

THE SIGNIFICANCE OF ASL AND ITIL AM FOR APPLICATION MANAGEMENT

Recently two reference models for the application management domain have been available on the market: ASL and ITIL Application Management. Many questions have been posed about their position in relation to each other. This article endeavours to clarify matters in this respect.

ITIL AM deals with the ties between users and their ICT organisation, and with those aspects that need to be considered in the course of application development in order to create applications which can be readily managed. ASL covers what needs to occur within the application management processes and how the latter relate to each other, and by doing so helps structure and improve an application management organisation.

Authors: Machteld Meijer (Getronics PinkRocade) and Hans Boer (IBM Global Services)

Rationale

In 2001 a book entitled *ASL, een framework voor applicatiebeheer* (Van der Pols, 2001) appeared on the market, thereby bringing the Application Services Library (ASL) into the public domain. The English version ASL, a framework for Application Management has been published in 2003 by Van Haren Publishing (ISBN 90-77212-05-1). The book provides a description of a framework of processes in the field of application management based on best practice. However, there was a danger of confusion arising when ITIL published a book called *Best Practices for Application Management* (OGC) in 2002. This must have been a relief for a number of people, because ITIL was finally devoting attention to the domain of application management, which had been neglected until then. However, the assumption that ASL would become a superfluous standard following the publication of this book, is unfounded. This article shows that both reference models play their own role and serve their own purpose.

The essence of ITIL Application Management

The primary purpose of *ITIL, Best Practices for Application Management* is to provide support for the development and maintenance of applications viewed from the perspective of IT service management. In this respect, ITIL AM contributes to the development of manageable applications and to the prevention of the occurrence of the familiar situation in which applications are 'thrown over the wall', if little consideration has been devoted to the implications of their management. ITIL AM offers IT service managers an insight into the role that they should be playing throughout the entire life cycle of an application, and hence also in relation to the execution of a process which is not specific to them, namely, application development.

Within ITIL AM application management is defined as a superset of application development and service management (see Figure 1). This is a different definition from the one that is common in the Netherlands as defined by Looijen and Delen (1995) and with which ASL also ties in.

ITIL: 'Application management is the superset, which describes the overall handling, or management of the application as it goes through its entire life cycle. This life cycle encompasses both the application development phases and service management activities.'

As such, ITIL actually indicates that it does not recognise application management as a separate discipline.

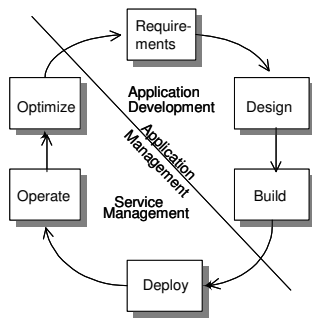


Figure 1 – Application management according to ITIL (source: OGC)

ITIL AM describes a number of matters which are vitally important when structuring an application management organisation, such as the relationship between ICT organisations and their customers, fleshing out specific roles, the capabilities of a management organisation, how one uses the expertise which people have available, and also how IT management techniques can help maintain relations with the relevant users.

ITIL AM does not describe how applications should be managed. However, it does cover a number of aspects which can be referred to when establishing processes for the development and maintenance of applications.

The life cycle of applications which ITIL AM refers to, describes the various stages through which an application passes from the time it is required until that when it is no longer used. In each stage of an application's life cycle service management can add value and play a role when defining and or verifying requirements from the perspective of management. When developing applications the requirements for their management are as important as those pertaining to their functionality. Within each stage roles are defined within the perspective of service management, which need to be fleshed out while the applications are being developed in order to make them easier to manage.

Alignment of ICT to business

Approached within the context of ITIL AM, the principle underlying the value of ICT lies in the contribution which the latter makes to fulfilling the demands made to it from the business perspective. This means that the demands of the business must always be considered in all the operations pursued by an ICT organisation. Technology is deployed to service the business and not for its own sake.

