



PSMMC

WfMC BPM Excellence 2013 Finalist

Prince Sultan Military Medical City, Saudi Arabia

Mind the gap: From legacy system to successful BPM

Executive Summary

Prince Sultan Military Medical City (PSMMC) formerly known as The Riyadh Military Hospital (RMH) is located in Riyadh City and considered as one of the most advanced medical centres in the Middle East. PSMMC is the Medical Services Department (MSD) for the Ministry of Defense (MOD). The hospital now has a capacity of more than 1,400 beds and employs over 12,000 staff.

Key challenges faced by the hospital were related to patient safety. These included identifying the right patient, providing the right treatment to the right patient and preventing identification fraud and misuse of medical services by patients.

Existing legacy system used by the Patient Affairs department (as explained below) could not address these challenges. A BPM system was introduced to streamline and manage the improved processes of various departments associated with Patient Affairs.

PSMMC has already had a positive experience with the BPM and Bizagi system after the Family and Community Department, Al-Wazarat Health Centre (WHC), was automated with over 70 processes last year. The system delivered end to end patient care for over 2,000 outpatients.

The success of the first BMP initiative encouraged the PSMMC management team to consider the same BPM solution for this much larger initiative which required the end to end automation of a 1400 bed hospital, serving the big part of the city.

Key drivers for both projects was to deliver a highly intuitive system that medical professionals can use daily and easily and that helps to improve patients care and reduce costs.

“Bizagi BPM helped Prince Sultan Military Medical City to become a flagship hospital in Saudi Arabia, often used as an example for delivering the highest quality patients’ care”

DR. Adnan A. Al-Tunisi, CIO, PSMMC

1. Overview

Many hospitals around the world are aware of the significant operational and administrative efficiencies delivered by the Hospital Information System (HIS). Apart from time savings, reduced paperwork and increased focus on patients, HIS also provides two additional benefits: laying the groundwork for improved quality of care, and qualification for disease specific treatment recognition programs, which may eventually lead to increased reimbursements. One may document clinical outcomes on paper, but HIS makes it easy to track data, identify trends and target specific areas for improvement.

PSMMC started using BPM in conjunction with HIS at one of its Primary Family and Community Health Care centres, WHC. After a very successful implementation of BPM in that centre, the ICT department of PSMMC proposed the use of BPM to streamline, monitor and control the activities of Patient Affairs department of PSMMC. Thus the Project "Patient Affairs Management System" (PAMS) was initiated.

PAMS is one of the sub-module for e-Medserve HIS. The project was led by a team, with advanced BPM implementation experience and deep technical knowledge gained by implementing the WHC project.

There are 9 departments within Patient Affairs:

- Registration
- Patient Relation
- Appointment and Reception
- Medical coordination
- General Admission
- Obstetrics and Gynecology
- Medical Records
- Medical Reports
- Mortuary
- Translation

The key objectives of the PAMS project were as follows:

- Cleanse and validate the patient data fetched from the legacy HIS system with the help of the integration layer provided by the BPM system
- Introduce advance verification devices and Smart Medical Cards which will help PSMMC to meet their Patient Safety objectives
- Effective fraud detection with biometric verification, which prevents ineligible patients from receiving medical treatments
- Controlled Monitoring of day-to-day activities of Registration Office of the Patient Affairs
- Key reports and metrics generation for Patient Affairs Management regarding the number of new patient registration and other patient related activities

The key challenges faced were as follows:

- Identify the Right Patient and provide the Right treatment
- Prevent identity theft of eligible Patients
- Address the challenge arising from the fact that in the local Saudi culture, it was challenging to request women to identify themselves by uncovering their face
- Ensure seamless integration of BPM system with the existing HIS (Legacy System)
- Deliver integration of BPM system with Ministry of Interior's National Information Center for registering new patients
- Clean and enhance the validity of the patient data coming from the Legacy system

All these challenges were addressed successfully with the help of the BPM system implemented with Bizagi BPM suite.

2. Business Context

When an unregistered patient visits PSMMC they need to visit the Patient Registration Department to get registered and receive the Patient Medical Card. This is very essential for the patients to receive all the medical service benefits.

Prior to the implementation of the BPM system, the patients were registered via the Hospital Legacy System which does not have a proper validation option leading to fraud and misinformation of patients, restricting PSMMC in adhering to the JCI's Patient Safety Standards.

