

CUSTOMER NEEDS AND STRATEGIES

SOA in Local Government — A Solution for Local Communities, as Implemented by Inter Access for the Municipality of Ridderkerk

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IDC OPINION

This study provides an example of the effective use of service-oriented architecture (SOA) in a mid-sized enterprise with limited IT resources. This example shows an innovative approach that makes it possible to deliver adaptable applications to the public via the Internet as well as to front-office staff. Target organizations for this solution are local government municipalities in the Netherlands, so the solution is generalized to accommodate the wide range of scale of operation determined by the size of individual municipalities. The particular implementation described here uses a hosted approach to the deployment of the SOA infrastructure and run-time environment, leaving the legacy applications executing within the data center of the municipality.

IDC believes that this example of SOA deployment shows:

- SOA provides business benefits that are not beyond the reach of small IT operations, provided that appropriate technology and implementation assistance are employed.
 - The adaptability offered by SOA means that a generalized solution can be implemented by organizations with similar requirements but very varied starting points (in terms of legacy applications deployed, availability of technical resources, required transaction rates, etc.).
 - SOA makes it realistic that a hybrid hosted/in-house deployment can be made to work successfully, in this case by hosting the SOA infrastructure at a service provider while leaving legacy applications in place.
 - There is a gradual penetration of generalized services being made available by central government and substantial bodies such as banks, with the potential of very high levels of reuse.
 - The impact of changes in the underlying legacy applications can be isolated from other components of the architecture by relatively simple changes to the XML messaging.
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IN THIS STUDY

This study details the experiences gained in the implementation of citizen-facing local government services. The solution described here is generalized for Netherlands local government institutions, and the specific implementation that is the focus for this study is for the Municipality of Ridderkerk. ICT service provider Inter Access has used a service-oriented architecture (SOA) approach to integrating backend systems through an Oracle-based middleware layer so as to provide a composite application delivering a consistent interface for citizen and front-office interaction. The study shows an example that uses an ASP delivery approach to enabling leading-edge deployment of SOA solutions at a medium-sized enterprise with limited in-house IT resources.

SITUATION OVERVIEW

The Municipality of Ridderkerk

Local government in the Netherlands is divided into 467 different communities (municipalities), each of which, in law, is an autonomous unit required to perform various services on behalf of its citizens and central government. There are extreme variations in size of these municipalities. The Municipality of Ridderkerk, close to the large city of Rotterdam, is one of the smaller municipalities, serving around 45,000 citizens and employing around 350 staff altogether. Of these, the IT organization comprises only seven staff.

As can be imagined, the autonomous nature of these bodies, and the differences in scale, have led to many variations of IT infrastructure to deliver what are essentially similar services. The services are supported by numerous back-office applications, and the traditional user interface has been via a front-office function where a number of manned service desks (this number varied between four and nine in the case of Ridderkerk) provide a human interface for in-person visitors or to process paper-based forms. In common with many local and national government organizations, little attention had been paid to surveying its citizens to establish how these clients would prefer to interact with the available services.

The process of making the services more available to clients was started in 2001 with the establishment of a "virtual community" concept. This was as a result of an initiative of "VIAG" (the association of IT managers in local government) for public services to be more outward-looking. It was recognized that citizens would need a single point of contact that would provide access to all services, and that single interface should be available via a number of entry points to include, but not restricted to, the Internet, email, telephone, and in-person visits. However the top priority was seen to be the provision of a single physical front desk, where staff would be provided with a single composite application through which to provide greater responsiveness in addressing client needs.

A "citizen service" project was established to develop an integration solution in partnership with the municipalities of Ridderkerk, Arnhem, and Tiel, and with the Benelux-based ICT service provider Inter Access. It is worth emphasizing that the primary purpose of the project was to enhance the accessibility of services to the public. "Accessibility" in this sense includes a single point of access, consistency of use across multiple services, availability of services from multiple connection points and devices, and the continuous availability of services outside of the normal hours of business. Cost saving was not put forward as a business target. This aim on its own puts the project several years ahead of mainstream thinking, which at the time was focused very heavily on cost reduction.

