible and user-friendly, DataValidator, enables validation, cleansing and transformation of data, efficiently preparing it for use in financial modelling and reporting processes.



RiskAgility FM

Insurance liabilities, asset modelling, post-processing

- Distributed processing performance
- Easily adapted to an organisation's products and business processes

RiskAgility FM provides the best possible environment for creating and maintaining sophisticated modelling applications with cloud and distributed processing options.



ResQ

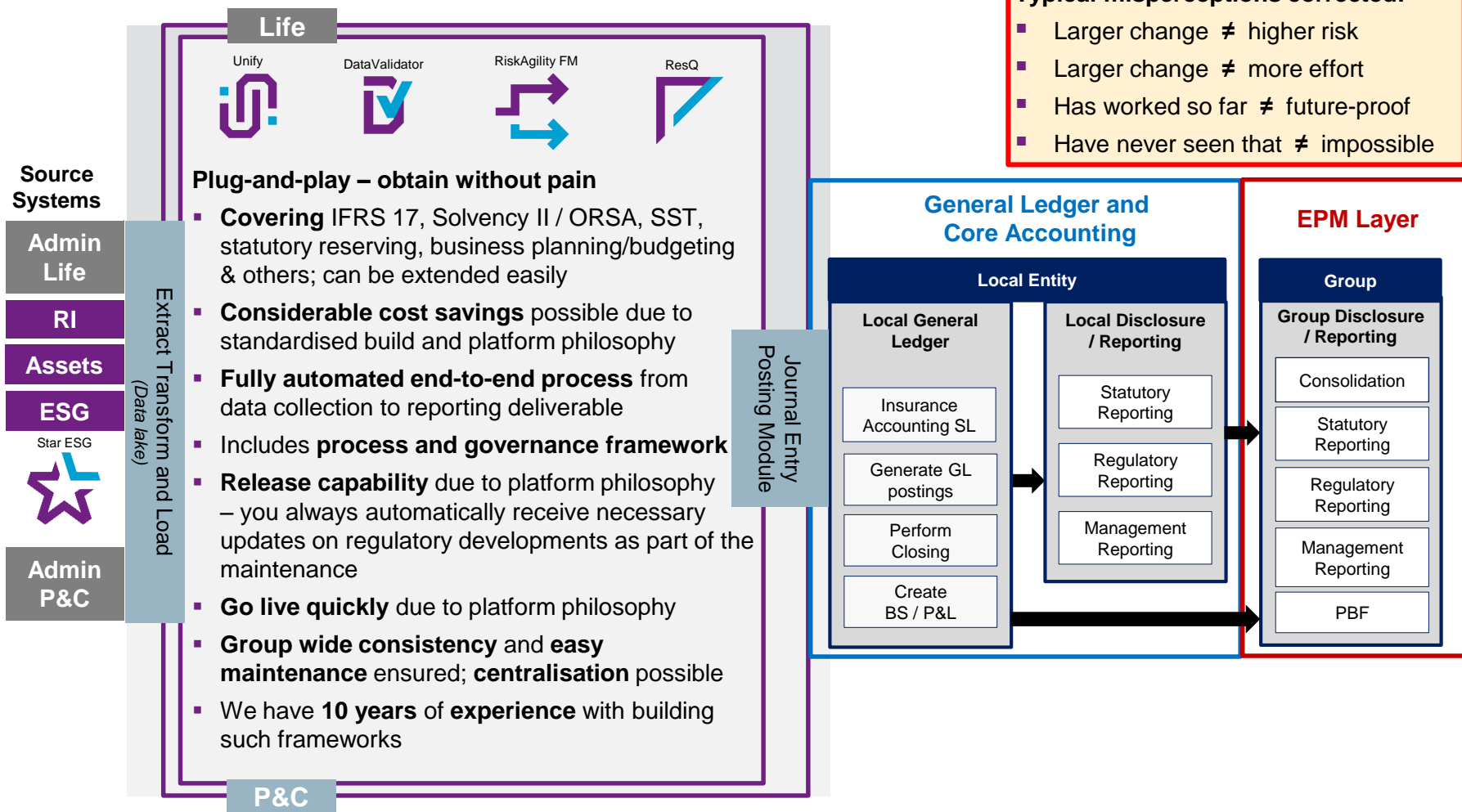
Combining powerful reserving and data management

- Industry leading Reserving software
- IFRS-compliant library
- Supports methods such as COC, VAR, TVAR support, bootstrapping when calculating RA

An integrated solution combining powerful reserving and data management to deliver efficient, team-based reserving with enforced consistency across a project. Reduces the opportunity for human error through the use of wizards and management of aggregation calculations.

FRIP – one consistent machine for all reporting needs

Our reporting framework to rent



Typical misperceptions corrected:

- Larger change ≠ higher risk
- Larger change ≠ more effort
- Has worked so far ≠ future-proof
- Have never seen that ≠ impossible

Risk mitigation, delivery and cost savings: the FRIP solution

Less operational risk and easy use (so you sleep better)

Enterprise landscape replaces “toys” in actuarial reporting



- Actuaries love playing which is necessary for analysing and understanding !
- But unlike today actuaries should **not** run or maintain productive systems – this necessity many of them fear and erroneously call “loss of control”
- FRIP solves this issue: your actuaries can add value and “play” with the numbers; the productive system is maintained professionally

We take the main risks of change



- Regarding feasibility and unforeseen challenges
- We pre-finance the build, so there is no major up-front project cost for you
- Fixed annual fees for build, regulatory maintenance and software licences

Plug-and-play



- All IFRS 17 requirements are included in the base offering
- End-to-end solution covering
 - Data preparation and validation
 - All calculations; i.e. valuation models and post-processing
 - Preparation of results for reporting
 - Governance, workflow design and automation
- Re-design of current processes included
- Our solution also covers cloud access and management through a ‘solution as a service’ (SaaS) application using Microsoft Azure and vGrid

Tailored to your needs

- We **cover all reporting** you need – Group & local, regulatory & internal; relevant parts of achievable cost savings require some re-design of processes and methodology; will be done by us under the fixed annual fees
- We offer you our solution for selected local entities or the entire Group; relevant parts of achievable cost savings require some re-design on Group level hence full Group coverage

Costs down!

