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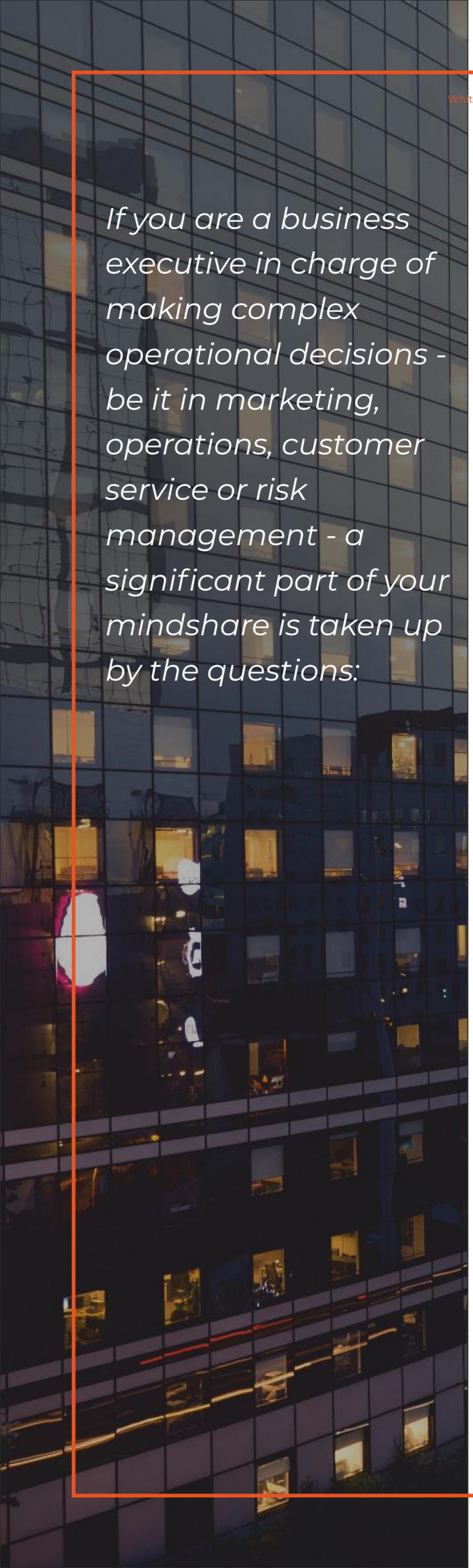
Harness the Power of Data Using Incedo Lighthouse™ for Operational Decision Automation

WHITEPAPER



If you are a business executive in charge of making complex operational decisions - be it in marketing, operations, customer service or risk management - a significant part of your mindshare is taken up by the questions:

- Am I focusing on the right problems and solving issues that will make a material difference to business performance?
- Am I tracking and monitoring the impact these actions are creating on key business metrics, am I getting systematic feedback to reinforce actions?
- Am I evaluating multiple corrective / corroborative action alternatives using data-driven insights?

In today's VUCA (Volatile, Uncertain, Complex and Ambiguous) business environment, the above questions recur with ever-increasing frequency and depth.

Every critical-thinking business executive knows that it is not enough to rely on pre-defined rules to make decisions in today's world. Consider this - cross-sell and up-sell can become cornerstones of a bank's growth strategy given that it could be more than 5 times cheaper to sell to an existing customer than onboard a new customer. Also, deeper penetration into customers means lower attrition as well. Well-run, mid-sized as well as large banks have sold an average 6 products per customer. So, if you are a bank whose cross-sell ratio is lower than this, then you need to dig deep into the wealth of demographic, behavioral and transactional data to identify pockets of business that need to pull up their socks. And this you would need to do on a frequent basis e.g. every month, as business moves fast. So, rather than a one-time effort of identifying leads/ targets using static rules, you need to think of an intelligent system that provides far more effective campaign design inputs dynamically.

Decision makers are increasingly required to make decisions in a dynamic environment under the following circumstances:

Uncertainty:
The situation evolves with time and it is difficult to define business rules a priori. For example, Covid-19, the dynamic nature in which the pandemic spread and the varying response strategies at state/country/city levels have created unprecedented uncertainty in consumer behavior for banks.

Contextual:
Increasingly, external factors have a significant impact on how decision makers need to respond to situations. For example, interventions by the Federal government (Covid-19 relief loans) and Federal Reserve (reduction in interest rates) drive consumer loan repayment behavior and in turn, impact focus areas and actions taken by Collections teams in Retail Operations for banks.

