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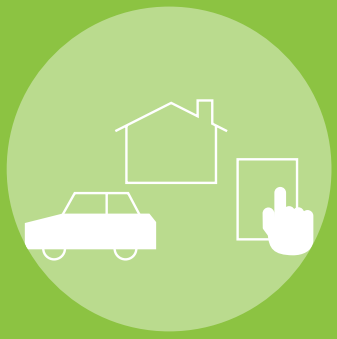

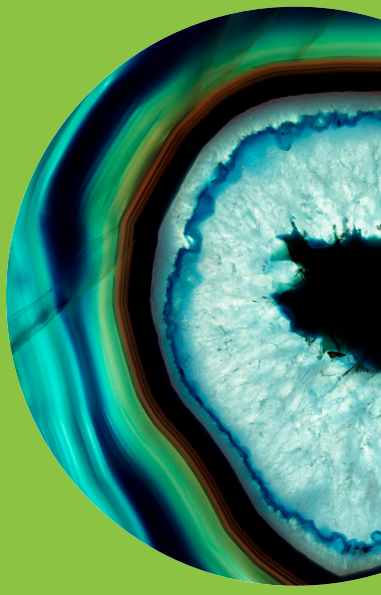

INSIGHTS FROM CUSTOMER EXPERIENCE AWARENESS

ERICSSON

GENERATING ACTIONABLE INSIGHTS FROM

Customer Experience

AWARENESS

In today's ICT marketplace almost all networks provide a high degree of objectively measurable quality. As a result, quality alone is no longer sufficient to distinguish a service provider from the competition and ensure customer loyalty. Instead, customer experience awareness has emerged as one of the most important business enablers for service providers, by helping them understand the opinions, needs and motivations of users. New enabling technologies for data analytics in the customer experience awareness field can provide richly detailed and actionable insights for business optimization.

JÖRG NIEMÖLLER, NINA WASHINGTON, GEORGE SARMONIKAS

THE INTERNET OF THINGS (IoT) offers users many great opportunities and simplifies many facets of life, but for some, its all-encompassing nature can be overwhelming and alienating. Service providers that recognize this risk have the opportunity to differentiate and create environments where each individual user feels comfortable and can rely on their intuition. Doing so successfully, however, requires a high degree of customer experience awareness.

In the not so distant past, objective QoS was the central concern for service providers. The idea was that a high degree of QoS enabled by an excellent infrastructure would lead to a positive customer experience with a high degree of satisfaction and loyalty. This was reflected in business metrics such as churn rates and users' propensity to call customer care.

While that logic still holds true to a certain extent, there are many factors that it fails to take into account on an individual user level. The fact is, individual users are never truly objective, and a subjective individual user might not always feel satisfied – even when experiencing good service. Understanding why this is the case is essential to developing customer experience awareness and gaining the insights required to make the right decisions to actively manage the user's perception.

There are several ways to go about developing a higher level of customer experience awareness, including training, goal setting and optimization of the organizational structure. In many cases, a customer experience management (CEM) system will also play a key role.

A CEM system is a business assurance tool that monitors and actively controls the impact that the user's perception of a product, brand or service has on the business result of a service provider. The central figure in CEM thinking is the individual user: a human being with personal opinions based on subjective perceptions, who is embedded within a particular social environment. The user's perception is based on their individual expectations. The moods, feelings and specific context of every user play a major role in developing their opinions and attitudes, and ultimately determining their actions and behaviors. Just as users can never be objective in forming their perception of their service providers, they are frequently inconsistent in their actions.

A good CEMsystem requires a holistic understanding that goes all the way down to an individual level, with a broad range of contextual information about the user taken into consideration. The resulting insights become actionable if they are combined with business processes at the individual user's level that make it possible to personalize their experience.