The starting point involves the examination of the relationship between a business and its ICT strategy. Here we are using the strategic alignment model developed by Henderson and Venkatraman (Henderson and Venkatraman, 1993). Using this model we will examine the various types of collaboration which can exist between a business and ICT and the role of the latter in relation to the former. The following four approaches to the *alignment* of business and ICT will be discussed:

- ICT as a **cost centre**;
- ICT as a **profit centre**;
- ICT as an **investment centre**;
- ICT as a **service centre**.

It has been observed that various approaches occur within organisations depending on the relevance of ICT to a specific feature of business. This is how ITIL AM seeks to provide the means for determining what a business actually demands in the way of services from an ICT organisation.

ITIL AM then indicates how important it is to be familiar with an organisation's key business drivers in order to ensure that its ICT is properly aligned with it. An ICT organisation's KPIs (key performance indicators) must be drawn from those of the business features which ICT supports. ITIL AM discusses everything within the context of a Strategic Alignment Objectives Model (SAOM).

Then ITIL AM deals with the question as to whether an ICT organisation is indeed capable of supplying what a business demands of it, in other words whether the ICT organisation has the appropriate capabilities, and it offers some tips as to what to examine in order to determine this. Should the ICT organisation be unable to provide the requisite support, it is possible to source the services that are to be provided, from an external organisation utilising different forms of collaboration.

By way of an aid for the determination of the manner in which business processes are supported by ICT, an application portfolio is introduced: a repository of metadata about the applications which support the relevant business processes. It is a useful aid for monitoring the utilisation and performance of applications but naturally does not in itself yield a portfolio of applications which tie in closely with the interests of the business concerned.

Bringing the capabilities of an ICT organisation into line with business requirements

Once the requisite services have been defined and the performance required of an ICT organisation has been produced from the relevant key business drivers, it is imperative to determine whether the ICT organisation is able to satisfy these demands and can also continue to do so. In this respect ITIL AM assumes that matching the capabilities of the ICT organisation with the demands of business is an ongoing process, in other words, the changes that continue to be required, represent the only constant in this alignment. This requires an ability on the part of an ICT organisation to be able to adapt to changing demands constantly.

Where an organisation is highly dependent on ICT, the latter consequently constitutes a business risk which needs to be managed. In an optimum situation the capabilities of an organisation are regularly monitored and assessed, following which the organisation is able to adapt. The Software Engineering Institute's CMMI (Capability Maturity Model Integrated) and the ITIL book *Planning to Implement Service Management*, are cited as monitoring tools, yet ASL self-assessments (Deurloo, 2003) and IT Service CMM (Niessink, 2001) can also play a role depending on the relevant objectives (Meijer, 2001, 2002).

Naturally, it is possible to source some of the capacity which is required but is not available, by collaborating with an external organisation (outsourcing, co-sourcing or partnership).

Cooperation and application management

ITIL AM indicates that application management depends on a good, effective team in order to produce qualitatively superior applications (team dynamics). In other words, the people who perform the work and the cooperation between them represent the most important factors for the achievement of proper application management. Reference is also made to the importance of having a common goal and a thorough understanding of the business in which one works.

As in the case of projects, application management involves exercising control over the tension between resources, the product that is to be supplied, and the available time. In order to control this assessments must be performed and standards need to be drawn up, based on which it is possible to evaluate a team's performance.

Another aspect which the book considers in detail, is how expertise and experience are shared, as well as the findings of data analysis (financial information, system details and so forth) using knowledge management. Following a brief discussion of knowledge management it considers the latter's significance for application management in the various stages of an application's life cycle.

The description is not exhaustive. Amongst other things, little attention is devoted to the significance of knowledge management for actual management. However, it does devote attention to added value when application management occurs.

Managing the relationship between business and ICT

The chapter on managing the relationship between business and ICT deals with the influence which applications have on the quality of the services that are provided, by establishing a link between them and a specific business feature. What contribution does an application make in relation to efficiency and cost savings? How essential is a business process and consequently the relevant application?

It is stated that by determining the characteristics of applications one can establish a relationship between the quality of an application portfolio and the contribution made to a business on this basis. Quality attributes can be used for the purposes of 'objectively' determining this quality (Hertroys, Boer, 1998).