Iterative:
Decisions are no longer limited to linear cause-and-effect scenarios. Instead, decisions have to be made in an iterative manner in a 'test and learn' mindset. For example, as fintechs continue to disintermediate the banking business, consumer banking teams are being forced to switch to experimenting aggressively with product/service variants (read bundles, pricing strategies etc.).

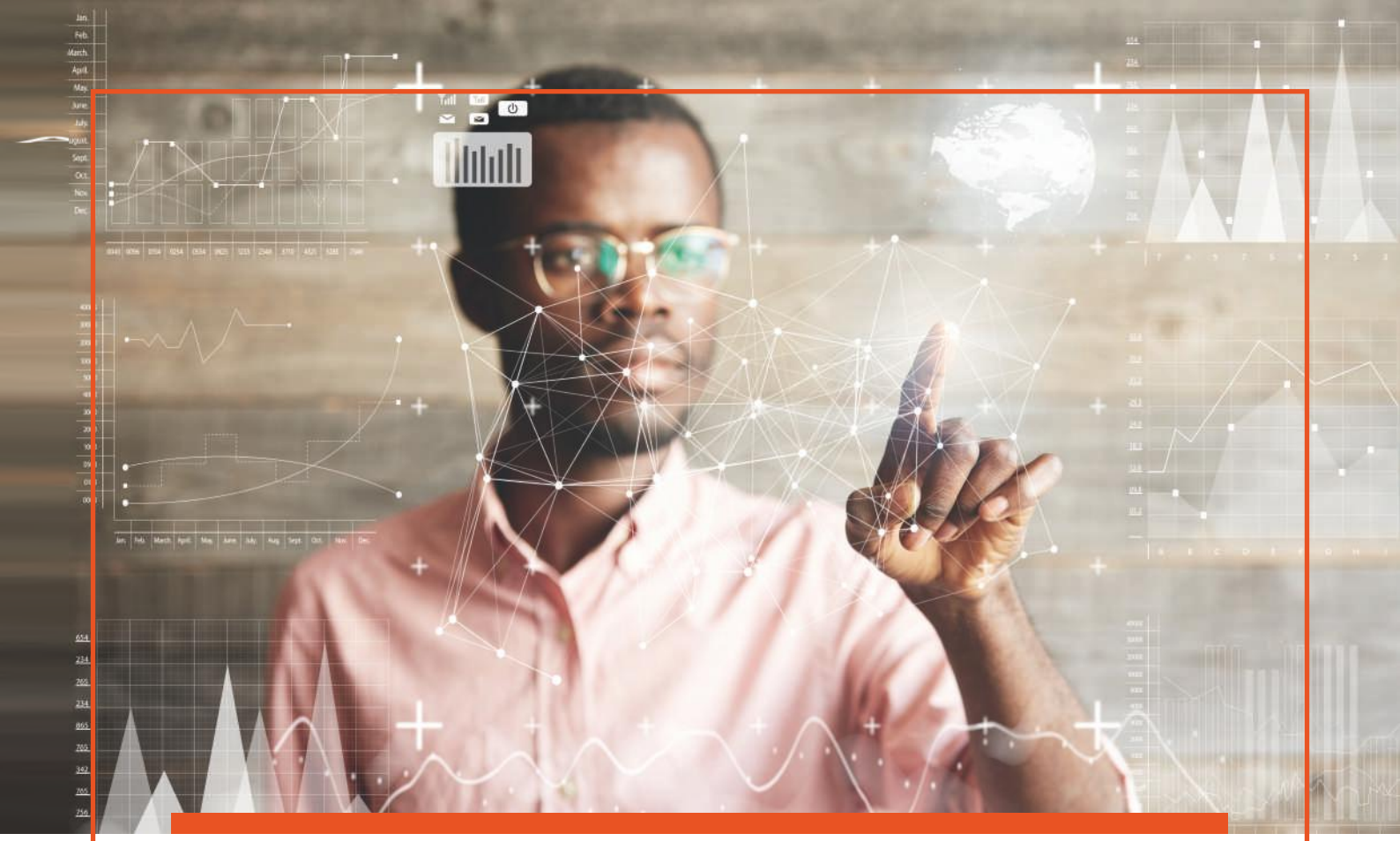
There is clearly an opportunity to provide Decision Automation Solutions that can leverage AI/ML technologies to augment the human decision-making process. We believe that Data and AI/ML can be leveraged to develop the next generation of Decision Automation Solutions.

