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SERIES M: TMN AND NETWORK MAINTENANCE:
INTERNATIONAL TRANSMISSION SYSTEMS,
TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE
AND LEASED CIRCUITS

Telecommunications management network

Enhanced Telecom Operations Map (eTOM) – Representative process flows

ITU-T Recommendation M.3050.3

ITU-T M-SERIES RECOMMENDATIONS

TMN AND NETWORK MAINTENANCE: INTERNATIONAL TRANSMISSION SYSTEMS, TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE AND LEASED CIRCUITS

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ITU-T Recommendation M.3050.3

Enhanced Telecom Operations Map (eTOM) – Representative process flows

Summary

ITU-T Recs M.3050.x series contains a reference framework for categorizing the business activities that a service provider will use. The Enhanced Telecom Operations Map$^®$ (or eTOM for short), which has been developed by the TeleManagement Forum, describes the enterprise processes required by a service provider and analyses them to different levels of detail according to their significance and priority for the business. This business process approach has built on the concepts of Management Services and Functions in order to develop a framework for categorizing all the business activities.

This Recommendation contains representative process flows.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

ITU-T Recommendation M.3050.3

Enhanced Telecom Operations Map (eTOM) – Representative process flows

1 Scope

The Enhanced Telecom Operations Map® (eTOM) [GB921] has been developed by the TeleManagement Forum as a reference framework for categorizing all the business activities that a service provider will use. It should be noted that the TMF retains ownership of the eTOM and copyright of the underlying IPR. The ITU-T will own the copyright on the M.3050.x series ITU-T Recommendations themselves.

This Recommendation is a part of a series of ITU-T texts dealing with eTOM, and which have the following structure:

– M.3050.0: eTOM – Introduction.

– M.3050.1: eTOM – The business process framework. (TMF GB921 v4.0.)

– M.3050.2: eTOM – Process decompositions and descriptions. (TMF GB921 v4.0 Addendum D.)

– M.3050.3: eTOM – Representative process flows. (TMF GB921 v4.0 Addendum F.)

– M.3050 4: eTOM – B2B integration: using B2B inter-enterprise integration with the eTOM. (TMF GB921 v4.0 Addendum B.)

– M.3050 Supplement 1: eTOM – ITIL application note. (TMF GB921 v4.0 Addendum L.)

– M.3050 Supplement 2: eTOM – Public B2B Business Operations Map (BOM). (GB921 Addendum C.)

– M.3050 Supplement 3: eTOM to M.3400 mapping.

Additional parts will be published as material becomes available.

This series of ITU-T Recs M.3050.x builds on the Management Services approach described in ITU-T Recs M.3010 and M.3200 by developing a Business Process Framework.

This Recommendation contains representative process flows. It provides additional insight into the eTOM framework and its application through the description of some example business scenarios, or applications, in which the eTOM framework is applied, and shows process flows and related information that demonstrate how the eTOM processes interact in these situations. It should be read in conjunction with ITU-T Rec. M.3050.1 and other Recommendations in the M.3050.x series.

2 References

– ITU-T Recommendation M.3010 (2000), *Principles for a telecommunications management network*.

– ITU-T Recommendation M.3200 (1997), *TMN management services and telecommunications managed areas: overview*.

3 Definitions

Definitions of the following term may be found in ITU-T Rec. M.3050.0:

– eTOM

4   Abbreviations

Abbreviations used in this Recommendation may be found in ITU-T Rec. M.3050.1.

5   Introduction

A number of example scenarios are described in this Recommendation. These can be considered as "Use Cases", if this terminology assists, with a business, rather than an implementation perspective, since the eTOM framework and these scenarios seek to define the business requirements rather than a particular solution that addresses these requirements. Nevertheless, since these scenarios are examples, certain assumptions have been made about the nature of the business problem concerned, and it should be stressed that these assumptions do not imply that the eTOM framework can only be applied in the context described. Instead, these are intended to provide insight for the cases considered, but many other scenarios and examples can be addressed, and it is hoped that as the work on the eTOM framework progresses, a growing library can be assembled on these.

It should be emphasized that the representative process flows shown here should not be viewed in the same light as the process elements set out in ITU-T Rec. M.3050.2: these process flows illustrate how to apply the eTOM framework and the process elements in support of representative business scenarios, and thus provide additional insight into the use of eTOM.

The value of information is confirmed when it is put to use. The eTOM framework has many possible applications, but the most obvious way to use a framework of Process Elements is to use it to guide the design of actual Process Flows that deliver value for the Enterprise.

To appreciate this, it is important here to differentiate between Process Flows and Process Elements, especially from the point of view of how they relate to standardizing processes.

The **Process Elements** in the eTOM framework are intended as an exhaustive list, i.e., an enterprise uses only the eTOM process elements when categorizing business activities within process implementations. Should an exception arise where some activity is identified as not being supported by (i.e., able to fit within) any existing process element, then a new process element would be created and added to the eTOM framework in order to maintain its role as a comprehensive process framework.

The **Process Flows** represent the way that the business activities (in the form of the process elements) can work together to satisfy a particular need. An exhaustive list of process flows will never be completed because needs are continually changing, but this is not an issue as the individual scenarios, and the process flows developed around them, provide insight that contributes to an enhanced understanding of how the eTOM framework can be used. What is important for an enterprise that is trying to improve its efficiency by re-using its process and IT capabilities, is that it must ensure that process flows are built using business activities that are categorized using only the eTOM process elements.

The representative scenarios and process flows described in this Recommendation make use of a tried and proven method intended to ensure that process flows can be built using the eTOM process elements in order to address the actual business needs identified in each case.

For the scenarios included here, some description is included with each explaining the scenario concerned and its scope of application.

A number of diagrams have been developed to assist in fleshing-out these scenarios. The first scenario, on Fulfilment, explains the use of these.

Many of the diagrams are produced with the aid of a process analysis tool, and some of the conventions involved may not be obvious. The flow diagrams are organized into "swim lanes" or horizontal tracks that follow the layers visible in the eTOM framework (e.g., CRM, SM&O, etc). This is done to assist readers by positioning processes in their familiar relative orientation as seen in

the eTOM structure. Within each swim lane, individual processes are then shown with interactions that link the processes within and between the swim lanes. Note that these interactions are primarily concerned with event transitions, i.e., the interaction is labelled to identify the event that causes the transition from the originating to the destination process. This transition may imply transfer of information, but it is not the primary purpose of the labelling to highlight the information that may be involved. This reflects the reality that other mechanisms for information sharing (e.g., access to common databases) may be involved and are documented separately. Also, the binding of information with process has implementation implications and, therefore, needs to be done in recognition of potential implementation choices. Further work on these information aspects is under way in conjunction with other work and activities within TM Forum, and will be documented in due course.

Process flows are initiated and terminated in the diagrams by boxes that may be shown outside of the swim lane area. Arrowed boxes pointing right-wards indicate Events (initiating a flow), while arrowed boxes pointing left-wards indicate results (terminating a flow). As flow diagrams can become very extended, in some cases these have been broken into sub-flows for convenience. These can then be linked together via Events and Results, as indicated.

6 DSL Fulfilment process flows

6.1 DSL Fulfilment assumptions

The Fulfilment process to be documented here is only one scenario out of many possible ways of delivering a Fulfilment process.

To scope a typical generic Fulfilment process, here are the assumptions used:

- There is limited pre-provisioning of infrastructure to end users (perhaps more typical of HDSL than ADSL).

- Part of the resource needed will be provided internally and part externally using supplier-partner processes e.g., the ISP is the retailer and is buying the Local Loop from the incumbent carrier.

- At Level 2 only the dominant process flow is shown: exception cases (e.g., no resource available) may be detailed in Level 3 Flows.

- Multiple external suppliers will be considered for external supply of resources.

- The service has moderate complexity and, after negotiations with the customer's purchasing staff are completed, the SP's technical contacts will interact with the customer's engineering staff.

6.2 DSL Fulfilment process interactions

The first step in documenting the end-to-end (E2E) flows is positioning the Fulfilment flows in their context within the overall eTOM model.

Figure 6.1 shows this context for Fulfilment. As would be expected, the majority of the high-level process linkages are within the Level 1 Fulfilment process grouping, but a number of significant interactions are identified outside of this vertical process area.
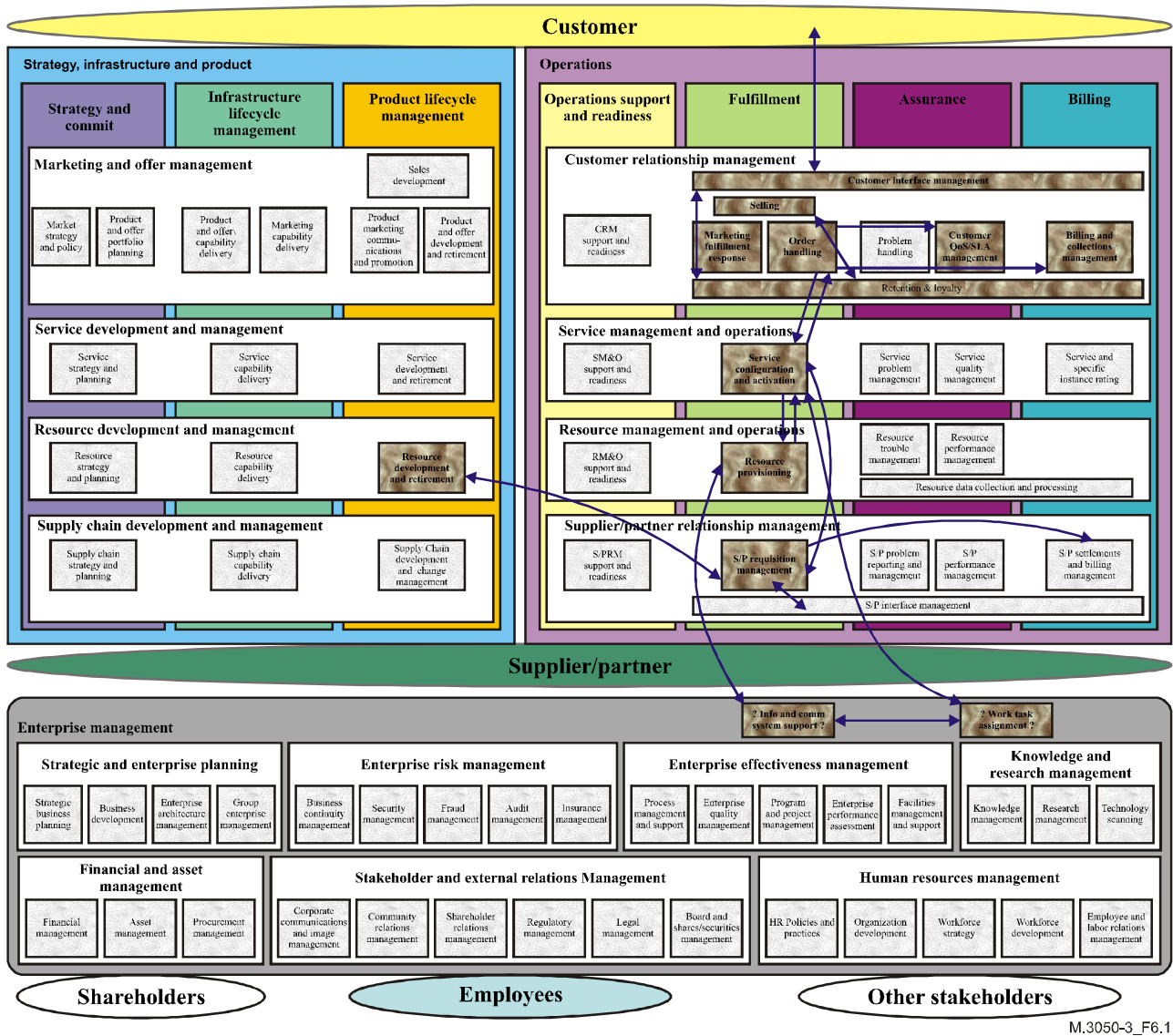
Figure 6.1/M.3050.3 – Fulfilment process interactions

6.3 DSL Fulfilment process flows

Further insight is developed through a more detailed illustration of the process interactions among the major Level 2 processes involved.

Flow diagrams for the DSL Fulfilment example are divided into three flows representing three phases within Fulfilment: pre-sales, ordering and post-ordering. This is shown in the three Level 2 process flow diagrams (Figures 6.2a, 6.3a and 6.4a).

Here the Level 2 processes are shown with relative positioning similar to that in the eTOM framework, to assist understanding and to make the diagrams more intuitive.

Start points for the Fulfilment process are shown, and the interconnecting arrows indicate events or information linking the Level 2 processes.

