



business intelligence

and the Ultra equation

Observation + Response + Analysis + Evolution = Heightened Efficiency



Ultra ensures the highest efficiency of an airport's operations; with all available resources precisely configured to the needs of passengers, management, and staff.

This is accomplished by means of the Ultra equation.

Observation +
Response +
Analysis +
Evolution =

Heightened Efficiency

This equation enhances an airport's powers of:

Observation

The current state of the airport becomes more visible than ever, with the finest of details displayed for instantaneous comprehensibility. Users are empowered with immediate insight into developing situations.

Response

The right actions are now taken at the right times, by the right people: based on clear representations of current status, including the automatic or manual triggering of notifications. Emergent challenges are thus identified, and corresponding responsibilities delegated, with new degrees of swiftness.

Analysis

Operational efficiency is now recorded consistently and with fine granularity, allowing performance to be calibrated, measured, and reviewed. The practical consequences of decision-making are rendered clear, permitting the progressive upgrade of policies and procedures.

Evolution

The results of analysis are distributed through a structured reporting mechanism; which opens the way to informed consideration of remedial or corroborative actions. These include the progressive update and extension of programmatic logic-routines that embody an airport's fundamental business-rules, so that routine decision-making becomes increasingly automated.



...and is applied to the airport's key Spheres of Efficiency:

operational
data

All airport operational data is continuously gathered, maintained, and accurately updated with absolute reliability; and is thus made available for instantaneous access at any time.

business & operational
administration

Accounts, privileges, and resource allocations are ascertained and modified without error; through intuitive, effective, secure controls.

customer
service

Passengers' well-being is supported through a consistent attentiveness to their persons, possessions, and dispositions.

situational
awareness

The state of your entire airport, moment by moment, is made comprehensively clear, and with fine granularity.

team
notification

Every employee, regardless of location, is immediately aware of emergent needs; and is assigned clear responsibilities.

...and

intelligence

business

Historic levels of operational efficiency are clearly identifiable; thereby distinguishing every shortfall, and duly encouraging programs of improvement.

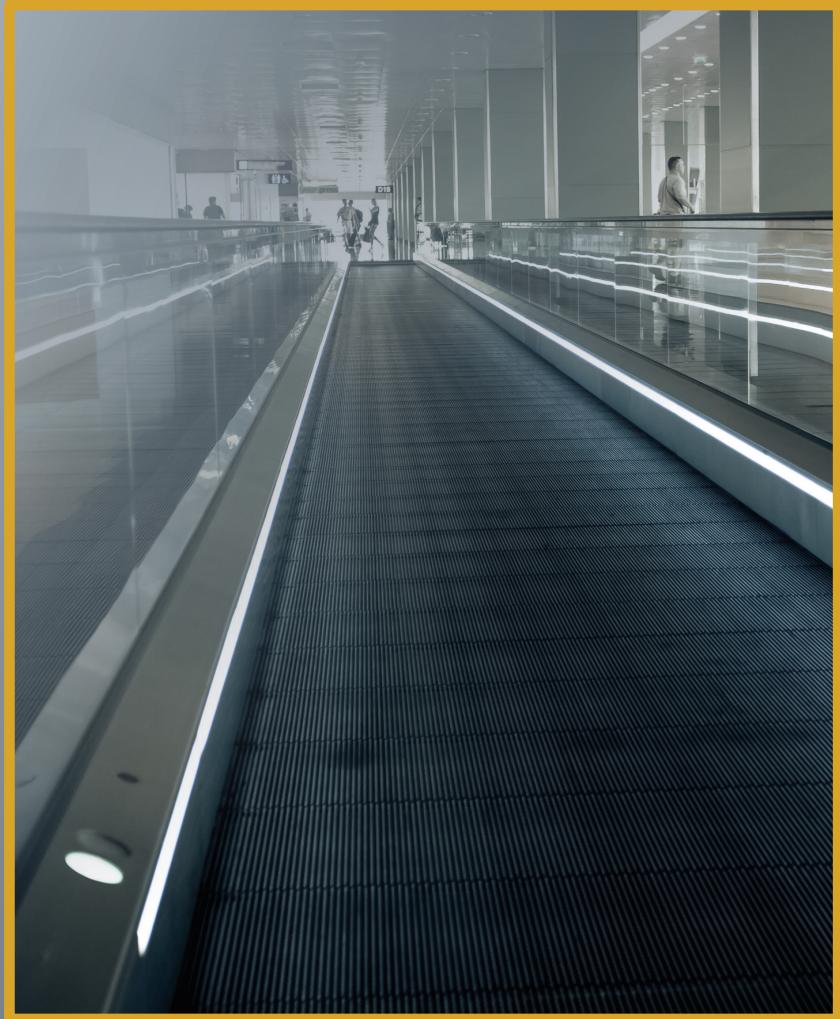
Challenges exist in the following key areas:

Performance: Key Performance Indicators must be represented in fine detail.

Pathology: Problem-recurrence, viewed over long periods of time, must be clearly distinguished.

Presentation: Critical findings must be summarized, packaged, and circulated; so that decision-makers are fully empowered with knowledge, and can appropriately drive investment and process-change.





operational performance

To improve airport-efficiency, we must design and implement procedures for measuring how effectively we discharge specific responsibilities: this will allow the establishment of a clear record over time; in which the results of one activity-type might be usefully correlated with those of another. Ultimately, we should be able to determine, from established historical fact, exactly where things are working; exactly where they are not; and quite how success- or failure-levels in one particular area may be influencing the rest of the airport.

In many cases, the raw information required for constructing such a record is already in existence: the time at which an aircraft pushes back from the stand; the time at which it takes off; the time at which it becomes visible on local radar; and the time at which it lands and goes *in blocks*; are all entered, manually or programmatically, into data repositories in one location or another; and so should be available for assimilation into an ongoing historical record. In some cases, however, the existence of such data may be unknown to the general airport-management community; or the data may simply be considered too difficult to access. Such situations require the

introduction of effective methodologies for the gathering of critical information, as described in the document *Operational Data and the Ultra Equation*, which should be consulted.

The most important forms of data to be gathered are, by convention, referred to as *Key Performance Indicators (KPIs)*. Many involve the *timeliness of flights*, during the course of their visits to the airport: landing, taxiing, going *in blocks*, allowing passengers to disembark, unloading bags — and then preparing for eventual departure. Indeed, the success of airport-operations depends perhaps more than anything on the achievement and maintenance of high efficiency in these areas.

With appropriate data fully gathered, tools must be supplied for making KPIs comprehensible to management team-members. Most likely, a given KPI, such as *Number of Outbound Flights Delayed*, will be made capable of inspection across previous weeks, months, and even years; and will need to be broken down by *Category*. This might include degree of delay; carrier; airport origin; airport destination; aircraft type; weather conditions; passenger load; and so forth. By correlation of one or more categories with the



operational pathology

KPI itself, the management-team will be able to determine where and to what extent delays occur, and what recurring factors may be in play.

Such insight is bound to constitute a valuable preparation for escalation the discussion to executive-management level, so that appropriate visibility into the nature of problems can be attained, and appropriate procedural changes duly considered.

It should be noted that correspondences between KPIs can become extremely complex: thus, delays in baggage-transfer may ultimately be attributable to the delays experienced by a particular carrier;