Our platform Incedo Lighthouse™ has been designed and developed from the ground up with the following objectives:

Distill signal from noise:
Identify the right problem areas to focus on by organizing the metrics (KPIs) as a hierarchy from lagging to leading metrics and then applying the Autonomous Monitoring and Issue Detection algorithms to identify anomalies that need to be addressed in a targeted manner. Thereby, identifying efficiently crucial problem areas, the business should focus its energy on voluminous datasets that are updated at short intervals (typically daily).

Leverage context:
Apply Intelligent Root Cause Analysis algorithms to identify the underlying behavioral factors through specific micro-cohorts. This enables action recommendations that are tailored to specific cohorts as opposed to generic actions.

Impact feedback loop:
Evaluate action alternatives with controlled experiments to determine the most effective actions - and use that learning to iteratively improve outcomes from the decisions.



Autonomous Monitoring and Issue Detection

Metric monitoring with KPI trees ML models to flag anomalous behavior

Operationalize Actions and Monitor Impact

- Evaluate action alternatives with controlled experiments
- Integrate recommendations with operating workflows

Intelligent Root Cause Analysis and Action Recommendations

- ML models to identify behavioral drivers
- Integrate ML based targeted AI recommendations

Autonomous Monitoring & Issue Detection

- Start with strategic objectives and a set of CXO level business KPIs that measure the health of a business.
- Plot inter-relations among KPIs in the form of a hierarchical tree structure, and have a way to auto-calculate the values at every data refresh. Typically, the KPIs at / towards the root of the tree are lagging indicators of the business.
- Identify 'nodes of concern' in the KPI tree autonomously, leveraging anomaly detection algorithms that run on the data underlying the KPIs.

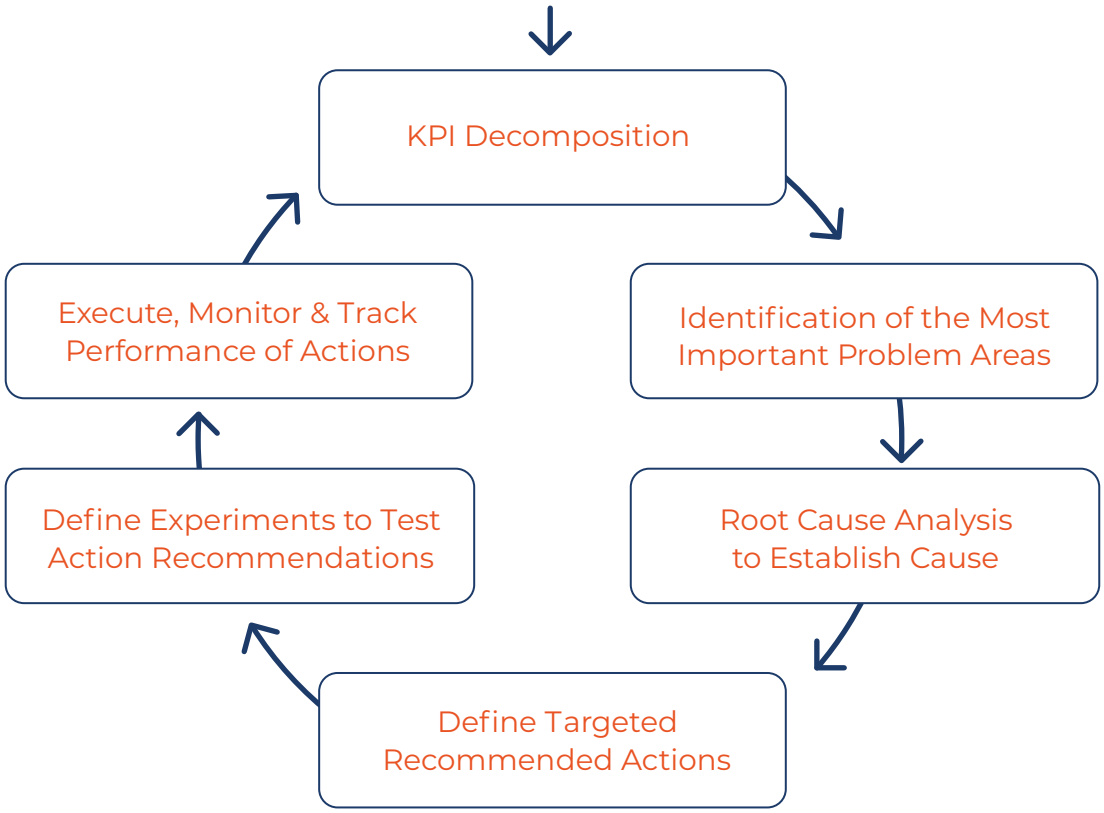
Intelligent Root Cause Analysis and Action Recommendations

- Determine root causes and identify drivers that explain the movement and shifts in KPIs using rule-based and ML-based algorithms.
- Finalize improvement actions at individual level (account, customer, product) that would materially improve target KPIs by evaluating potential options using Experimentation implementing testing approaches such A/B, Test / Control and Pre / Post in an iterative manner.