The path to actionable insights

A CEM system provides insights that can be used as the basis for decision making and action taking that will help optimize business results. These insights are typically expressed in scores and indicators that quantify a particular aspect of users and their experience. For example, the Net Promoter Score (NPS) quantifies in a single number the user's general willingness to promote the service provider, which is an indirect expression of their level of satisfaction and loyalty. The NPS measures user perception of the overall performance of the service provider, and has become a very useful tool for raising awareness of customer experience within an organization.

> THE MOODS, FEELINGS AND SPECIFIC CONTEXT OF EVERY USER PLAY A MAJOR ROLE IN DEVELOPING THEIR OPINIONS AND ATTITUDES, AND ULTIMATELY DETERMINING THEIR ACTIONS AND BEHAVIORS

CEM systems are specifically designed for particular business optimization use cases, generating a variety of use-case-specific scores and indicators as their primary output. In network operations, for example, any substandard user experience is detected automatically with low latency from performance metrics and brought to the attention of support technicians for further analysis and rapid response. This contributes to overall business optimization, as problems are solved quickly, hence limiting their effects as well as the number of users who are exposed to them.

Every business process or optimization use case that would benefit from customer experience

Terms and abbreviations

BSS — business support systems | **CEM** — customer experience management | **ELI** — experience level index | **IOT** — Internet of Things | **MOS** — Mean opinion score | **NPS** — Net Promoter Score | **OSS** — operations support systems | **S-KPI** — service KPI

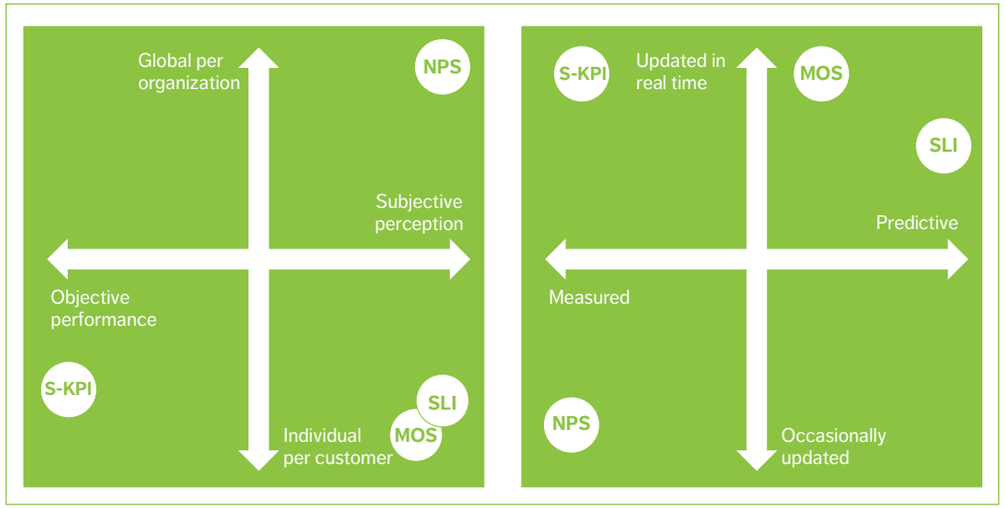

Figure 1
Properties of scores

awareness will have its own particular requirements with respect to scores. Aside from the main subject that a particular score expresses, the following characteristics are relevant:

- **Scope:** Does the score reflect an insight at the individual user level, for a group of users, or for an entire organization?
- **Outreach:** How many users are included?
- **Subjectivity:** Does the insight reflect an objective fact or a subjective perception?
- **Predictive:** Is the insight directly measured or the result of a predictive model?
- **Latency:** How quickly does the score need to reflect an experience?
- **Frequency:** How often is an update of the score needed?

These use-case-specific requirements are directly reflected in the way a score is obtained and implemented. A service KPI (S-KPI) and similar low-latency, high-outreach measurements are needed for swift corrective action to be taken. Most of them are objective metrics measuring technical performance, and they make it possible to distinguish individual users. The characteristics of the KIP are reached with considerable effort in terms of the efficient handling of a real-time input data stream. The raw data comes from an extensive distributed probe network, and is correlated and processed in near real time.

