This article discusses the business operations and processes of Resource and Capacity Management (RCM) that helps to be transform IT systems. This methodology helps to modify and integrate the current assets and tools in realizing end-to-end automated business processes using an SOA. We looked at the enterprise view of the RCM center, build the business component models, identify the hot components and develop an SOA solution layered enterprise architectural model. The business services are identified and transformed into candidate IT services by applying SOMA service identification and analysis technique. This case study also provides example of IBM'S CBM-SOMA methodology, IBM SOA solution in modernizing existing RCM IT systems and its business operations.

Introduction

Resource and Capacity Management (RCM) is an IBM resource capacity planning, monitoring & management and hiring center where IBM business unit's resource demands are fulfilled with existing available internal resources and if no internal resources are available or suitable, it initiates external hiring activities through the human resource department. The center carries out capacity planning activities for short term and long term durations as well as helps to absorb sudden fluctuations in demands arises from various units and regulate these demands for smoothening out its destination center, human resource department, operations for external hiring with its controlled hiring processes. The center always strives for excellence of nullifying demand and supply gaps.

The center has its five sources of resources for demand fulfillment from all business units. They are from rotation, roll-off, bench, hiring, SSP (IBM contractors) and graduate hire channels. Similarly the demands can be generated from three sources: 1. existing project engagement, 2. new engagement and 3. backfill demand. The backfill demand is for refilling the positions in the projects for resigned candidates.
This center is well established and periodically conducts audited business processes for carrying out all its day-to-day operations. Some of the important processes to mention are capacity planning process, fulfillment process; hiring execution, resource rotation, roll-off, bench management, SSP operations and GH hire processes. It uses IBM world wide strategic tools such as Professional Marketplace, Global Opportunity Marketplace, PD tool, Project DB, Lotus Notes based tools, and Microsoft® Excel for carrying out these processes.

An IBM's CBM-SOMA methodology is adopted in transforming the business processes to IT domain and its SOA-solutioned layer stack enterprise architecture model is leveraged for defining the RCM center enterprise architecture – to be model. This article discusses each section of enterprise architecture model in detail while optimizing the existing business process and defining the IT solution. During this process, a couple of times, workshops were organized with process owners, understood their current as-is processes, documented their current pain points with the existing processes and tools and proposed to-be process logical and physical models.

**Figure 1. A Demand - Supply view of RCM center**
RCM center – CBM map

Figure 2. RCM center CBM hot components

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<thead>
<tr>
<th>Direct</th>
<th>Control</th>
<th>Execute</th>
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<tbody>
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<td>Supply strategy and planning</td>
<td>Resource supply management</td>
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<tr>
<td>Demand strategy and planning</td>
<td>Resource demand management</td>
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<td>SSP operations</td>
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<td>Business analytics</td>
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Description of business components

**Supply Strategy and Planning:** Since the scale of operations being executed under GDC IBM India is high (as high as that of Geos), the resource supply strategy and planning are very important. This component is responsible for building strategies on hiring resources on short term and long term basis and accordingly preparing the hiring execution plans. This component takes care of business priorities, organization strategies at global level.

**Demand Strategy and Planning:** From the business growth plans of IBM as well as customer, future acquisitions and merger plans of customers and market driven strategies like adoption of new technologies, the resource demand strategy is built to meet organization goals. Accordingly the resource demand for long term is planned.

**Resource Supply Management:** This component is responsible for collecting supply information, generates a resource supply statement of employees, affiliates, joint ventures and contractors that can be used for short term and long term planning. It understands the Business unit needs for resources based on business priorities, strategic initiatives, and other considerations. It also has functionalities like creating profiles of needed resources and specified skill sets, derived from BU needs. The component analyses supply of resources both domestically and internationally. It builds initial workforce capacity plan based on existing resource supply and demand for specific skills.

**Resource Demand Management:** This component is responsible for collecting demand information and generating a demand plan consisting of firm (work underway), opportunity
(pipeline) and forecasted demand that can be used for both short term and long term planning. It develops a demand plan by matching resource supply to BU demand, identifying capacity gaps.

**Resource Administration**: This component ensures that correct resource information like JRSS, skill set, resume, DOJ etc are available in the respective repositories. It facilitates post on-boarding activities like on-boarding kiosk, on boarding DM talk for the hired resources. It also responsible for maintaining the practitioner score card. It also manages non-deployable resources in the context of LOA and long leave.