Operationalize Actions & Monitor Impact

- Push selected actions to the Systems of Execution (SOE) at client's end that would implement actions on the ground.
- Continually receive feedback from SOE to track the success of implemented actions via autonomous monitoring, again leveraging anomaly detection algorithms, and course-correct on the go.

Incedo Lighthouse™ implements this virtuous cycle using a 6-step workflow that encodes the Data -> Insights -> Actions journey:



Step 1: KPI Decomposition

In this step, the overall business objective is converted into a specific problem statement which articulates Key Performance Indicators (KPIs) that are tracked at the CXO level. These uber level KPIs are typically lagging (i.e. resulting or outcome) indicators. These are useful to express the business problem at hand, have senior leadership level visibility and are monitored / tracked closely by business analysts. But, these are not enough to help operational level managers to know the status at their span level in closer to real time. For that the lagging indicators have to be broken successively into their component level indicators / factors till we reach a level that is not possible to be broken further or we reach a level at which a significant number of operational-level decisions are made.

The result of this iterative process, of breaking the higher level KPIs down to their component level KPIs successively, leads to the formulation of KPI trees. The lower nodes of the KPI trees typically consist of leading (i.e. operational/process level or input) indicators that can be directly influenced through better operational decisions. The KPI trees formulated this way help address the original business objective.

Incedo Lighthouse™ provides the below features that aid the KPI Decomposition step:

- **Self-service:** An easy-to-use, self-serve UI lets users define and configure KPI trees by themselves, with minimal to no dependence on IT, to structure a business problem into the language of KPIs e.g. cross-sell percentage via digital channels.
- **KPI repository:** Functionality to contribute to and leverage a shareable repository of KPIs that are available to several business users from multiple departments that way baking in consistency of KPI definitions and adding efficiency to the process e.g. recovery rate (collections).

- **Automation of calculations:** Data pipelines that establish data connectivity with the data sources and automate KPI tree refresh process e.g. daily or periodic refresh of full set of KPI trees to provide updated insights to business users to aid in operational decision-making.

Step 2: Identification of the Most Important Problem Areas

The KPI tree created in the previous step consists of several nodes that are connected logically in an inverted tree-like structure. The root of the tree is a single node that then breaks down into multiple nodes which are its children and each child breaks down into its own children. The nodes at the end of the structure are leaf nodes. Typically, the leaf nodes of the tree extract the data from the analytical data warehouse or other sources using SQL queries. And the parent nodes utilize the built-in, aggregation logic to calculate the values at their level.

While the KPI tree provides an overall numbers-driven picture of the performance of the business that could be as latest as yesterday (or even intra-day, data refresh cycle permitting), it still lacks critical identification of specific areas of performance dip that need to be addressed immediately.

Incedo Lighthouse™ employs anomaly detection algorithms for that purpose, whereby the timeseries data of each of the metrics at each of the nodes of the KPI trees are analyzed in order to understand if the performance dip observed, especially in the last data update, is a significant deviation from the trend - and therefore a cause of worry, or it is a temporary blip and should only be observed further in the future.

Incedo Lighthouse™ provides the below features that aid in identifying most important problem areas in the KPI trees:

- **Timeseries Anomaly Detection:** Machine Learning algorithms to monitor KPI movements across timelines and flag exceptions e.g. if yesterday's outbound call rate is anomalously low or just a one-off blip.
- **Non-timeseries Anomaly Detection:** Machine learning algorithms to identify the accounts, transactions or products that stand-out from other clusters in a significant manner, when compared on key dimensions or features, so as to design a custom treatment for them e.g. the accounts / customers that have significantly reduced their purchase or transaction volumes when compared to their peers (same level of affluence, same number of years with the bank etc.)
- **RAG status of Nodes:** Depending on severity, frequency and recency of anomalies in its metrics, the individual nodes are indicated in R/A/G to draw immediate attention.