Inter Access

Inter Access is a 25-year-old ICT service provider that is based in Hilversum, the Netherlands, and operates throughout the Benelux region. It is privately owned with reported 2004 revenues of greater than €100 million, of which €75 million was services revenue. Inter Access employs around 900 staff, making this the largest independent systems integrator in the Benelux region.

A deliberate decision has been made to target the specializations within the company towards the implementation of Oracle and SAP enterprise application suites, and the use of IBM WebSphere, Oracle database and application server, SAP NetWeaver, and Microsoft .NET application platform technologies. It has achieved the highest level partner status for each of these specializations. Inter Access' business consultancy unit operates independently of the vendor specialization teams to provide unbiased IT strategy assistance.

The adoption of the skills needed for these target specializations has been accelerated by acquisition, in particular of the EBS consultancy with specialist Oracle skills. At the same time, some non-core operations have been spun off, reducing the company size from around 1,100 to the current 900.

Inter Access segments its target market towards the two vertical markets of public sector and trade and industry, and focuses on the medium enterprise of 20 to 2,500 seats. Typical customers fall within the range of 200 to 2,000 seats.

The company has developed particular skills in using integration to reduce costs and improve adaptability, and is rapidly adopting SOA as a primary capability. This vision is formally defined and promoted in a very open fashion through a strategy booklet made available to all employees.

In addition to traditional systems integrator project work, Inter Access provides hosted services for Oracle and SAP enterprise applications, with some 6,000 seats already deployed using their hosted application services. Inter Access differentiates this hosted services offering from earlier, unsuccessful ASP models through its implementation of separate instances for each customer instead of the more normal shared applications approach. This has allowed for successful deployments where there are strong security requirements. Contracts are based on "per seat per month" providing considerable flexibility to scale costs according to demand.

The role of Inter Access in this project is that of a full partner, sharing the development costs and risks along with the three participating municipalities.

