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# Implementation of a global distributed software development organization

Boris Dago Kouame

► **To cite this version:**

Boris Dago Kouame. Implementation of a global distributed software development organization. Software Engineering [cs.SE]. 2013. dumas-01281433

**HAL Id: dumas-01281433**

**<https://dumas.ccsd.cnrs.fr/dumas-01281433v1>**

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**MEMOIRE**

**présenté en vue d'obtenir**

**le DIPLOME D'INGENIEUR CNAM**

**SPECIALITE : INFORMATIQUE**

**OPTION : SYSTEMES D'INFORMATION (ISI)**

**par**

**Boris DAGO KOUAME**

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Mise en œuvre d'une organisation de développement logiciel  
distribuée à l'international

/

Implementation of a global distributed software development  
organization

**Soutenu le 18 janvier 2013**

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**JURY**

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## ACKNOWLEDGMENTS

I express my deep gratitude to my wife for her support during those years long master of software engineering continuing education process.

I am thankful to Sylvain Dusserre for his supervision at Volvo Information Technology and for this opportunity he gave me to work in depth on such an interesting subject.

My gratitude to Julie Soyer for our successful collaboration at SPA F. distributed delivery coordination team.

A specific thanks to Meena Suryanarayanan for the accurate Indian perspective of software engineering and management she shared with me.

My gratitude to Jean-Michel Kiat (IBM) and Denis Auroy (Cap Gemini), the experienced global software professionals I have interviewed for this thesis.

An overall thanks to the global software professionals of Volvo IT whom I have worked with during my work placement.

I am thankful to Bertrand David for his supervision at CNAM Lyon.

A deep thanks to FongeCIF Rhône-Alpes for its funding of my period of work placement.

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## INTRODUCTION

Globalization of the world economies is recognized as one of the main trend of this 21st century. It has brought many changes to most of industries and in particular to software development.

Global software engineering (GSE) came out to address this new situation and was first used by organizations to benefit from cheaper, faster and better development of software products and services. Literature about this topic have since underlined that those benefits are far from full achievement. Despite several years now of practice in GDE, for most organizations, it is still considered as an immature field [Smite. 2010]

Volvo Information Technology (Volvo IT) is a global software company committed to its global strategy delivering IT solutions with projects that can be distributed to teams located all around the world.

Soft Products & Aftermarket Foundations (SPA F.) program at Volvo IT is involved in this global distributed environment with its headquarters based in France and teams assigned in India, Brazil and Poland. In the prospect of an increase of the number of its offshore developers, at the end of 2012, program management decided to strengthen its distributed software delivery framework.

The “Global Distributed Software Factory” (GDSF) project at SPA F. was born. Every aspect of its offshored software development organization (between design and integration stages) was expected to be improved, from Technology to Management. Among those, software delivery quality, estimation methods, recruitment processes were specifically identified.

This document describes global software development at SPA F (acknowledging Volvo IT global strategy without challenging it).

It starts with a first chapter describing the context (the company, its infrastructure and the program) where our works took place.

The second chapter is dedicated to the description of the project with its targets, challenges and mission to achieve.

The third chapter aims at giving the reader a general understanding of what is the state of the art in global software engineering with information related to its evolution, information and communication technologies, main models, potential benefits, customers, destinations and status.

Chapter four details the implementation of the global distributed software factory (GDSF) built up at SPA F. program. It presents its setting and architecture with stakeholder structure, one team, industrialization, management and support aspects.

Chapter five completes SPA F (Soft Products & Aftermarket Foundations) GDSF achievements with complementary inputs (challenges and solutions) to be used for future new or updated setups.

# CHAPTER 1

## A GLOBAL SOFTWARE ORGANIZATION IN A WORLDWIDE GROUP

This chapter presents the context in which this subject has been addressed. From a global group with a global infrastructure to one of its leading global programs, it describes their related situations leading to the target to set up SPA F. (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory).

### 1.1. Volvo Information Technology part of Volvo group

The Volvo group is one of the world's leading manufacturers of trucks (first in Europe, second in the world), buses, construction equipment, drive system for marine and industrial applications [Volvo. 2012]

Its organization (Fig. 1) is split in 2 parts and 8 sub-divisions [Volvo. 2012]:

The first part is related to Group trucks areas (Sales, Marketing, Join Ventures, Operations and Technology) which 2 first sub-divisions are geographically distributed in 3 world regions (EMEA for Europe, Middle East & Africa, Americas and APAC for Asia Pacific).

The second part comprises the following areas: Construction equipment, Business areas (out of manufacturing) and Financial & Business support.

It employs about 100,000 people all around the world, has production facilities in up to 19 countries and sales of products in more than 180 markets. [Volvo. 2012]





**Figure 1: Volvo group organization**

Volvo Information Technology (Volvo IT) is a global company, a wholly owned subsidiary of the Volvo group. It delivers reliable industrial IT solutions, competitive telematics services and insightful consulting services to its customers inside and outside the group.

Its roots date back to the 1920s, from a Swedish local entity (headquartered in Gothenburg) to a global worldwide company of around 5500 employees spread out within 35 locations around the world, working for customers in approximately 60 countries [Volvo IT. 2012].