Step 3: Root Cause Analysis to Establish Cause

Once the nodes that are critical in nature from a performance standpoint are identified, the next step is to identify the root causes of the dip in performance. If we were to do a new analysis everytime i.e. every day or every period for this then it would be highly inefficient and by the time we are done, the business and associated problems would have moved on. We, therefore, need to 'package' this root cause analysis into a set of pre-defined and pre-configured model sets. Also, this is to be done while keeping in mind the multi-faceted nature of the problems at hand.

Incedo Lighthouse™ accomplishes this using the below pre-packaged configurable model sets, the output of which is presented in a format that is conducive for the next step action recommendations.

- **Cohort Analyzer:** Cohort Analyzer attempts to establish the sections of customers, accounts or transactions that are highly likely to be responsible for the change in a key metric represented on the nodes of the said KPI tree. This is done by letting the user define various cohort archetypes - rule based, decision tree based or activity path based. Each cohort archetype can have multiple cohort types e.g. for a banking use case related to identifying responsible customer groups that are pulling down collection rates, the cohort archetype of a decision tree could have two cohort types such as 'demographics based' and 'transactions based'. Each of them could then contain multiple cohorts which are nothing but the customer groups with each group responsible partially for the change in key metric in a decreasing order of contribution. By automating the identification of cohorts (micro-segments) that drive KPI movements, it provides significant insights into the root causes of performance issues.

- **Clustering and Segmentation:** Further to uncovering the cohorts, the functionality is provided to create custom clustering and segmentation models that provide additional insights that indicate natural groupings in the population (accounts, customers, transactions). This further describes the cohorts on behavioral dimensions that are arrived at using feature engineering, with the advantage of a ready workflow setup in the platform for hosting and using all the analytical artifacts together in the Data Science Workbench of the platform.

Step 4: Define Targeted, Recommended Actions

If the workflow stops at only delivering the insights using anomaly detection and root cause analyzer, however sophisticated the algorithms are, it would still be a lost cause if the executives are not supported on taking the corrective, preventive or corroborative actions based on the insights delivered.

Therefore, **Incedo Lighthouse™** incorporates the Action Recommendation module that enables the actions to be created at each individual cohort level for a targeted corrective or improvement treatment based on its individual nuances.

The Action Recommendation module helps define and answer for each cohort:

- **What:** What is the right action to implement? E.g. define & deploy a targeted contact strategy, define & deploy a loss-mitigation strategy, define & deploy a marketing strategy.
- **Who:** Who needs to be targeted? E.g. specific cohort or a group of cohorts.
- **When:** How long should the action be executed? E.g. defining a period to run the targeted high frequency contact strategy to increase collection rate as Jan 1 to Jun 30.
- **Goal:** What is the expected outcome? E.g. define the focus KPI (from the KPI tree) and target improvement desired in that KPI from the action undertaken.

The actions can be designed & defined by executives based on their expert knowledge of the domain and the context or those can be recommended by the system leveraging the historical data by employing machine learning for pattern recognition, identifying similarities between the under-consideration cohort characteristics and the historical cohorts-actions data inclusive of success rates. The actions run for a specific period and can be made exclusive if needed, in which case, the same customer or account would not be targeted by different actions during the same period.