Basic run cost



- According to our experience with such projects over the last 10 years you on average can **sustainably free up roughly 60-80%** of your reporting actuaries for value adding tasks
- Certain adjacent processes like business planning/ budgeting are covered by our solution hence become considerably cheaper than today; **further FTE reductions in finance** are possible
- The speed of our solution typically **saves 50-90% cloud cost** compared to your current solution
- Some existing software licences may be abandoned
- If an entire insurance group is covered by FRIP, we expect **considerable additional cost savings** can be realised at Group level

One-off project cost



- Downsizing the IFRS 17 project** saves you a large amount until 2022
- Usually a number of local projects and local additional tools may be abandoned which considerably reduces extraordinary project cost

Selected benefits for IFRS 17

Fully automated end-to-end process from data collection to reporting product; process re-design and error handling; onerous contract identification; if you like: UOA = contract



- System based automated process drives progress; including real-time progress tracking and “bottleneck identification”; FRIP setup includes re-design and implementation of all related processes and automated process error handling
- Group-wide standardisation easily possible regarding processes and results output on quite granular level for optimal comparison
- Clear & transparent responsibilities; input data quality analysed automatically after upload; input data to be approved before further progress to minimize iterations; manual intervention during processes only for reviews and approvals/rejections
- Bottom-up policy-by-policy calculation (i.e. UOA = contract is possible without onerous manual processes) with automatic identification of onerous contracts (at inception and thereafter) and dynamic allocation of UOAs to e.g. cohort baskets (BBA) or otherwise homogenous baskets for overarching aspects like collective discretionary or rule based profit sharing (VFA)

Understand your numbers and manage the business

- Actuals-based automated bottom-up calculation of P&L; i.e. based on list of actual claims cases (policy number, type of claim, size of claim, ...) expected CSM development is replaced by actual CSM development
- > 40 steps in your CSM roll-forward and drill-down into details of insurance contract result for each step; analyses and drill-down viewable in FRIP for respective roles in your process landscape



Governance embedded



- Responsibility model with currently 15 pre-defined groups and their respective access rights and duties
- Tailored to reflect your roles and responsibilities seamlessly
- Audit reports created and stored automatically for both standard process and your specific needs

Secure data storage; minimal impact on feeder systems



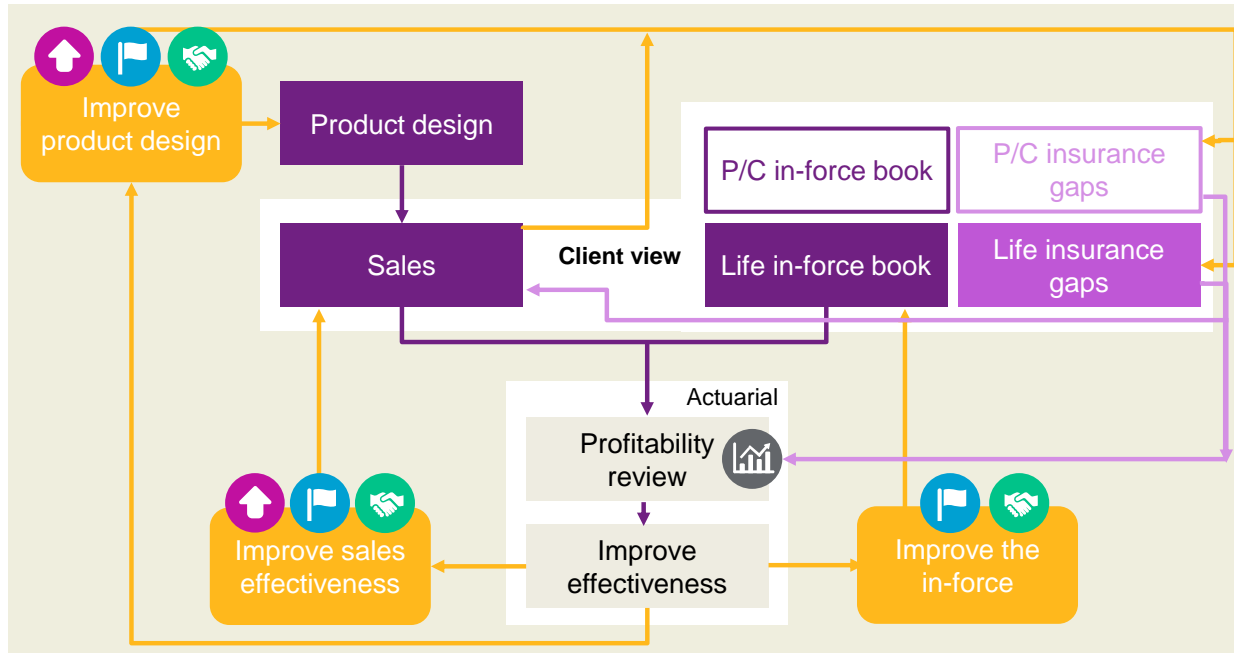
- Input data, intermediate results, final results, models, tools, approvals, rejections stored and archived in secured environment
- Policy admin system and other feeder systems remain untouched in their current shape; they stay solely feeder systems – no feeding results or flags back into those systems