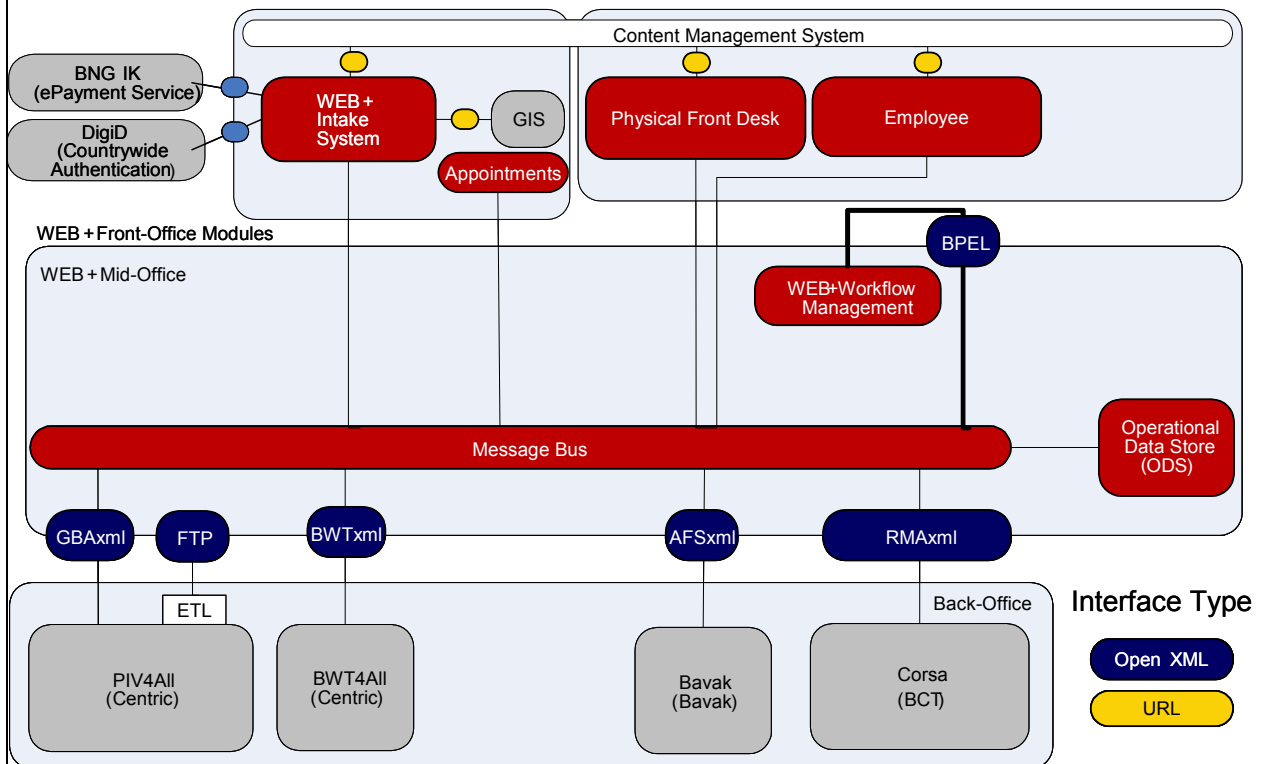
"Citizen Service" Project Details

Project implementation commenced in early 2004 with the aim, ultimately, to have citizens being able to drive back-office systems without human assistance. The first live deployment was made in October 2004. This implementation period of around six months included a degree of "wait time" while scope and design decisions were being made. The approach taken was to develop a scalable integration solution that would be portable to different municipalities where different combinations of back-office applications were in place. Typically, municipalities will have around 300 such back-office applications, of which some 20–30 are significant. The implementation at the Municipality of Ridderkerk is currently quite small in scope, but with further services planned for near-term integration.

Figure 1 shows the architecture adopted.

FIGURE 1

Schematic of SOA Implementation at Municipality of Ridderkerk



Source: Inter Access, 2005

The intention is to leave in place the established back-office applications and to maximize the reuse and longevity of these systems. The "mid office" tier fills the role of enterprise service bus, providing message transformation, routing, and persistence, and additionally caching information in an operational data store. The front office is a new composite application used by staff in the physical front office, but also made available to the public via the Internet, and capable of supporting access from different device types.

Mid-Office Layer and the Use of Oracle Fusion Middleware

The heart of the system is the mid-office layer. This is constructed entirely on Oracle Fusion Middleware and database products. The Oracle Fusion Middleware tools are felt by Inter Access to be technically complete, particularly with respect to integration.

Although the initial design was started before Oracle announced its acquisition of Collaxa, the Collaxa product — now the Oracle BPEL Process Manager — offered reduced complexity and greater adaptability, and so became the choice for the orchestration component. This is the most important component of the mid office layer. It provides technology-independent mapping between all of the services that need to be invoked to satisfy user requirements. The constraints imposed by the currently supported level of the BPEL standard means that the BPEL Process Manager performs "technical orchestration" rather than "process orchestration." By this it means that the engine provides transformation, message routing and sequencing, but the more complex process orchestration decisions are managed externally by Java-based logic.

Oracle tools are used throughout to monitor exceptions and to provide visibility into workflows and individual tasks, providing many of the attributes of business activity monitoring (BAM). The metadata that describes and drives the mid office layer is maintained by Oracle Studio.

One of the primary requirements was to extend availability to 24 x 7, but in many cases the back-office applications are either unable to support this requirement, or else the additional cost of providing 24 x 7 support for these applications could not be justified. The solution adopted is to selectively cache information from back-office applications into the mid office layer, and this role is performed using the Oracle 10g database. Hence a citizen who has initiated a building planning request, for example, can track the progress of the request over the Internet, even out of hours when the supporting back-office application is unavailable. This mid-office cache is treated as an operational data store (ODS) and maintained in a consistent state with the corresponding back-office systems. The ODS is populated initially by conventional extract, transform, load (ETL) utilities, but thereafter is maintained in a consistent state with the operational systems by subscribing to appropriate messages flowing through the mid office message bus.

In addition to the process management and connectivity performed by the mid office, the mid office also provides integration with document management (the DMS/RMA function). To do this, the mid office automatically converts data from HTML into .pdf (Adobe standard). Information is entered electronically, whether by front desk staff or directly by citizens, is converted to electronic documents that can be delivered as hard copy, can be routed as part of a workflow or can be stored as legal document. The introduction of this type of mid office resulted in significant time savings for some processes (from ten days to two days in a typical process), again improving the level of service provided to citizens.