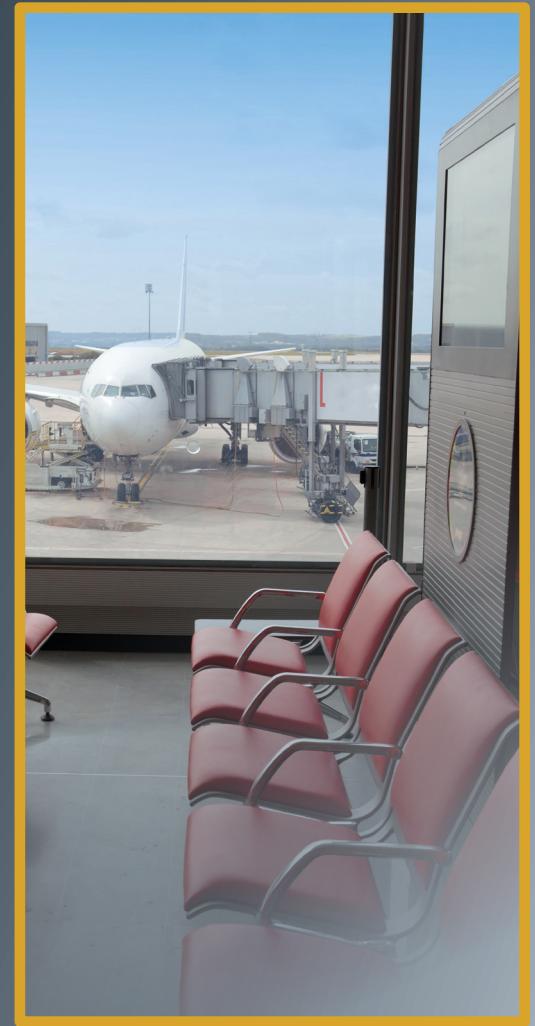
possibly in relation to a particular point of origin; possibly in relation to particular weather conditions at that point of origin; and so forth. Consequently, the tools that display information should give their users maximum flexibility in terms of cross-referencing different statistical sets: it may be that only through a protracted period of analysis — combining one data-set successively with others — can an endemic problem finally be recognized, and its abiding, root cause understood.

The airport most able to manage such informational complexity will have the greatest insight into its operational status; and will thus be best positioned to determine which procedures need to be amended; and what investments scheduled; for the long-term assurance of passenger-satisfaction and growth.

The sheer volume of data to be inspected by an airport's management-team may demand an elevated perspective; whereby the occasional occurrences of some particular delinquency, experienced over months or years, can be isolated from all other data; and so potentially made more comprehensible. This may call for a special analytical tool, capable of summarizing and filtering the output of lower-level tools; emphasizing problems that are serious; and recur over long time-periods; and yet occur infrequently enough to be missed, if a team's main focus is day-to-day management.

For such a system to exist, the base tool-set whose data will be accumulated and sorted must be capable of reflecting numeric thresholds whose crossing is to be considered especially important, and therefore worthy of special interest. So, a tool that displays how many departure-delays have occurred during the last month may also display the duration of each delay; and may highlight any delay whose duration is greater than an established threshold. This in itself will be of interest to the user of the tool; however, even greater significance might be determined by using the higher-level tool to draw together all the scattered evidence such delinquencies, allowing users to witness the pattern and frequency of violations across many months or years.

It may also be useful to consider *departure* itself as an outstanding competency, whose different aspects (such as timeliness of push-back,



of clearance for departure, of taxi-time, and of further delay due to congestion or adverse weather conditions) should be viewed in combination with one another. Thus, a high-level strategic view of the competency, with evidence of all the violations that have occurred over the longest time-periods,

can be used to determine whether underlying chronic or recurrent problems — possibly assumed by daily operations personnel to be random, and so unworthy of sustained attention — actually do need to be addressed.

operational presentation

In order to discover problems at the heart of our operational system, we must be able to inspect the many correspondences that exist between different *Key Performance Indicators* and the categories according to which their data should be subdivided. This may require extensive research, employing tools that provide maximum flexibility for visualizing one data-set alongside another, and inspecting how their constitutive elements may interact. Such complexity inevitably means that while skilled users may develop tremendous facility for uncovering low-lying or otherwise covert sources of trouble, other interested parties, such as executive-management team-members, may not immediately

be able to share the newly available knowledge. Therefore a *reporting system* is surely required; whereby such truths as have been discovered by the expert eye can be isolated and clearly explained to organization as a whole.

Ideally, this should provide both graphical and statistical representations of any given issue, and so offer the most intuitive terms of reference for its understanding. Potentially, evidence will need to be refreshed continuously over some time-period, so that ongoing context-changes can be ascertained not to undermine the basic contention of a problem's existence and required remedy: therefore, the reporting system should support the recurrent production of reports, on an appropriate, regular basis; such that the information is reliably delivered to all team-members needing to be informed. This might be achieved by means of automated email-dispatch, or web-site update.



Operational Presentation of this kind is arguably the most important step in the entire process whereby data is analyzed, and conclusions reached; since it is indeed the *final step*, whereby the entire team can be brought to concur on a particular kind of action; and with the certainty that future reports can be generated, to bear evidence of the success of procedural changes. Without this final assurance of clarity, the overall analytical procedure might never achieve the persuasiveness required for *Analysis* to be transformed into *Evolution*, and so acquire the most enduring, positive effect.