This view can be developed further to indicate sequencing, and to imply involvement by different Level 3 processes within the indicated Level 2 process, as shown in process dynamics diagrams (e.g., Figure 6.2b). Here, a given Level 2 process may be shown several times to allow the sequencing of its involvement in the flow to be more clearly seen. Typically, different functionality is involved at each point for a given Level 2 process, so this is a step towards identification of the specific Level 3 process or processes within the Level 2 process which will support the interactions.
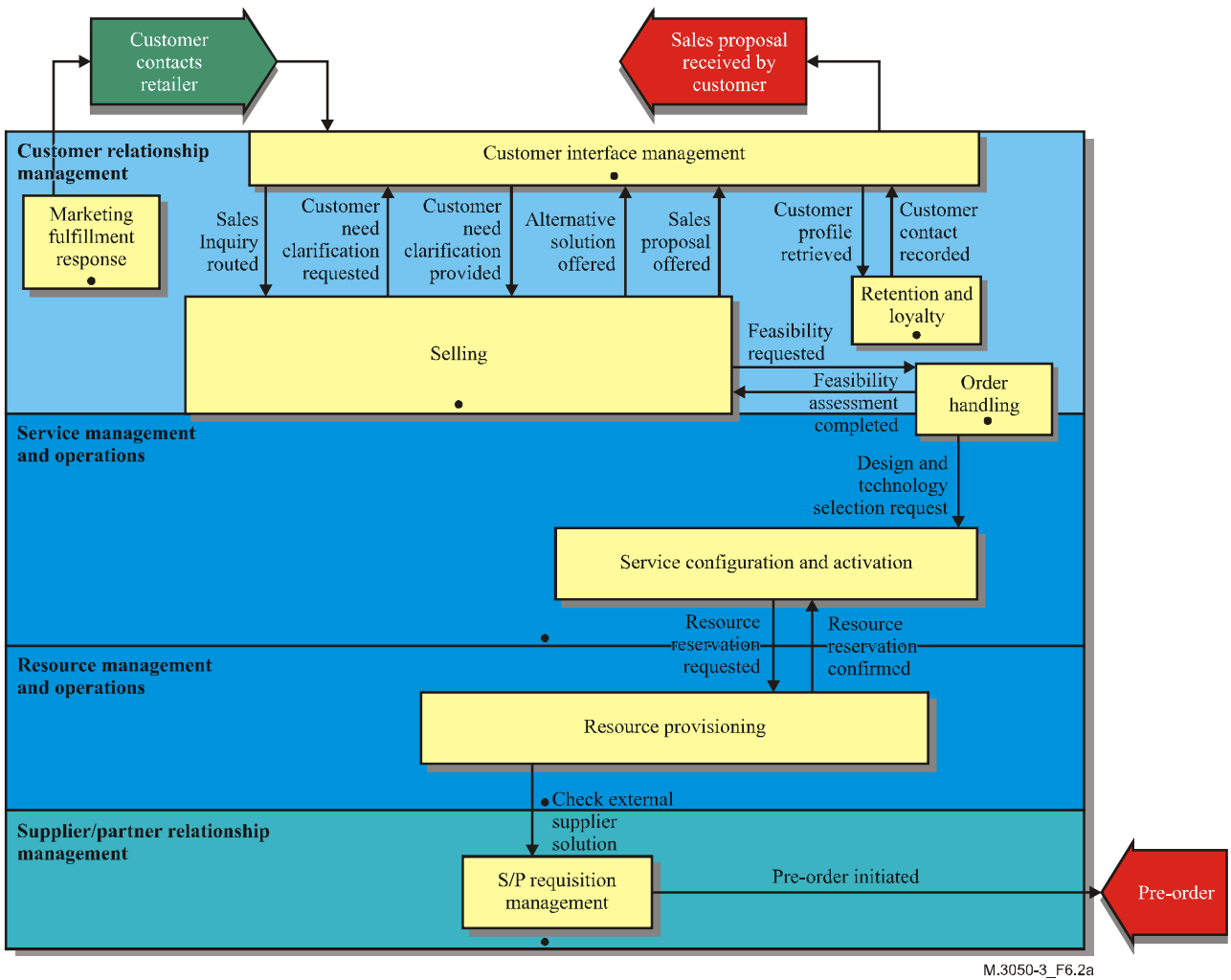
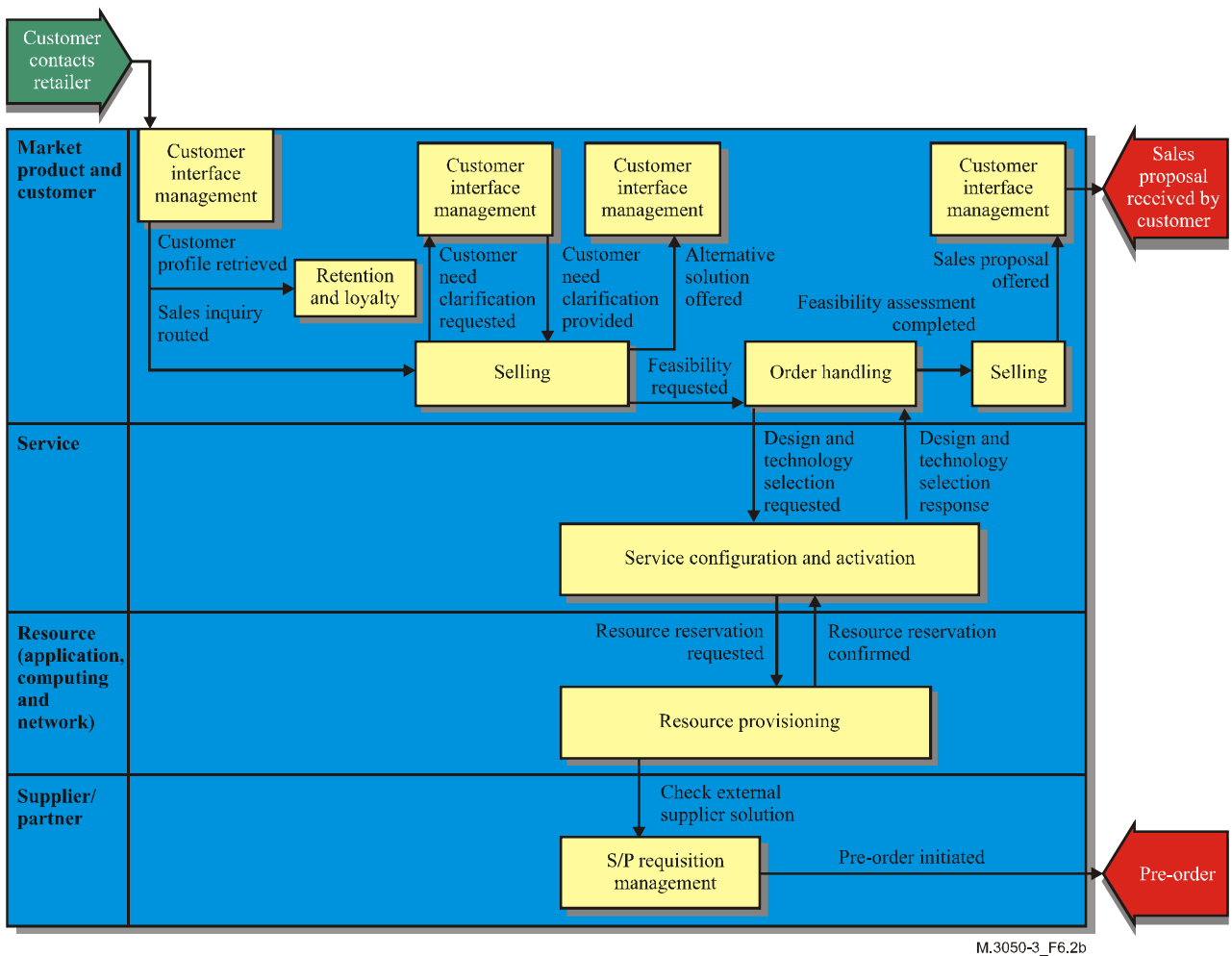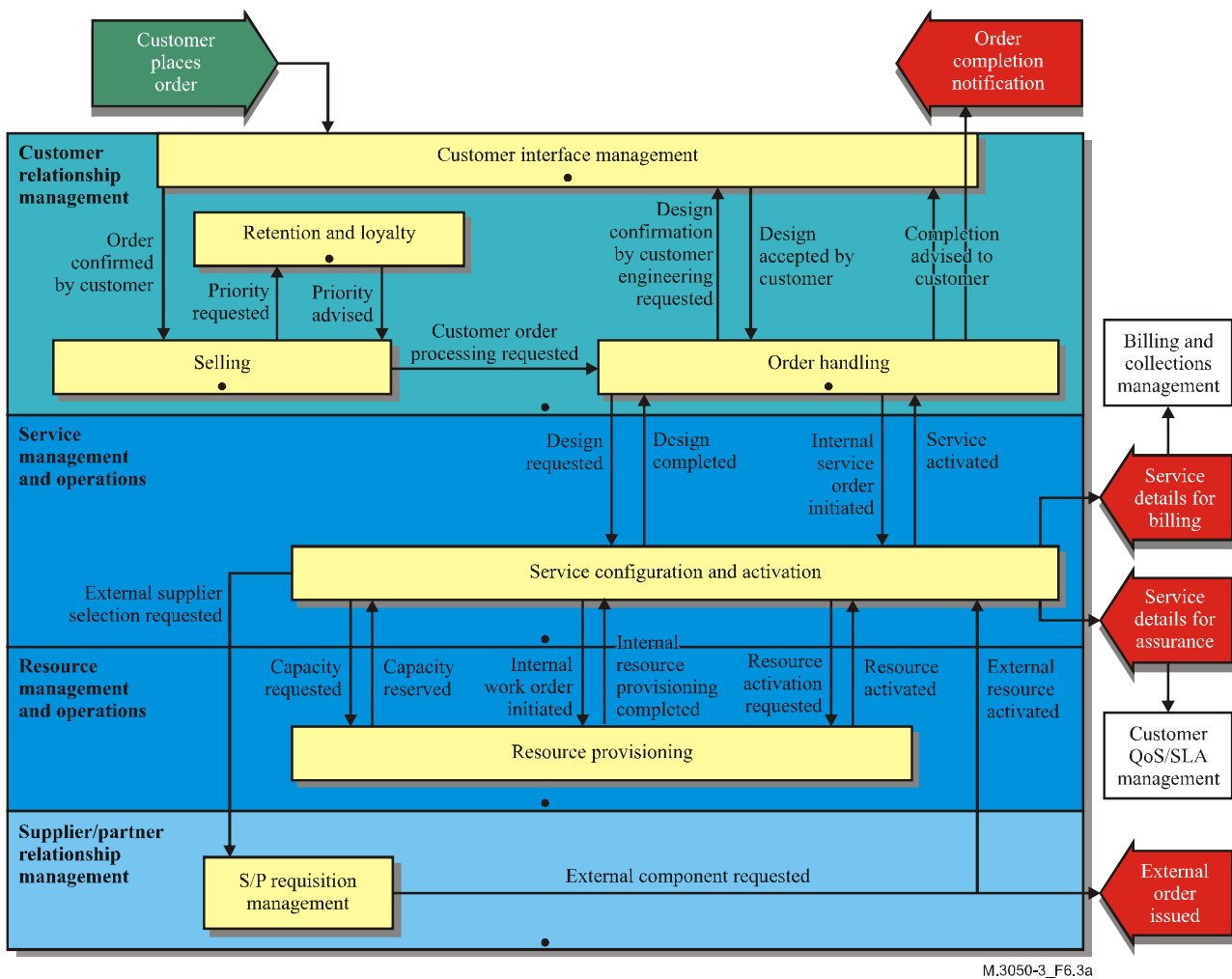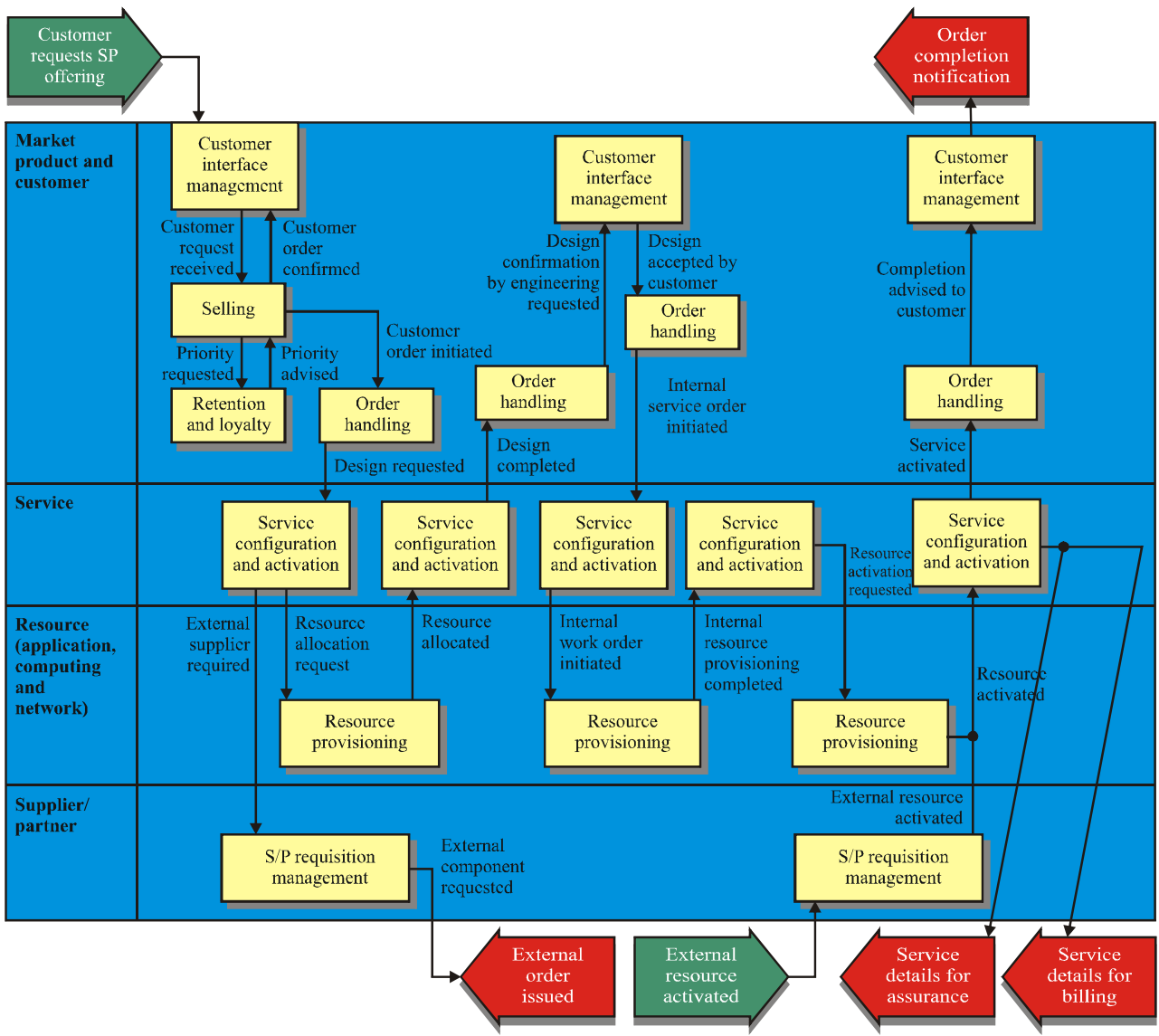**Figure 6.2a/M.3050.3 – Pre-Sales Level 2 Process Flow**
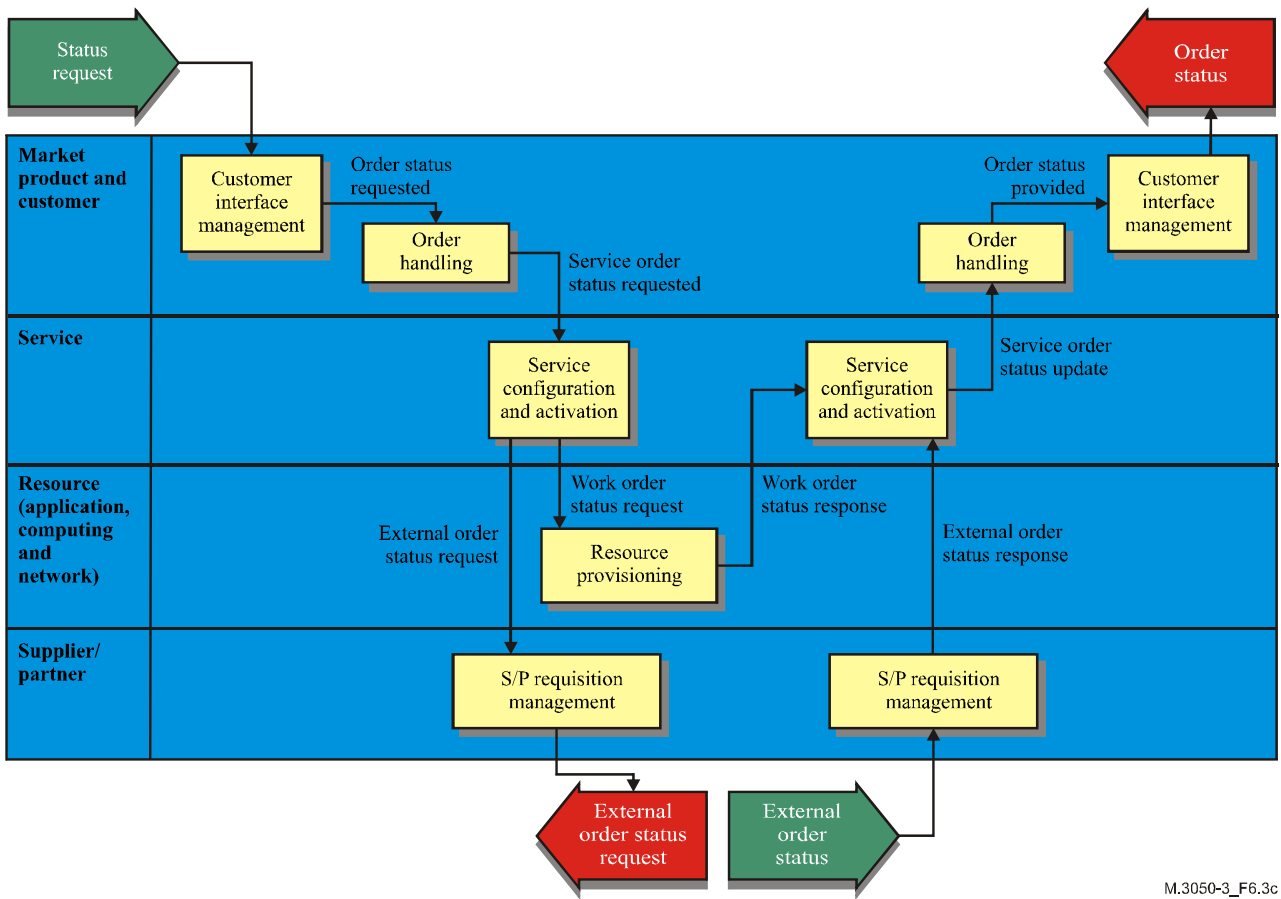
Figure 6.2b/M.3050.3 – Pre-Sales Process Dynamics Flow
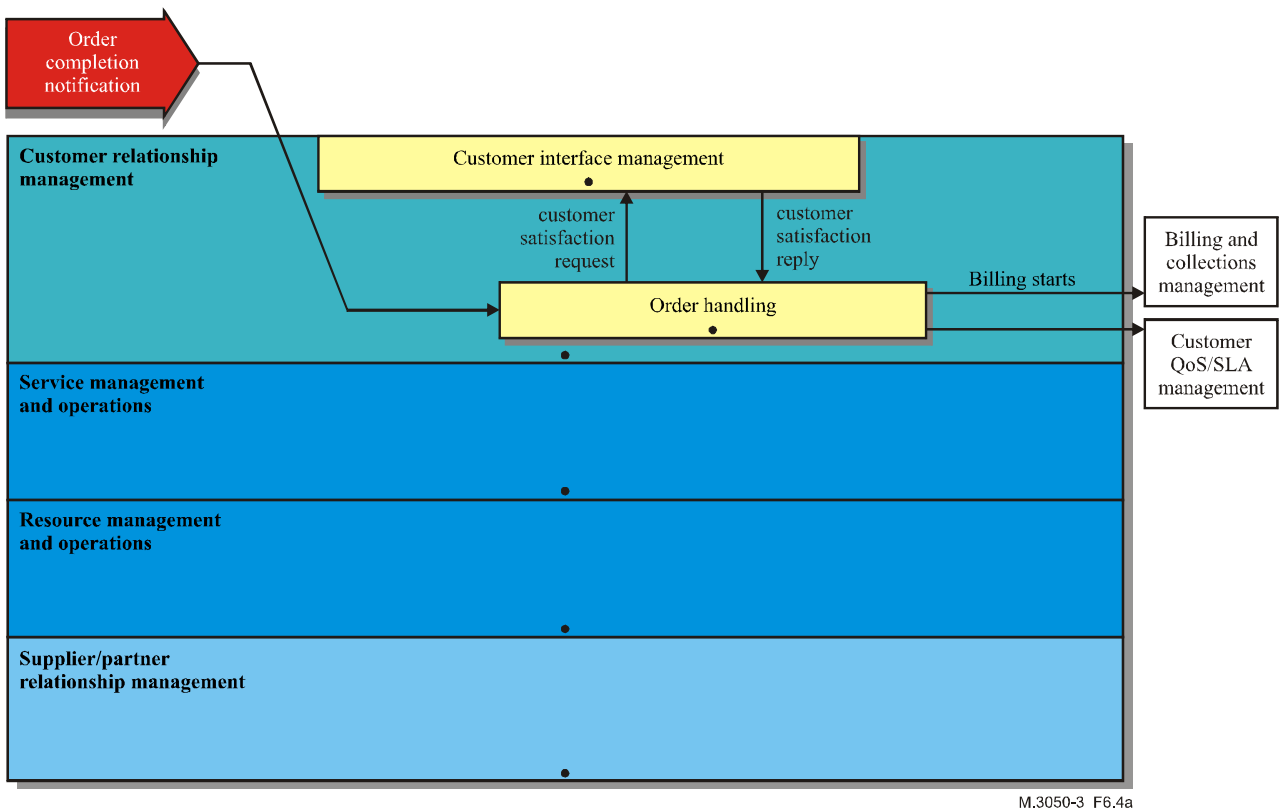
Figure 6.3a/M.3050.3 – Ordering Level 2 Process Flow