In the case of the Municipality of Ridderkerk implementation, as has been described, the entire mid office layer is hosted by Inter Access on its blade server with virtualized storage, the whole environment being replicated for disaster recovery. The current facility has approximately 150 blades at the primary site, sized at approximately 50–60 users per blade. Oracle's grid manager is deployed by Inter Access to permit dynamic resource provisioning to vary the physical resources made available to the mid office application as the workload varies.

Security Constraints

Security, performance, and availability were identified early on as critical factors. Availability, as described above, has been resolved by the intelligent use of caching in the mid office. Performance has not been an issue so far, helped by the ability provided by Oracle grid manager to dynamically assign resources. However, some design compromises had to be made in order to achieve the required level of security.

Inter Access maintains a UDDI service metadata registry that provides all the information needed to dynamically invoke the services that are made available by the back-office layer. However, this presents a potential security exposure, and the solution implemented has been to use a firewall to block access to all calls except those originating from the Oracle BPEL Process Manager. This places the BPEL engine in the loop for every message that goes through the system, effectively performing the role of proxy to any service requests. SSL encryption is implemented for all messages. The need for this solution is due to the lack of support for WS-Security in the version of the BPEL Process Manager currently deployed by Inter Access. The deployment of a later version that supports appropriate Web services security standards should remove the constraint placed on the architecture and permit dynamic service invocation. The acquisition of security infrastructure vendor Oblix (with its identity management technology) by Oracle could see a resolution to this in a short timeframe.

The deployment of an identity management tool would ease the current security constraints by providing controlled access to Web services to more than one user. Effectively, this would provide firewall-type security managed at the level of individual users, permitting controlled access to Oracle Process Manager and individual services. The identity management solution from Oblix also supports the WS-Security standard, which provides message-level authorization.

In addition to the controlled access provided by identity management, HTTPS could continue to be used to mask the content of a message.

Note that an option would have been to use a third-party Web services security product to achieve the required level of security. It would also have been possible to have used a third-party business process engine to provide extended process automation. However a decision was taken to keep within the Oracle product set, both to avoid skills fragmentation and to simplify the technical architecture.

Back-Office Layer

The initial set of services incorporated in the Municipality of Ridderkerk implementation are legacy back-office applications that provide registrar functionality and planning consent. The application in Figure 1 named "PIV4All" provides comprehensive services for the registration of births, marriages and deaths, plus notification of change of address and other related activities. The "BWT4All" provides planning consent functionality, covering aspects such as planning a new building, extending or demolishing buildings, etc. These applications are both provided by Centric.

Adapters provide the critical capability of accessing the legacy applications as services. This presented some initial difficulty as Centric did not at first support an XML interface or see the need to provide one. Being "green screen" applications, no convenient API was available to provide an entry point into the applications.

The solution implemented was to build custom adapters using screen-scraping technology from Engage! This has proved a satisfactory solution. It works functionally and is adequate for the moderate volume of transactions to which it is subjected. It provides full bi-directional interaction, with the ability to initiate a service request, transform this to an input screen, and then to transform the resulting screen map into a service result message. This is a good example of the ability to surface legacy applications as services in the absence of source code or specific application knowledge. However, this approach is dependent on the stability of the screen layouts used. Any changes to the screen layout require changes to the mapping in the screen-scraping product, resulting in increased maintenance costs.

Subsequently, Centric has made available versions of their applications that will accept XML as an alternative to screen-based interaction. This shows a growing recognition in the application vendor community that the SOA model is gaining momentum and must be accommodated within applications of all types. The solution implemented by Centric uses a proprietary XML dialect, so the implementation of this new application interface (after the system went live) shows the degree to which technical challenges can be isolated and the impact reduced. The work to change the back-office layer from screen scraping to the native XML interface took only three days effort over an elapsed time of three weeks, showing the adaptability of the architecture.

The back-office layer includes an archival system that stores a persistent copy of all data — structured and unstructured — that is maintained by subscription to messages flowing through the message bus. The archival system is the Corsa document store provided by BCT, a Netherlands-based software company.

The Bavak system provides functionality for making appointments. This application provides a hard-coded interface to the front-end application, so should be considered to be outside of the scope of the SOA solution.

XML Message Types

GBAxml, BWTxml, AFSxml (scheduled), and RMAxml are open standards. Where the first three messages are very domain-specific, the last (RMAxml) is by structure very generic. The message format can support document exchange between applications and is implemented as the interface to the Corsa/BCT document store.