Ultra enhances an airport's powers of *Analysis* and *Evolution* by means of software market packages that support team-members' gathering of Business Intelligence. An extensive system of Charts allows Key Performance Indicators to be cross-referenced with one another, and individually subdivided by Category; the results being displayed in intuitive graphical forms. Strategic Dashboards are similarly used to highlight efficiency levels in key areas over time. Additionally, a system of Reports permits critical findings to be summarized and dispatched directly to decision-making personnel.

ultra charts

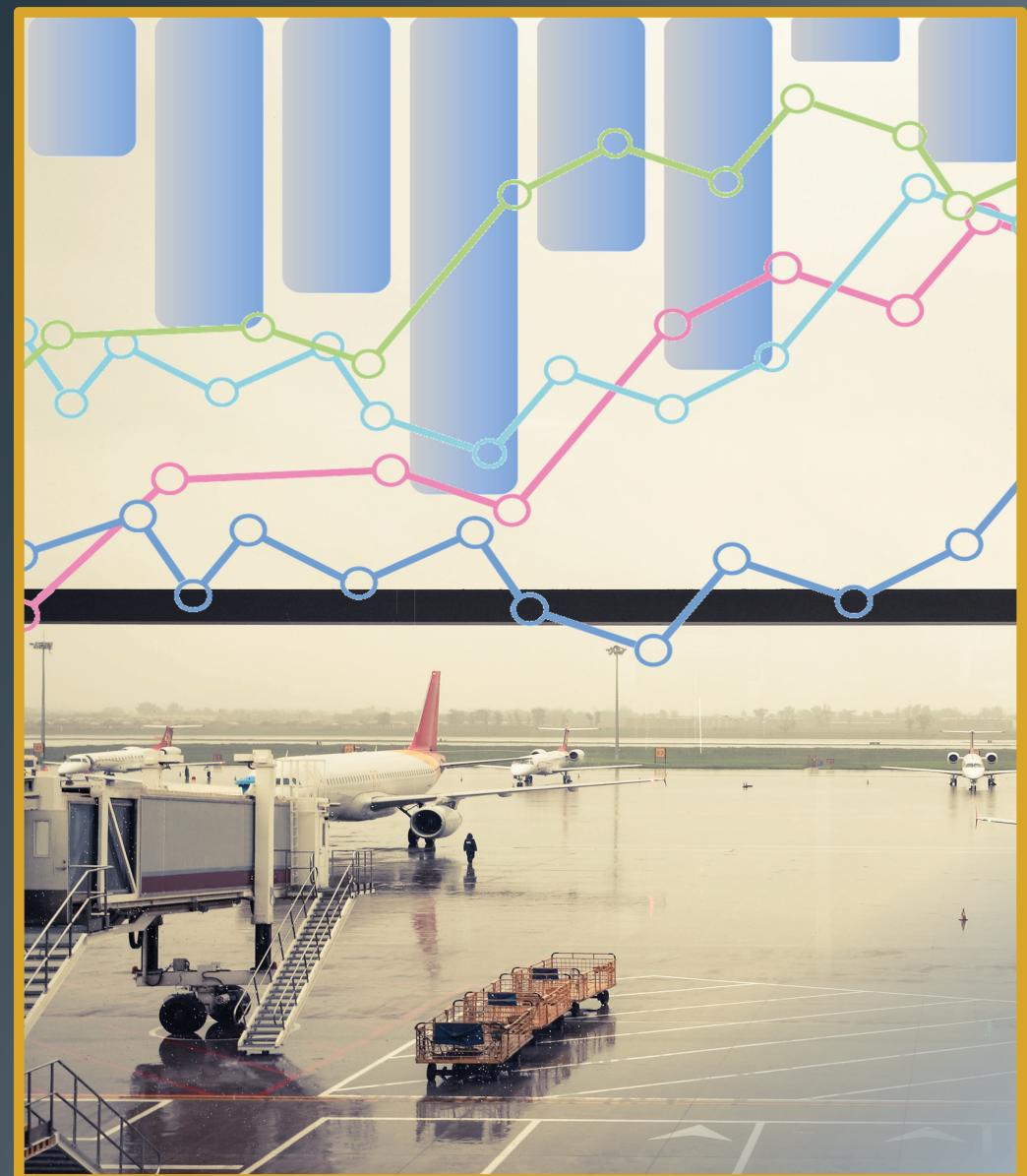
...are interactive graphical displays; identifying operational performance-levels through visual representations of one or more KPIs. Each KPI may be broken down according to an applied Category, which may be a unit of time: for example, the total number of flights delayed in departure for a given year may be broken down per month.