Figure 6.3b/M.3050.3 – Ordering Process Dynamics Flow

Figure 6.3c/M.3050.3 – Ordering Process Dynamics Flow: Status Updates

Figure 6.4a/M.3050.3 – Post-Ordering Level 2 Process Flow

7 PLM process flows

7.1 PLM Assumptions

Product Lifecycle Management encompasses the processes required for the definition, planning, design, build, delivery, maintenance, revision and retirement of all products in the enterprise's portfolio. They enable a Service Provider to manage products in relation to profit and loss margins, customer satisfaction and quality commitments.

PLM processes are end-to-end oriented processes that enable the enterprise strategic and business vision; they drive the core operations and customer processes to meet market demand and customer expectations.
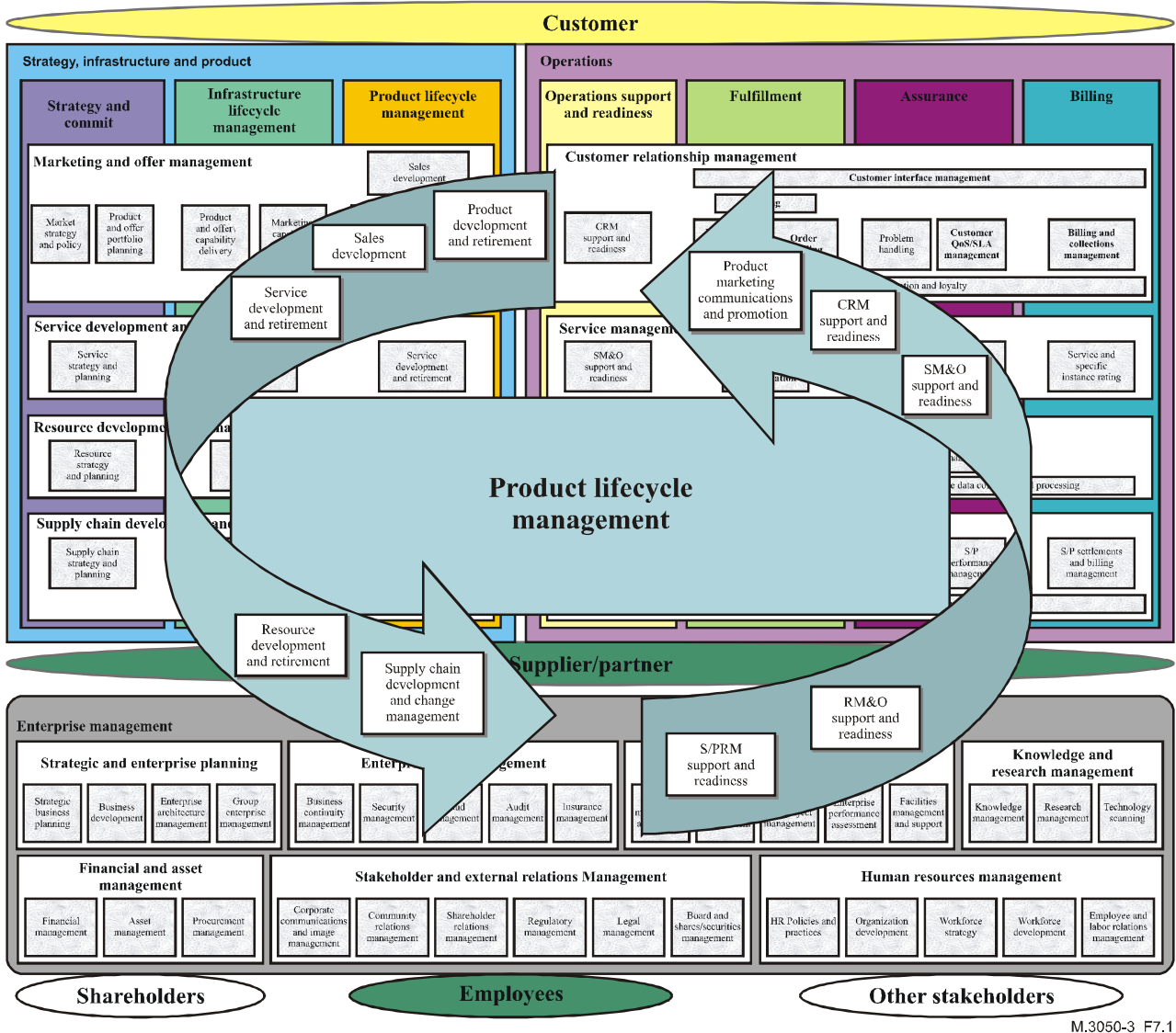

Figure 7.1/M.3050.3 – Scope of Product Lifecycle Management

PLM spreads across the whole enterprise; Figure 7.1 shows the scope of Product Lifecycle Management across the eTOM framework.

7.2 PLM process interactions

PLM processes are end-to-end processes that affect and have interactions with most entities in the enterprise. PLM process flows can be represented in many different ways depending on the use and the scope of application, and such interactions could become so dense that they could simply confuse. To simplify, Figure 7.2 selects an example of such process interactions in PLM; and the diagram depicts an extract of all the possible process flows from PLM. It should be noted that depicting the entire set of process interactions for PLM would require a significantly more complex diagram.

Figure 7.2/M.3050.3 – Example of PLM process interactions

To address this complexity in the more general case, PLM processes could be organized according to different scope levels, for example, in terms of Core PLM, Strategic PLM, Operational PLM, E2E PLM, etc. as depicted in Figure 7.3.
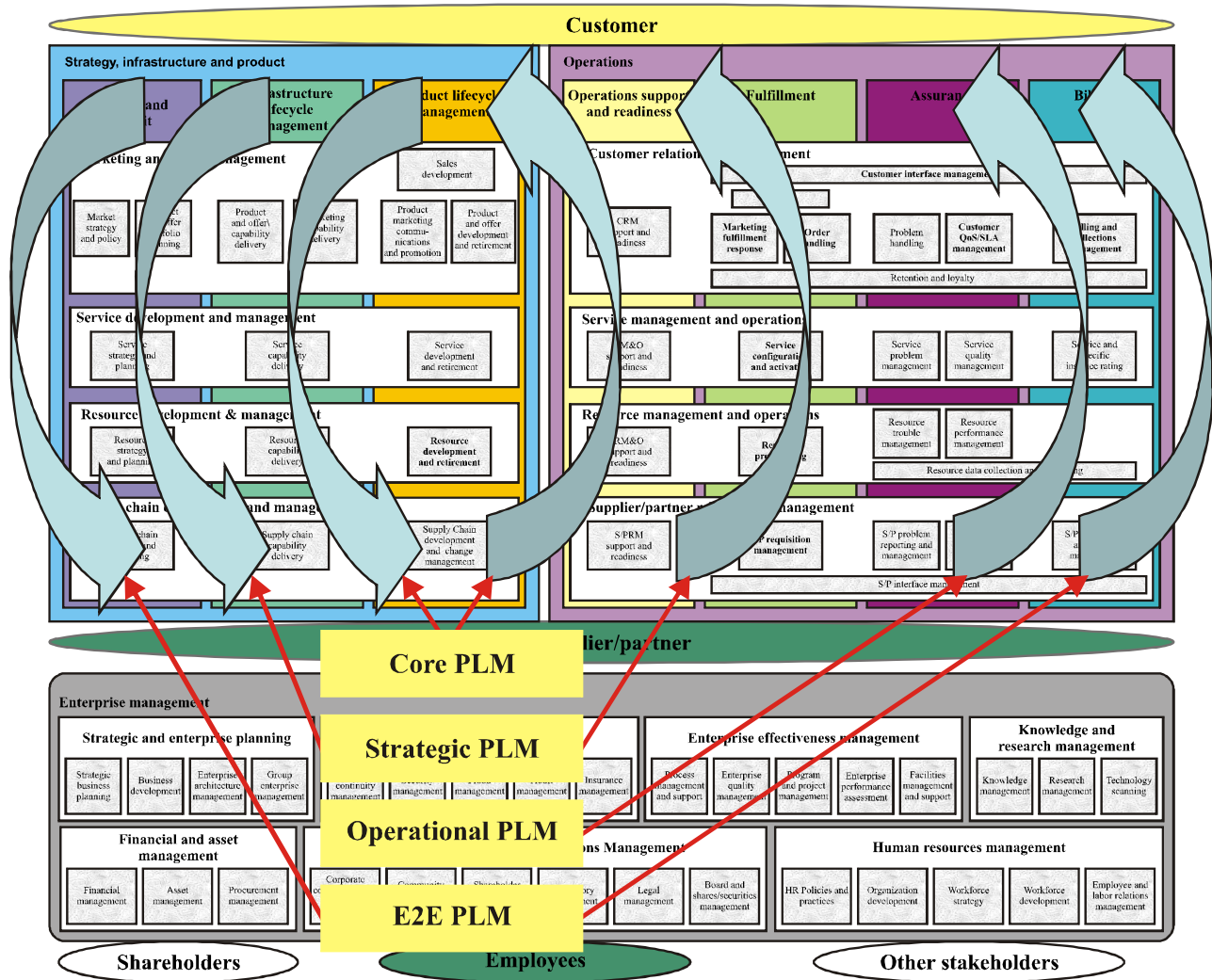

Figure 7.3/M.3050.3 – Different Scopes for PLM

7.3 Application of SIP business processes

In order to describe how the Strategy, Infrastructure and Product (SIP) business processes from the eTOM framework can be used in an actual environment, this example draws on the work of the Product Lifecycle Management (PLM) Catalyst project within the TM Forum's Catalyst program. This project illustrated how TM Forum NGOSS concepts and framework could be leveraged to dramatically improve the processes and systems for building and releasing new products, through the automatic linkage of appropriate product information to the right operations systems and information catalogs on the network side. It demonstrated integrated Product Lifecycle Management with established flow-through order processes, showing how product managers can effectively manage the product lifecycle from beginning to end, with a real-time capability to create, approve, release, distribute, order, fulfil, and bill for new services.

In support of this, the process flows included here show eTOM level 2 processes involved in PLM, with some aspects of relevant level 3 processes also included.

7.3.1 Approach

Based on a selected business scenario for PLM (see later), the relevant eTOM business processes have been identified. Additionally, business process KPIs and triggers have been defined to illustrate how these PLM scenario processes can be measured against their performance indicators.

In PLM, a product can have one or more services and each service is supported by one or more resources. These and other rules were identified and mapped to corresponding eTOM business processes based on a commonality that determines the way business actions are executed whilst, at the same time, covering specific business requirements.

The results illustrate the effectiveness of the eTOM and related NGOSS work, such as SID, across all activities involved with the scope of the project, such as product, service, resource and supply chain planning, specification, development, test and delivery to the operations environment, using product and service bundle concepts. The insights gained on the SIP (Strategy, Infrastructure and Product) area of the eTOM framework have been used to feedback into the ongoing eTOM work.