Front-Office Layer

The front-office application provides composite access to back-office services presented as number of portals. The primary functionality exposed by the application in its current deployment consists of social security and benefits, building planning and local tax (domestic and business rates). For example, when a citizen moves from one rented house to another, a change of residency notification can be sent automatically to the local government. Another example is that on reaching the age of 65, citizens can apply for a "65+ benefits pass" and in addition for modifications to their house make it easier to continue to live there independently.

Web+ uses internally developed web forms that after completion are automatically converted into .pdf, which can be filled in online by citizens, or filled in on their behalf by front-office staff. The front-office application creates XML from these forms, and the information content drives appropriate activities through the mid office layer. The entire forms are made persistent in the Corsa document store.

A geographic information system (GIS) is integrated with the front-office application to provide an interactive mapping interface. The system already knows the coordinates of an individual citizen so can display an appropriate section of map through the interface. Using this a citizen can show the precise location of a proposed building, or a tree that needs to be felled, etc.

The front-office application is used primarily by public-facing staff at physical front-office desks, but is also available to the community via the Internet. No formal launch has been made of the public availability of the service with the wish to avoid a sudden order of magnitude change in transaction volumes, but a steady increase is being experienced in public self-service access through word of mouth awareness.

Use of External Web Services

A small number of generic interfaces to central government have been enabled as Web services, and the use of these has been incorporated into the municipal government solution. These Web services are invoked directly by the front-office layer as needed, without any need for changes to back-end applications. Important among these Web services are:

DigiD

DigiD is the digital identity management service for citizens. It provides a secure single sign-on capability for local and central government services in the Netherlands. Once a citizen has established a digital identity, secure access can be established with a number of electronic services. Depending on the security requirements of the selected service, DigiD will prompt for an appropriate level of user identification, ranging from simple username and password through to PKI.

BNG IK Payments Service

Some services offered will require an associated payment — such as printing official documents of birth certification. To manage this type of payment, the Bank Nederlandse Gemeenten (an independent bank, but jointly owned by local government communities in the Netherlands) has established a Web service that can be initiated by any appropriate application. There is a high level of reuse of this service.

Currently, both DigiD and BNG IK are invoked directly by the front-office. Although these Web services are designed to operate as part of a service-oriented architecture, they have been integrated for the time being with to avoid the security constraints described earlier. It is expected that once the implementation of central identity management has taken place, this will resolve the remaining security issues and deployment of these secure services via the mid office will become possible. This will provide a more adaptable architecture, with less need for changes to the Web+ front-office application when functionality is added or altered.

Implementation Differences

As described earlier, three municipalities took part in this joint project along with Inter Access. This study primarily describes the experiences of the Municipality of Ridderkerk for three reasons:

- ☒ It was the first deployment of this solution.
- ☒ It is a small municipality and therefore of interest as an example of SOA deployments in the SME sector.
- ☒ Whereas Arnhem deployed the solution on their in-house servers, Ridderkerk and Tiel elected to use an ASP-style deployment on Inter Access' blade farm. Both have approximately 50,000 citizens.

This last point shows the potential of the SOA approach. The legacy applications in the back-office layer continue to execute on the established platform at the Municipality of Ridderkerk, while the middle and front-office layers are hosted and managed by Inter Access.

FUTURE OUTLOOK

It should be recognized that this is still early in the deployment phase of the project. The initial focus on improving access to services appears to be addressed well and no doubt there will be a considerable increase of self-help use of the supported services, as well as an extension of the number of services available.

As was described earlier, the prime motivation focus for the project has been to deliver this improved level of service. It is likely, though, that future phases will also look at improving cost-effectiveness. In this respect, it is likely that the capabilities of the architecture will be used to optimize the processes involved (as opposed to cutting the cost of individual activities). This should remove altogether the need for some costly tasks such as letter-writing while further improving the speed of response to citizen requests. The optimization of processes will be better served by the architecture when a higher level of functionality (through adoption of later versions of the BPEL standard) is available in Oracle's BPEL process engine.

