- **Monitor**. Performing continuous review of the operating environment.
- **Share and Inform**. Providing a broad range of information products to other organizations based on the activities it conducts.

Having agreed upon a set of core activities that describe the overall business of the agency the team began development of the organizationally-agnostic business model. As described in Martinez and Cane (2012), the authors chose the IDEF0[1] modeling technique to model the organization's activities, and swim-lane diagrams for the business processes. The model was developed using Microsoft Visio 2010 Professional Edition software. The Professional Edition was chosen because it supports IDEF0 modeling, albeit in a very rudimentary way that requires considerable manual review to ensure consistency among the models developed.

The model was developed starting at the top (A-0 or context) level, wherein all of the inputs, controls, outputs, and mechanisms (ICOMs) for the agency's core operational activities were defined. Figure 1 presents the A-0 diagram for the agency's core processes.

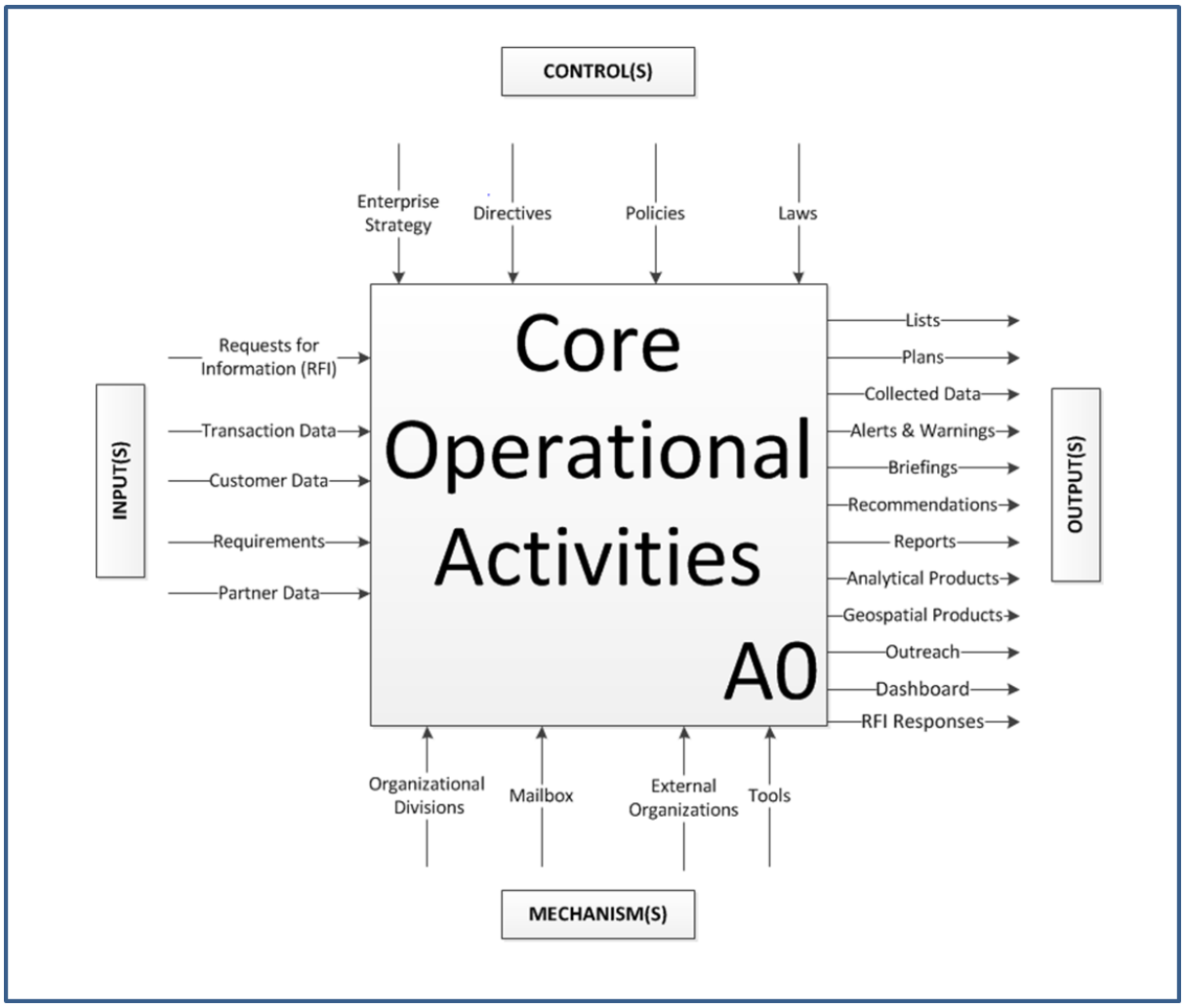

Figure 1. Top-Level (A-0) Agency Context Diagram

[1] Integrated DEFinition (IDEF) 0 is a standardized notation and approach for conducting business modeling.