7.4 PLM process flows

In order to define the business process flows across the SIP and Operations areas, a scenario with the following issues has been considered:

There are products and service bundles made of components that can be accessed at any time and reused to further define and build new products and services. A product manager can then generate ideas from the analysis of current product and service bundles. These aspects are covered by SM&O Readiness processes that also support Manage Service Inventory processes.

The new product proposal is then submitted for approval by the product manager. Once approved, the development project for the new product and related services and resources starts. The primary processes that support this project are: Product & Offer Portfolio Planning, Product Marketing Communications & Promotion, Product & Offer Development & Retirement, Service Strategy & Planning, Service Development & Retirement, Resource Development & Retirement, Product & Offer Capability Delivery, Service Capability Delivery and Resource Capability Delivery.

Once the new product with its associated services and resources is developed, tested and accepted, all of its configuration information including pricing rules and promotions are transferred to the Operations area through the Product Development & Retirement, Service Development & Retirement, and Resource Development & Retirement processes respectively. The configuration information is then transferred to the Manage Service Inventory and Manage Resource Inventory processes, which are part of the SM&O Support & Readiness and RM&O Support & Readiness processes respectively. Additionally, CRM Support & Readiness processes provide all of the necessary updates to support the new product as well as its marketing campaign and billing.

Customer Interface Management, Selling, Service & Specific Instance Rating and Billing & Collections Management processes create or update the necessary information to offer the new product and services to the market. This includes price, billing, discount and other parameters and rules.

The customer requests the new product through a call centre, sales channel or self-provisioning via the Customer Interface Management and Selling processes. In order to fulfil the order and deliver the requested product, the following business processes are involved: Order Handling, Billing & Collections Management, SM&O Support & Readiness, Service Configuration & Activation, Service & Specific Instance Rating, RM&O Support & Readiness, and Resource Provisioning.

The customer invoice related to the new product and services is generated; the processes that support the business flows here are: Customer Interface Management, Billing & Collections Management, CRM Support & Readiness, Service & Specific Instance Rating, and Resource Data Collection & Processing.

If the customer later on requests a change in the new product, the following business processes will be involved: Customer Interface Management, Selling, Order Handling, Billing & Collections Management, SM&O Support & Readiness, Service Configuration & Activation, RM&O Support & Readiness, and Resource Provisioning.

The business process flows that support the above-described scenario are shown in Figures 7.4 and 7.5 below. Figure 7.4 describes the product manager accessing the product and service bundles inventory when envisioning a new product and/or service based on the components of existing ones; then further actions are described in order to obtain approval for a new product development project. Figure 7.5 depicts the process flows involved with product development after approval has been granted from the product manager or a higher executive committee. The business process flows described represent a change request received from a customer requiring the new product and/or service.
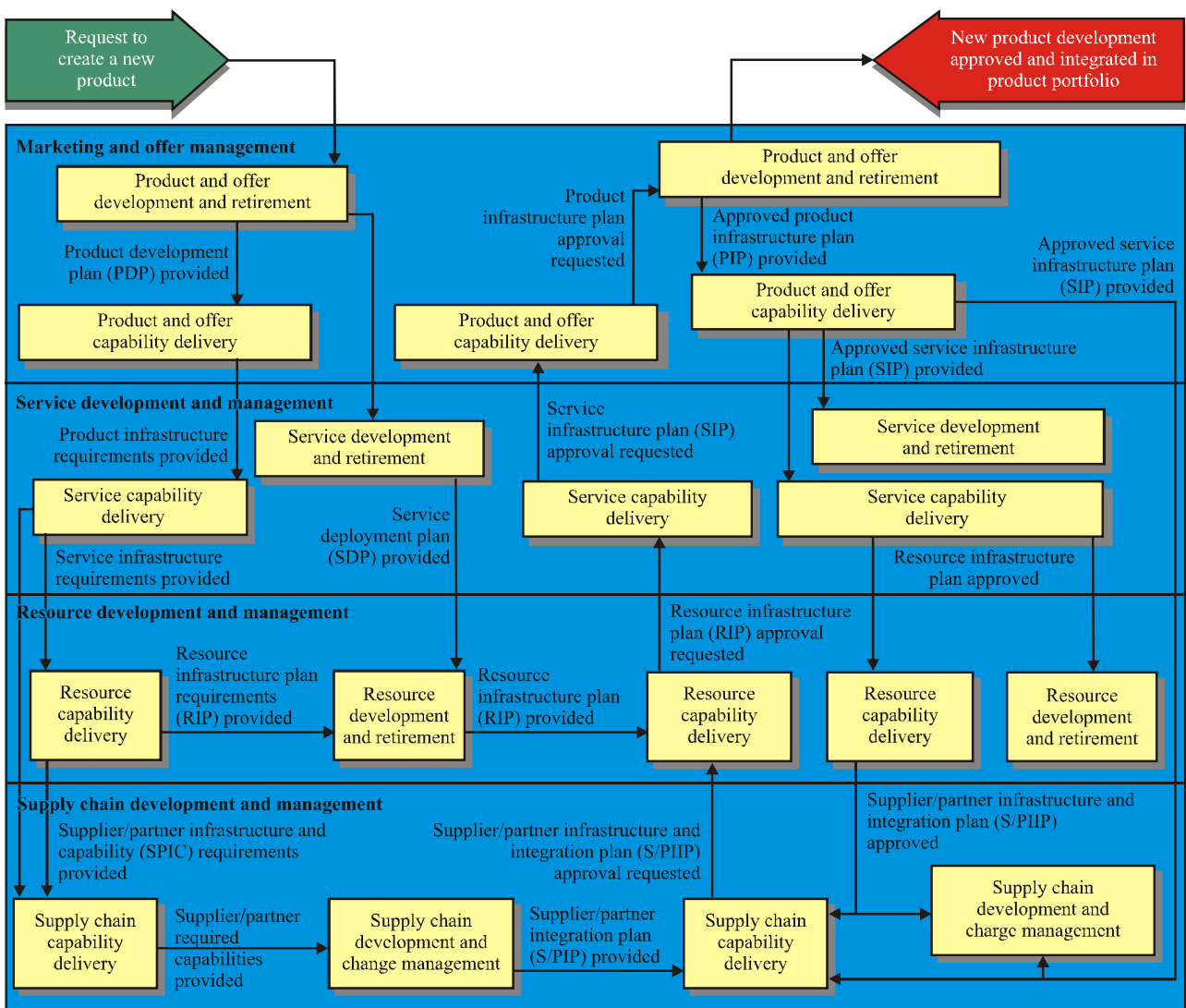
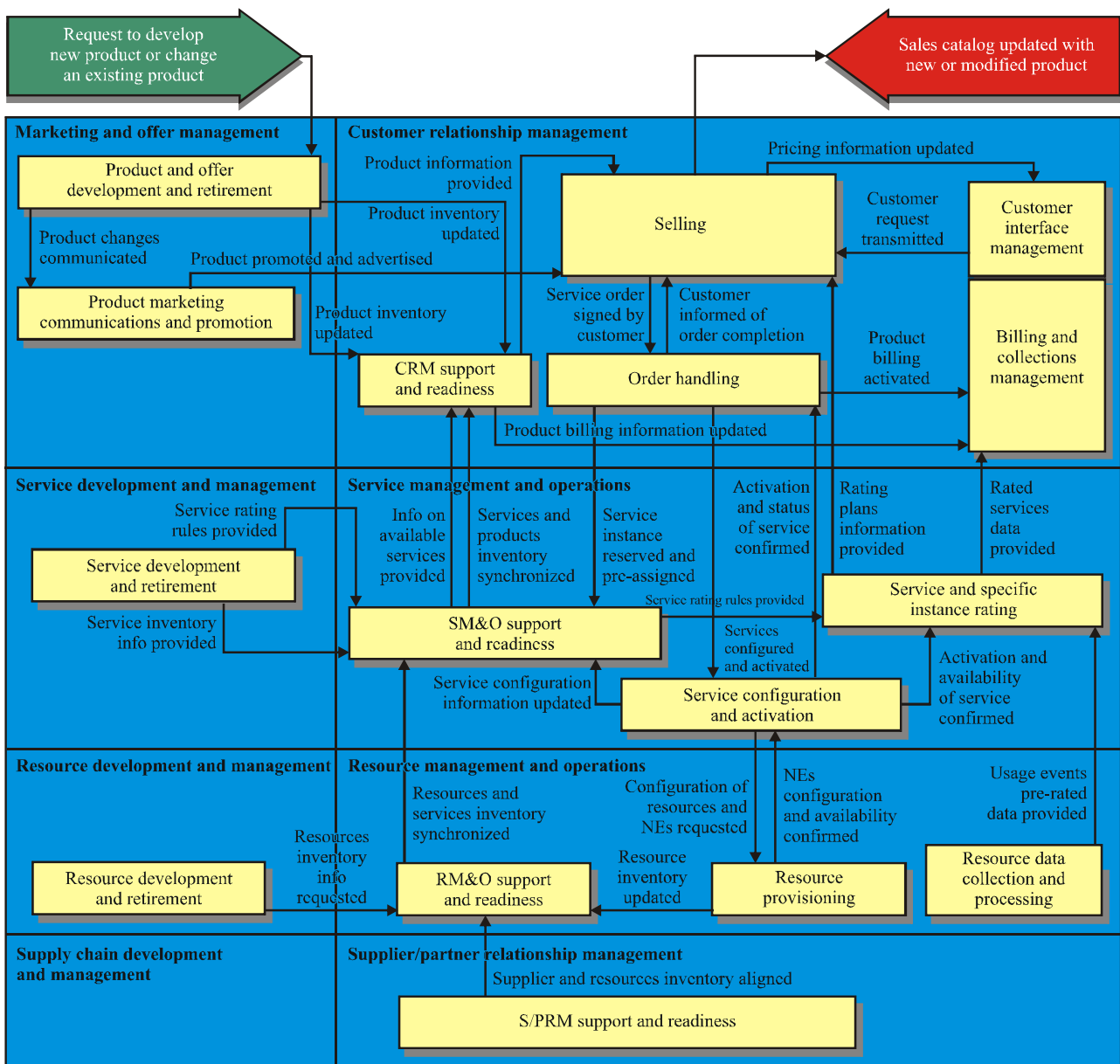**Figure 7.4/M.3050.3 – Approve the development of a new product (pre-approval)**

Figure 7.5/M.3050.3 – Develop new product or modify an existing one (post-approval)

8 SLA process flows

8.1 SLA Assumptions

The SLA process flows depicted here have their origins in the *SLA Management Handbook* [GB917] where a set of use case scenarios and TOM process flows were depicted in order to illustrate the interactions between the TOM processes involved in SLA management. In a liaison between the SLA Management Team and the eTOM Team, the TOM flows have been updated to eTOM process flows for version 2.0 of the SLA Management Handbook. A subset of these flows is provided in this clause.

The lifecycle of an SLA is analysed in the following five phases as shown in Figure 8.1.

• Product/Service Development;

• Negotiation and Sales;

- Implementation;

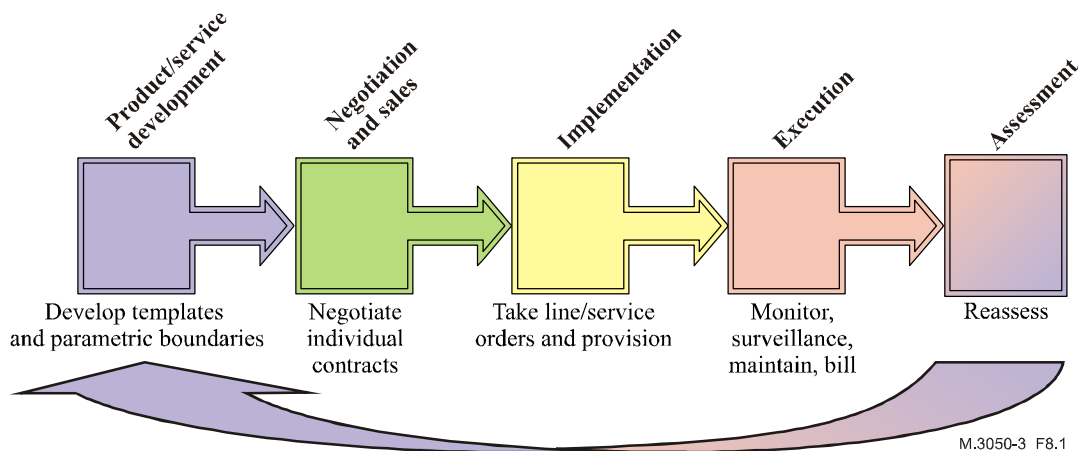- Execution;

- Assessment.

Figure 8.1/M.3050.3 – Product/Service and Associated SLA Lifecycle

Scenarios were selected to illustrate the process flows required to support the above SLA lifecycle phases. They were not intended to be prescriptive but were provided as one possible approach to the process flows involved in SLA management. The scenarios originally selected have not been changed for the eTOM flows except where it was thought necessary or desirable in the light of experience with the original flows and with the different scope of eTOM compared to TOM. This is evident, for example, in the fact that there were no processes for supplier/partner relationships in TOM, and so the original scenarios did not include such processes. In one of the flows depicted here, a relationship with a third-party service provider has been included in order to show how supplier/partner processes can be used. Clearly, such relationships can be included in other flows, but the first step was to adapt the TOM flows to eTOM flows and then to exploit the wider scope of the eTOM framework as required.

Another point on which work within the TM Forum has progressed is in the clarification of the relationship between product and service, and the greater emphasis on marketing processes in the Service Provider enterprise. Although a product can consist of several services, the scenarios here retain the approach of the original flows in that a product consists of one service. In further work in this area, it would be desirable to coordinate the performance of several services comprising a product and to examine the flows required for the management of SLAs for such products, as well as between several service providers in a value chain.

The original TOM flows were designed to be generic as the focus was on SLA management and not on any specific implementation of a service, and this is also the case in the eTOM flows. Again, it would be desirable to examine this approach given the different kinds of service now available, particularly in the mobile environment, and the work being undertaken in this area by the TM Forum.

The process flows selected here are those for Stages 4 and 5 of the SLA lifecycle, i.e., the Execution and Assessment phases. The scenarios originally selected for these two phases are shown here, first as interaction diagrams and then as eTOM process flows. As with the TOM process flows, these flows are provided as examples depicting illustrative approaches to aspects of SLA management in the two lifecycle phases.