The HIS system used by the Patients Affairs Department was legacy system based (mainly Mainframes). The system was very rigid and had many drawbacks. Auditing clerk's activities and running complex validations on screens was difficult to accomplish. Due to this, the system was prone to user input errors and mistakes, which corrupted the patient data on the system.

So the first phase of the project focused on improving and automating the **Patient Registration** process taking into account that the **Patient Security** is a key component of it i.e. ensuring that each patient is correctly identified when registers for treatments.

Security and correct identification is a huge problem in Saudi Arabia as nearly all women come dressed in their religious clothing including the veil that covers big parts of the face, so the identification is impaired. The traditional identification approach based on the medical identify cards proved ineffective as many citizens borrow medical cards from relatives and as the identity is difficult to confirm when the face is covered, some patients in the past were treated with wrong medications based on the card information. This could have proved fatal.

“**By integrating Bizagi with biometric technologies, the patients were properly identified, the right treatment was offered to the right patient and identification fraud and misuse of medical services was prevented**”

3. The Key Innovations

In addition to streamlining and automating the Registration Process, a very important innovation was the introduction of the advanced verification devices with biometric verification and Smart Medical Cards that contained the identification data. This technological innovation delivered effective fraud detection which helped to identify patients properly, prevented ineligible patients from receiving medical treatments while providing the right care to the right patient.

3.1. Business

Migrating from the legacy platform to a new process oriented Patient Affairs Management System was a huge leap for PSMMC Patient Affairs. PAMS BPMS project streamlined and automated the activities of the department. A robust process for registering patients were established with clearly defined roles and responsibilities for the clerks and managers of the department. With the powerful process analytics tool, it was possible for the management to audit the activities performed by the clerks, analyze the trends and foresee the requirements of the Medical city in ways never done before.

3.2. Case Handling

Multiple processes were defined and implemented to cater to the needs of all the departments of the Patient Affairs.

Registration Process: The Registration process is the key process to enroll the patients at PSMMC. This process used to be a fairly simple task which involved entering patient data into the legacy system and printing a card needed for treatment purpose.

This task was made more reliable and robust with the new BPMS. Apart from entering demographic data related to patients, the new BPMS allows the patient demographic data to be embedded in the patient card (on a chip).

As an add-on, a Palm sensor was introduced in the new BPMS to capture the palm information of the patient for identification purpose. This was a great achievement that met the goals of the Patient Safety at PSMMC.

The Palm data is also stored on the chip of the Patient Card. Palm Identification devices and Smart Card readers were introduced at various locations (nursing stations and point of care), to rightly verify the patient and to provide the right care to the right patient.

The Registration process incorporates various registration services namely – New Patient Registration, Patient family member Registration, Amending Patient details etc.

The process starts by searching for the right patient as the first activity of the process. On successful searching of a patient, various registration services appear on the screen for the user to choose from. The process takes various paths in the process flow based on the services selected by the clerk.

This automated step-by-step approach in the process (modeled to cover all the scenarios) helps the clerk not to miss any steps related to the patient registration.

Cases can be divided into two types, a Medical Card Exchange and cases related to New Registration at the Registration Office. The key case related innovations include:

- Creation of **8 new cases for card exchange, per hour**, per work station during peak hours
- 10 work stations were established around the hospital for Exchanging the Medical Card (old card with the new one). This enabled PSMMC to handle **400 to 600 cases per day** related to Card Exchange
- On average there are over **600 Registration case created each month**

In terms of business process innovations, they were:

- A total of **13 Main Processes** were automated
- **18 Structural Sub-Processes** were created
- A total of **120 Sub-Processes & Electronic Requests** were automated

3.3. Organization & Social

From an organization perspective, this was a huge success. A process oriented work culture was introduced and adopted at the Patient Affairs department. There was more clarity on the tasks that was assigned to the Clerks. Continuous improvement and optimization of Registration processes was possible now with the help of Bizagi BPMS suite.

The implementation of a BPM process ensured that there were clearly defined roles and responsibilities, so the registration process speed has improved which boosted morale and job satisfaction within all teams involved.

All stakeholders are more efficient and productive, as they handle less paperwork, all steps are archived in a structured manner and there is more control and visibility over the whole operation, which leads to increased compliance with healthcare auditory policies.

As new processes were more structured and transparent, it became easier to follow the agreed workflows and deliver improved quality of service.