As can be seen from this model, the agency complies with higher-level enterprise strategies, directives, policies, and laws (the controls), to transform various sorts of data (transaction data, customer data, and partner agency data) in response to various requirements and specific requests for information (RFI), to produce a variety of outputs. Among these outputs are:

- Planning documents such as operating plans and lists of product recipients
- Copies of the data it has collected and compiled
- Results of activities such as reports, geospatial and other analytical products, and briefings
- Alerts and warnings based on its monitoring of the environment
- Recommendations for action by other organizations or agencies
- Outreach to other organizations or agencies to share its collective knowledge and experiences
- Posting of information on a dashboard visible to higher levels of the enterprise
- Responses to RFIs

In support of the majority of its activities, the agency employs the three major organization divisions. However, it also draws support from some external organizations for specific capabilities that it does not organically possess. In addition, it uses a mailbox through which RFIs can be readily submitted and automated tools to conduct some of its analysis. Having defined the major core activities for the agency, the architects built the next level (A0) model to show the relationships among these activities. The A0 model is depicted in Figure 2. Note that due to limitations in the modeling tool, colors are used to illustrate linkages. Specifically, all ICOMs that originate or terminate external to the organization are typically depicted in black, unless there are multiple sources/destinations that make them hard to follow. Colors are also used to depict internal relationships. For example, *Plans* is colored red and *Lists* purple to show that they are outputs that serve as controls on other activities; *Request Collection* is colored green to show that it is an internal feedback to another activity; and *Analytical Results* and *Situational Awareness* are colored blue to show that they represent internal output-input relationships.