8.2 SLA process interactions

The process interactions are first shown as high-level linkages in the eTOM model. They are categorized as Normal Execution, Execution with SLA Violation, and Assessment.
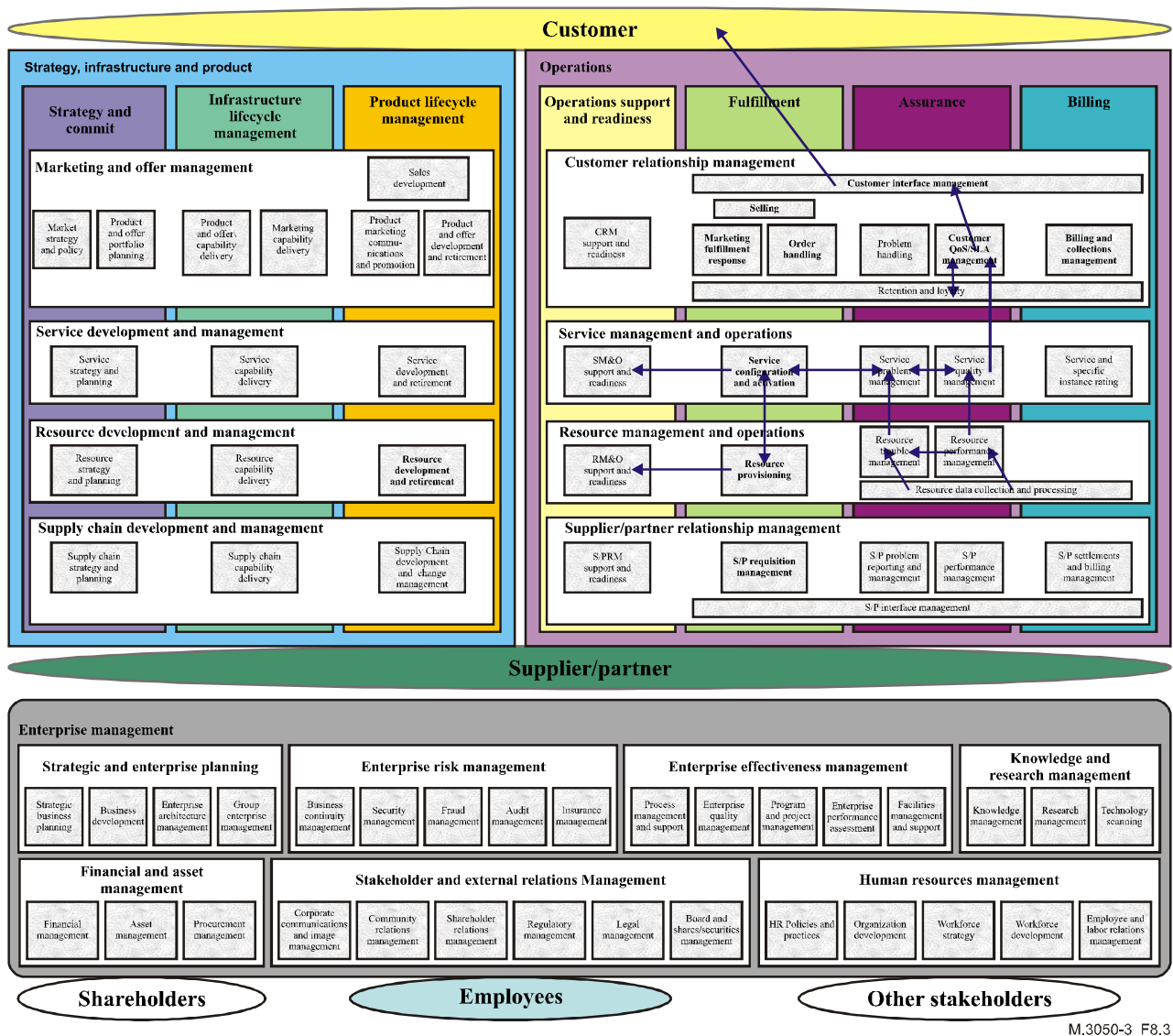
8.2.1 Normal execution

The Execution phase covers all normal operations of the service instances covered by the SLA.

Figure 8.2 presents normal in-service execution and monitoring where performance data is collected from resources and analysed for resource performance, then for overall service quality, and finally checked against the customer SLA. In this case, a third-party service provider is involved and performance data from the external service components is included in the service quality analysis. In addition, a billing flow was added to show how both internal usage data as well as data from the third-party service provider is incorporated into the customer bill. All of these interactions occur in the Assurance process grouping for the resource performance and service quality analysis interactions and in the Billing process grouping for the billing interactions.
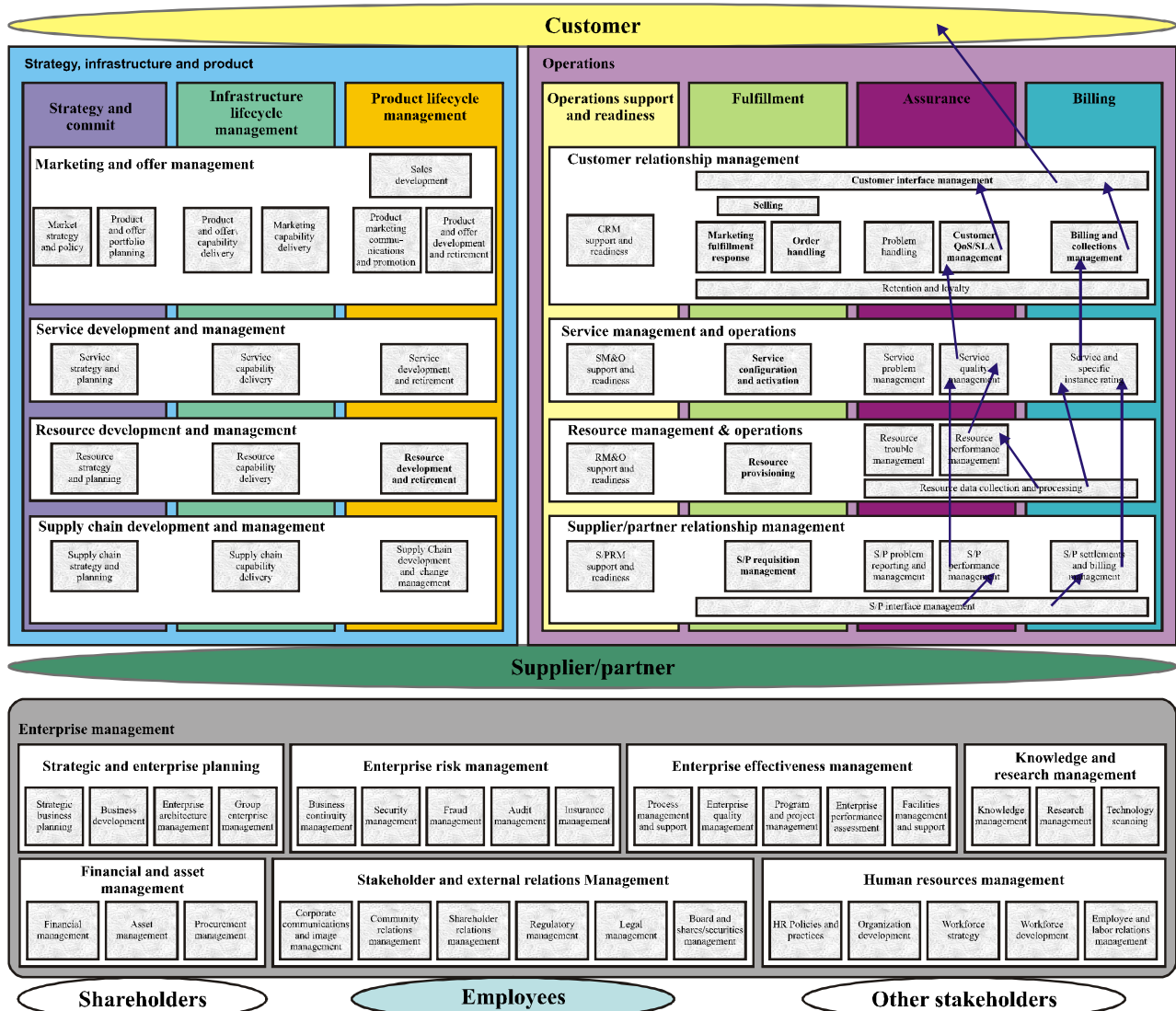
**Figure 8.2/M.3050.3 – Normal execution of SLA Service
Case A: Performance data during normal operation**

**Figure 8.3/M.3050.3 – Normal execution of SLA Service
Cases B and C: Threshold crossing alerts and resource failure alarms**

Figure 8.3 illustrates the case where threshold crossing alerts and resource failure alarms are reported and have to be rectified. However, after checking against the customer SLA it is established that no SLA violation has occurred. Most of these interactions occur in the Assurance process grouping, but interactions also take place with the Fulfilment and OSR process groupings.

8.2.2 Execution with SLA violation

Figure 8.4 shows the operation of the service where real-time SLA violation handling is required. In this case, the customer reports a problem that is rectified but which leads to a violation of the customer SLA so that a Billing rebate is given. In this case, there is interaction between the Assurance and Billing process groupings, but interactions also take place with the Fulfilment and OSR process groupings.
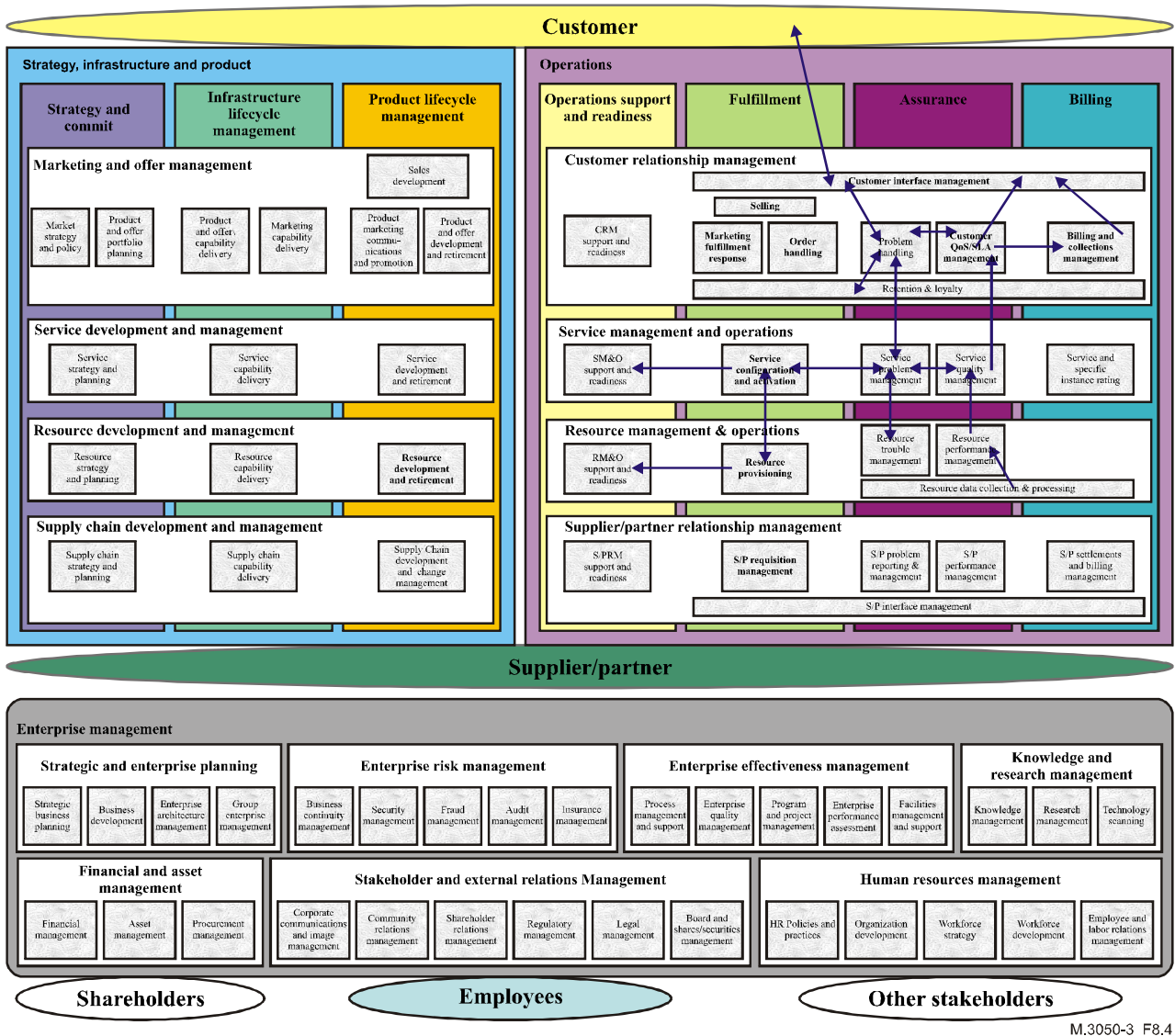
Figure 8.4/M.3050.3 – Customer detected SLA violation

8.2.3 Assessment

The Assessment phase can relate to a single customer SLA and the QoS required, or it can be related to the Service Provider's overall quality goals, objectives and risk management.

Figure 8.5 represents the case where the customer needs have changed and there is no SLA to meet these needs. The interactions occur in the Market, Product and Customer layer and involve not just Operations process groupings but also Product Lifecycle Management process groupings.