4. Hurdles Overcome

4.1. Management

The major challenge that Patient Affairs management had to overcome was a very weak processes and data consistency delivered by the HIS legacy system. There was hardly any knowledge of BPM or process automation within the management team. This understanding needed to be built from scratch. Having a management that clearly understands the benefits of BPM, makes the design and implementation considerably easier. Strong management sponsorship is key to the success of any BPM project.

4.2. Business/Technology

There was a high dependency on the patient data maintained in the legacy system. The Patients Affairs Department had to undertake a huge paradigm shift when moving from the legacy system to BPMS.

Due to this, there was a high complexity in the integration layer with the Bizagi BPM suite. Complexity involved integration of Bizagi BPMS with the existing legacy systems at PSMCMC to enable the constant and immediate access to the Patient data. Data entered to Bizagi BPMS was synchronized with the centralized HIS repository through the integration and web services layer provided by Bizagi.

There were hurdles in optimizing the Business Activity Monitoring (BAM) and the accuracy of process analytics due to the unclosed and pending process tasks started by the end users. This was resolved by taking advantage of the Bizagi SOA layer. SOA layer was used to detect and monitor pending process instances and analyze its state before performing the transfer to the process instance creator or process rollback.

4.3. Organization Adoption

There were many challenges faced by the PSMCMC's team during the implementation of Patient Affairs Management System. A lot of credit goes to Bizagi for supporting the implementation by providing advice and sharing Best Practice.

The end users were more accustomed to working on the legacy system as they were using it for years. The concept of process oriented approach and BPM was new to the team and the knowledge transfer delivered through training and informal meetings had its own challenges (both technical & cultural).

“ Bizagi build the bridge between the legacy and the BPM system. Powerful integration and web services together provide a wraparound layer which cleanses and validates the patient data fetched from the legacy HIS. Through intuitive workflow modeling, BPM accelerates data quality and compliance, be it for new patient onboarding, biometric ID and reporting

5. Benefits

The BPM approach delivered various benefits to the hospital, users and patients. It enabled the PAMS management to manage their departments more efficiently and effectively.

Specific benefits of e-Medserve HIS using BPMS platform include:

- **Treatments delivered on-time** by the Emergency Department which ensures higher patient safety and reduction of undesired outcomes.
- **Reduced errors and costs** associated with manual administration of medication in the pharmacy and nursing units.
- **Delivery of evidence based error reporting processes** that provide a better understanding of where errors occur and how much they cost.
- **Clinical alerting applications** to notify clinicians of abnormal results and to interrupt medication administration more rapidly until results are analyzed
- **Clinical decision support reporting analysis** to help physician and clinical decision makers understand data and affect clinical protocols.
- **Disease Management processes** that help proactively manage chronically ill patients, thus slowing the progress to more serious stages of disease.
- **Computerized Physician Order Entry (CPOE)** preparedness, application readiness, and implementation support to address physician order entry tasks.

5.1. Cost Savings / Time Reductions

Together with the aim of improving customer service and patient care, there was the need for reducing costs. Cost reductions are observed from the reduction of manual activities and paperwork as well as optimization of resources and reallocation of activities and people.

The Patient affairs department at PSMMC was dependent on accessing the Legacy system daily to do their job and to maintain the patient data. The legacy system were not able to provide correct and accountable data due to its current state.

With the help of reports provided by Bizagi's BAM and Process Analytics, Patient Affairs department were able to save cost, stop malpractice and speed up their overall processes and procedures.

An important process at PSMMC Patient Affairs department was the Audit Process. Audit process was used to audit and monitor each and every data change done by the department employees. Before BPM, the procedure was to validate each data entry in the system based on the report printed every day. This caused a huge waste of time and paper.

A significant improvement was achieved with the BPM system by introducing document scanning and processing. This helped to improve employee productivity as they no longer depended on the printed reports and needed to perform manual verifications.

The process and sub-process cycles have experienced a significant reduction in time. The effective interaction and coordinated work between different areas as well as between healthcare providers and other personnel has helped Patient Affairs to deliver a faster and high quality patient care. Effective communication, rapid data entry, and improved coordination from one party to another have been the key factors in achieving these time reductions.

Cycle time reductions were also observed in: decreased patient waiting times, faster completion of procedures, shorter treatment times and quicker activity planning.