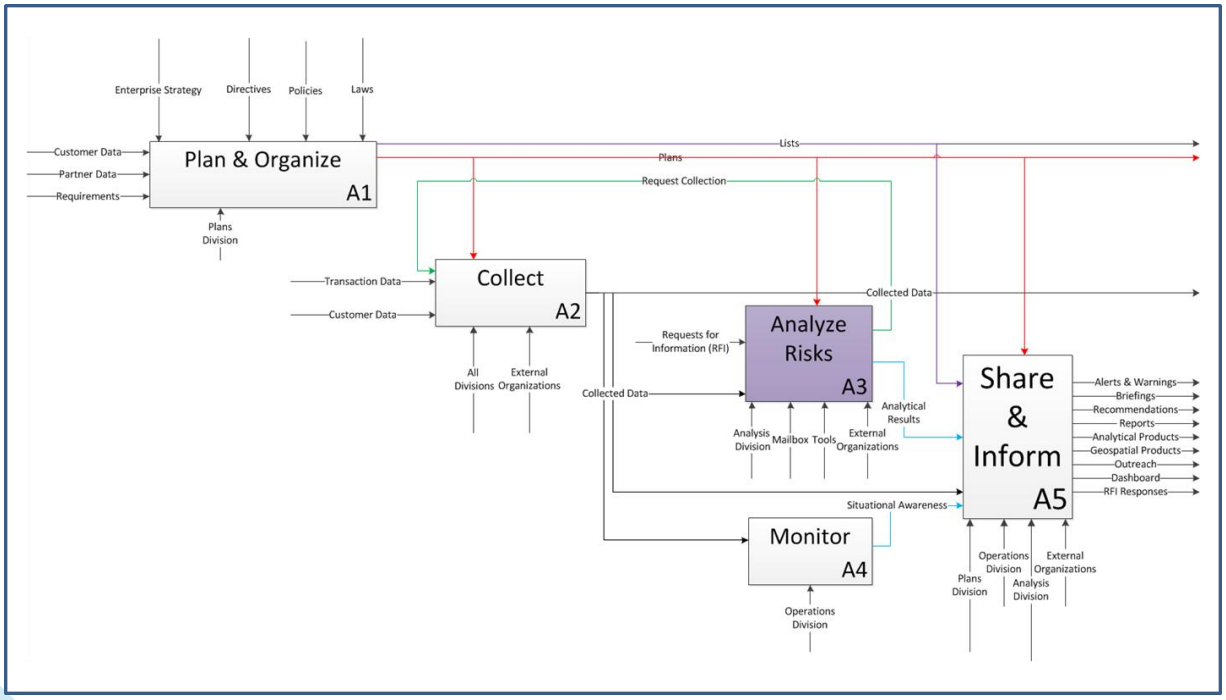

Figure 2. A0 Level, Major Agency Core Activities

At the A0 level, the team started allocating organizations to the various core activities based on the statements in the agency's planning documentation. The authors examined the statements in the plan for each organization, and identified which of the major core activities best summarized the activities described for a particular organization. For example, the *Monitor* activity is the principal responsibility of the Operations Division. Similarly, the *Plan and Organize* activity is the principal responsibility of the Plans Division. However, the planning document indicated that more than one organization was involved in conducting most of the other activities. For example, each organizational element was responsible for some *Share and Inform* activities and all Divisions appear to *Collect* data. At this level of the model, one can begin to see interactions among the activities. For example, the plans developed by the Plans Division serve as guidance for the work done by the other divisions.

Since this was a proof-of-concept effort, only one activity, *Analyze Risks*, was selected for a more detailed examination, hence, the color highlighting it in Figure 2. The next-level decomposition of the Analyze Risks activity is presented in Figure 3.

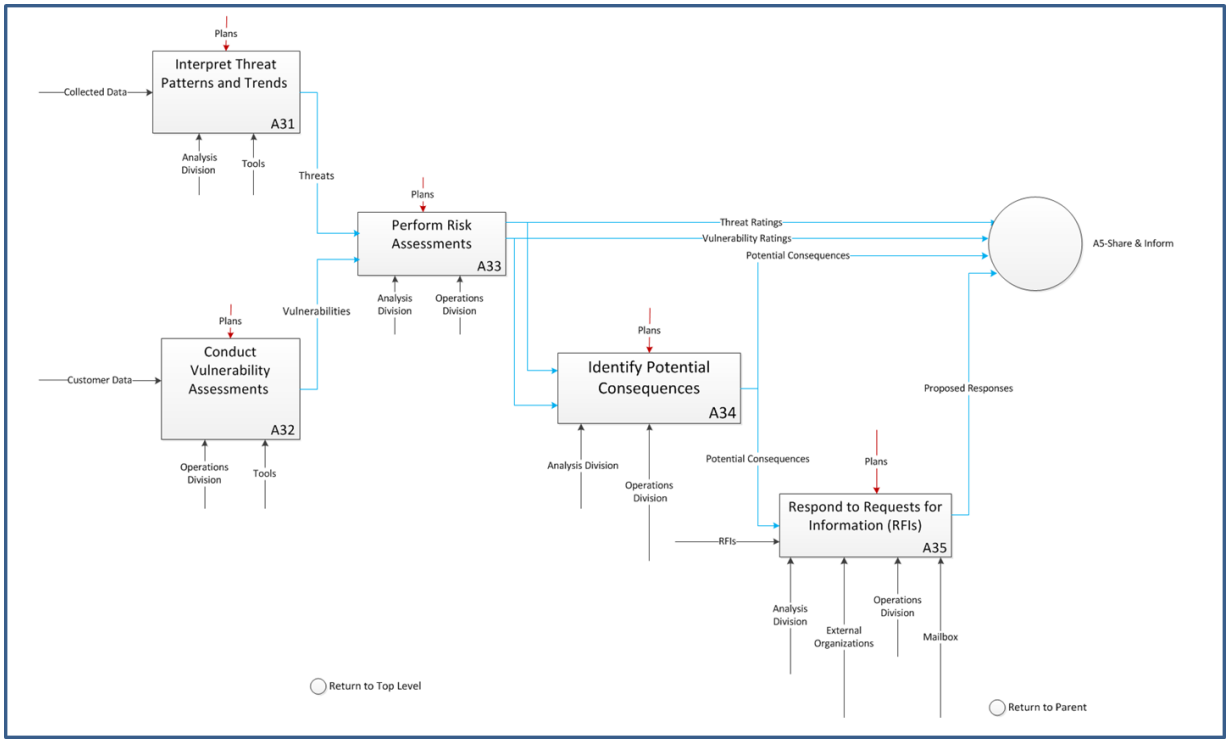

Figure 3. Activities Related to Analyze Risks

Development of this level required careful reading of the documentation and consultation with the agency's staff. For example, the Operations Division and the Analysis Division was described as responsible for conducting risk assessments. However, the two divisions actually perform complementary activities related to risk assessment. As shown by activities A31 and A32 in the diagram, the Analysis Division supports risk assessment by first examining collected data to identify threat patterns and trends. On the other hand, the Operations Division supports risk assessment by first examining customer data to identify vulnerabilities to threats. The activities of the two organizations come together in activity A33, Perform Risk Assessments, as specifically called out in the planning document.