Surveys and studies that approach the user directly and ask for feedback have a completely different technical profile from the S-KPI – that is, the characteristics of these scores are quite different. The NPS is a prominent example, as it is a direct measurement that typically has high latency, with significant time intervals between distinct measurements. Furthermore, the outreach is not very high, with only a few percent of the user base included in every measurement activity. In *Figure 1*, the characteristics of four different types of scores are compared – S-KPI, NPS, service level index (SLI) and mean opinion score (MOS).

Measuring subjective user perception

The ability to understand the user on an individual and personal level has become one of the most promising areas within CEM. Nevertheless, it is one of the most challenging tasks due to the complexity of the user as an individual. Understanding the user as an individual means gaining an accurate idea of their level of satisfaction as well as their expectation, behavior, loyalty and intention. These factors are determined and influenced by personal properties such as sentiment, perception, experience and need. The links between these properties are complex, and can vary significantly depending on personal context, such as the social environment and timing of experiences. Furthermore, experiences that are totally unrelated to the service provider can have a major impact, because they influence many factors from general priority setting to momentary moods.

It is possible to measure these factors by asking the user to complete a survey. Getting consistent and accurate answers requires smart ways of asking questions, however. For example, NPS surveys ask users if they would recommend their service provider. This is a proxy question used to indirectly measure satisfaction and loyalty by triggering more accurate responses than asking users directly about their level of satisfaction.

Survey-based methods fail completely in use cases that require agile action to be taken, however, because low latency in terms of insight availability and outreach to the entire user base are prerequisites for taking personalization actions. Consequently, while perfectly suited to clarifying customer experience performance at an organizational level, the NPS is of no use in personalizing the treatment of users.

The individual's indication of their level of satisfaction provides a valuable insight for many use cases in marketing and service operations. It helps in the selection of recipients in marketing campaigns, for example, and can support product planning. The individual insight level allows for the customization of service offers tailored to single users. Low latency and frequent updates make it possible to adapt the personalized offer dynamically according to changes in the individual user's needs.

Ericsson has introduced the SLI as a satisfaction score that meets the technical properties of use cases that require agile action [1]. Reached using a predictive model, it is a personal score available for every user. It is updated frequently, and with low latency after a user activity. Experience-related S-KPIs that originate from the network probe infrastructure are used as input. Psychological factors relating to subjective perception form the basis for interpreting the objectively measured experience expressed by the KIPs, and indicate a subjective level of satisfaction. The following psychological effects have been identified:

> UNDERSTANDING THE USER AS AN INDIVIDUAL MEANS GAINING AN ACCURATE IDEA OF THEIR LEVEL OF SATISFACTION AS WELL AS THEIR EXPECTATION, BEHAVIOR, LOYALTY AND INTENTION

- Perception is individual, so different models are needed for different users.
- A negative experience has more impact than a positive one on the overall level of user satisfaction.
- Surprising experiences are more significant than less surprising ones.
- The user forgets experiences as time passes.
- The more significant the experience, the longer it will be relevant.
- The context of each experience event may affect the user's perception.

The SLI model is a psychology-based hypothesis that represents these factors mathematically. The model is trained using survey-based reference data. In this way, it is calibrated to how service and network experiences are perceived by a particular user base. The combination of psychological research with state-of-the-art machine learning algorithms is the central innovation that makes it possible to master the complexity of individual user perception. The insights provided by the SLI are designed for direct consumption in decision-making and action-taking

processes, contributing to increased personalization of the user experience.

In short, the SLI and the NPS both provide insights into subjective satisfaction, but they target different sets of use cases and therefore take different approaches to reach the technical use case requirements. The SLI introduces the ability to act on an individual user level and ultimately improve the NPS, which is an important indicator of business success.

Understanding the experience journey

In all of their interactions with a service provider, users undergo an experience journey: a sequence of experience events they are involved in over time. These events can be direct interactions such as visiting a point of sales, calling customer care or simply using a service. But even events that do not involve the service provider directly are considered part of the experience journey. For example, the user might share their opinion of a service with other users on social media platforms.