Some core technical features for IFRS 17

- Group-wide standardisation of approach to most valuation aspects – e.g. asset modelling; calculation of P&L steps and basic items like premium timing, UPR, etc.; separation approach towards investment result and insurance contract revenue
- Separation of insurance contract revenue from other result contributors is available – and adjustable to your needs if required
- Rules for automatic onerous contract and profitability testing can easily be tailored to your definition
- Consolidation functionality for insurance groups included covering both standard accounting consolidation rules and limited liability put option for consolidation of risk results; independent of Group structure hence structure changes can be introduced easily and can be analysed in advance (M&A)

Improving the company performance

Through evaluation, insight and positive feedback loops



Profitability review

Sales effectiveness review

Anti-selection review

Cross-/up-/re-selling review

- Many insurers face sub-optimal information flow and lacking feedback loops between operational and finance teams. Digitization programmes therefore often lack underlying data intelligence to optimize coordination of client facing initiatives.
- FRIP helps closing this information gap. By enriching the data you obtain business insight into various areas of interest.
- Please find basic examples to the right →

Enrichment examples	Availability and benefits. Keep in mind the big data logic: adding a data item increases the space to be analysed by a dimension; i.e. your benefits grow super-linearly
Sales person	Available. Identify quality of sales (level of claims, surrender,...); "cross-saleability" of sales persons; sales force distribution (i) on map, (ii) per product type, (iii) per customer class,...
Geography, post code	Available. Analyse post code penetration map regarding distribution of (i) product mix, (ii) volume & quality of sales, (iii) policy size vs. expected society mix, (iv) # sales / inhabitant
Job type, salary level, education	If not available, derive e.g. from combination of policy size, health risk class and post code. Identify insurance gaps for up- or cross-selling, also across Life & P/C (FRIP can cover both, combine such information in anonymised way and feed back proposed action). Identify re-selling potential based on customer's expected risk capacity and risk/return affinity.

Short solution overview

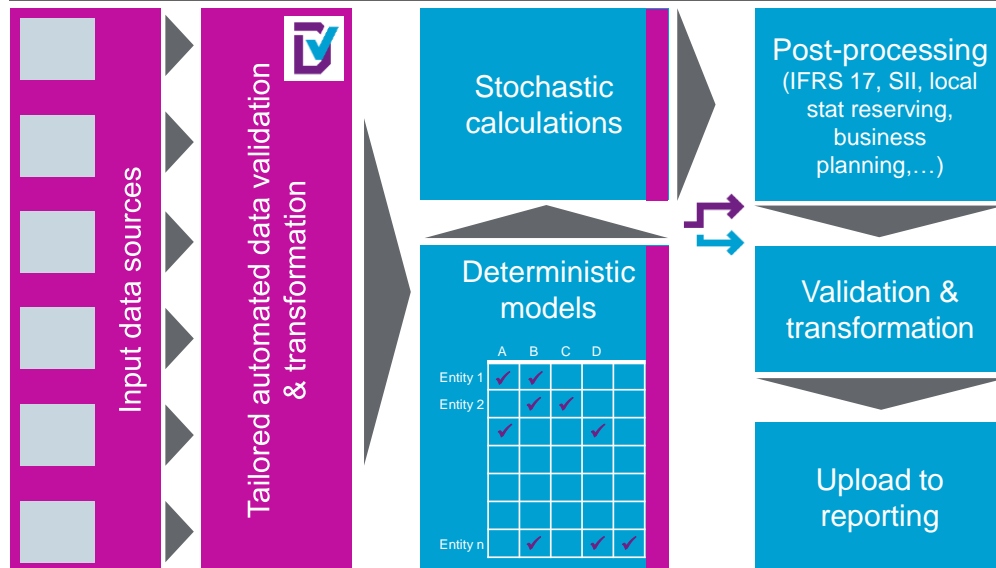
ILLUSTRATIVE

Tailored

Standardised



Workflow design; Process automation; Governance; Audit reports



- “**End-to-end**” reporting framework for all reporting purposes (“from outside policy admin system to outside MIS / General Ledger”)
- Included are all calculation tools, process design, workflow design, automation, process error handling, governance, data transformation and extensive validation
- **Standardised** framework: low run cost, short implementation, future-proofness, coverage of all regulatory requirements
- At the same time **tailored to your needs**: all your business and management specifics are covered adequately
- **We pre-finance** the implementation for you **and** offer considerable **guarantees** regarding future-proofness, quality and cost
- **Save cost & pain**: plug-and-play FRIP instead of large in-house implementations and reduce reporting run cost (**typically by 60-80% in FTE**)

	FRIP	“Flexing”-like	Model points	Policy by policy
Speed	Green	Green	Yellow	Red
Accuracy	Green	Yellow	Yellow	Green
Ability to standardise & centralise	Green	Yellow	Red	Red

Speed, accuracy, potential to centralise

- High speed: quick answers & low cost
- Accuracy is much more important for IFRS 17 than for S2 or ORSA – accuracy levels of average S2 models will not be enough
- Most actuarial tasks are very similar for all companies. Standardisation ensures good model quality, distributes good approaches and saves considerable maintenance cost.

Know your customer & improve business – add value beyond reporting!

- Develop RAG maps for customers and sales force along dimensions like post code, job class / risk class, “penetration” of customers’ insurance needs, sales persons’ preferred products
- Therein analyse aspects like unusual experience regarding behaviour; including surrender, premium cessation, disability, mortality
- Develop actions for different groups in map like surrender prevention, surrender encouragement, selective sales force training to enhance cross-/re-/up-selling, cessation of cooperation with certain sales persons, product design

Analyses on above and similar aspects can easily be obtained as direct output

Trust is a pre-condition - therefore security is key!

We are absolutely aware of the fact that the rent option requires considerable trust from our clients. It contains both business critical data and IP we need to protect. On top of our clients' data and IP it also contains some of our own IP which helps aligning both sides' interest in security. Therefore we have installed organisational Chinese Walls. These are at the core of retaining the very high level of trustworthiness required for our clients to accept such kind of service offering.