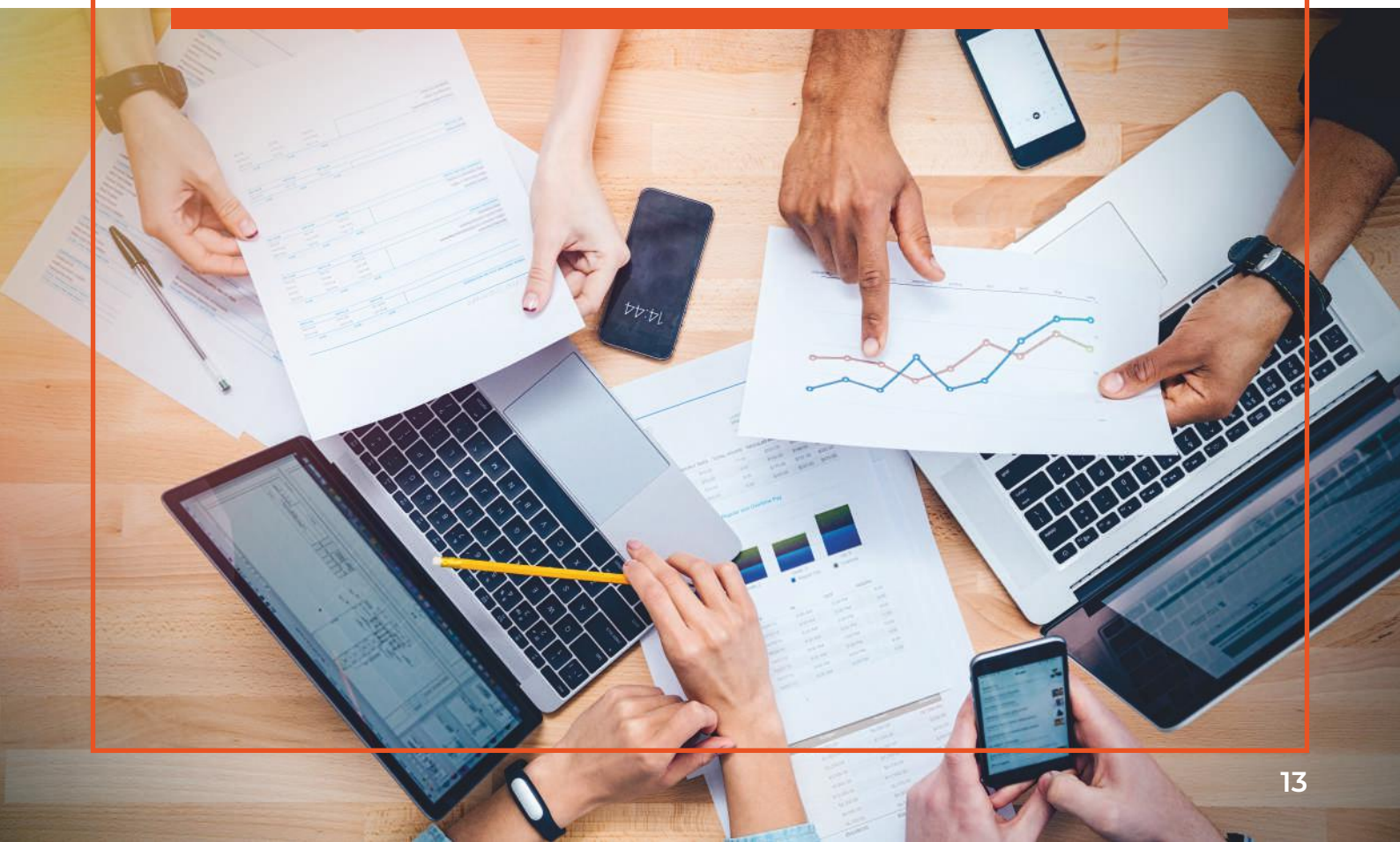
Step 5: Define Experiments for Each Recommended Action

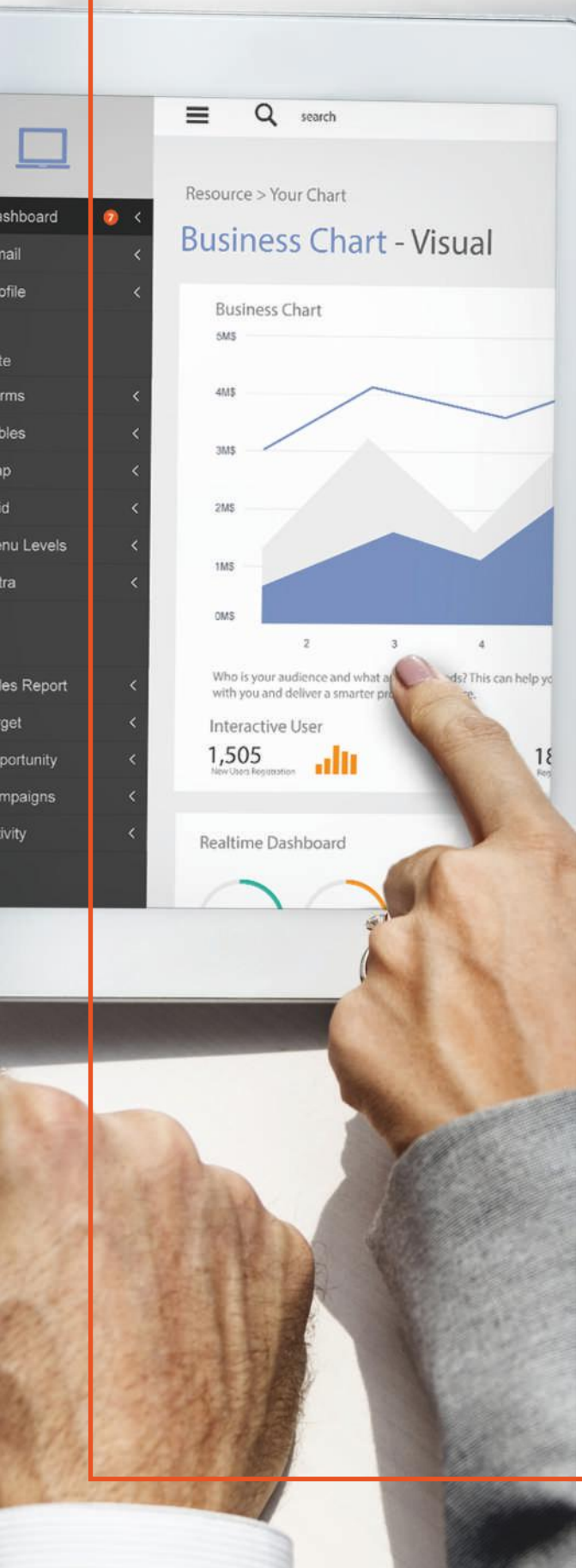
Before implementing actions on the ground, it is important to test them on a smaller scale so as to be able to select a particular treatment, that is, a version of that action that is likely to produce the highest impact i.e. highest change in the primary metric. This is known as the