Figure 8.6 depicts the process interactions relating to the internal business review concerning the overall SLA performance across all customers, as well as a realignment of service operations and service goals to improve overall service class performance. The process interactions here occur among the Assurance process groupings as well as among the OSR process groupings.
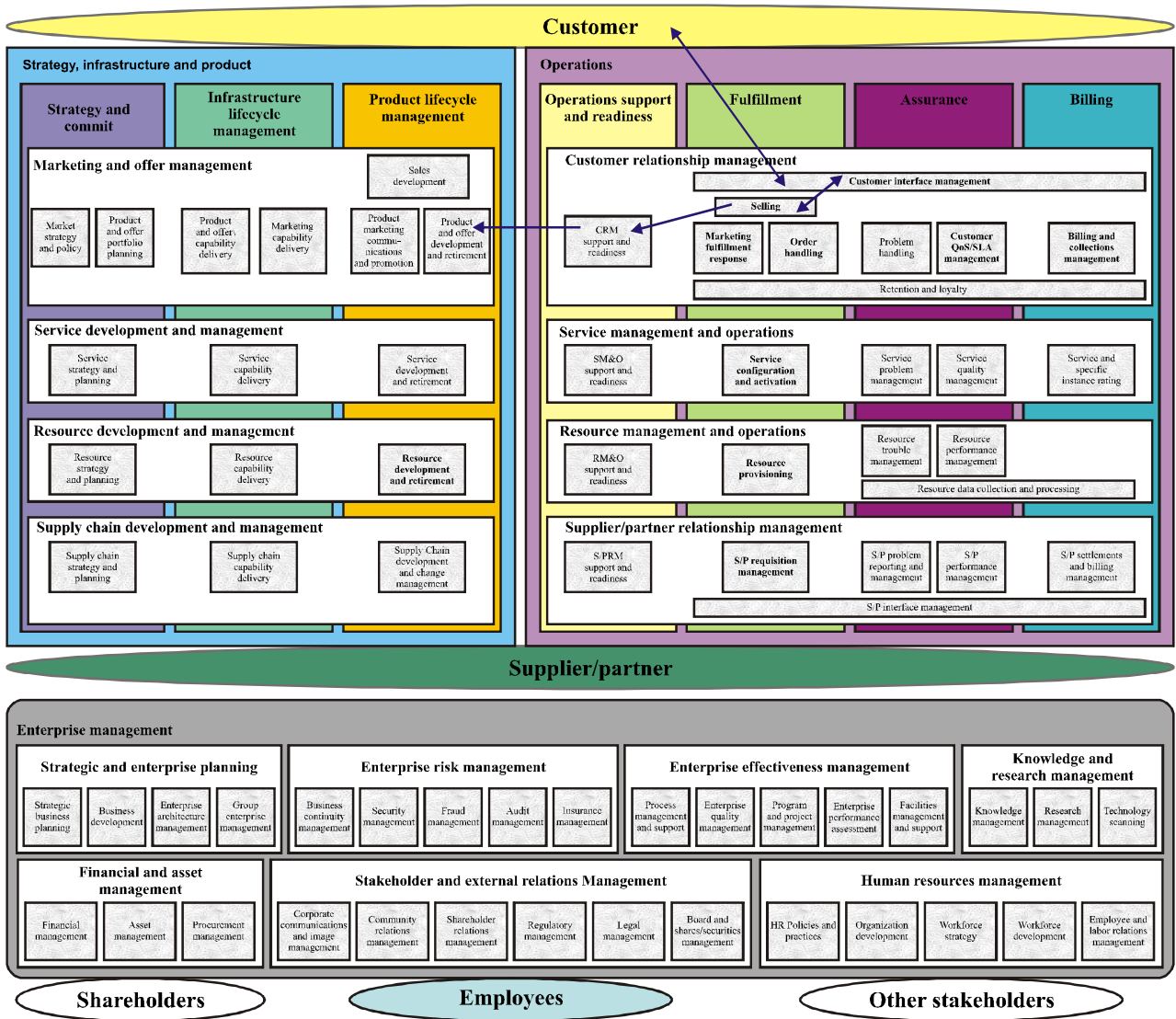
Figure 8.5/M.3050.3 – Assessment initiation
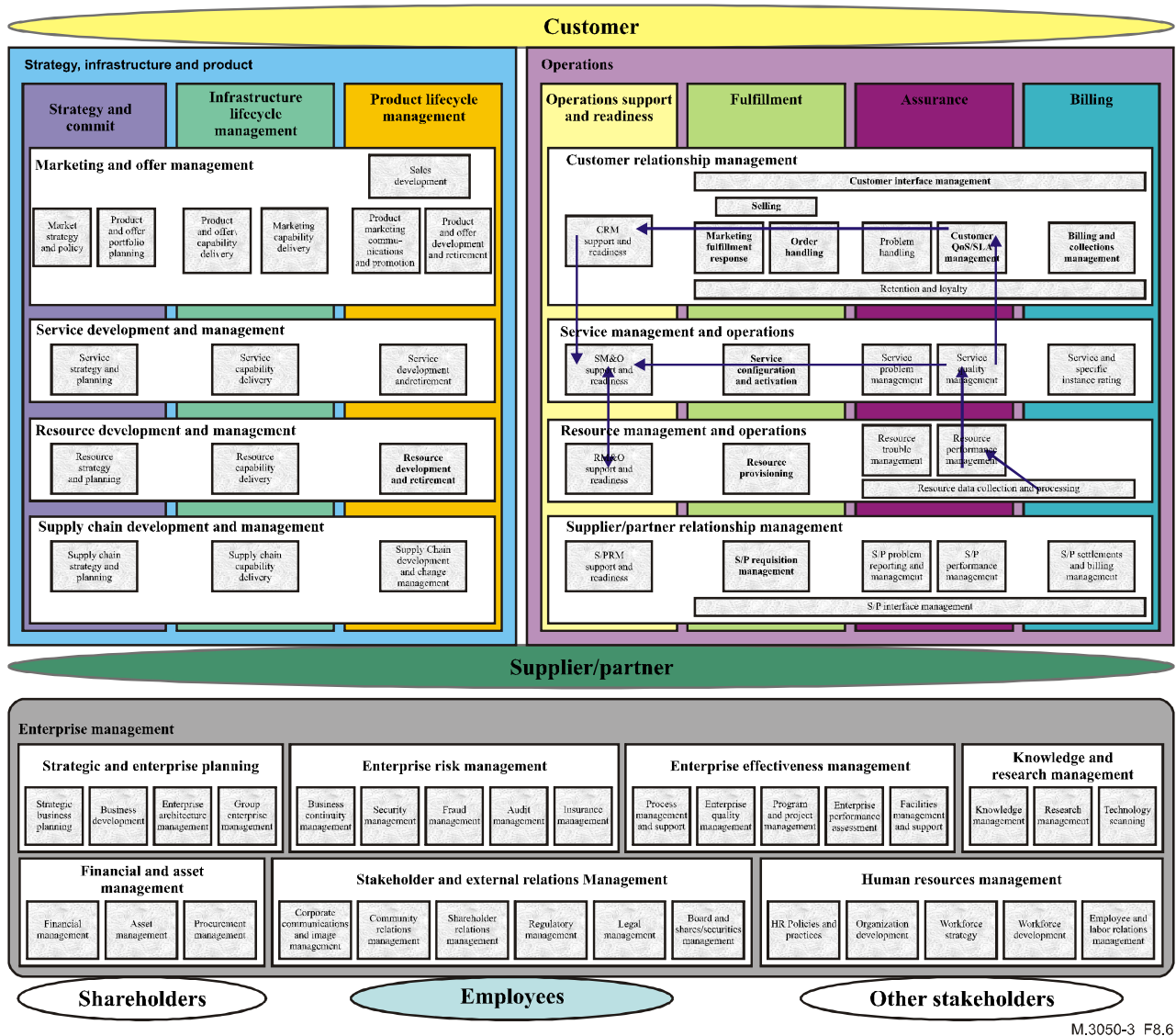**Case A: Customer needs have changed**

Figure 8.6/M.3050.3 – Assessment initiation
Cases B and C: Internal assessments at the customer and service layers

8.3   SLA process flows

The process flows presented here are based on the process interactions between the Level 2 processes shown in the interaction diagrams and provide more detail of the processes involved and the actions undertaken for each of the scenarios depicted.

8.3.1   Normal execution

Normal execution, also known as steady state, is the phase where the customer receives service on all the contracted and instantiated service instances. This clause first analyses in Case A a situation where no outages or other alerts occur and the customer is billed for the service used (Figure 8.7). It then analyses in Cases B and C the situation where, although outages occur, no outage exceeds either the individual or aggregated parameters set in the SLA (Figures 8.8 and 8.9). In the first case of normal operation, a supplier/partner is also involved; in the second case, the outages are within the Service Provider enterprise and so do not involve a supplier/partner.
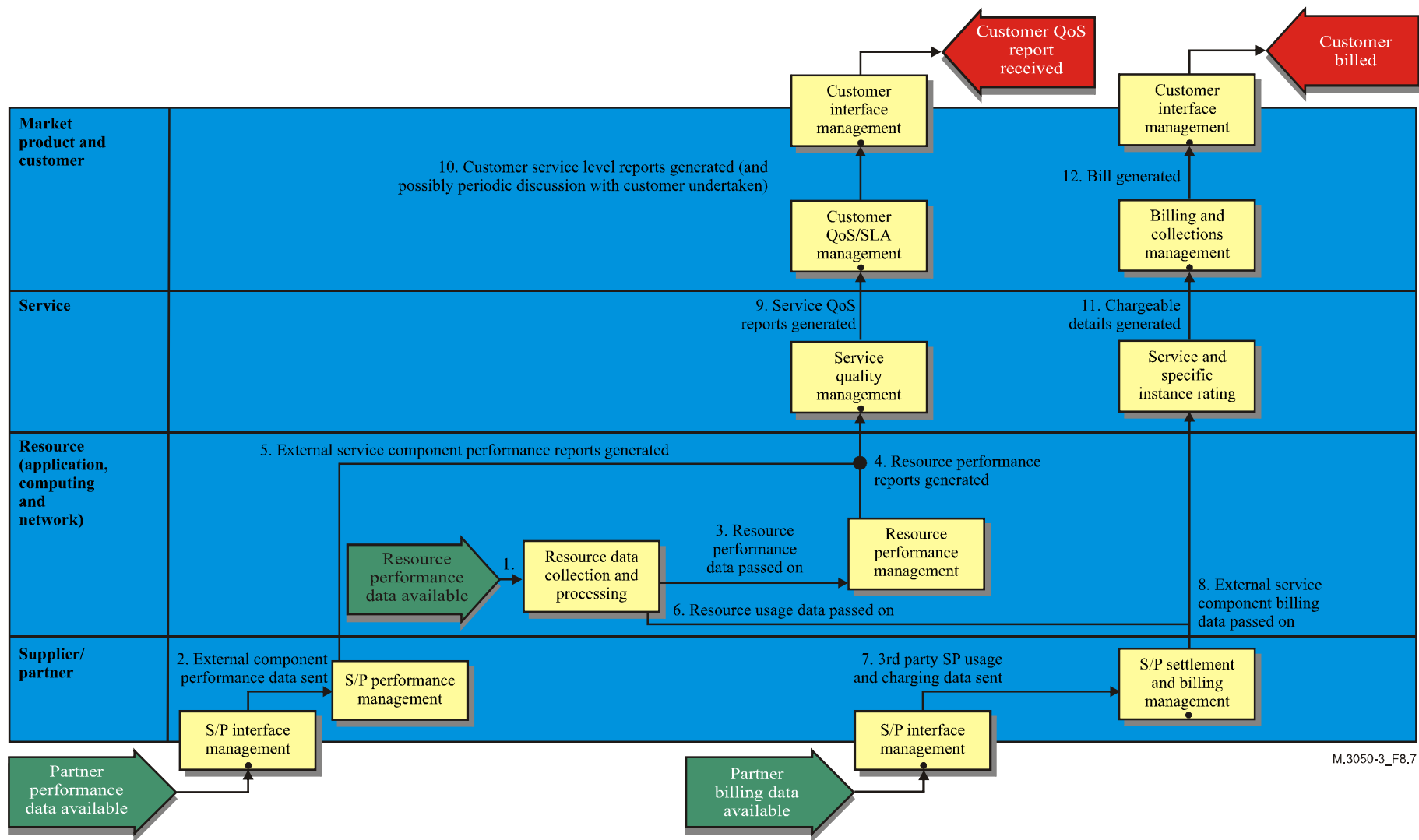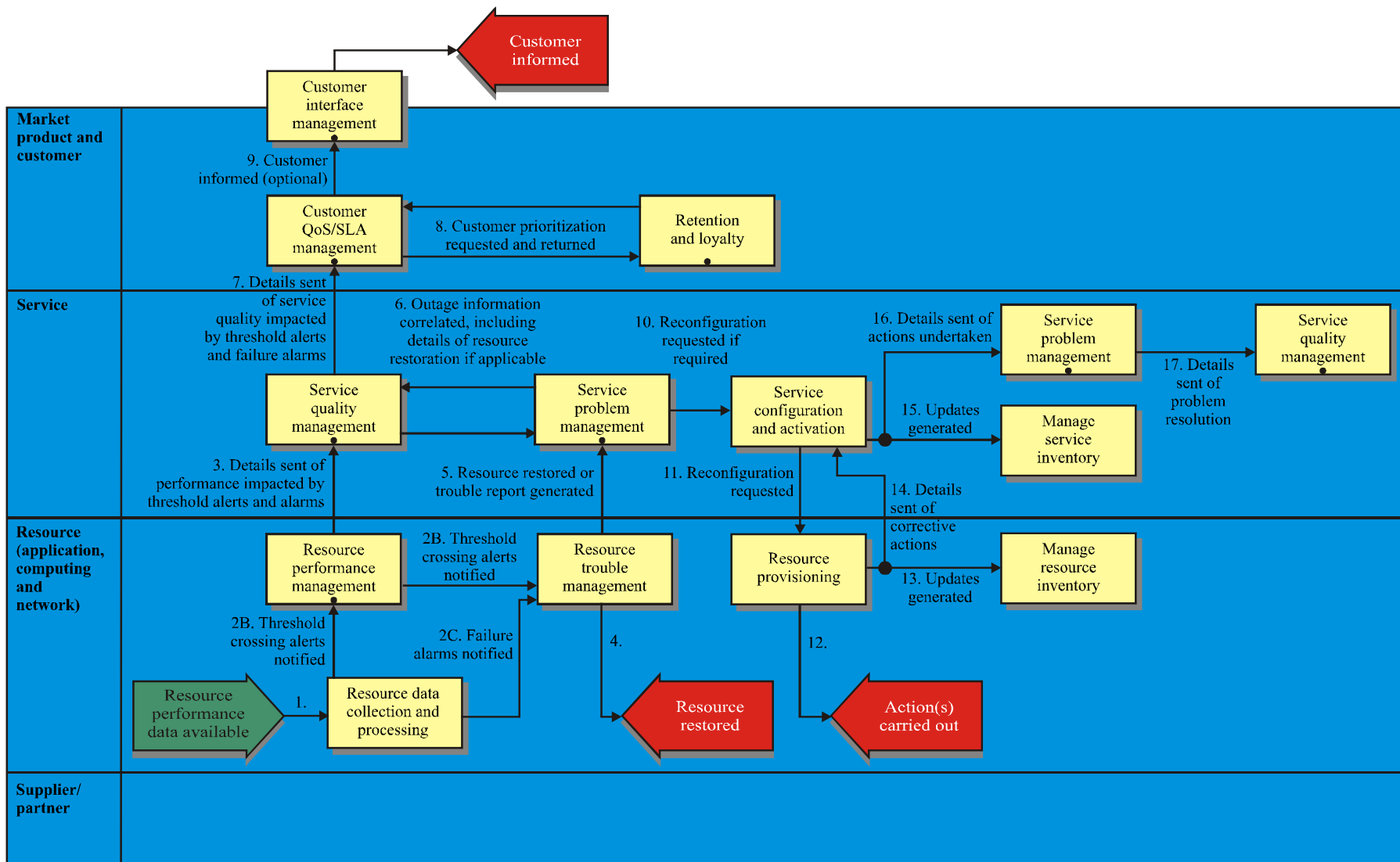
**Figure 8.7/M.3050.3 – Normal Execution of SLA Service
Case A: Performance Data during Normal Operation**

The steps shown in Figure 8.7 for Case A are as follows:

1) During normal operation, performance data that is used for general monitoring of service levels as well as for longer-term capacity prediction is collected on an ongoing basis from the service-providing infrastructure by *Resource Data Collection & Processing*.

2) During normal operation, performance data from external service components of third-party service providers is sent on an ongoing basis to *S/P Performance Management* for general monitoring of service levels, as well as for longer-term supplier/partner capacity prediction.

3) *Resource Data Collection & Processing* sends performance data to *Resource Performance Management* for further analysis.

4) *Resource Performance Management* sends resource performance reports to *Service Quality Management* for QoS calculations and averaging to maintain statistical data on the supplied service instances.

5) *S/P Performance Management* sends external service component performance reports to *Service Quality Management* for QoS calculations and averaging to maintain statistical data on the supplied service instances.

6) *Resource Data Collection & Processing* sends resource usage data to *Service & Specific Instance Rating* for rating service usage.

7) Third-party service providers send their usage and charging data to *S/P Settlements & Billing Management*.

8) *S/P Settlements & Billing Management* analyses the data and passes it on to *Service & Specific Instance Rating* for rating service usage.

9) *Service Quality Management* analyses the performance reports received and sends overall service quality reports to *Customer QoS/SLA Management* so that it can monitor and report aggregate technology and service performance.

10) *Customer QoS/SLA Management* checks the service quality reports it receives against the individual customer SLA and establishes that no SLA violation has occurred. *Customer QoS/SLA Management* sends periodic service level reports to the customer on either a requested or agreed basis.

11) *Service & Specific Instance Rating* sends charging details to *Billing & Collections Management*.

12) *Billing & Collections Management* generates bills for the customer on either a requested or agreed basis.