The following describes the quantifiable costs savings and time reductions that resulted from this project:

- The registration process has been optimized and **reduced from 15 to 6 minutes, an improvement of 50%**
- The normal new patient registration cases were **increased from 100 to 150 (50% increase)**

Migrating from legacy to process was a huge leap for PSMMC. By clearly defining roles and responsibilities to every clerk and manager, it was possible for management to audit the activities performed by clerks, analyze trends and forecast requirements in ways never done before.

5.2. Quality Improvements

Well defined and controlled business process was implemented at the Patient Affairs department of PSMMC. Earlier systems were prone to human errors and were not capable of restricting users from performing unauthorized tasks. All this factors contributed to lower quality and productivity.

These issues were addressed successfully by the new BPM system. User data entry is controlled and validated, based on the registration service type selected by the user. Roles and responsibilities are well defined, based on business process activities to restrict unauthorized patient data manipulation. A proper and well defined sub process is in place for auditing the activities performed by the staff. This increased the accountability and quality of service at the Patient Affairs.

Changes made during the process improvement phase (introduction of patient verification activity) reduced the serious incidents and patient complaints which contributed to the patient safety.

PSMMC has to comply with lengthy government policies and procedures. New standardized processes, transparency, better control and easy access to all related information provided by the BPM system helps to deliver traceability and auditability at any stage required.

Use of Bizagi e-Medserve HIS substantially improved the quality of data gathered, facilitated precise prescription writing and helped to capture important information regarding the patients' health. Because the entire patient's data resides in one electronic clinical data repository, the system can alert providers of important patient care issues based on widely accepted evidence based clinical guidelines.

The most obvious example is prescription drug interaction warnings. But the system does also recognize more subtle care issues, such as a diabetic patient's need for an annual eye exam, and a foot examination on each visit. The system actively assists physicians and nurses by highlighting issues which have an overall effect on the quality of care offered to patients.

The Patient Affairs department were successfully able to track the stock levels of all consumable items (like Patient Cards) and order them on time thus avoiding shortages and patients' dissatisfaction.

Key quantifiable quality related improvements:

- **Human Errors have decreased to 80%**
- Most of the registration steps are automated, reducing staff intervention and time taken. **Staff productivity has increased by 60%** as early as two months after Go Live date.

“ **Having successfully completed the end-to-end patients’ care automation for 2,000 outpatients’ unit, PSMMC deployed Bizagi to improve patients’ registration and security for its 1,400 bed hospital resulting in registration time reduced by 50% , human errors decreased by 80% and staff productivity increased by 60%.**

6. Best Practices, Learning Points And Pitfalls

6.1. Best Practices and Learning Points

- ✓ Integration with Legacy system are always a big challenge, so a well prepared approach is advised to face the worst case scenarios
- ✓ It is a good practice to initiate a comprehensive change management program involving all stakeholders and senior management in the very early phases of the project to encourage adoption and knowledge transfer
- ✓ Learn your BPMS first before the design phase; understand its strength and limitations well as this will help to avoid delays in the project delivery
- ✓ Encouraging end users to visualize and simulate the process activities from their perspective at an early stage will help with the training and cultural acceptance after project Go Live

- ✓ Consider project development and Go Live delivered in phases
- ✓ Ensure the involvement, endorsement and feedback from all stakeholders from the very beginning of the BPM initiative

6.2. Pitfalls

- ✗ Define clear and realistic expectation for the end users
- ✗ Without proper feasibility study, do not commit
- ✗ Avoid solving problems during advanced stages of the project or late feedback from stakeholders. Try to look at all possible scenarios during the definition and design phase

7. Competitive Advantages

Staying ahead of industry standards has now become a necessity, especially in healthcare where service levels will always be looked at with detail by patients and regulatory entities.

PSMMC has gone one step forward. With the determination of providing the best standard of healthcare services for its patients, PSMMC has definitely achieved a competitive advantage over other health institutions that haven't recognized yet the value that agile and transparent processes, efficiency and reduction of manual tasks can bring for their patients.

Thanks to BPMS, PSMMC has become eligible for quality recognition programs and pay-for-performance (P4P) model was introduced. Both, the hospital and physicians can apply for recognition as high quality care providers in several programs. To qualify, they must submit large volumes of sample data showing that they meet expected treatment performance criteria.