In keeping with the organizationally-agnostic business modeling approach, this activity was further decomposed to determine any duplication of effort between the two divisions, or if, in fact, each one did something different. Figure 4 presents the further decomposition of A33, Perform Risk Assessments.

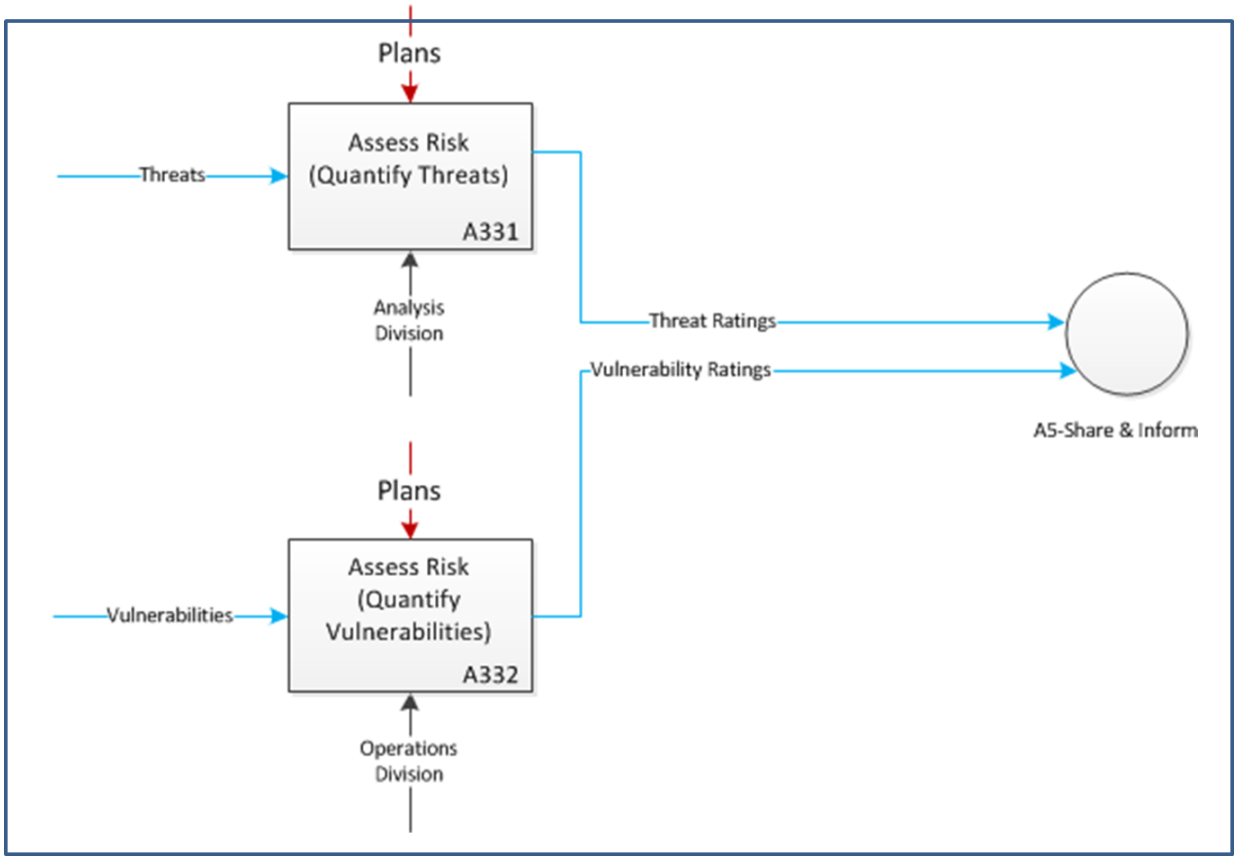

Figure 4. Further Decomposition of A33, Perform Risk Assessments

Closer examination of the documentation did not provide any explicit description of differences between the activities of the Analysis and Operations divisions. For each one, the specified activity was the same, Assess Risk, for which the specified output was a risk rating. Based on its discussions with the agency staff, the architects concluded that the only real difference between the two activities was that the Analysis Division was responsible for Assessing Risk by Quantifying Threats (converting Threats into Threat Ratings, while the Operations Division was responsible for Assessing Risk by Quantifying Vulnerabilities (converting Vulnerabilities into Vulnerability Ratings).