The experience journey is a powerful conceptual tool for continuous monitoring and categorization of experiences. A prominent and widely used example is TM Forum's Experience Lifecycle Model [2], which defines 22 phases to categorize the individual experience events in the journey. This model, illustrated in *Figure 2*, was recently updated under Ericsson's leadership to cover digital service providers across domains and user experience in the Internet of Smart Everything.

There are always two distinct roles in the context of a model for experience journeys: the observed user, and the service provider that is using the model for structured recording of observations with rich details about the user.

It is notable that the user's experience while consuming the service is just one of 22 phases in the journey. It begins before the user becomes a customer, with the realization that there is a need for a service or that current services are no longer a good fit. The first few phases of the journey determine interest and loyalty, and a good understanding of these can be highly relevant, allowing a service provider to approach users at the right time with the right message. The Experience Lifecycle Model clearly illustrates the significant paradigm shift from network-operation-centric CEM to taking a holistic view of the user.

Each phase in the journey and every experience event is connected to a rich set of contextual details and metrics. In service usage, the S-KPIs are related to the usage event. For customer care, respective KPIs determine the details of an interaction between the user and the service provider. All of these experience-event KPIs provide rich input to analytics. For example, the SLI model utilizes service-usage events to determine user satisfaction.

The Experience Lifecycle Model reveals, however, that the SLI is missing experiences from other phases of the journey, which also contribute to user satisfaction. The psychological scoring model of the SLI is designed to utilize further KPIs as long as they correlate with user satisfaction. This means the scoring can easily be extended to further parts of the journey for higher prediction accuracy. Ericsson calls the resulting score the experience level index (ELI) [1].

With respect to the user journey, interaction between the user and the service provider can occur in various phases and through many different channels. The diversity of these touchpoints means a user can start an interaction on one channel and then continue later on a different one. For example, the user might first call customer care to get information about a service offer, and later resume this dialogue at a point of sales. The overall experience is not only determined by each individual interaction, but by the entire journey. In this respect, continuity and consistency across the individual touchpoints are highly important for ensuring a good user experience.

The concept of a seamless and consistent journey experience is referred to as "omni-channel" by TM Forum [3]. The technical solution for reaching it consists of a consolidated operations support systems/business support systems (OSS/BSS) backend with consistent data and detailed handling of each user's communication history. This is another example in which delivering a good user experience requires a high degree of personalization.

Subjective perception scoring

- The NPS is a business performance benchmark for the service provider that measures customer experience. It is based on surveys in which a number of users are asked if they would recommend the service provider to friends, colleagues and family.
- The SLI predicts a user's current level of satisfaction by interpreting observations about their service usage and the delivered service quality. An analytics model evaluates the observations and delivers a score. The SLI is frequently updated and available for every user.
- The ELI expands the SLI model to include additional phases of the user journey.