The new BPMS has not only dramatically improved efficiency throughout the hospital, but has also improved clinical care and treatment as per defined, evidence-based treatment guidelines. As more P4P programs are rolled out, Bizagi-based e-Medserve system will become the underlying solution for gathering, tracking and delivering required data across all military hospitals.

The BPM system has empowered the PSMMC to achieve the following:

- ★ Deliver Patient centric solution
- ★ Become Clinician lead and Evidence based
- ★ Take advantage of Integrated applications
- ★ Utilize tightly controlled Workflows
- ★ Actively embark on the Process Improvement Program

The BPM based information system have also enabled PSMMC to take the lead in unifying the medical records of patients, across all military medical facilities in Saudi Arabia by using the correction and verification procedures within the business processes.

A strong emphasis now is on the continuous improvement, so the BPM team constantly monitors and optimizes the performance of the processes, while working with the users on prioritising the process change requests.

For all these reasons the PSMMC gained a significant competitive advantage and has become a flagship hospital in Saudi Arabia, often used as an example for delivering the highest quality patients' care.

8. Technology

ICT department at PSMMC had a prior experience with Bizagi having deployed it at WHC to automate the outpatients' services. Bizagi BPM suite was selected because of its ease of use, simulation capabilities and an open platform. The Bizagi premier technical support services were praised for providing expert advice and for addressing various implementation challenges.

Complex problems were resolved with the help of custom components built to take advantage of the BPMS integration and SOA layer; this approach removed the need to invest in expensive third-party SOA products.

The diagram below explains a simplified architecture of the Patient Affairs Management System project. The BPMS layer and the .Net components were used to meet the Patient Safety requirements at PSMMC. Smart Card Encoding devices and Human Identification devices (Palm Sensors) were integrated into these layers, enabling PSMMC to meet their patient safety concerns.

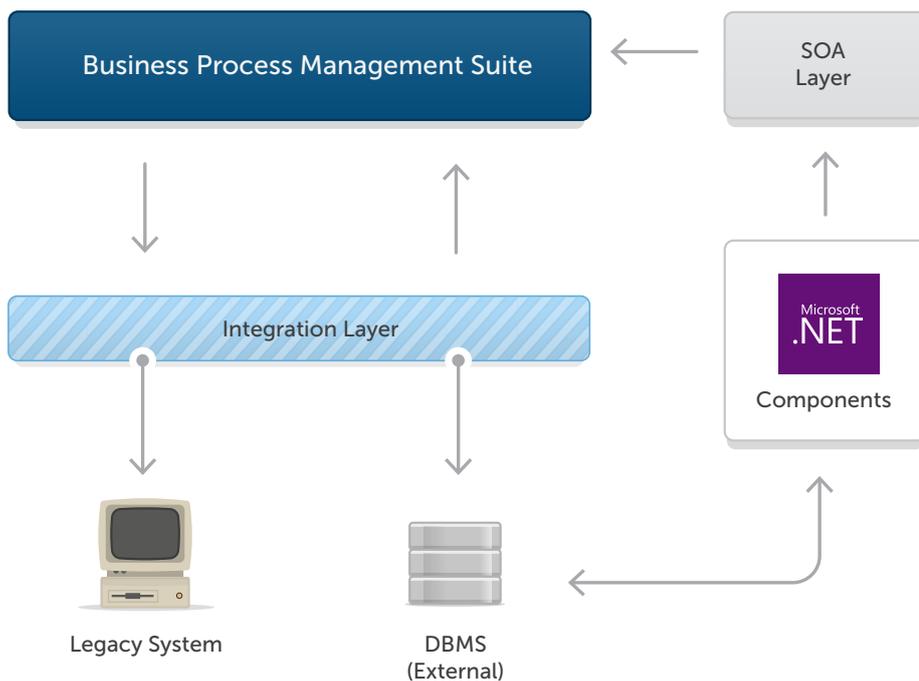


Figure 1 – Patient Affairs Management Simplified Architecture

Bizagi integrated BPM Suite enabled PSMMC to manage their complete patient registration process cycle. As Bizagi Process Modeler can be downloaded for free from the Bizagi website many PSMMC users were able to learn the system prior starting the project. Bizagi website also offers a comprehensive self-service program that includes e-learning, training courses and videos, so the learning curve was significantly shortened.