**Assign and Track resources**: This component assigns the supply of resources from all possible channels like roll-off, rotation, bench, hiring and SSP operations to the resource demand needs of different project accounts. It also tracks the resource end-date with project engagement, tracks resources for project rotation needs, tracks resources on bench. Its aim is to meet the targeted fulfillment plans of the organization resource demands efficiently.

**Resource Hiring**: This component acts as a broker between the R&CM and Staffing team for smoother execution (escalations, project specific hiring, and hiring events). It hires the right person for the right demand at the right time. It builds the hiring pipeline to meet variations in demand. It takes decisions based on conversion ratios of hires.

**Graduate Hire**: This component manage the campus hires as well as hires with less experience, less than 12 months. It builds the supply by providing necessary trainings and make them ready for the job. It deploys the graduate hires in the projects for both shadow period as well as actual deployment. It plans how many people to hire, which category, from which campus/company.

**SSP operations**: This component manages the sub-contractor hiring and deployment. It also manages the vendor relationship like strategic vendor, skill sets, outlook etc. It works on deployment of the SSP candidate in sourcing resumes, interview, working with procurement, on-boarding, termination/re-deployment etc.

**Business Analytics**: This component reports to measure performance, drive specific behaviors of R&CM and delivery. The adhoc reports generated by this component help to identify and provide solutions to problems. Some of its tools help in improving productivity of R&CM. It analyses to forecast, identify problems ahead of time and help to automate repeated manual procedures.

The Red color painted components shown in figure 2 is identified as RCM hot components for first priority of business transformation. The Yellow colors painted components are identified as "potential hot components" for second priority of business transformation.

**Current Pain Points**

**Fulfillment**

- Capacity planning cycle duration spans over a month. Time consuming manual process slowing various stake holders' decisions and correspondence causing to generate in-accurate capacity plan output in which latest dynamics of demand and supply entities are not taken into consideration.
• In-accurate fulfillment plan due to day-to-day changes in demand and supply availability.
• SSP processes are running as silos and no closed connectivity with current fulfillment and hiring systems.
• Resulted in lost revenue due to untimely filling of resources for the demands.
• Need to decrease work of extended RCM center execution staff like competence fulfillment manager, Practice Area fulfillment manager, Resource Managers and Deployment managers etc.
• Need to reduce demands with lacking of full specifications and its validation and reduce time required to resolve for fulfillment.

Hiring

• Generation of present hiring asks is laborious process and no streamlined collaboration or workflow among various stakeholders involved in finalizing the same.
• Presently RCM hiring and Human Resource department are working as independent big silos. All interactions between these two departments are manual and exchanges of information through excel sheets.
• Providing correct hiring details with fine details of JRSS to the HR staffing team is a challenge.
• Current position code generation for the new hires is manual process with 4 member team.
• Mapping and updating of current hiring requests with previous hiring requests for optimization.
• All hiring sub processes are manual.

Business Architecture decisions for To-Be Process models

Fulfillment System

• Current capacity planning process is a bottom approach where the un-solutioning demands drives the hiring after internal supply fulfillment requirements are met. In the proposed modernization, it is decided to follow top-down approach where the analytics based Supply plan drives the hiring in majority.
• Current capacity planning process is made to retire from the RCM operations.
• The demands validation process by PAL is brought outside the scope of RCM fulfillment process where the delays in validating demands will not be accounted for RCM fulfillment process. The validated demands become input to fulfillment process. In a nut shell, it is made as an upstream process.
• The solutioning is completed and fulfillment plan is prepared only for the demands which are required to meet within 45 days window.
• The current fulfillment solution not only considers available internal resources from various channels but also the current hiring requests which are in pipeline for external hiring to provide fulfillment planning.
• The external resources for fulfillment plan to be considered are IBM Regular hire ANOB, SSP ANOB, tech select, PDM select candidates.
• The hiring request against open seat PMP demand is created only when all internal resources and existing hiring requests based on supply plan fails to meet the demand requirements. In practice, these types of hiring requests constitute only 3 to 4 percent of total hiring requests.
• Provide demand priority score DPI figure for each demand based on attributes provided in the business rules document.
• Eliminate the concept of monthly or weekly fulfillment plan prepared on weekly basis. It is day-to-day ongoing process to provide solution for the 45 days of window for the demands generated incrementally day to day.