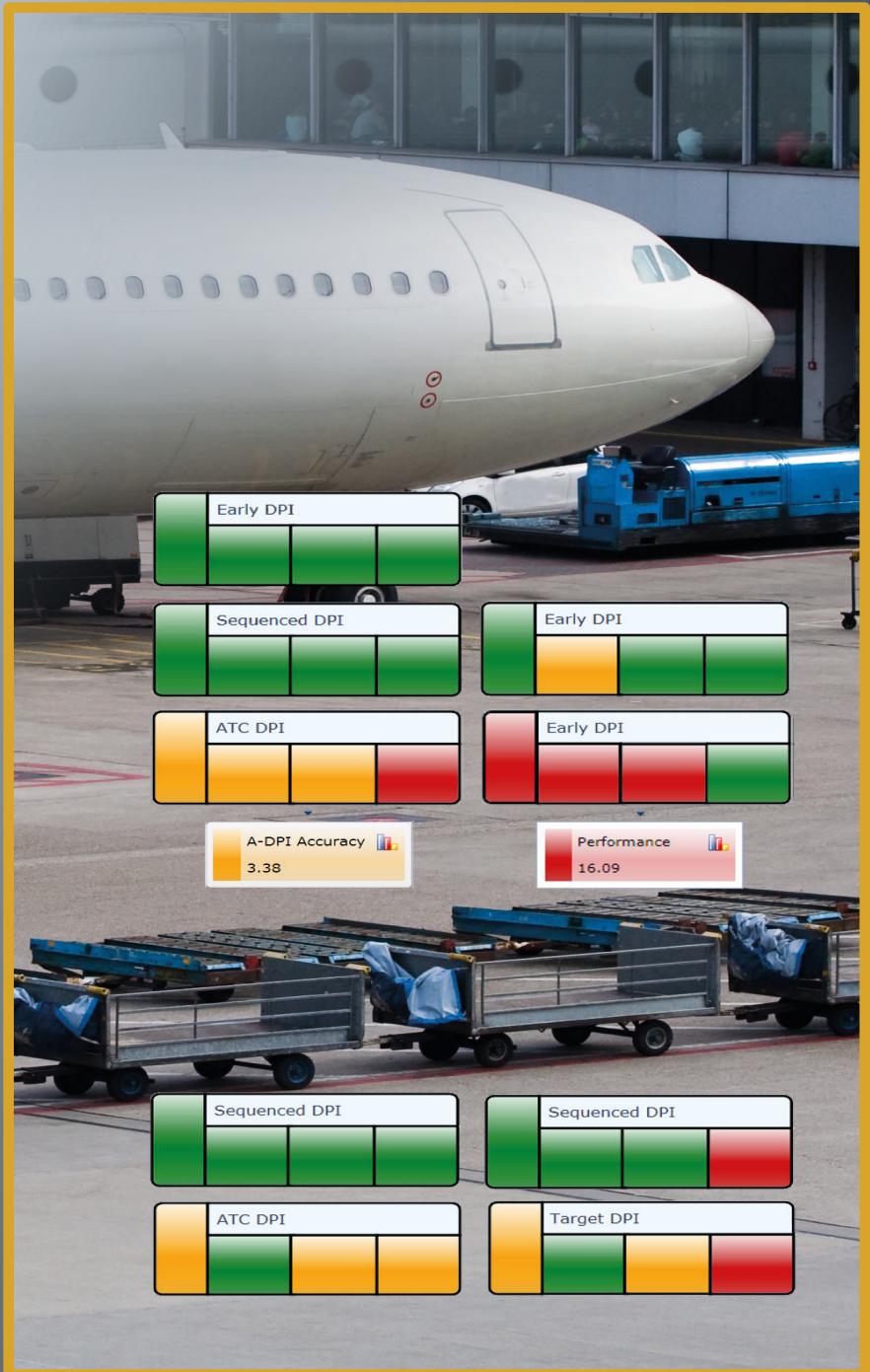
Charts may reveal their data in successive stages, due to their inbuilt *drill-down* capability: this means that by left-clicking on a particular data-field within a Chart, you change the Chart appearance, and are able to see a new, deeper level of information. Thus, by clicking with the mouse on a given month, you might further break down the flights that were delayed in departure for that specific month — this time by airline. Then, clicking on one particular airline might break down the data yet again — this time, by day of the week, or by airport terminal. Alternatively, Charts may reveal additional information by means of tool-tips; so that when the mouse hovers over a data-field, a pop-up window appears, displaying valuable, associated data.