Authoring / Construction

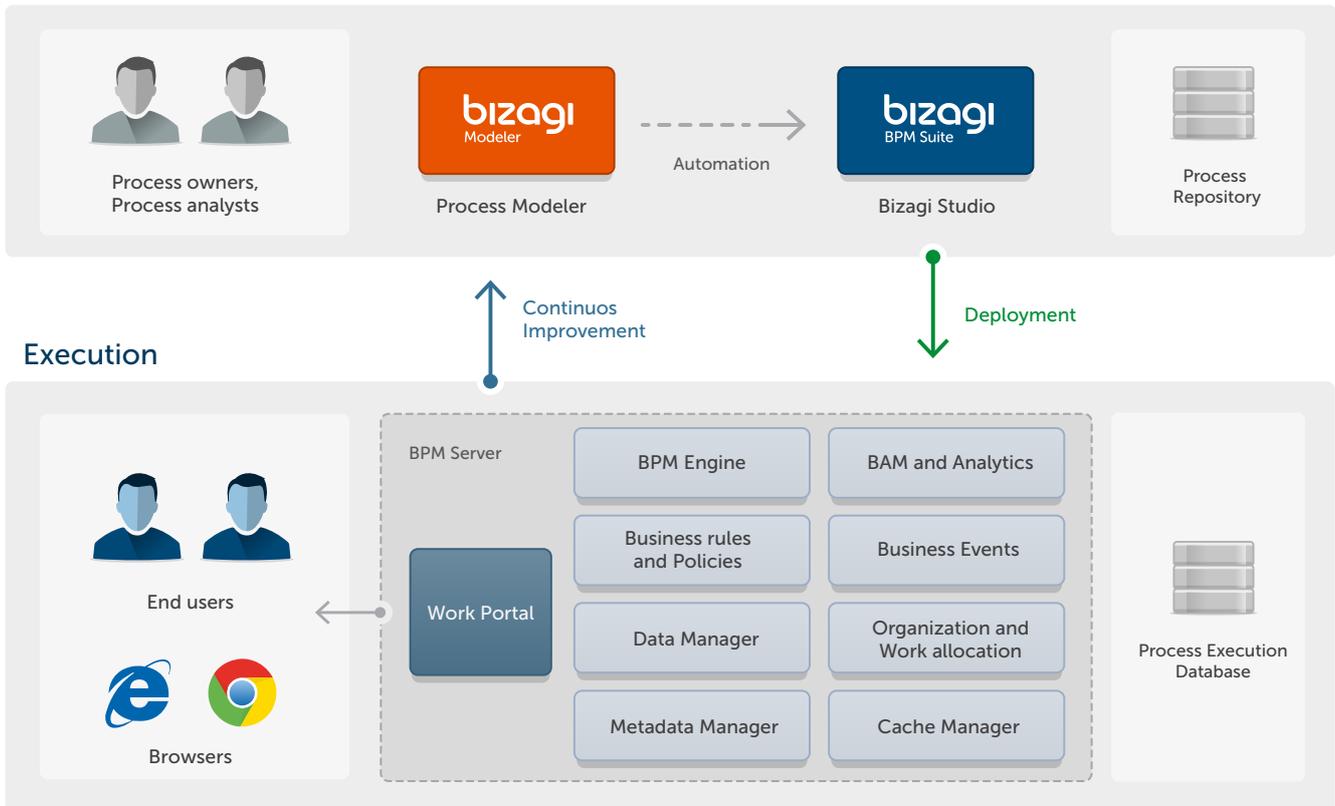


Figure 2: Bizagi's System Architecture

Bizagi BPMS offers a complete solution which includes design and implementation of the process workflow and automation of processes. Bizagi is an integrated BPM Suite, so PSMMC was able to manage the complete process life cycle without any other external tools. Bizagi's flexibility and capability of integrating and automating several processes simultaneously, creates a robust system can be easily adapted to business growth as more and more processes are automated.

Bizagi is a modern business collaboration tool for faster process automation. Bizagi's built-in functions, ease of use and flexibility makes it the ideal BPM solution to obtain faster results.

In Bizagi, most of the common and recurring requirements in process automation have been pre-built. These include:

- Control and visibility
- Alarms and notifications
- Performance analysis and reporting
- Auditing and traceability
- Workload routing and balancing
- Mobility
- Open Integration APIs
- Corporate features (multi-tenancy, BPMN process engine, multiple language support, time zones, long lasting process transactions, enterprise data model, among others)