Development and maintenance of FRIP are performed by a dedicated team to ensure data and IP protection and avoid dilution of the solution's design philosophy. To protect all parties' data and IP effectively no data or information on clients' IP used in our rent solution is passed to Willis Towers Watson colleagues outside the team. We will neither use our clients' data or IP brought to us within the rent solution in serving other FRIP clients nor in consulting other clients outside this customer group. Obviously breaching these core principles in a trust based business model immediately and irrevocably destroys the entire foundation of the business model itself. Because FRIP involves a longer term commitment from both sides our focus on communicating and enforcing these principles in our rent solution is even higher than it anyway is in consulting our clients in general.

All Willis Towers Watson employees on a regular basis have to complete training and exams on the content of our Code of Conduct. The Code of Conduct forms part of our work contracts. On top of this all our colleagues involved in developing and maintaining FRIP are asked to sign a separate agreement regarding the data and IP protection along the lines outlined above.



**For more information or to find out how you
can benefit by moving to FRIP, please contact:**

FPT@willistowerswatson.com

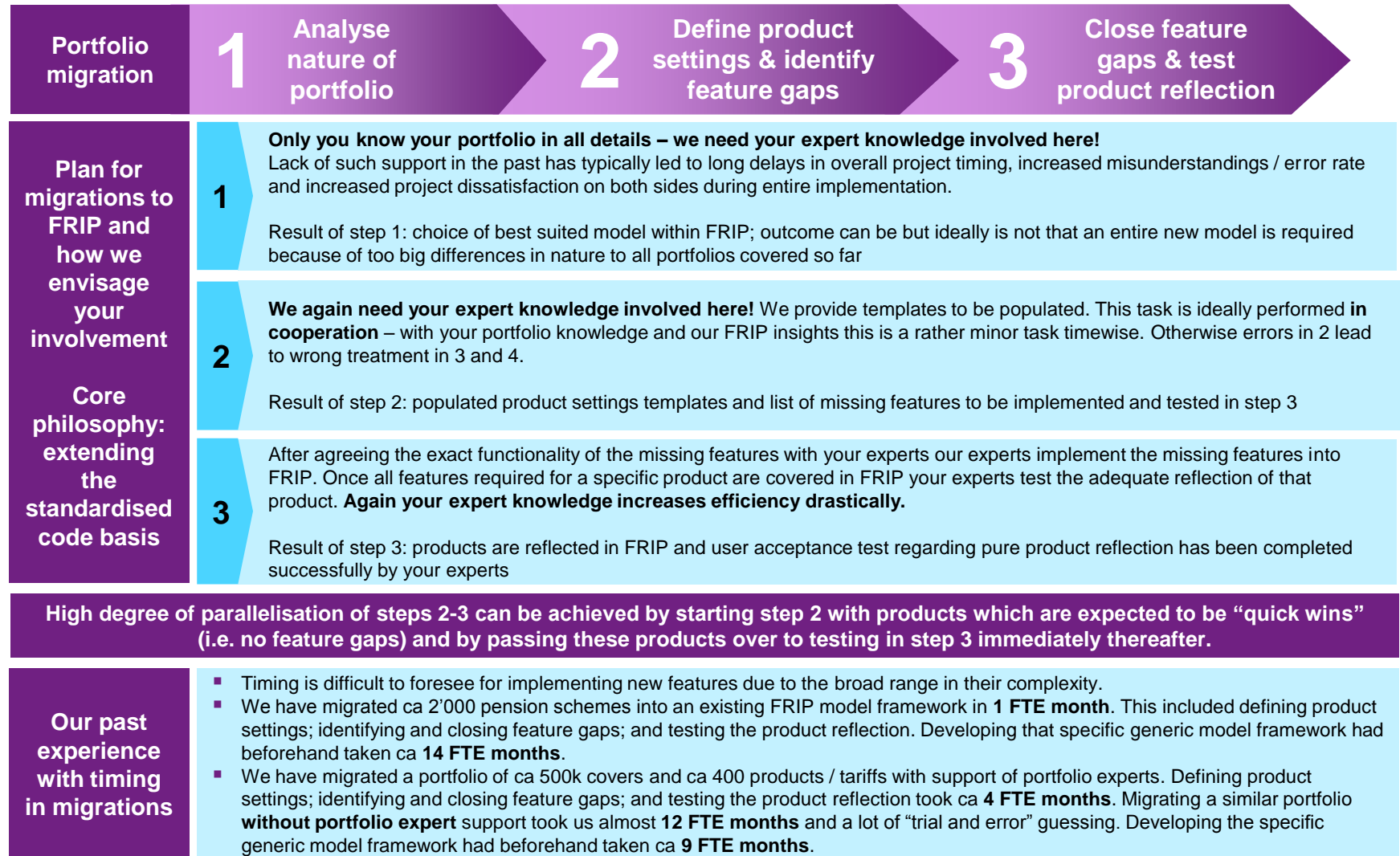


FRIP - Appendicies



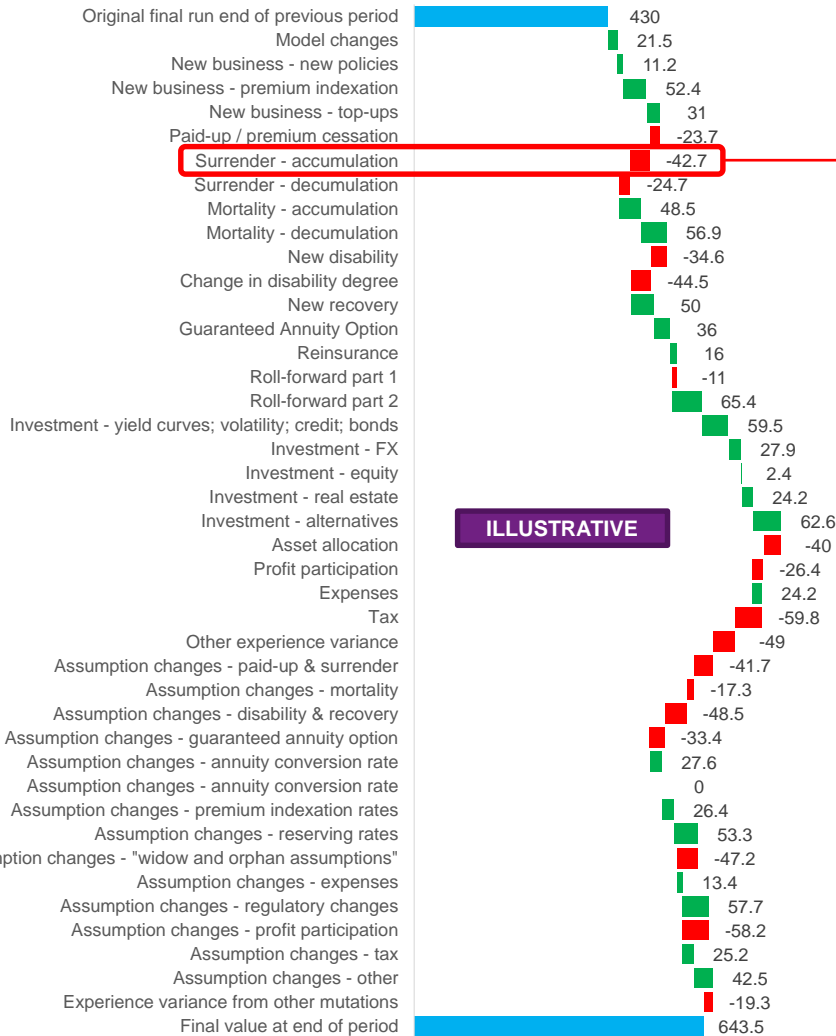
Migrating your portfolios into FRIP – easy only due to its design

The following can be performed in parallel for each of your portfolios



Improve the business – interactive portfolio behaviour analysis