Again, because the model was developed only to demonstrate the process, no attempt was made to further decompose activities A34 and A35.

Figure 5 presents the full set of activities that were identified for this sample application in tree form. The activities highlighted in green represent the lowest (leaf-level) of the Analyze Risk activities.

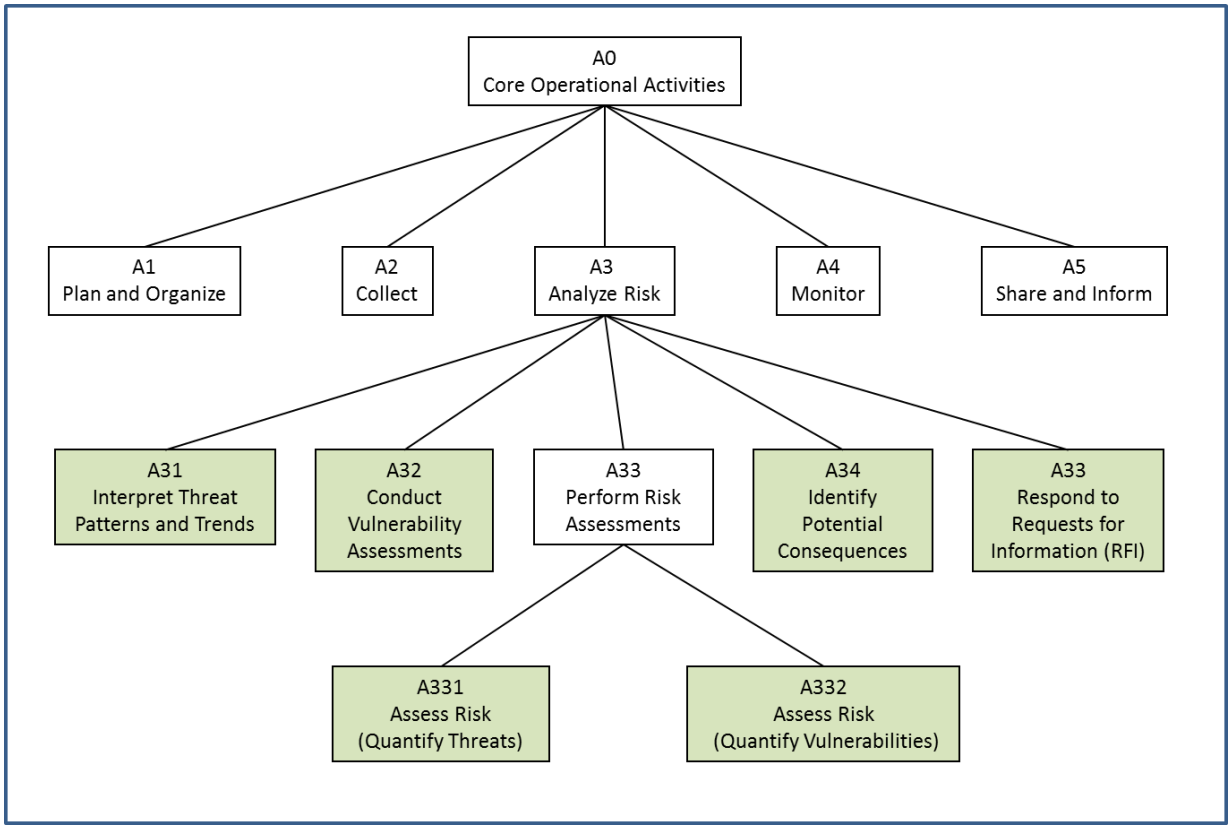

Figure 5. Lowest (Leaf-level) Analyze Risk Activities

These lowest (leaf level) activities (each performed by an individual organization) can be linked to show the sequential processes by which the organization produces the overall business results.