**Hiring System**

• In the proposed top-down approach, the supply plan is wetted by CFE/SFE’s and SLC & RCM leads for conversion into hiring plan.
• The logical allotment of a resource from external hiring channels to the PA/sector/cross sector happens during solutioning period itself.
• The logical allotment continues and conforms to physical allotment of resource as long as there is no change in demand requirements till the candidate is on-boarded.
• Allot the candidates on DPI based allotment business rules as mentioned in the business rules document whose logical allotment got disturbed or whose logical allotment is yet to be made at the ANOB stage.
• Bring the offer release approval and offer exception approvals tasks by CFE/SFE and SLC & RCM leads respectively are brought into the scope of hiring process modernization.
• Link the supply plan conversion to hiring ask plan with the following internal factors.
  • Demand capture statistics
  • Similar skill set in bench
  • Ad-hoc requirements of CFE/SFE and SL&C leads

**IT Architecture decisions**

**Fulfillment System**

• Presently RCM operations are being driven by Excel sheet based data stores. It is hampering the productivity of RCM staff due to machine hangs when they are dealing with large volumes of data opened in excel sheets from their desk tops and think pads. Everyday downloading the data from world wide tools and processing the data in excel sheets becomes monotonous, more manual and over killing the productivity of RCM staff. It is recommended to go for an in-house RDBMS data stores as proposed in enterprise solution view section.
• It is proposed to have a process oriented SOA based IT system to realize the RCM business operations.
• It is proposed to have SOA based ESB architecture with WebSphere adapters for real time data integration for capturing the data from world wide demand, supply and HR strategic tools to proposed in house rdbms systems.
• Develop a web based fulfillment system as 1) End-to-End work flow using IBM BPEL choreography 2) Individual supporting functional user interface use cases.
• Prepare fulfillment plan in proposed fulfillment system and propose and assign them in PMP.
• Make fulfillment plan integration from proposed system to PMP.
• Proposed IT system has capability to generate daily based fulfillment plan.
• Proposed an automated workflow solution using IBM BPEL for manual solutioning of PFM and CFEs (with an automated workbench) for generating fulfillment plan.
• Cleansing & enrichment of supply & demand data using business rules in ESB layer.
• Retrieve only daily changes in data from supply and demand data marts.
• An automated pre-task for checking project codes and claim code for each demand and notification to GBS GD PMs.

Hiring System

• Replace lotus based HPAT tool, excel sheets to and from transfer from RCM to HR teams with a full-fledged SOA web based hiring application. Implement supply plan preparation, publishing, hiring ask generation, approval and closure processes, offer release approval and offer exception approvals in web based tracking tool. Build a web based hiring tracker for online collaboration among different stake holders.
• Provide clean integration between web based hiring system and GOM. Track all the HR events connected to the request ID by transferring recorded events from GOM to web based hiring system. It is recommended to publish the hiring requests from proposed hiring system to GOM either through data integration or application integration based on the details obtained from GOM data structure.
• Develop the use cases related to offer release and exception approval tasks into hiring system.
• Application prepares position code generation request at hiring system and make a web service call to HRMS system to get position code.
• Host a position code generation web service in HRMS system.
• Develop a web based hiring system as 1) End-to-End Work flow using IBM BPEL choreography 2)individual supporting functional user interface use cases.
• Develop a system DPI service for pipelining unassigned ANOB candidates.
• No manual feeding of hiring ask plan to hiring system.
• Hiring requirements updates from SL&C leaders through unified web based hiring system.
• An automated re-conciliation service which match ANOB details with request ask details for closure.
• An automated PeM, connection advisor updated service to the pipe lined candidates
• An automated Pipeline allocation service using DPI based business rules.
• An automatic conversion of supply plan to hiring ask plan by predefined business rule service.

RCM Enterprise Solution View

This section describes the RCM Modernization architecture at the enterprise service level expressed in a architecture layer model using IBM's SOA Solution Stack (S3) Model. The S3 model, is useful for architect and designer to design SOA solutions. S3 modelling has been fundamentally extended by identifying a set of architectural building blocks for each layer in the basic S3 model based on industry best practice and SOMA service modelling and guide SOA solution architects to established customized SOA solution architectural model.
The SOA Solution Stack identifies the SOA architectural layers and the key components of the solutions. The layer functions are realized via custom component development and / or provided by middleware infrastructure software. The horizontal dimension includes the following five layers:

- **Business Process Layer**
- **Service Layer**
- **Service Component Layer**
- **Functional and Technical Components**
- **Operational System Layer**

The **Business Process Layer** describes the business services and process components, which support execution of business processes via orchestration of atomic (fine grain) services. Examples of business services include demand to supply mapping service, demand validation service and demand priority indicator service etc. An example for main business process is the fulfillment planning process that consists of current demand information business service, supply information business service and demand-to-resource supply map business service. Related capacity planning processes in this layer includes orchestration of anticipated demand services, ANOB candidates supply service and deriving out long term capacity plans.