The application life cycle

With regard to those aspects described above, ITIL AM thus deals with the importance of matching business demands to an ICT organisation and of constantly determining whether the service provided by the latter still satisfies the requirements that have been set for this purpose. What still remains is the application production and maintenance process. In this respect it is important for one to ensure that the results of this process do not disrupt the level of the quality of the service provided. More to the point, this process should ensure that the level of service provided to the business is boosted even further.

ITIL AM does this by providing a description of an application life cycle before dealing with those aspects which are important in this respect for the provision of qualitatively superior service by an IT management organisation. This ensures that attention is constantly devoted to the provision of service based on the application that is to be created, and that this is not determined subsequently. The subsequent determination of whether an application satisfies the requirements for providing proper service, is a source of discussion and irritation, and constantly generates conflict between a development organisation and an IT management one. In this respect the development organisation generally manages to gain the support of the business, as the latter also wants any functionality that has been developed, to be put into service as soon as possible. This is true when viewed both solely from a business perspective and on the basis of a personal interest in completing the relevant project within budget and on time. However, the result is often that the IT management department is required to provide a service based on an application which fails to satisfy the requirements made of it as of the very first day.

It is therefore important that the interests of IT management be properly secured during the process of creating and maintaining applications. ITIL AM bases its description of an application's life cycle on the assumption that there is a process of development which is followed by one of service management. This constitutes the beginning of a cycle which is constantly followed in respect of every subsequent version of an application. As the cycle is followed ITIL AM specifies in the case of each stage the manner in which attention needs to be devoted to aspects of service management.

Non-functional requirements

- Manageability
- Efficiency
- Correctability
- Installability
- Controllability
- Maintainability
- Operability

- Etc...

Figure 2 – Non-functional requirements of applications

If we take the requirements process as an example, we can see that only a limited amount of attention is devoted to determining the functional requirements and that it is mainly directed towards matters such as non-functional requirements, those pertaining to usability and change cases. A manageability checklist (see Figure 3) is an important tool that is used in this respect and which is employed in all stages of the life cycle. This checklist is used to establish a link between standard ITIL service management functions and those activities to which attention needs to be devoted during the execution of the relevant stage.

Service Management Functions	Examples of requirements phase manageability checks
Configuration Management	Identify environment that application will need to run in'
Change Management	Specify change cases' Specify the level of changes that the application can accommodate'
Release Management	Identify how applications need to be released, including what makes up a release' Identify
Incident Management	Identify how to handle errors in
Availability Management	Determine whether the requirement is 7x24x365'
Service Level Management	Identify what level of service the business needs'
.....

Figure 3 – Examples taken from checklist to ensure the development of manageable applications

In this way one can more or less guarantee that one is aware of the various aspects of service management. In addition, ITIL AM specifies in the case of each stage which roles need to be dealt with during application development or maintenance when viewed from the perspective of service management, and what the purposes are of this involvement.

The chapter which describes the stages of the life cycle, constitutes the essence of the book. The following section on ASL mainly concerns comparisons with this part of the book.

The essence of ASL

In this part we will briefly deal with the structure of the ASL framework. Here the emphasis is placed on those aspects and processes in respect of which ASL and ITIL AM differ from each other, so as to establish a basis for a description of the way in which the models are used in the following section.

The Application Services Library (ASL) consists of a process model for application management based on years of practical experience supplemented with best practices for structuring processes and organisations. The aim of ASL is to flesh out the requirements that are set for application management as a link between business information systems management (the management at the client and user end, formally indicated with functional management) and technical infrastructure management, thereby professionalising application management. These requirements pertain to uniformity, manageability, reliability, comprehensibility and the outlook for the relevant application management organisation. ASL complements ITIL, which in its extrapolation of best practices chiefly

focuses on professionalising a service organisation in relation to technical infrastructure. In this respect application management is the discipline which maintains the functionality and operation of the relevant application (the software). ASL seeks to use applications to provide optimum support for business processes throughout the latter's entire life cycle.