Process optimization could bring significant benefits to municipalities. Each municipality supports around 1,000 processes with some 300 of these being public-facing. In the case of Ridderkerk, 53 of these are delivered digitally. Additionally, central government is looking towards greater involvement of municipalities in some centralized functions — such as the ability to apply locally for benefits that are administered centrally. This interaction with central government will fully exploit the type of architecture put in place by the project described here.

An important factor in the ongoing success of the project is to retain a positive attitude in the public-facing staff of the municipality. In the project so far there was initial reluctance by some staff and the system was rolled out initially to just a small proportion of staff. However, this attitude has gradually been replaced by a general desire to become better at proactively helping the citizen users of the services. In practice it has been found that the role of front-office staff is far more rewarding when they can see they are providing an improved level of service.

From the perspective of Inter Access, it now has a customizable and scalable solution that can be shown to provide an improved level of service to citizens, and which could attract a substantial customer base from the Netherlands' 467 municipalities.

ESSENTIAL GUIDANCE

While still at an early stage in its live use, the deployment of SOA at the Municipality of Ridderkerk reveals some lessons that will help others in their adoption of more agile IT applications:

- ☒ Getting the architecture right is at least as important (possibly more important) than the functionality of delivered solutions. If the architecture is right, the solution can be evolved as determined by experience and changing business needs.
- ☒ Size of organization need not be a constraint to the successful adoption of SOA — even a small IT operation can benefit from SOA given the right external support.
- ☒ The selection of a deployment partner such as Inter Access, which is prepared to take a share of the risk against the ability to reuse the solution in other implementations, is a large factor in being able to cost-justify the initial cost of deploying a SOA solution.
- ☒ The Oracle BPEL Process Manager has been shown to provide the required adaptability and to isolate the impact of changes from other parts of the system.
- ☒ Oracle's Grid Manager can be used to change the number of resources supporting different components of the architecture as work loads vary.
- ☒ Security management should be addressed early in the architecture design decisions, and should look beyond initial functionality to likely extensions outside of the organization.
- ☒ Hosting is a viable option for SOA implementations. In fact, SOA provides greater flexibility to adopt hosting for just those parts of the system that make sense in the particular set of circumstances.

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- ☒ *Application Architecture and Infrastructure for the Agile Business* (Doc #AD12K, January 2004)
- ☒ *Western European Integration Server Software Platform Competitive Analysis, 2003* (Doc #AD05L, July 2004)
- ☒ *Western European Database Management Competitive Analysis, 2003* (Doc #AD06L, July 2004)
- ☒ *Western European Application Server Software Platforms Competitive Analysis, 2003* (Doc #AD07L, August 2004)
- ☒ *The Virtualization of Data Management* (Doc #AD08K, October 2003)
- ☒ *Data Challenges in a Multimedia Message Service Center — The Use of Berkeley DB Embedded Database Within LogicaCMG's MMSC* (Doc #AD10L, November 2004)
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- ☒ *Cape Clear — Vendor Profile* (Doc #AD02M, April 2005)
- ☒ *European End-User Survey: Adoption of Service Oriented Architecture* (Doc #AD03M, April 2005)
- ☒ *Analysis of Responses to Delegate Survey Carried Out at SOA Conference, London, March 2005* (Doc #AD04M, April 2005)
- ☒ *Oracle to Acquire TimesTen — Increasing the Potential for Strong Data Management in the Service Layer* (Doc #AD52M, June 2005)

Synopsis

This study details the experiences gained in the implementation of citizen-facing local government services. The solution described here is generalized for Netherlands local government institutions, and the specific implementation that is the focus for this study is for the Municipality of Ridderkerk. Systems integrator Inter Access has used a service-oriented architecture (SOA) approach to integrating back-end systems through an Oracle-based middleware layer so as to provide a composite application delivering a consistent interface for citizen and front-office interaction. The study shows an example that uses an ASP delivery approach to enabling leading-edge deployment of SOA solutions at a medium-sized enterprise with limited in-house IT resources.

According to Rob Hailstone, IDC's Western European Software Infrastructure Research director, "An essential aspect of a mainstream computing architecture is that it should be an appropriate, cost-effective choice for the whole spectrum of organizations that deploy IT solutions. This study shows that, given the availability of good design and implementation assistance, plus competent middleware software, SOA can add value to the services delivered by a relatively small IT operation. We should expect further phases of this project to show still greater cost-effectiveness."

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