The **Service Layer** describes the service contracts of the supported services. This includes support of business services as well as atomic (fine grain) services. The service contracts are specified using Web Service Description Language (WSDL) and service management policy.
governed by the Governance layer. Example list of candidate services for capacity planning are demand information service and supply information service and mapping services. Similarly for hiring sub systems, the hiring ask generation service, ask consolidation service and ask approval service etc becomes potential candidate services.

The **Service Component Layer** describes the service provider components to support the implementation of the service contracts. The service components included functional components and technology components. The functional components are realized by subsystems. A sub system may consist of one or many service components. In our RCM modernization SOA layered model under each service component corresponds to each subsystem further consisting of one or many functional components as shown in the above diagram.

The **Operational System Layer** includes the existing IBM world wide systems and tools used for RCM operations. The PMP is demand capturing and assignment tool for fulfillment. Global Opportunity Market place (GOM) is used by HR department for collecting new joiner's information. PD tool for internal supply information with all skill set details is used for supply information. Blue pages / Live core DB used for capturing candidate details in generation of supply report. HRIS system being used for updating the candidate details, position code generated by the BUCOMG, PAL and PeM information. The IBM world wide strategic tool, OODB replaces the current lotus notes based SSP IS tool. Proper interfacings to these existing tools are proposed with RCM modernization system.

The vertical dimension contains the following four layers:

1. Integration Layer
2. Quality of Service (QoS) Layer
3. Data Architecture Layer
4. Governance Layer

The **Integration Layer** is supported with Integration Controller and Message transformer components. The Integration Controller including both Gateway Enterprise Service Bus (ESB) and internal ESB. An ESB is a managed infrastructure to provide transport protocol conversion, service end-point virtualization and routing, and service mediations including message transformation, logging and security services. It interfaces with the Service Registry and Service Management runtime to manage services execution. The gateway ESB infrastructure provides security enablement (via HTTPs and Web Service Security option) based on the proposed RCM's mid-tier infrastructure.

The integration points of the proposed RCM modernization system to existing operational systems include

- Fulfilment plan proposal from proposed RCM modernization fulfilment sub system to PMP.
- GOM to proposed RCM modernization hiring sub system (replacing HPAT tool).
- PMP demand and supply data integration with proposed RCM modernization fulfilment system.
The **Data Architecture Layer** is based on a set of proposed relational database systems supply, demand, hiring and fulfilment data repositories. Currently all the supply and demand information is being handled through flat files and excel sheets downloaded from G42 demand reports from PMP tool and supply report information acquired from various tools. In the proposed RDBMS repositories, with the help of data integration, mediation modules and with set of business rules, the supply and demand data from the PMP is copied and enriched with PAL details, sectors, account information which is available from fulfilment database repository. In addition to the business units information details, the fulfilment repository also consists of internal and external fulfilment proposal plan details. It also contains end–to-end fulfilment transactional data including on-boarded person information from hiring to be assigned to the demand. Also maintains unallocated ANOB details for candidate matching. At the appropriate time frame, data from audit data will be archived to history databases.

Similarly a separate DB store component has been proposed for hiring sub system where capacity plan guidance information (unmatched supply to demand information), hiring ask information, status of hiring, GOM data, hiring allocation details etc are stored.

The **QOS Layer** provides operational management and monitoring of processes and services executions. It is supported by service management infrastructure software using IBM's Tivoli® suite of service management products or in-house written monitoring and management services including security services. For high performance transactional data monitoring and management, caching services are proposed at various layers for architecture and periodic data retention mechanisms are proposed.

The **Governance Layer** provides entire RCM operational services management support. RCM operational governance processes that support management include:

- Bench governance process
- Rotation governance process
- Roll-off governance process
- Hiring governance process
- Fulfilment governance process
- Demand control governance process

All the above governance processes needs to be defined by establishing a three tier governance body comprising of RCM, HR, SL&C & Sector heads, RCM, HR, SL&C & Sector leads and RCM, HR executive members.