Based on the information captured in the IDEF0 activity models and by discussions with the sponsoring agency's staff, the information flows within and between the Divisions; were depicted as "threads" of information flows in the form of a swim-lane diagram, as depicted in Figure 6.

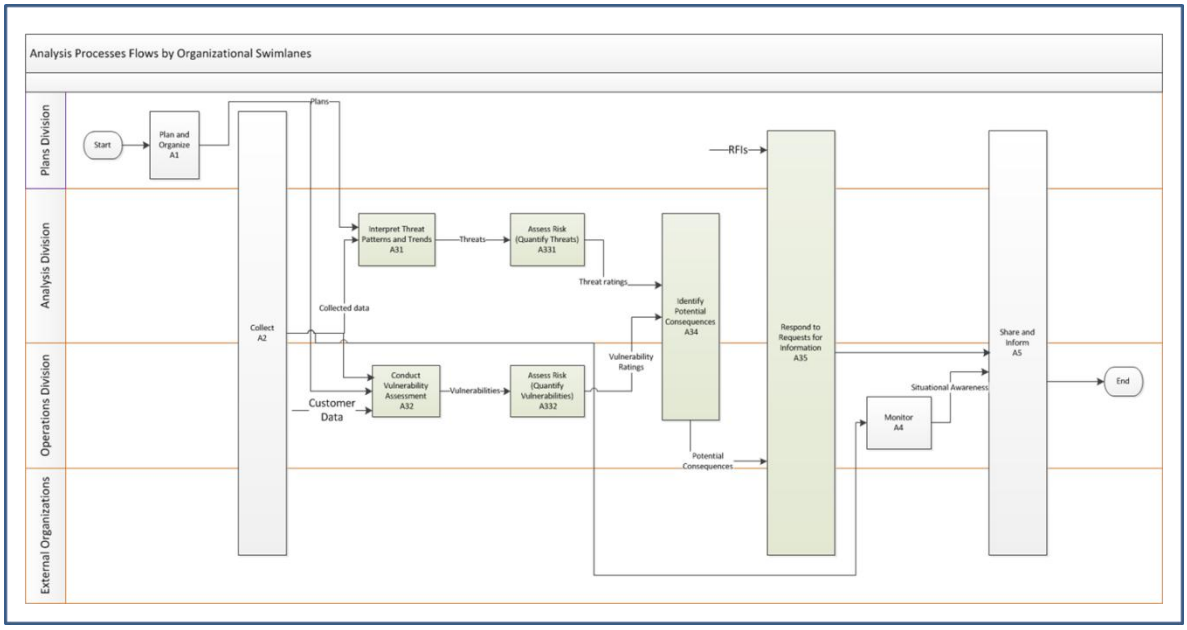

Figure 6. "Swim-Lanes" for the "Mechanism" Organizations to Show Information Flow

The Analyze Risk activities, highlighted in green, are presented within the context of the other core activities to show how they fit into an overall process for the agency.

As can be readily seen from the swim-lane diagram there are some activities depicted (A2-Collect, A34-Identify Potential Consequences, A35-Respond to Requests for Information, and A5-Share and Inform) that cut across multiple organizational lanes. This is because either the organizations conduct duplicate activities, or as is more likely, those activities have not yet been decomposed to a sufficient level to identify the particular organization responsible for conducting the activity. The only way to resolve the ambiguity will be to conduct more detailed analysis to determine who is really responsible for conducting the activity (for the As-Is situation), or who should be (the To-Be model).

As simple as this organizationally-agnostic activity modeling exercise has been, the authors believe that it offers opportunities for organizational realignment. For example, as depicted in Figure 6, the Analysis and Operations divisions appear to be conducting parallel sets of activities, some of which are so similar (i.e., A331 and A332) that they could possibly be combined and given to just one of the two organizations to perform. By further decomposing the activities that cut across several swim lanes, other potential opportunities for realigning organizational responsibilities against one consistent activity model may also be discovered.

In conclusion, through this sample real-world application, the efficacy of organizationally-agnostic activity modeling through IDEF0 and swim-lane modeling of the lowest level hierarchy activities is shown. More importantly, when combined with a visual presentation of the result, as demonstrated by the swim-lane diagram, the models readily point out potential opportunities for organizational realignment of responsibilities. When organizational changes are made, it is a simple process to update the IDEF0 models and to move the activities to the new swim-lane. This method enables continuous organizational improvement.

ACKNOWLEDGMENTS

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