Charts may display multiple data-sets simultaneously, with different axes differently calibrated. Controller/receiver relationships are supported; so that two different Charts can be displayed in adjacency, with the user's left-clicking on the visual elements of the one Chart provoking display-changes in the other. Users are free to zoom and pan over Chart data as they wish; and to modify the time-bar that determines how much data is displayed simultaneously. Dynamic filtering can be employed, so as progressively to exclude data from a given Chart; and so allow only most the most immediately important details to remain, with increased visibility.

Charts thus provide flexible, broadly based support for an airport's powers of *Analysis*,

currently available business intelligence market packages





ultra strategic dashboards

...summarize performance levels for critical *Key Performance Indicators*, so that users can see at a glance where problems occur. Each Dashboard groups Indicators hierarchically, to form *Value Chains*, each of which represents a general area of airport operations. If any Indicator within the Value Chain reveals that operations have been inefficient, the Dashboard displays this graphically — at the highest, summary level, so that it can be immediately seen.

For example, a Dashboard might be designed by an administrator to consist of two Value Chains, named *Arrival* and *Departure*, to correspond to the movements of flights in and out of the airport. The value chain named *Arrival* might itself be designed to contain individual Activities; for *Aircraft Landing*, *Aircraft Taxi In*, *Aircraft Disembarkation*, and *Aircraft Offloading* — these activities all being considered pertinent to the arrival of flights. Each Activity is built from one or more *Value Items*. Therefore, the *Aircraft Landing* item might itself have been built from the values *Late (vs Scheduled)* and *Late (vs Estimate)* — these being standard Indicators, frequently used in the composition of Ultra Charts and Reports (see below). Both Summary and Value Items are graphically represented in the Dashboard so as to reflect whatever degrees of inefficiency may have been captured by their underlying data. Thus, if the data for either *Late (vs Scheduled)* or *Late (vs Estimate)* is indeed indicative of inefficiency, their *Value Item* is displayed in a warning colour; as indeed in the higher-level Activity it has been used to build, *Aircraft Landing*.

In this way, a Dashboard can expose inefficiencies deeply embedded within an airport's operations, allowing users to recognize and respond to the associated problems with speed. Efficiency and inefficiency are declared through colourization; with green indicating acceptable efficiency, amber indicating moderate inefficiency, and red indicating unacceptable inefficiency.

In this way, Ultra Strategic Dashboards support an airport's powers of *Analysis*; isolating and emphasizing each instance of *Operational Pathology* that might impose, over time, a pervasively negative effect on airport-efficiency.

ultra reports



business
intelligence

Ultra thus empowers an airport's operations-team with the most comprehensive insight into efficiency-levels and problem-sources, as manifested over the passage of time.



Through Ultra technologies, an airport significantly increases its effectiveness, in terms of understanding the...

Performance: that has been achieved, by degrees, across multiple areas.

Pathology: that may underlie daily activities, and require strategically remedial changes.

Presentation: required to peers, supervisors, and executive management; in order to apprise all equally of the nature of a critical problem; and so prepare the way for due process-modification and resource-redeployment.