**SOMA methodology for Service Identification: business component – resource hiring example**

**Process Decomposition**

The process decomposition of resource hiring is shown in below figure. Resource hiring can be broadly decomposed into four sub processes namely Prepare supply plan process, hiring execution, resource allotment and resource on-boarding processes. This level 2 decomposition of business processes from resource hiring is:
1.1 Prepare supply plan
1.2 Hiring execution
1.3 resource allocation
1.4 resource on-boarding

From level2, the processes are further decomposed into leaf processes known as

**1.1 Prepare Supply plan**
1.1.1 Create supply plan
1.1.2 Publish supply plan
1.1.3 Approve supply plan (in the context of hiring)

**1.2 Hiring Request generation & tracking**
1.2.1 request ID process
1.2.2 track hiring

**1.3 HR recruitment Process**
1.3.1 Sourcing & selection
1.3.2 Offer Processing

**1.4 resource allocation**
1.4.1 Fetch demand DPI
1.4.2 resource allocation
1.4.3 Position generation

**1.5 Hiring Ask closure**
1.5.1 Re-conciliation process
1.5.2 Request closure process

From these each leaf processes the candidate services are identified and are maintained in initial service portfolio.
Figure 4. Level 3 Process Decomposition of Hiring component
**Figure 5. Service Portfolio**

A UML diagram showing this hierarchy for resource hiring business process provides a roadmap for detailed design and implementation.

The hiring type class attributes decides whether the type of hiring is IBM full time regular, SSP or IBM part time hire. Based on this hiring type attribute, the sub processes for hiring these channels would change. The hiring of SSP is driven from bottom up approach ie based on PMP demand specification. For 90 to 95 percent of IBM regulars, the hiring ask is derived from supply plan and the remaining percentage is driven from PMP open seat demand request. Hence we have classified the hiring based on the ask type for hiring resource ie from supply plan or PMP demand mentioned below figure as hiring source class. The other class attributes JRSS/Band/Location are common for any resource hiring. From this variation oriented analysis we have identified few more services which are mentioned below.

1. get hiring requests based on supply plan
2. get hiring requests based on PMP demand seat
3. get SSP hiring requests
4. get IBM regular hiring requests
5. get hiring requests matching JRSS/Band based on supply plan
6. get hiring requests matching JRSS/band based on PMP demand seats
7. get hiring requests matching JRSS/Band/location based on supply plan
8. get hiring requests matching JRSS/band/location based on PMP demand seats
9. get hiring requests matching JRSS for SSPs
10. get hiring requests matching JRSS & location for SSPs etc

Figure 6. Hiring Variation Oriented Analysys View

Goal Service Modeling

The goals and KPIs and metrics identified for resource hiring process are shown in table 1, below.

Table 1. Goals and KPIs

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<th>Goal</th>
<th>KPI</th>
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<tr>
<td>Immediate absorption of joining resources into IBM projects</td>
<td>Joining bench &lt; organization’s target figure</td>
</tr>
<tr>
<td>Regulate high demand fluctuations with pre-generated hiring ask from supply plan</td>
<td>Zero demand overdue &gt; 30 days for assigned hiring channels</td>
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Sub goals identification for minimizing joining bench:

- Delay offer approval and joining formalities for the resources whose skill set matches with maximum number of bench resources skill set.
  - Build a service which captures this information.
- Ensure allocation of candidate during offer accepted and confirmed period itself.
  - Build an alert service to the un-allotted candidates
- Ensure allocation of off-shore project for the landed resource recruiters.
  - Build an Identification service for mapping the landed resource to redundant off-shore demand
- Ensure allocation of joined resource to other demands in case the demand is withdrawn after the offer is released.
• Build an alert service to re-allocate the candidate.

Sub goals identification for zero demand overdue > 30 days for hiring channels

• From the supply plan, distribute the hiring ask creations for the similar skill set at different timings intervals to have better control over hiring asks.
  • Develop a tracking service for same skill set, the status of hiring.
• Identify hot skills in the market for the current window and place requests in addition to the supply plan requests.
  • Build a service to identify hot skills in the market.

Existing Asset Analysis

Presently there is no IT system supporting resource hiring operations from RCM end though we have GOM which only supports HR related operations. Lotus application based built SSPIS tool, HPAT tools can not considered for leveraging existing assets as a policy to scrap all lotus notes based tools used in RCM.

Conclusion

After exhaustive study of current operations and tools at RCM center, India and having understood the pain points of various stake holders of RCM, we have proposed to build an IT solution for fulfillment and hiring systems. These proposed systems make use of its sibling IBM world wide strategic tools like PMP and GOM for integration to fulfill completeness of its functionality. The proposed systems are built with SOA standards based approach, easily pluggable with existing tools, high scalable and configurable to position them at any of IBM global delivery centers worldwide.

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