Experimentation step which provides data-driven evidence to business executives based on which they can confidently implement the most significant action treatment at full scale. That said, experimentation is an optional step, especially in cases where executives have significant trust in their expertise and judgment about success of the said action and / or where the particular action is inevitable or inexpensive.

Incedo Lighthouse™ has an Experimentation engine that supports business executives to make an informed decision on actions to be undertaken. Some of the key features of the module are:

- **Determine the experiment type from the Options:**
  - **Digital A/B:** For testing all the parallel options or treatments available under the action. In this case there is no control group, so the executives have made up their minds to change from the status quo. An example - if the action is about passing a reduction in interest rate (and it is decided that keeping the rates same is not an option), then the action treatments or options could be about 3 levels of interest rate discounts.
  - **Test/Control:** For testing all the parallel options or treatments available with the control group for which no action is taken. In this case, the comparison is among the treatments or options as well as with the control group. An example - same as above with a change that there is a control group which sees no reduction in the interest rates; so the comparison is across the 3 levels of rate reduction and the control group.





- **Pre/Post:** This option is to test across the time horizon, the same population - once before the action is taken and then post the action period completion. It is to be noted that the pre-action period and post-action period has to be the same for a fair comparison. In this case, the sample chosen for the experiment does not undergo further division.

- **Finalize the target sample size** to undergo the experiment based on the original population size and confidence interval desired. In addition, in case of A/B and Test/Control, further division of the sample population into the treatment groups is usually kept to be equalized for a fair comparison in the end.
- **Identify success metrics and define targets** to help finalize the specific action treatment to be chosen for full scale implementation post the experimentation stage. The treatment or the option that achieves or goes closer to the target is typically chosen for implementation.

Step 6: Execute, Monitor and Track Performance of Actions

Post the experimentation stage, comes the final step of executing the finalized action treatment / option on the full scale of the target population. This requires a two-way, solid handshake between Incedo Lighthouse™ and the System of Execution (SOE) that is used as an operations management system at the client.

Incedo Lighthouse™ covers the following activities in this step:

- **Execute Actions:** Finalized action data including action metadata (name, duration etc.) and a target population list is sent to the SOEs (e.g. Workflow systems; Experimentation platforms) for operational execution.
- **Monitor KPIs:** How is the KPI responding to the

actions is tracked using the actions-outcomes data sent over back to Incedo Lighthouse™ by the SOE. Further analysis is done using the KPI tree structure - change at a node with drill-down to individual cohorts.

- **Experiment Summary:** How are the actions performing over a period of time i.e. historical analysis of actions is done to update the recommended actions list for the future.

In summary, Incedo Lighthouse™ accomplishes:

- Autonomous identification of interrelated business metrics that are witnessing anomalies or out-of-order behavior based on analyzing TBs of data that is refreshed on a daily basis using machine learning technology. This is achieved by various state-of-the-art anomaly detection algorithms working on timeseries and non-timeseries data.