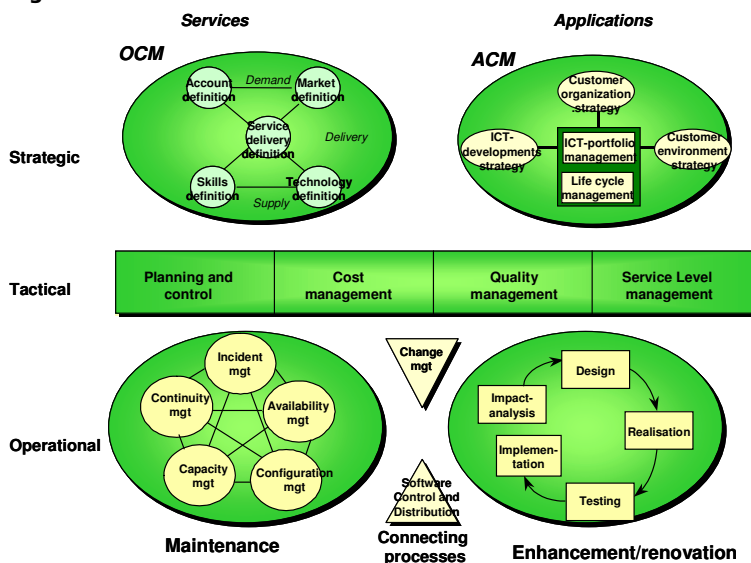
ASL shows that many problems pertaining to the management of ICT can be traced back to communication difficulties. In order to limit the breakdown of communication a number of mechanisms may be implemented within the context of application management, such as service teams, service level agreements and maintenance purposes, and the proactive sharing of ideas about the future of the support provided for the relevant business processes with the aid of applications.

Within the context of ASL application management is regarded as a collection of operational, management and strategic processes. They cover both service-oriented processes and those focusing on applications (products). The main features of these processes are described within the ASL framework.

The ASL Framework

The ASL framework can be broken down into six clusters of processes from the operational to the strategic level.

Figure 4 – ASL framework



The ASL framework is depicted in Figure 4. The clusters of processes and the latter themselves are dealt with in greater detail below. In this respect a relationship is established with ITIL in general and ITIL AM in particular.

Maintenance

The maintenance cluster contains the processes which most closely resemble those of ITIL. Applications are there to be used. Maintenance processes need to be executed to ensure the optimum use of these applications. Within the context of application management these maintenance processes ensure that business processes receive the best possible support with the aid of the applications that are in service, with a minimum of resources and as little possible disruption to operations. This means keeping applications running and ensuring that they support an organisation's day-to-day operations. In practice these activities can readily account for 20% to 40% of those comprising application management.

Within the technical infrastructure management domain similar processes occur which have the same goal. However, at issue is the undisturbed operation of the hardware and the networks on which the relevant applications run.

Figure 5 lists a few examples of the various items in the different environments.

Item	Application Management	Technical infrastructure management
Subjects of calls which trigger incident management	<ul style="list-style-type: none"> program error command to change incidental processing command request for information 	<ul style="list-style-type: none"> normal output not received functions constantly slowing down job held up due to lack of space (internal notification) authorisation problem
Service call (example)	<ul style="list-style-type: none"> 'the results of the calculation are incorrect' 	<ul style="list-style-type: none"> 'the printer is not working' 'MS Word is failing to respond' (KA environment)
Cause responsible for a user being unable to work properly (example)	<ul style="list-style-type: none"> program error 	<ul style="list-style-type: none"> network or server malfunction
Configuration management object (example)	<ul style="list-style-type: none"> system documentation program source code (also packages and maintenance versions) data definitions test files and scripts SLA and other contracts 	<ul style="list-style-type: none"> servers PCs network hubs system software
Capacity management measures	<ul style="list-style-type: none"> tuning (access path analysis) purging archiving alternative data storage non-standardisation of database model 	<ul style="list-style-type: none"> install fast processors expand memory increase printer capacity
Aspects of availability management	<ul style="list-style-type: none"> running the appropriate processes at the right time determining and transmitting appropriate processing data, time and order to the technical administrator 	<ul style="list-style-type: none"> running job as commanded or according to production plan
	<ul style="list-style-type: none"> mean time to remedy program error mean time between application failures determine file storage times 	<ul style="list-style-type: none"> mean time to repair printer mean time between failure of operational processing ensure files are stored
Security management (authorisation)	<ul style="list-style-type: none"> application authorisation 	<ul style="list-style-type: none"> authorising jobs technical implementation of authorisation
Continuity management (contingency action)	<ul style="list-style-type: none"> contingency test: <ul style="list-style-type: none"> test contingencies: <ul style="list-style-type: none"> documentation maintenance procedure development environment arrange software escrow 	<ul style="list-style-type: none"> contingency test: <ul style="list-style-type: none"> system up and running files can be accessed contingencies: <ul style="list-style-type: none"> production environment printers and desktops establish contingency infrastructure