Dimension 1: Drivers for change



Dimension 2: Impact on P&L lines



Dimension 3: Lines of Business / segregated funds

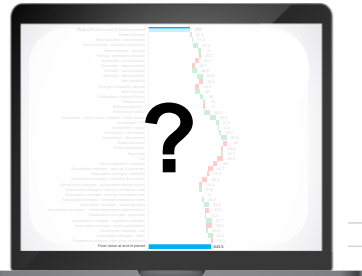
Dimension 4: Periods (e.g. years or quarters)

Dimension 5: Tailored; e.g. sales channel or geography

Improve the business – use actual events in roll-forward

Obtain decrements statistics, sales force ranking, postcode analyses et al for free

Based on decrements assumptions



Based on actual events



Example: premium cessation

PUFUND STATE CHANGE	Change	State	% chng	Change	State	% chng
STP_INITIALIZE	-	5'529	-	-	21	-
STP_PREM	-	5'529	-	-	21	-
STP_PAYDIS	-	5'529	-	-	21	-
STP_OAA	-	5'529	-	-	21	-
STP_FEES	-9.8	5'519	-0.18%	-0.0	21	-0.19%
STP_RISK_PREM	-2.8	5'516	-0.05%	-0.0	21	0.00%
STP_INV_RET	11.4	5'527	0.21%	0.0	21	0.21%
STP_PUP	-4.6	5'523	-0.08%	4.6	26	21.56%
STP_SURR	-18.7	5'504	-0.34%	-	26	-0.34%
STP_MORT	-0.2	5'504	0.00%	-0.0	26	0.00%
STP_DISAB	-2.9	5'501	-0.05%	-	26	-
STP_RECOV	0.9	5'502	0.02%	-	26	-
STP_MAT	-	5'502	-	-	26	-
STP_CAPINJ	-1.3	5'501	-0.02%	0.5	26	1.87%
STP_REINSURANCE	-	5'501	-	-	26	-
STP_FINALIZE	-	5'501	-	-	26	-
STP_INITIALIZE	-	5'501	-	-	26	-
STP_PREM	-	5'501	-	-	26	-
STP_PAYDIS	-	5'501	-	-	26	-
STP_OAA	-	5'501	-	-	26	-
STP_FEES	-9.7	5'491	-0.18%	-0.0	26	-0.19%
STP_RISK_PREM	-2.8	5'488	-0.05%	-0.0	26	0.00%
STP_INV_RET	11.3	5'499	0.21%	0.1	26	0.21%
STP_PUP	-4.6	5'495	-0.08%	4.6	31	17.38%
STP_SURR	-18.7	5'476	-0.34%	-0.1	31	-0.34%
STP_MORT	-0.2	5'476	0.00%	-0.0	31	0.00%
STP_DISAB	-2.9	5'473	-0.05%	-	31	-
STP_RECOV	1.0	5'474	0.02%	-	31	-
STP_MAT	-	5'474	-	-	31	-
STP_CAPINJ	-1.3	5'473	-0.02%	0.4	31	1.38%
STP_REINSURANCE	-	5'473	-	-	31	-
STP_FINALIZE	-	5'473	-	-	31	-