Figure 8.8/M.3050.3 – Normal execution of SLA service
Cases B and C: Threshold crossing alerts and resource failure alarms. Steps 1 to 17

The steps shown in Figures 8.8 and 8.9 for Cases B and C are as follows:

1) Notifications are collected from the service-providing infrastructure by *Resource Data Collection & Processing* on an ongoing basis. In Cases B and C, these notifications are in the form of:

2B) **Threshold Crossing Alerts** that represent congestion or performance degradation in a congestable resource that leads to slowed or diminished capacity to support customer services. *Resource Data Collection & Processing* sends all performance data to *Resource Performance Management*, which identifies a resource performance problem and requests *Resource Trouble Management* to discover the cause of the alert and possible impact on service performance.

2C) **Alarms** that represent the failure of a component that affects the service of one or more customers. *Resource Data Collection & Processing* sends data on alarms to *Resource Trouble Management* for further action.

3) *Resource Performance Management* sends details of the **Threshold Crossing Alerts** to *Service Quality Management* so that various notifications and other steps may be taken to ensure that required service KQI levels are maintained.

4/5) Depending on the nature of the problem*, Resource Trouble Management* either triggers automatic resource restoration procedures itself and informs *Service Problem Management* of its actions, or it raises alarm reports to *Service Problem Management*, indicating the time and potential duration of any outage to allow *Service Problem Management* to determine potential alternate actions to minimize service impact.

6) *Service Problem Management* and *Service Quality Management* correlate their information about the problem.

7) *Service Quality Management* sends details of the service impact of **Threshold Crossing Alerts** and **Alarms** to *Customer QoS/SLA Management*.

8) *Customer QoS/SLA Management* checks the customer SLA and obtains information on the significance of the customer from *Retention & Loyalty*. It undertakes various notifications and other steps in order to prevent customer SLAs from being violated, e.g., clocks started, tracking initiated.

9) *Customer QoS/SLA Management* may inform the customer of the QoS degradation, depending on the significance of the customer and the extent of the degradation.

10) If *Resource Trouble Management* has not been able to trigger automatic resource restoration, *Service Problem Management* requests *Service Configuration & Activation* to undertake the required corrective actions. (Steps 10 to 17 are therefore only carried out if automatic resource restoration did not take place.)

11) As the problems have been notified in the resource layer, *Service Configuration & Activation* will require changes to be made to the underlying infrastructure per contractual agreements. This requirement is sent to *Resource Provisioning* for activation.

12) *Resource Provisioning* undertakes the required resource configuration changes to ensure that resources meet service KQIs.

13) *Resource Provisioning* generates updates for *Manage Resource Inventory*.

14) *Resource Provisioning* reports the results of the changes as well as the time taken and all other infrastructure and operational parameters to *Service Configuration & Activation*.

15) *Service Configuration & Activation* generates updates for *Manage Service Inventory*.

16) *Service Configuration & Activation* reports on the actions undertaken to *Service Problem Management*.

17) *Service Problem Management* sends details of the corrective actions to *Service Quality Management* for incorporation into ongoing service quality monitoring and management.
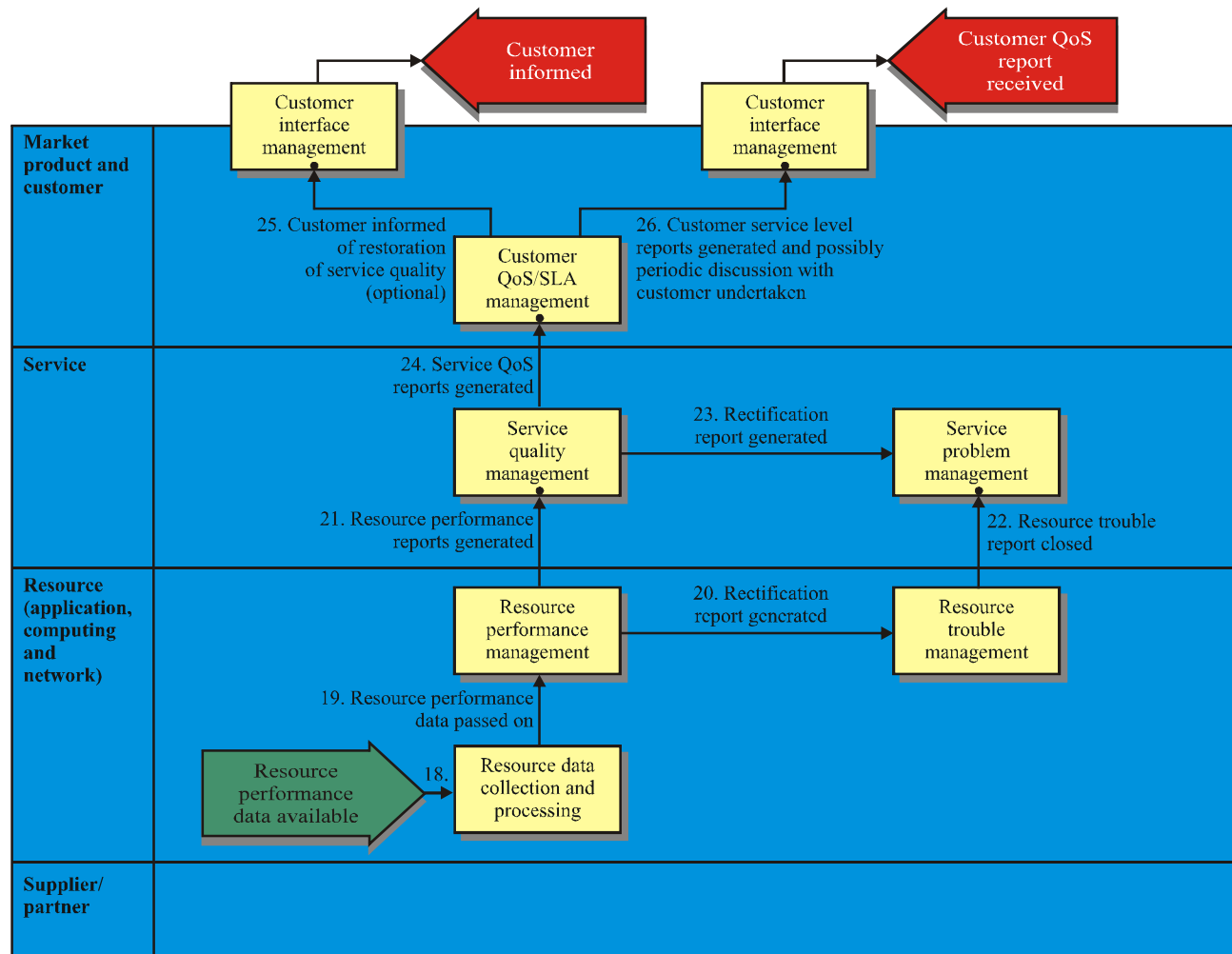
Figure 8.9/M.3050.3 – Normal execution of SLA service
Cases B and C: Threshold crossing alerts and resource failure alarms. Steps 18 to 26

18) Notifications and performance data are collected from the service-providing infrastructure by *Resource Data Collection & Processing.*

19) *Resource Data Collection & Processing* sends performance data to *Resource Performance Management* for further analysis.

20) *Resource Performance Management* establishes that the resources are meeting their KPIs and informs *Resource Trouble Management* that the trouble has been rectified.

21) *Resource Performance Management* sends resource performance reports to *Service Quality Management* for QoS calculations and averaging to maintain statistical data on the supplied service.

22) *Resource Trouble Management* informs *Service Problem Management* of the closed resource trouble report.

23) *Service Quality Management* analyses the resource performance reports and sends a rectification report to *Service Problem Management* when it is established that the troubles causing the **Threshold Crossing Alerts** or **Alarms** have been resolved and that the service is meeting its KQIs.

24) *Service Quality Management* sends overall service quality reports to *Customer QoS/SLA Management* so that it can monitor and report aggregate technology and service performance.

25) *Customer QoS/SLA Management* checks the service quality reports it receives against the customer SLA and establishes that no SLA violation has occurred. It may inform the customer of the quality restoration, depending on the significance of the customer and the extent of the degradation.

26) *Customer QoS/SLA Management* sends periodic Service Performance reports to the customer on either a requested or agreed basis.

8.3.2 Execution with SLA Violation

From time to time, service conditions will exceed the parameters specified in the SLA. At least two cases need to be examined, one where the Service Provider detects the outage first, and one where the customer detects and reports it first. The second case is depicted in Figures 8.10 and 8.11.
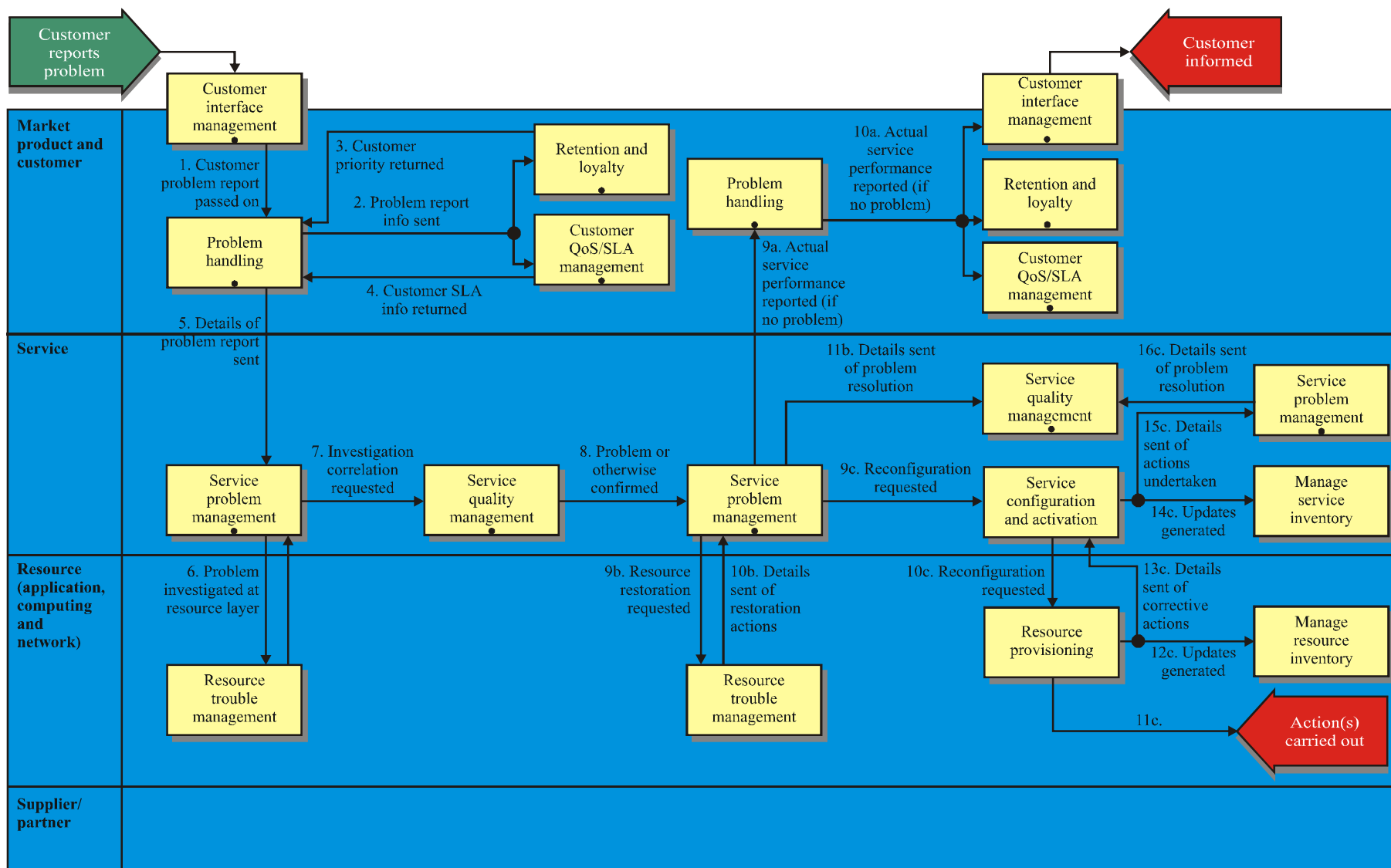
Figure 8.10/M.3050.3 – Customer Detected SLA Violation. Steps 1 to 16c

The steps shown in Figures 8.10 and 8.11 are as follows:

1) The customer perceives service degradation and reports the visible parameters to *Problem Handling*.

2) *Problem Handling* sends details of the problem as reported by the customer to *Customer QoS/SLA Management* and *Retention & Loyalty*.

3) *Retention & Loyalty* returns information to *Problem Handling* on the significance of the customer.

4) *Customer QoS/SLA Management* checks the customer SLA and undertakes various steps for tracking the problem in order to prevent the customer SLA from being violated, e.g., clocks started, tracking initiated. It determines potential priorities or other actions depending on the type of customer SLA and informs *Problem Handling*.

5) *Problem Handling* sends a detailed problem report with contract commitment data and request prioritization to *Service Problem Management* for normal flow handling.

6/7) *Service Problem Management* investigates whether there is a problem, possibly engaging *Resource Trouble Management* for further investigation, and then requests *Service Quality Management* to correlate its findings. *Service Quality Management* either confirms the trouble report or, if no problem is noted, returns the actual service performance to *Service Problem Management*.

Service Problem Management then carries out one of the three following alternatives:

Alternative a

9a) If there is no problem, *Service Problem Management* sends the actual service performance to *Problem Handling*.

10a) *Problem Handling* informs the customer of the actual service performance as well as *Retention & Loyalty* for future reference and *Customer QoS/SLA Management* so that any steps initiated can be terminated.

This flow alternative then terminates.

Alternative b

9b) In some cases, *Service Problem Management* requests automatic resource restoration procedures from *Resource Trouble Management*.

10b) *Resource Trouble Management* undertakes the required procedures and sends details of the actions to *Service Problem Management*.

11b) *Service Problem Management* informs *Service Quality Management* of the corrective actions.

The flow continues at step 17.

Alternative c

9c) In other cases, *Service Problem Management* requests *Service Configuration & Activation* to undertake the required corrective actions.

10c) *Service Configuration & Activation* will require changes to be made to the underlying infrastructure per contractual agreements. This requirement will be sent to *Resource Provisioning* for activation.

11c) *Resource Provisioning* undertakes the required resource configuration changes to ensure that resources meet service KQIs.

12c) *Resource Provisioning* generates updates for *Manage Resource Inventory*.

13c) *Resource Provisioning* reports the results of the changes as well as the time taken and all other infrastructure and operational parameters to *Service Configuration & Activation*.

14c) *Service Configuration & Activation* generates updates for *Manage Service Inventory*.

15c) *Service Configuration & Activation* reports on the actions undertaken to *Service Problem Management*.