Figure 5 – Different items in the case of application management and technical management

Within ITIL the maintenance processes are not dealt with as part of ITIL AM but are regarded as generic IT service management ones, comprising part of the service-delivery and service-support processes. ITIL descriptions devote limited attention to the specific aspects of the substantive management of applications.

Enhancement and renovation

Organisations' business processes change. Because information systems are closely related to these business processes, applications will need to change in order to ensure that they can be used to their full extent. The enhancement and renovation processes of ASL ensure that the relevant applications are modified to accommodate new needs and requirements due to changes in an organisation and its surroundings. The necessary adjustments are made to data models, the software and documentation.

In particular, ITIL AM describes what attention should be devoted to during application development, so as to make it possible for one to manage and operate the relevant application properly at a later stage. Within its enhancement and renovation cluster ASL

describes what action one needs to take and the stage of modification during which this should occur. Some of the items described as part of this cluster can also be used in the course of application development. Following the 'optimise' stage of ITIL AM (an assessment to determine whether an application needs to be modified) a new life cycle is started for the purposes of these modifications (see Figure 6). This second and the subsequent life cycles may be compared to the ASL maintenance stage but are not described separately within ITIL AM.

The processes which ASL has included in the enhancement and renovation cycle, are also largely dealt with as part of ITIL AM (see Figure 1), albeit not from the perspective of maintenance but from that of development. Consequently, where the design process covers the modification of the design of existing applications within ASL, in ITIL AM it is concerned with the creation of designs for new ones.

ITIL Application Life Cycle Stages	ASL Processes
1st life cycle	
Requirements	<i>Application development</i>
Design	
Build	
Deploy	
Operate	<i>ASL management processes</i>
Optimise	
2nd life cycle	
Requirements	Impact analysis
Design	Design
Build	Realisation
	Testing
Deploy	Implementation /software control and distribution
.....

Figure 6 - The ITIL life cycle stages as opposed to the ASL approach

Connecting processes

In the case of ASL the change management, and software control and distribution processes represent the elements connecting the two clusters of operational processes. Change management constitutes the inbound route in the direction of enhancement, while software control and distribution make up the outbound route in the direction of maintenance. Change management defines and administers the logistics of change, while software control and distribution are responsible for the logistics of physical items within an information system.

In ITIL Version 2 (2002) the process of software control and distribution was replaced by release management. This process includes software control and distribution, on the one hand, but also comprises activities relating to planning, creating and implementing releases.

Like ASL, ITIL includes a process of change management. This process manages changes. However, in the case of ITIL the assembly of releases, which occurs as part of the change management process within ASL, takes place within the context of release management.

Management processes

It is preferable for application management and maintenance operations to be managed in relation to each other with regard to time, funds, and external and internal quality. Within

ASL the management processes are responsible for the common direction of the operational ones in respect of maintenance as well as enhancement and renovation. The management processes are fed by the following two clusters that are to be discussed. They represent the policy input. The strategic and operational levels feed the management processes and are in turn fed by the latter. Both the future and day-to-day reality are therefore anchored in these processes.

Within ITIL this management is spread over the service delivery processes.