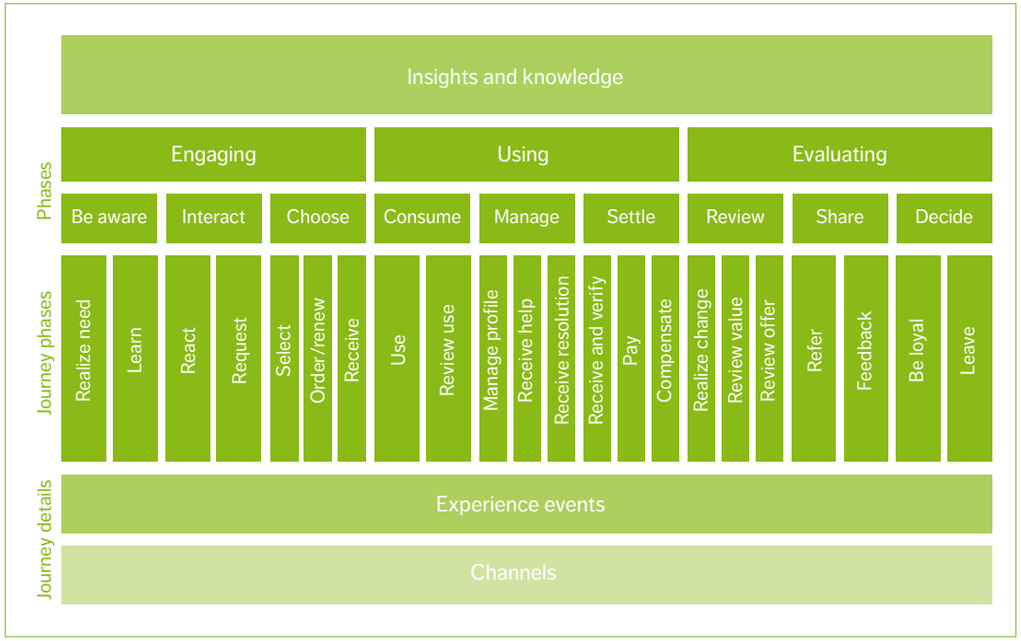

Figure 2 Experience Lifecycle Model

From IoT to Internet of Smart Everything

The combination of the IoT and the exponentially increasing smartness of all manner of things is driving us into a new phase of digitalization known as the Internet of Smart Everything. In this emerging reality, the user is part of an infrastructure along with a large number of physical things, services and social media platforms. Things can be understood as autonomous entities with built-in intelligence that represent physical entities in the digital context. At the same time, new smart services are launched every day, and social media platforms and other interaction channels continue to grow. Familiar offline services – public transportation and utilities such as electricity and water, for example – are also increasingly presented and managed through digital channels. Terms like "smart city,"

"smart cars" and "smart meters" refer to this ongoing transformation.

The Internet of Smart Everything constitutes a vital new dimension in CEM. The number of digital interactions with the user is set to increase dramatically, resulting in a new level of complexity in the user journey.

In the IoT environment, users experience a presentation layer through which more or less smart things and related services interact with them. The things present information, request decisions and learn from the interaction. A good user experience is an effortless and intuitive one without unnecessary interactions. Users should always be aware of what they can do, how they can reach their goals efficiently, and what consequences an action will have. All of this should be enabled with the right level of relevant information available at the right time.

It is important to recognize that users are different in their abilities to cope with and accept this new environment. The digital natives of the 21st century will interact more intuitively than many others. Personalization makes it possible to customize the entire experience for each individual.

CEM suppliers follow IoT developments closely, and will launch new capabilities to manage new types of interaction experiences. New and extended scores will help to capture experiences and facilitate personalization. The analytics backend will incorporate new KPIs that are a more accurate reflection of user experience. And new and improved algorithms will process all available data into ever better recommendations for action taking.

While the experience of users when interacting and using smart things is obviously paramount, it is also true that smart things themselves act like users when interacting with each other or with human users. The smart thing decides autonomously to use services or to communicate. It has requirements that need to be satisfied by the services and infrastructure that it utilizes. As a result, the same tools used to determine and actively manage the experience of a person can be applied to the experience of a smart thing.

The analytics infrastructure

In order to provide a high level of customer experience awareness in a vast and complex digital world, a CEM system needs to support four types of analytics in a flexible analytics backend:

- **Descriptive analytics** determines information about the current situation and presents it in a way that makes it possible to capture the essential insight easily and decide on the appropriate action.
- **Diagnostic analytics** goes one step further, and finds causalities in the data.
- **Predictive analytics** learns from current and historical references to detect trends and anticipate situations before they occur, enabling early countermeasures to be taken to mitigate problems before they become significant.
- **Prescriptive analytics** directly proposes the best actions to be taken.

All of these approaches depend on access to raw data coming from various sources. The CEM system must be able to support many different systems with a great variety of interfaces and protocols for data access, together with respective information models. Typical sources of data are customer relationship management systems, billing and other BSS, network probes, IoT service enablement and any type of existing data warehouse. The results of user surveys can also be included in the analysis.