restyp	Change	State	% chng	Change	State	% chng
STP_INITIALIZE	-	5'557	-	-	-	-
STP_PREM	-	5'557	-	-	-	-
STP_PAYDIS	-	5'557	-	-	-	-
STP_OAA	-	5'557	-	-	-	-
STP_FEES	-9.9	5'548	-0.18%	-	-	-
STP_RISK_PREM	-2.8	5'545	-0.05%	-	-	-
STP_INV_RET	11.4	5'556	0.21%	-	-	-
STP_PUP	-	5'556	-	-	-	-
STP_SURR	-18.9	5'537	-0.34%	-	-	-
STP_MORT	-0.2	5'537	0.00%	-	-	-
STP_DISAB	-2.9	5'534	-0.05%	-	-	-
STP_RECOV	0.9	5'535	0.02%	-	-	-
STP_MAT	-	5'535	-	-	-	-
STP_CAPINJ	0.0	5'535	0.00%	-	-	-
STP_REINSURANCE	-	5'535	-	-	-	-
STP_FINALIZE	-	5'535	-	-	-	-
STP_INITIALIZE	-	5'535	-	-	-	-
STP_PREM	-	5'535	-	-	-	-
STP_PAYDIS	-	5'535	-	-	-	-
STP_OAA	-	5'535	-	-	-	-
STP_FEES	-9.8	5'525	-0.18%	-	-	-
STP_RISK_PREM	-2.8	5'522	-0.05%	-	-	-
STP_INV_RET	11.4	5'534	0.21%	-	-	-
STP_PUP	-5'548.0	(14)	-100.26%	5'660.0	5'660	-
STP_SURR	-	(14)	-	-19.2	5'641	-0.34%
STP_MORT	-	(14)	-	-0.2	5'641	0.00%
STP_DISAB	-	(14)	-	-	5'641	-
STP_RECOV	14.2	-	-100.00%	-	5'641	-
STP_MAT	-	-	-	-	5'641	-
STP_CAPINJ	-	-	-	-51.2	5'589	-0.91%
STP_REINSURANCE	-	-	-	-	5'589	-
STP_FINALIZE	-	-	-	-	5'589	-

Governance framework – automation

- Web-based control framework for all production, analyses, data handling, data storage, reviews, approvals and audit
- Web-based analysis reports and option to download any data container with input, intermediate or results data
- Real-time monitoring of any task, including velocity chart for identifying process bottle-necks
- Process breakdown into relative weight of process components
- Analysing error sources supported by a number of tools like current activity status, historical activity log, runtime for each sub-process, intermediate output files of each activity
- Transparent and easy view on process owner, process submitter, versioning of process, input and tools
- Overview of open manual tasks like reviews and approvals

Governance framework – data handling, storage, historisation

- Unify (hence FRIP) uses blob storage technology to store all data and tools
- Therefore format, size and internal structure of any data file is irrelevant for both the overarching process and most parts of the data handling itself
- All data, tools, process workflows, responsibility definitions and access rights are stored safely and can be changed only with adequate rights
- None of data and tools used in production can be changed retrospectively – only adapted by introducing a new version
- All input data, intermediate results and final results are stored and can be viewed with adequate rights (see below print screen)

Output data used in and produced by a selected sub-workflow

Storage time is defined in workflow setup; i.e. between self-defined short time and eternal

With adequate rights results can be downloaded and viewed on your computer while the process is running and thereafter during above-mentioned storage period

Final results are also stored in separate dedicated versioned data containers

Governance framework – responsibilities and access rights

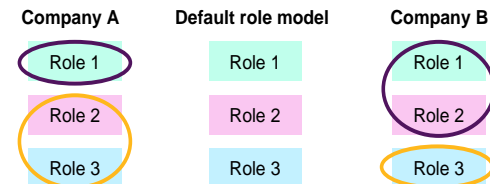
Standardised setup – tailored to your needs

Roles setup

- Ignoring the split into “provide”, “review” and “approve” there currently are 15 pre-defined main roles in FRIP; setup can be extended easily;
- Any duty or role can be activated or deactivated separately;
- Each role can be a single person or a group of people;
- Each role defines a duty and the rights the role has regarding this duty; e.g.
 - Responsibility: provide policy data; i.e. upload the policy data, run automated validation tests and review its adequacy as preparation for the approver to fulfil his/her role;
 - Access rights with respect to the policy data input interface: read/write;
 - This role’s default access rights for any other part of the system: none;
- Roles can be merged in different ways by assigning people or groups of people to roles; e.g.
 - In **company A** the provider of the policy data only provides, the approver performs the review;
 - In **company B** the provider also reviews; the approver only approves.

Governance model groups	Asset Data	Financials	Financial Market Data	CRTI	Assumptions	Policy Data	Deterministic Model	Stochastic Model	Deterministic Results Reviewer	Deterministic Results Approver	Calibration Results Reviewer	Calibration Results Approver	Stochastic Results Reviewer	Stochastic Results Approver	Reporting Recipient
Duties / tasks															
Asset Accounting	w,a													r	
Financial Accounting		w,a												r	
Financial Market Data			w,a								r		r		
CRTI				w,a					r		r		r		
Assumptions					w,a				r		r		r		
Policy Data						w,a			r		r		r		
Deterministic Model							w,a		r		r		r		
Stochastic Model								w,a			r		r		
Deterministic Results									r	a	r		r		
Calibration Results											r	a	r		
Stochastic Results													r	a	
Reporting													r	a	r

w: write; a: approve; r: read



Testing framework during production

Millions of tests are performed automatically during each production cycle

Input data validation

- Policy data: policy internal consistency and correctness line by line, flag by flag;
- Asset data: internal consistency asset by asset; aggregated cross-source consistency against financial accounting data;
- Financial accounting data: reasonability against previous valuations;
- Other: as appropriate;
- Automated error correction on demand; i.e. if rules are defined;
- Otherwise manual correction by respective responsible person;
- Audit report automatically generated and provided.