Strategic processes

It has already become apparent in this article that ITIL AM also devotes attention to business ICT alignment. In this respect the importance has been outlined of bringing ICT services into line with the relevant business processes. ITIL AM mainly devotes attention to those aspects which are relevant and the technologies that can be used, whereas ASL describes the procedures which may be followed in order to perform the activities concerned.

Applications Cycle Management

Applications Cycle Management (ACM) is a cluster of processes, which is responsible for defined long-term strategy for the various applications used for the overall supply of information within an organisation of users or customers in relation to the long-term policy of this organisation. The users organisation is thus at the heart of this cluster of processes.

ASL refers to a portfolio of applications which support business processes. As such, this denotes all of the physical applications in question.

Reference is also made to an application portfolio within ITIL AM. In the latter's case this refers to a repository of data concerning the applications that are in service.

Organisation Cycle Management

Organisation Cycle Management (OCM) is a cluster of processes, which focuses on the development of a vision of the future for an ICT service organisation and the translation of this vision into policy on upgrading the services provided by this organisation. ITIL AM does not deal with this matter.

Service as opposed to application-oriented

Expressed in the terminology of Looijen and ASL, application management focuses on supporting business processes with the aid of applications throughout the life cycle of these processes.

Two aspects can be identified in this definition. The first is the perspective of 'supporting business processes with the aid of applications'. This entails ensuring that these applications are always running and that they support an organisation's day-to-day operations, hence the ongoing provision of services based on proper arrangements about the level of service, the restoration of this level as expeditiously as possible in the event of any discrepancy, the prevention of malfunctions, and ensuring that the ICT service provider facilitates the provision of new services through its timely response to them. The focus is consequently on the provision of services, the services that are provided, and the use of the applications (along with the management of the relevant infrastructure) which make this possible. Service management therefore constitutes an important part of application management. Compared with the order used in ITIL, this has actually been turned on its head in ASL. In ITIL the service management processes constitute the core. Here application management represents a specific aspect of it: one of the resources for the provision of services lies in the applications, which are also managed.

The second aspect is 'the life cycle of these processes'. Organisations evolve and their surroundings and markets change. In order to ensure their constant optimum performance the information systems which support them, need to keep pace with them. This entails the modification of applications to accommodate current and future technical and functional requirements. This is an aspect which ITIL also clearly acknowledges. Application-oriented

processes account for the bulk of the costs involved in application management. Usually, far more time and money are devoted to the maintenance of an application than even to its original development. This is precisely why it is important to describe the manner in which professional maintenance occurs and where it differs from development.

The use of ASL and ITIL Application Management

This section discusses the differences and similarities between ASL and ITIL Application Management viewed within the context of use. In addition, we will show where these models overlap and how one can deal with this.

We can view these two standards in relation to each other from different vantage points.

Scope

ITIL Application Management is predominantly concerned with aspects of application management in the course of the development and to a lesser extent the maintenance of applications, and with the importance of business IT alignment. ASL covers the management (service management), maintenance and upgrading of applications, the manner in which this is directed, and the policy and strategy pursued in relation to application management.

Focus

ITIL AM focuses mainly on making applications more manageable. ASL concentrates primarily on describing application management processes.

Use

ITIL AM is certainly useful where IT service management wishes to become more involved in the application development and maintenance stages and where those involved in this development and maintenance would like to acquire a better understanding of what is required for the production of easily manageable applications. Here the emphasis is placed on their proper management within a technical infrastructure management environment. The main benefits which ASL offers application managers, lie in the improvement of their processes, thereby enabling them to provide qualitatively superior services and products. To IT service management ASL's added value is to be found in the fact that it devotes attention to differences in service management within the perspective of technical infrastructure management (infrastructure) and application management.

Business IT alignment

ITIL describes an approach based on a strategic alignment model (Henderson and Venkatraman) including control methods. ASL describes processes designed to ensure that the relevant services and application portfolio address customer requirements. The standards complement each other fully in this respect.