In early processing, the raw data is filtered, aggregated and correlated in order to maximize relevance. Basic statistical methods are deployed and S-KPIs are calculated in this step, creating the basis for more elaborate analytics. This phase includes a redundancy and irrelevance reduction, which is particularly important for input data streams, where the sheer volume of incoming data that also needs processing with low latency is a challenge in itself.

This infrastructure is ideal for use cases where the system is expected to deliver the basis for agile actions and countermeasures. A typical example is network operation, which needs to react rapidly on detected

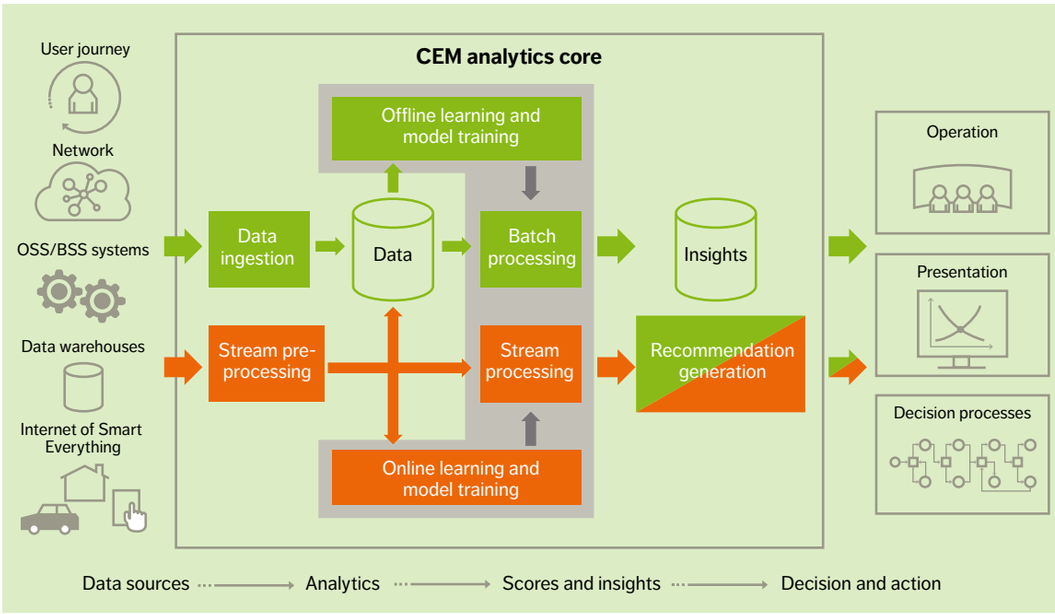

Figure 3 Logistics in a warehouse

service quality degradation in order to contain the effects of the issue. For the analytics backend, this implies the need for a scalable stream processing infrastructure that is able to process high volumes of data. Scalable rules engines can be applied to filter out interesting insights from the stream. In-memory data handling is another essential component in this context.

In other use cases, the insights will be based on a similarly huge amount of available data, but low latency is not required. Batch processing components based on MapReduce techniques, for example, constitute an essential enabler for this type of use case. Access to comprehensive historical data is often important for generating these insights.

Prescriptive analytics will support the service provider's technical and business experts in making their operational decisions. The domain experts will be able to automatize their decisions and action processes for more agile reaction and implementation of change. These expert systems are based on techniques for knowledge management and artificial intelligence. Rules engines are able to generate straightforward recommendations based on previous analytics insights. Ontologies and semantic models give meaning and context to data and analytics results. They make it possible, for example, to inform the recommendation system about business-level goals and strategies. Pairing this with machine reasoning

techniques leads to recommendations that are dynamically aligned with business-level concerns.