Tests within models

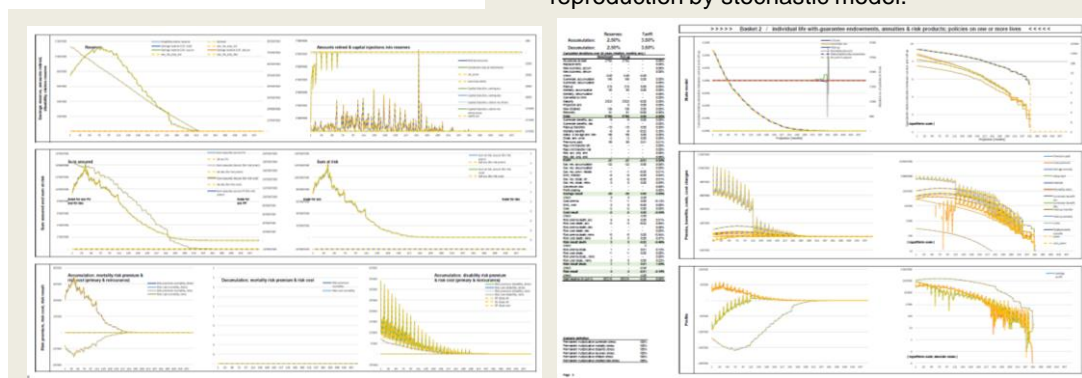
- The modelling framework contains soft (log but no failure) and hard (log and immediate failure) automated tests performed during each run;
- The deterministic models perform **for each policy** handled between **5 k** and **17 k** tests;
- For each aggregation basket** the stochastic model performs **ca 100 m** tests during the calibration and during any valuation run **per path ca 150 k** tests;
- Above numbers are for annual projections over 40 years; for smaller projection steps (e.g. monthly) the number of tests increases quite linearly;
- Key functions test whether their results allow continuing the overarching process in a meaningful way (hard);
- For selected soft tests a high-level results overview forms part of the standard model output.

Validation of calibration

- Why calibration? Two reasons: standardisation (i.e. only one global stochastic model) and speed;
- The bottom-up deterministic models write out cash flows which are aggregated into baskets and form the input for the stochastic model; nine calibration runs are performed in the deterministic models;
- Using this input the stochastic model accepts any out-of-sample combination of stresses and reproduces the bottom-up results nicely; much quicker and without knowing the products;
- The quality of this methodology has to be tested and approved each valuation date; tests are performed and test reports produced automatically for both calibration and selected out-of-sample test scenarios; review and approval require judgment and remain manual;
- Below see examples of test reports; solid non-yellow lines represent benchmark from deterministic models; dotted yellow lines represent reproduction by stochastic model.

Results validation

- Validating results requires judgment hence manual involvement and manual approval;
- Additionally automated reasonability tests can be defined; e.g. comparing with previous valuations.



Testing framework during build and maintenance

Modular testing and approval process – staging modular or in groups

Design principles

All components adhere to the following design principles to allow safe and easy testing

- Respective tests performed during production are also performed in each development or test run
- Each component can be used on-line and off-line;
- There are no differences in behaviour under on-line and off-line use;
- There are no differences in behaviour with and without distribution of tasks;
- i.e. distribution of tasks happens by running tasks in parallel; not by distributing single tasks onto several cores;
- Only exception is distribution of deterministic model tasks by distributing independent policy data onto several cores.

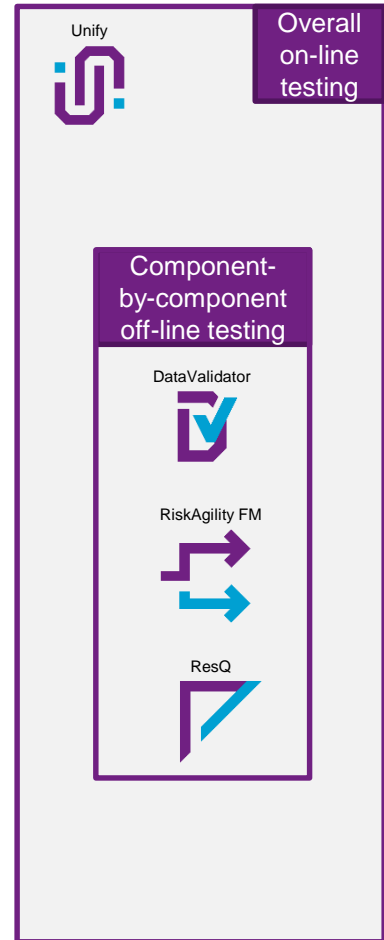
Testing

This approach allows identifying and locating error sources in minimal time and maximises overall safety in maintenance and testing process.

- For each component subject to change perform separate off-line “before vs after” regression tests;
- Perform combined example production test using above off-line one-by-one regression tests;
- Perform an end-to-end “on-line vs off-line” overall regression test on abovementioned example production.

Staging from testing to production

- Each Unify workflow and component used therein is automatically versioned; changing or overwriting a specific version accidentally or deliberately is impossible both in testing and in production environment;
- Staging of each workflow and each component from testing to production can be performed separately; or alternatively in a whole;
- Completely separate environments for testing and production are possible but technically not required; FRIP technically supports both setups;
- The framework for responsibilities and access rights on the previous page also covers the staging process although these roles are not mentioned in the table.



Model structure design – core principles

Standardisation

Standardised **multi-dimensional** model structure replaces traditional 2-dimensional “columns”

- Very flexible structure – **unknown future change is no threat**;
- Intuitive design, easy navigation;
- Master the model in a few days**;
- Abandon key person risks**;
- Implementation quicker by multiples**;
- We have implemented 2'000 pension plans in **1 FTE month**;
- And 450 individual life products (500k covers) in **3 - 4 FTE months**.