Observation +
Response +
Analysis +
Evolution =

Heightened Efficiency

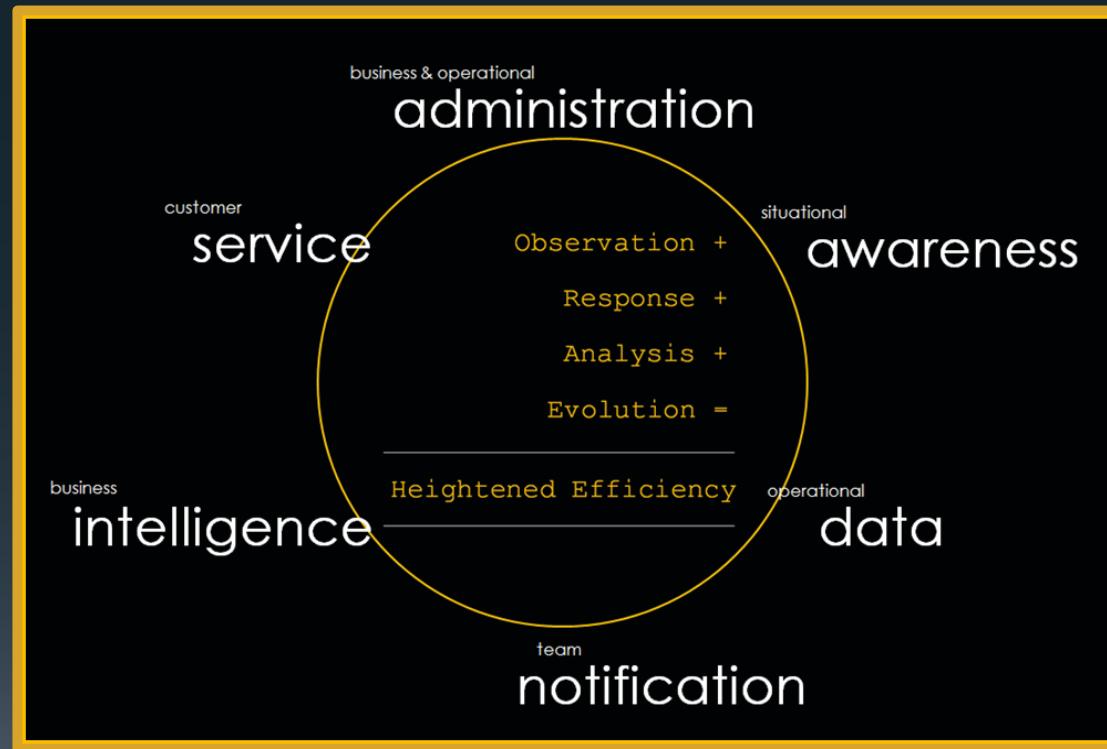
...the ultimate return being the systematic and comprehensive enhancement of an airport's powers of Analysis and Evolution.

The Ultra equation expresses the combination and sequencing of activities required for an airport's achievement of Heightened Efficiency; which is surely to be considered the absolute prerequisite of lasting customer satisfaction, and of business return.

If we can fully extend our powers of Observation, we duly win the ability to achieve the most effective Response to ongoing and emergent situations. Then, over time, we can apply broader Analysis to the results; and so determine what forms of positive strategic Evolution might be brought to bear; so as to eradicate underlying or recurrent problems, and ultimately raise management-effectiveness to a new level.

Ultra tools and technologies are designed to instantiate this positive cycle throughout the airport: those described in the current document, as supportive of extending Business Intelligence, are clearly dedicated to bringing our powers of Analysis and Evolution to optimal strength. By sharpening our insight into our performance-levels over time, and identifying the occurrence or recurrence of problems, we attain a better understanding of how optimally to modify procedures, and redeploy resources; and subsequently, by continuously remeasuring the results of the changes we commit to, ensure that we are truly on a path to a smoother-running airport.

See the other documents in this series, for more information on how the Ultra equation is activated, throughout the airport's six, natural Spheres of Efficiency, by means of Ultra tools and technologies.



Ultra team-members are available to provide further, detailed information on architecture and features; technology-demonstrations; and extensive professional references.

Contact:

Equation Consultancy and Deployment,
Ultra Electronics Airport Systems,
The Oaks,
Crewe Rd, Wythenshawe,
Manchester, M23 9SS, UK

info@theultraequation.com

+44 (0) 161 946 3600



© Ultra Electronics Limited 2015

Whilst all reasonable attempts will be made to keep this information up to date, Ultra reserves the right to vary this information without prior notice.

Ultra acknowledges due copyright for all images used in this document.