The four types of analytics act as enabling toolsets that allow a data scientist to set up analytics algorithms with the right technical properties for a given use case. Ericsson's state-of-the-art architecture is highly scalable for this purpose in terms of processing and data-handling capabilities. Its particular strength is in low-latency processing of network-based streams of metrics, the integration of diverse data sources and information models, and the incorporation of results into subsequent decision-making and action-taking processes throughout diverse OSS/BSS tools.

The analytics infrastructure of our CEM solutions has become a common base for Ericsson's entire digital business systems portfolio. This is an important step to reach a consolidated offering where a consistent experience for users across several touchpoints along their journeys is relatively easy to achieve.

The end-to-end analytics path is outlined in *Figure 3*, which distinguishes between the stream processing track – where low latency and real-time processing are enabled – and the batch processing track – where analytics on more static data is performed. Raw data enters the system on the left at preprocessing, which interfaces with a great variety of sources. The incoming data is immediately used in stream processing for low latency insights and stored in a distributed in-memory database to make it easily available for further analytics processing.

Training analytics models via machine learning, and using them in actual scoring and insight generation, are two distinct functions in the analytics workflow. Learning and model adaptation cycles can, however, be highly dynamic processes with continuous adaptation of the way that insights are generated.

The insights generated in analytics are kept available in a database for subsequent internal or external usage. Recommendation systems usually operate on the analytics insights. Decision making and action taking are typically distributed throughout the various business and operational level management and planning systems. Examples of business level systems and processes that profit from analytics insights are campaign and revenue management, as well as investment planning.

An essential component of future CEM solutions will be recommendation systems that are use-case aware and able to directly propose an action that would optimize a user experience. These systems would, for example, recommend when to start a marketing campaign for upsell and propose which users to include, or recommend investments into infrastructure upgrades to optimize the user experience.

These examples show the ever closer integration of CEM into business level processes and activities. Future recommendation systems will be aware of the service provider's business goals and preferred strategies to support staff in decision making. The resulting change in scores will then be used to track progress and verify the success of the actions taken.

The customer-centric organization

Many service providers find they need to adapt their business processes to make use of the new insights they receive from CEM. These process adaptations can be expected to produce significant improvements in business results. They are, however, only the first step in the process of becoming a truly customer-centric organization.

A customer-centric organization is characterized by four externally visible key abilities:

1 **Being attentive.**
No requests are left unanswered. The goal is to be perceived as flexible and available. The user feels every effort is being made to accommodate their personal needs with a customized solution.

2 **Being proactive.**
The service provider anticipates customer concerns and addresses them early before they become an issue. In this respect, it is important to choose the right time and channel for interaction.

3 **Being consistent.**
For a good experience, the dialogue with customers across channels needs to be seamless. The user expects the service provider to have a record of all previous contact so that they don't have to repeat themselves or receive conflicting information from different touchpoints. Information needs to be consistent, flawless and immediate.

4 **Being adaptive.**
Services and products are adapted continuously to meet customer needs. The customer feels their needs are fulfilled and experiences any changes as improvements.

These abilities crosscut a service provider's entire organization, demanding a high degree of engagement from every employee. This can be achieved through goal setting and training, but it also requires the right organizational structure and internal interfaces.

CEM helps identify both shortcomings within an organization and any necessary corrective actions. Furthermore, CEM insights enable each unit within the service provider's organization to master their tasks with continuous awareness of the customer experience impact. Customer-experience-related benchmarks are used as major success criteria for a unit. They can also facilitate investment decisions and indicate the return of investment of actions and changes.

Conclusion

Customer experience management is the practice of continuously managing and improving an organization's customer touchpoints and interactions. In an increasingly vast and complex digital world, there is a clear need for service providers to understand the customer experience – not only from the perspective of network and service performance, but also, to recognize each user as a subjective individual. Customer experience awareness has the potential to act as a key differentiator in the ICT industry, helping service providers transform into the kind of customer-centric organizations that can offer a high level of personalization. By combining technology, strategies and resources, any service provider has the chance to use customer experience awareness thinking – and CEM systems in particular – to significantly improve customer satisfaction and loyalty. ❁

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