Organisational maturity

A large degree of experience and a significant level of maturity are demanded of an application development or maintenance organisation, if it wishes to use ITIL AM properly. This is because such an organisation must be willing to look beyond its own confines to consider the interests of IT management organisations – and hence also the relevant customer's interests – in the course of development. In practice, it appears that this does not occur very often.

The effective use of ASL makes far fewer demands in terms of organisational maturity. The only demand which ASL makes, is that one is serious when one sets out to structure and improve an application management organisation. Amongst the tools available for this purpose is a self-assessment based on which it is a simple matter to define the most important action required for improvement (Deurloo, 2003).

SEVERAL FINAL REMARKS

ITIL AM actually shows that application management is not recognised as a discipline. As such, it demonstrates that there is a fundamental difference in its outlook in relation to ASL. This consequently gives rise to heated debate in the course of which ITIL devotees view ASL as something which is already covered by existing ITIL and application development processes.

This does not mean that one needs to choose one of these two views and consequently also opt for one of the two models.

One can draw the greatest possible added value from these two standards by genuinely using them as reference models. If an organisation is *starting* to establish its application management processes, ASL provides greater support in this respect. The aspects covered by ITIL AM certainly offer added value when setting up some of the processes. Still, it is always advisable to look at the other elements of ITIL in so far as they may be relevant, such as the service management processes, for example. This is in itself important in order to flesh out technical infrastructure management properly.

However, if an organisation has already established application management on the basis of fleshing out ITIL processes, it would also be advisable for it to consider incorporating aspects of ASL into them. For example, this would apply in the case of application portfolio management as well as to assess the manner in which one responds to malfunctions in the production environment. There is a chance that technical infrastructure management will cope with the consequences in many situations instead of devoting attention to the cause of the malfunction. The cause may lie in a different use of the application concerned, which may actually render it advisable to modify this application. ASL includes far more information about how one can structure application management processes, which may be used as a benchmark.

Irrespective of whether one has set up one's application management processes on the basis of ITIL or ASL, it is a useful exercise to examine the manner in which an organisation currently creates, implements and maintains applications in the light of ITIL Application Management. There are still a good many organisations in which the production of applications which can be managed and maintained properly, is not yet considered to be a feature of the quality of a product that is to be created, even though applications constitute an essential part of the components on which the IT services that are to be provided, are based, and they consequently have an important role to play in the continuity of business processes.

In short, both standards offer added value and it is really imperative that in our capacity as users we are not dogmatic and deal with the available models in a pragmatic fashion.

Dr Machteld Meijer is a senior consultant with PinkRocade, specialising in the fields of ICT process improvement and quality management.

Hans Boer is a managing consultant with IBM Global Services, specialising in the fields of business ICT alignment and ICT process improvement.

Literature and sources

- Deurloo, K, Van der Pols R. and Sieders, R., *ASL-zelfevaluatie: ASL-diagnose voor organisaties*, Ten Hagen & Stam, The Hague, 2003.
- Henderson J.C. and Venkatraman N., 'Strategic Alignment: Leveraging Information Technology for Transforming Organisations' in *IBM Systems Journal*, Vol. 32, No 1, 1993, pp. 4-16,
- Looijen M, *Beheer van informatiesystemen*, Kluwer, Deventer, 1995

- Hertroys P.A.W. and Boer H.: 'Service Level Management als brug tussen ontwikkeling en beheer' in *Management & Informatie*, No. 6, 1998
- Meijer M, *ASL, Software CMM en IT Service CMM : een vergelijking van drie modellen*, Versie 2.0 at www.aslfoundation.org , October 2001
- Meijer-Veldman, M. 'ASL en CMM, wanneer gebruik je wat?' in *Informatie*, 2002, 10, The Hague, Ten Hagen & Stam.
- Niessink F., *IT Service Capability Maturity Model* at www.itservicecmm.org., 2001.
- OGC, *ITIL: Best Practice for Application Management*, TSO, London, 2002
- OGC, *ITIL: Service Support*, TSO, London, 2000
- OGC, *ITIL: Service Delivery*, TSO, London, 2001
- Van der Pols R., *ASL: a framework for application management*, Van Haren Publishing, 2004.