16c) *Service Problem Management* sends details of the corrective actions to *Service Quality Management* for incorporation into ongoing service quality monitoring and management.
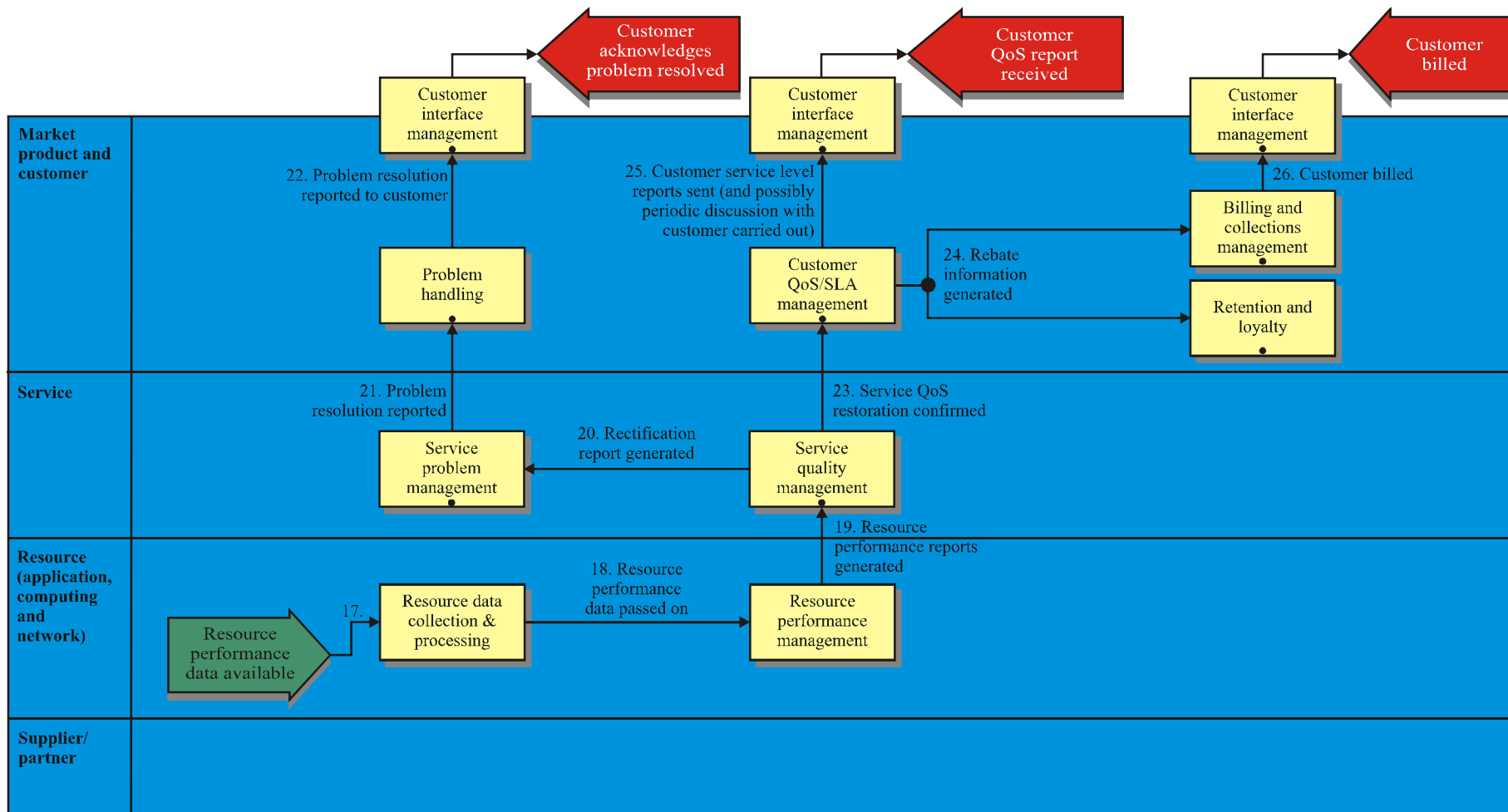
Figure 8.11/M.3050.3 – Customer Detected SLA Violation. Steps 17 to 26

17) Notifications and performance data are collected from the service-providing infrastructure by *Resource Data Collection & Processing*.

18) *Resource Data Collection & Processing* sends performance data to *Resource Performance Management* for further analysis.

19) *Resource Performance Management* sends resource performance reports to *Service Quality Management* for QoS calculations and averaging to maintain statistical data on the supplied service.

20) *Service Quality Management* analyses the resource performance reports and sends a rectification report to *Service Problem Management* when it establishes that the problem has been resolved and that the service is meeting its KQIs.

21) *Service Problem Management* reports that the problem has been resolved to *Problem Handling*.

22) *Problem Handling* informs the customer and receives acknowledgement from the customer that the problem is resolved.

23) *Service Quality Management* reports the problem resolution to *Customer QoS/SLA Management*. *Customer QoS/SLA Management* checks the details against the customer SLA and establishes that an SLA violation has occurred.

24) *Customer QoS/SLA Management* reports the violation rebate to *Billing & Collections Management* for billing adjustment and to *Retention & Loyalty* for future reference.

25) The customer is notified in semi real-time about the actions taken on their behalf.

26) *Billing & Collections Management* bills the customer at the end of the billing cycle with the SLA agreed treatment included.

8.3.3 Assessment

During the assessment phase, SLAs are examined to determine if they still fit the business needs. There are several triggers for the assessment, including periodic either per service or overall, customer-triggered reevaluation, customer exit, etc. Figure 8.12 shows Case A where customer SLA needs have changed because the customer's business needs have changed and there is no SLA meeting these needs, leading to an assessment of the potential for an enhanced product SLA. Figure 8.13 shows Cases B and C where internal assessments at the Customer and Service layers lead to a realignment of infrastructure support for SLA parameters and service KQIs respectively. In these flows, Level 3 processes from the Operations Support & Readiness vertical are included for increased clarity.
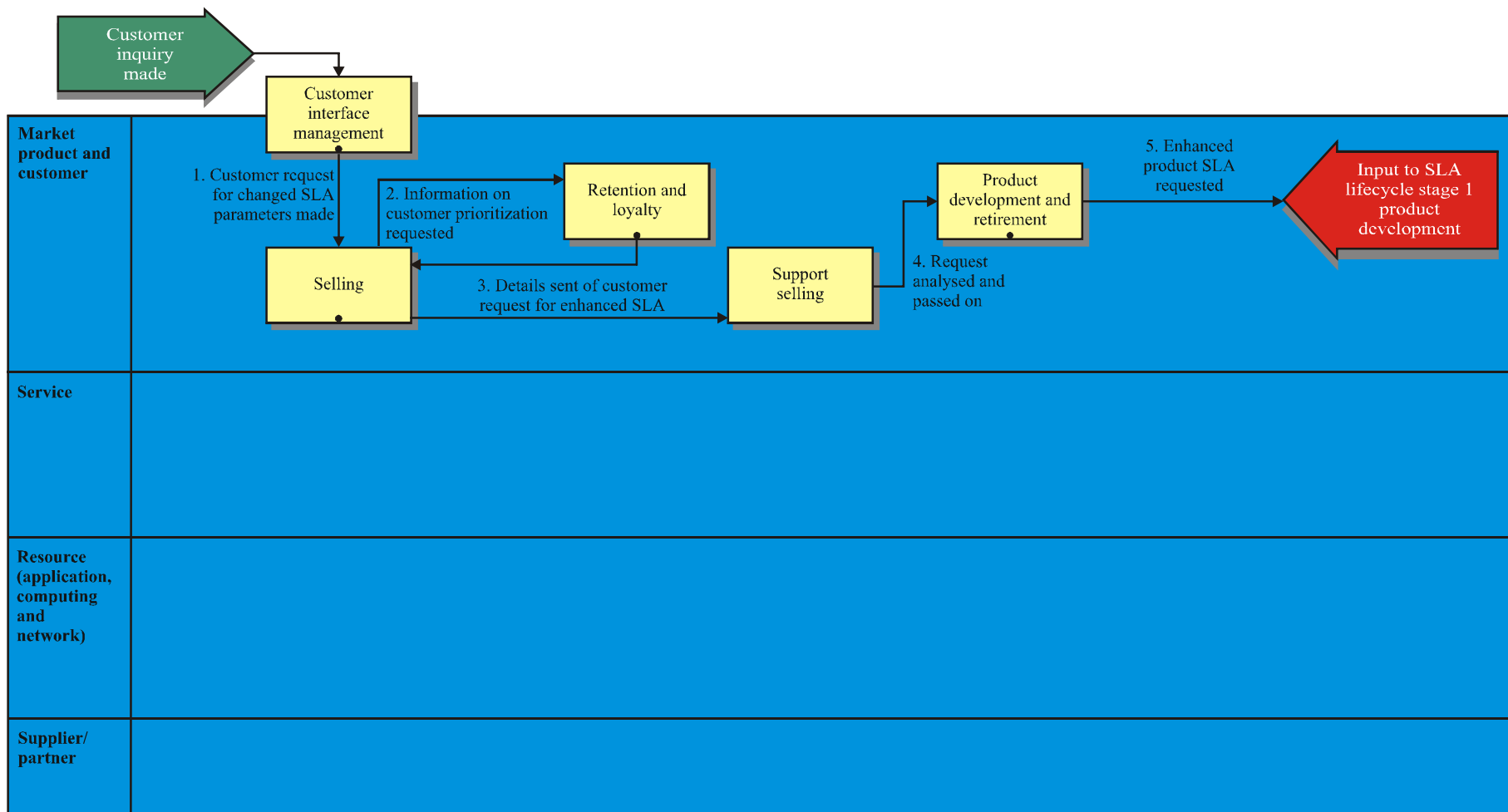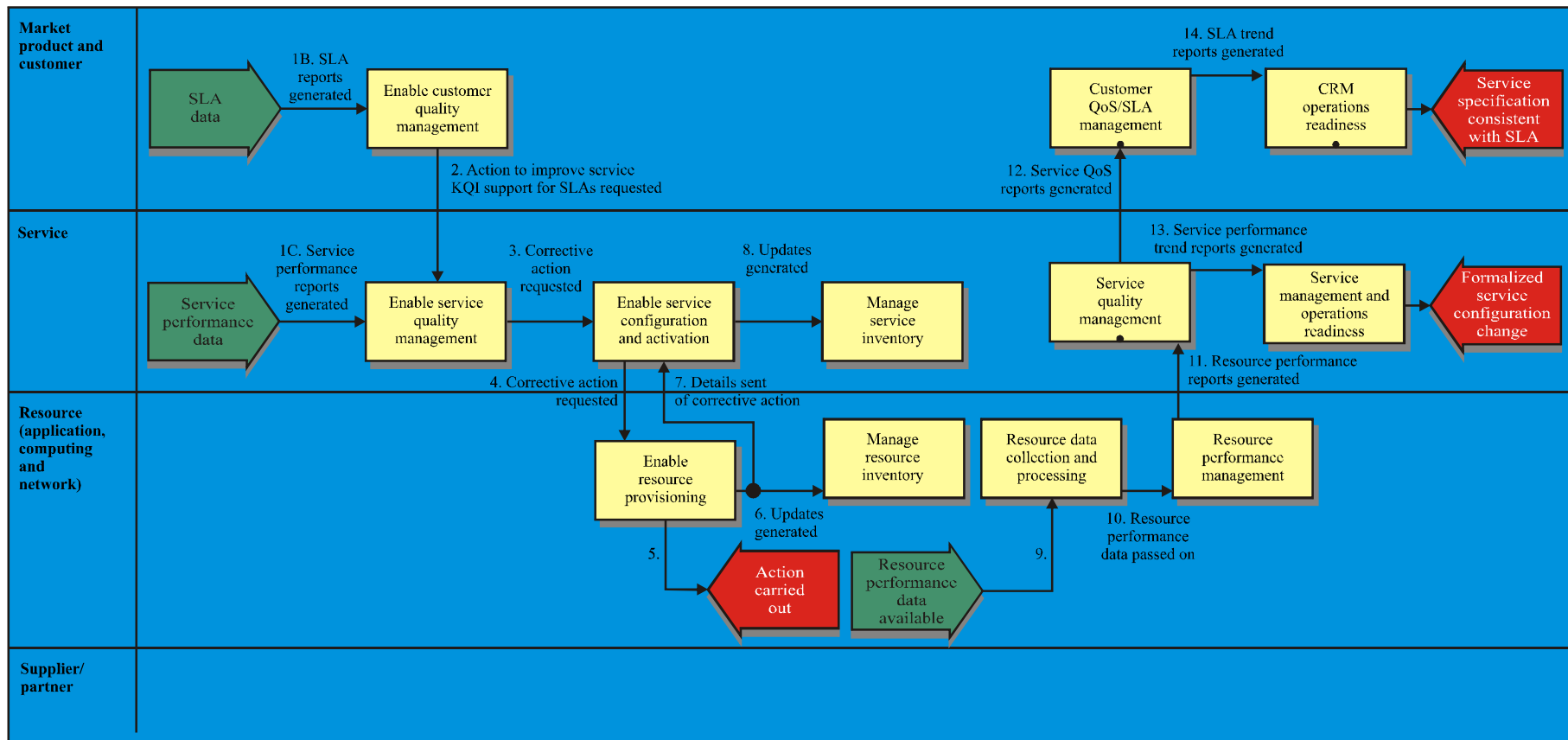
Figure 8.12/M.3050.3 – Assessment initiation
Case A: Customer needs have changed

The steps shown in Figure 8.12 for Case A are as follows:

1) The customer discusses changed requirements with *Selling*.

2) *Selling* checks the significance of the customer with *Retention & Loyalty*.

3) *Selling* is unable to meet the customer's requirements with existing product SLA(s). It sends details of the customer request to *Support Selling* for analysis.

4) After analysing the request, *Support Selling* passes it on to *Product Development & Retirement* for a reassessment of the existing product SLA(s).

5) *Product Development & Retirement* reassesses the SLA parameters and sends a request for development of an enhanced product SLA to the product planning processes.

Figure 8.13/M.3050.3 – Assessment initiation
Cases B and C: Internal assessments at the customer and service layers

The steps shown in Figure 8.13 for Cases B and C are as follows:

1B) *Enable Customer Quality Management* receives SLA reports for trend analysis (mainly from *Customer QoS/SLA Management*). *Enable Customer Quality Management* establishes that given SLAs are being violated too often, require excessive rebates, and that the service KQIs are not supporting the product KQIs.

1C) *Enable Service Quality Management* receives service quality reports for trend analysis (mainly from *Service Quality Management*). *Enable Service Quality Management* establishes that the service being provided is not meeting the required levels on an average basis.

2) *Enable Customer Quality Management* requests *Enable Service Quality Management* to undertake the required service class KQI improvements so that they will support the SLAs more adequately.

3) *Enable Service Quality Management* analyses the problems and requests *Enable Service Configuration & Activation* to undertake the required corrective actions to improve the service class KQIs.

4) *Enable Service Configuration & Activation* requests changes in the infrastructure from *Enable Resource Provisioning*.

5) *Enable Resource Provisioning* takes corrective action to ensure that resources meet the service class KQIs.

6) *Enable Resource Provisioning* generates updates for *Manage Resource Inventory*.

7) *Enable Resource Provisioning* reports details of its actions to *Enable Service Configuration & Activation*.

8) *Enable Service Configuration & Activation* generates updates for *Manage Service Inventory*.

9) Notifications and performance data are collected from the service-providing infrastructure by *Resource Data Collection & Processing.*

10) *Resource Data Collection & Processing* sends performance data to *Resource Performance Management* for further analysis.

11) *Resource Performance Management* sends resource performance reports to *Service Quality Management* for QoS calculations and averaging to maintain statistical data on the supplied service instances.

12) *Service Quality Management* analyses the resource performance reports received and sends overall service quality reports to *Customer QoS/SLA Management* so that it can monitor and report aggregate technology and service performance.

13) *Service Quality Management* sends service quality reports to *Enable Service Quality Management* for trend analysis where it is established that the service being provided is now meeting the required levels on an average basis.

14) *Customer QoS/SLA Management* sends SLA reports to *Enable Customer Quality Management* for trend analysis where it is established that given SLAs are now consistent with SLA requirements.

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[GB917]   TMF, GB917 SLA *Management Handbook*, Public Evaluation Version 1.5.

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