- Automated identification of the root causes as to why the performance dip or uptick identified in the previous step are occurring. This is done by utilizing various machine learning algorithms such as segmentation, clustering and random forests that identify cohorts e.g., specific groups of accounts, customers or transactions that are responsible for the movement of the said KPI.
- Analyzing effectiveness of the improvement actions at the cohort level to improve the business performance. This is done to assess effectiveness of these actions by subjecting those to controlled experimentation before final recommendation and implementation.
- Continually tracks the improvement of business performance on the ground due to implemented actions by processing feedback data from the client's workflow systems using KPI tree construct

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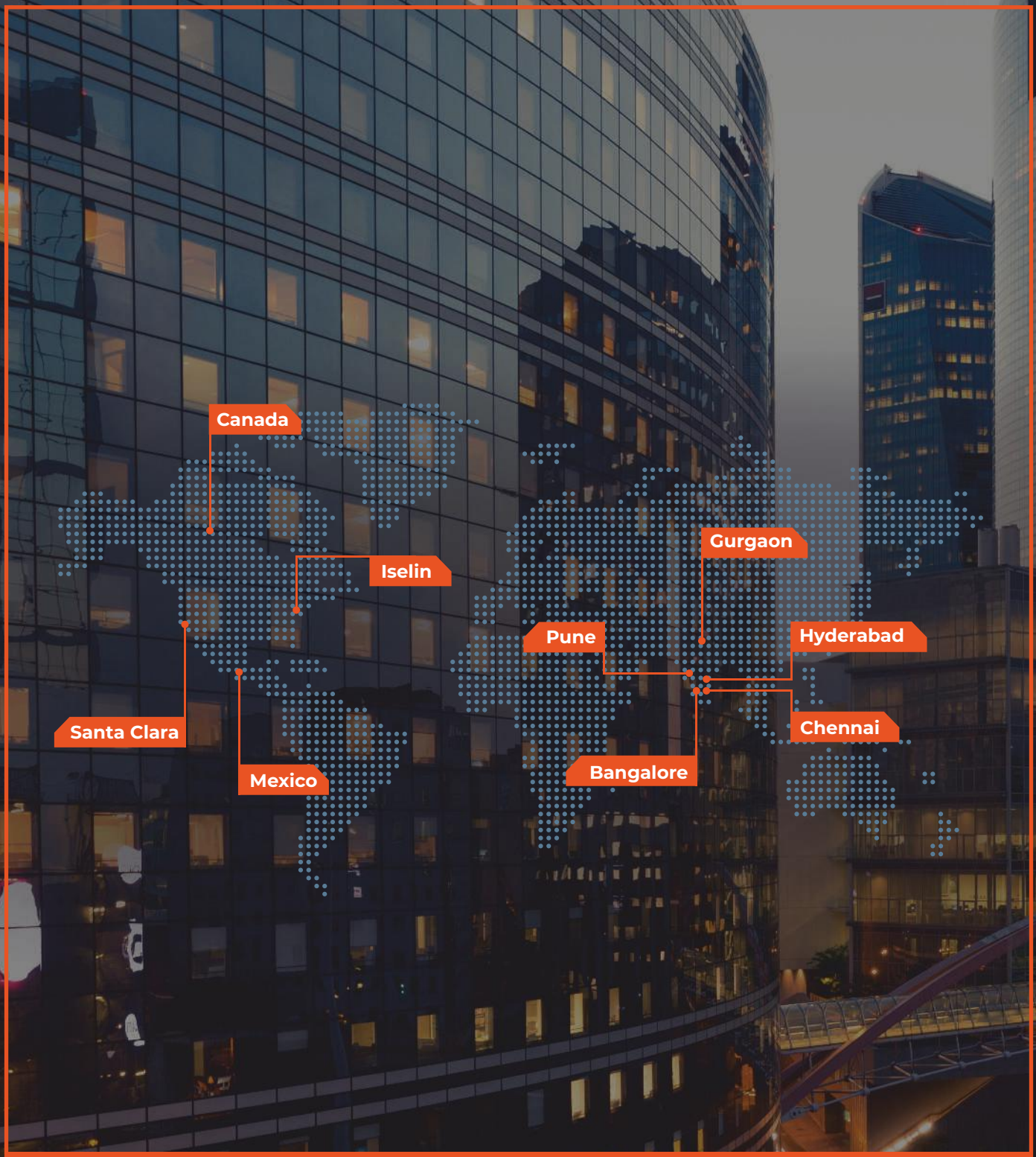

About Incedo

Incedo is a digital transformation expert empowering companies to realize sustainable business impact from their digital investments. Our integrated services and platforms that connect strategy and execution, are built on the foundation of Design, AI, Data, and strong engineering capabilities blended with our deep domain expertise from digital natives.

With over 3,000 professionals in the US, Canada, Latin America, and India and a large, diverse portfolio of long term, Fortune 500 and fast-growing clients worldwide, we work across financial services, telecom, product engineering, and life sciences industries. Visit our website to learn more about how we help clients transform today.

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