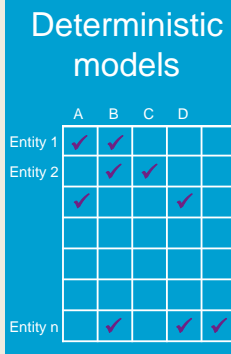
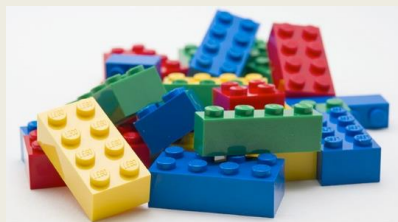
Basic dimensions include

- Time periods;
- Actions within one time period; e.g. premium paid, annuity paid, fee charged, risk premium charged, interest credited, new paid-up, new surrender, new mortality, new disability & recovery, maturity;
- Reserves; e.g. saving accumulation & decumulation, various claims reserves (direct and reinsurance), DAC, UPR.

The LEGO® approach

The **LEGO® approach** in deterministic models: cut products into little re-usable feature bricks

- Various products in many countries covered by same code;
- Products & tariff generations defined by parameter sets;
- Introducing new product means adding a parameter set to respective input tables if all necessary features have been used in other products before.



Therefore a handful of models is sufficient even for large groups spanning a number of countries in Europe and beyond; with considerable advantages:

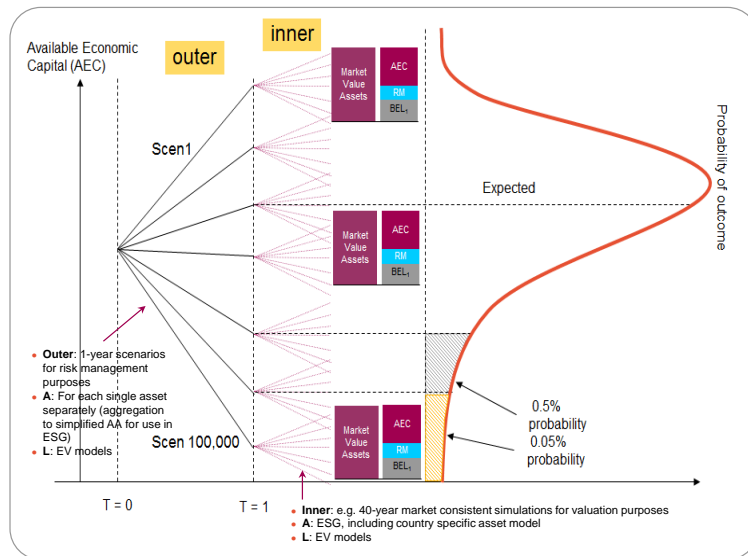
- Maintenance efforts are limited to fewer models;
- Features can be implemented less often & leveraged quicker;
- New requirements have to be introduced into less models in parallel.

One stochastic model

- High level of consistency; easy comparability on very granular level
- Easy & quick maintenance, low cost of implementing and maintaining
- Products reflected only by their cash flow behaviour
- Combined permanent extreme stresses applicable (for financial market, surrender, mortality, disability, inflation) without re-running deterministic models
- No known limits for asset model, management rules and number of risk factors
- Accuracy: close to “ad seriatim” per policy
- Speed: 1'000 annual simulations in roughly 1-3 mins (annually, liabilities only, one core)
- Simplicity: no risk model needed – nested stochastics are finally practical

	FRIP	“Flexing”-like	Model points	Policy by policy
Speed	●	●	●	●
Accuracy	●	●	●	●
Ability to standardise & centralise	●	●	●	●


Selected model features – Nested Stochastics



- **Basket aggregation and accuracy** – liability portfolios are running through the stochastic models highly aggregated; however delivering accuracy close to policy-by-policy calculations (thus also enabling hedge accounting in IFRS)
- **Speed** – our stochastic model runs 1'000 annual simulations on one core in roughly 10-15 mins (including asset and credit model), rather independent of the portfolio size
- **Asset valuation** – assets are projected heavily aggregated into classes; however, under the side condition that stresses' results are equal to one-by-one valuation

- **“Global” outer scenarios** – in the extended ESG all market and insurance risk factors are stressed simultaneously, taking into account their respective distributions and correlations
- **Group aggregation** – on-the-fly and dynamically using Group structure input; Group structure is not fixed in the system
- **LLPO** – limited liability put option can be applied if required; this means letting a subsidiary fail in case of default instead of paying unlimited amounts for its recovery
- **Convergence enhancer** – for risk management purposes usually mainly a certain part of the outer distribution is relevant; therefore we use the following approach
 - Run all legal entities (“LE”) simultaneously;
 - For each LE and each outer path perform the inner best estimate path;
 - Thereafter run the stochastic inner simulations in blocks of e.g. 50 inner simulations for all LE with asymmetric behaviour;
 - After each block determine the per-outer average for each LE and on an aggregated Group level;
 - Sort outer values and determine the relevant risk position (e.g. VaR or Euler) by involving adjacent outer values with reduced weight;
 - Apply a convergence measure; i.e. while the result does not stay within certain boundaries compared to a pre-defined number of previous values, move to the next block of inner simulations;
 - Before doing that shorten the list of outer scenarios to be considered by removing outer scenarios at the positive end of the distribution.
- **Automation and distribution** – above procedure runs fully automated, parallelized on cloud and iteratively repeated until the result's convergence is sufficient

Daily updates – for e.g. daily updates between closing dates we recommend integrating our product **RiskAgility EC**

A woman with blonde hair, wearing a white blouse with black piping, stands in a modern office. She is pointing her right hand towards a whiteboard on the left side of the frame. In her left hand, she holds a tablet. The background shows large windows with a view of a city skyline. The overall lighting is bright and professional.

**For more information or to find out how you
can benefit by moving to FRIP, please contact:**

FPT@willistowerswatson.com