Application Delivery (AD) is the delivery unit within Volvo IT where this mission has been performed. It is the entity responsible for IT Projects and Application Management within Volvo IT. Its purpose is to develop, maintain and support business application solutions that meet customers' demands such as the ones of SPA F. program.

Relying on its domains distribution to sites (Fig. 2 & 3), the AD sourcing strategy is to balance (50%-50%) the number of its resources between traditional sites (Sweden, Europe, North America, Japan, Korea) and BPIC (Brazil, Poland, India, China) ones [AD. 2012].

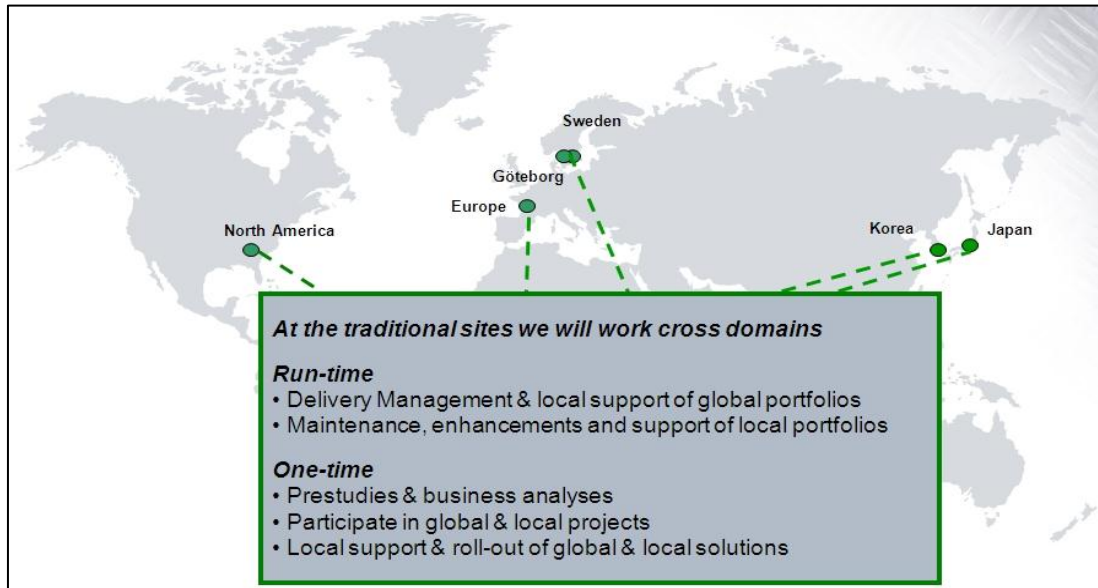


Figure 2: Global distribution of traditional AD sites

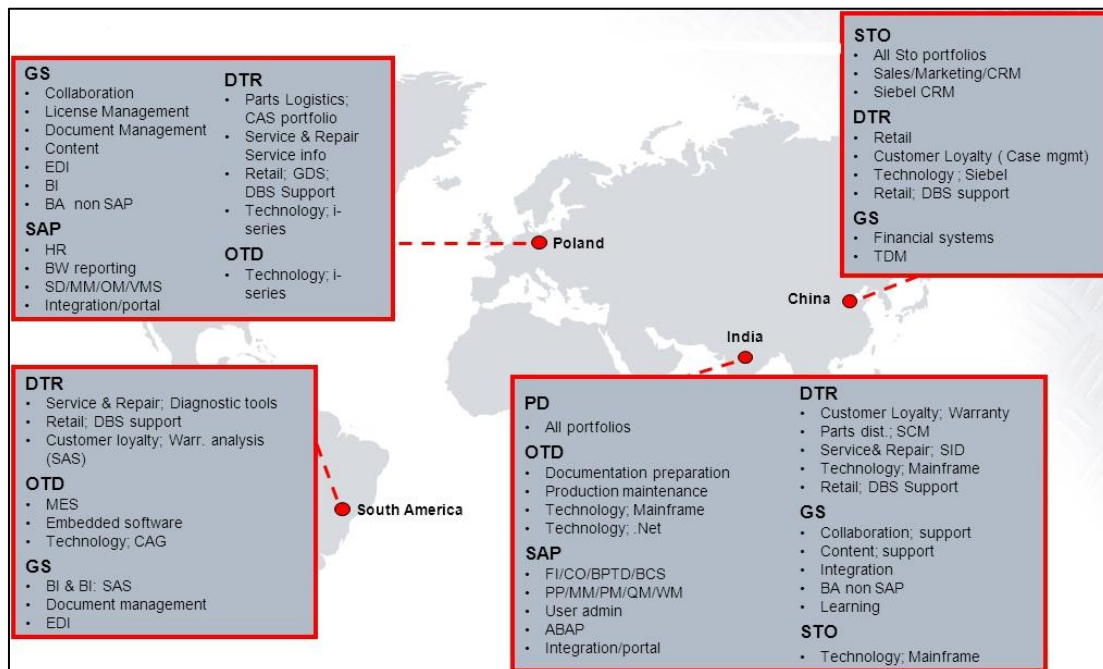


Figure 3: Global distribution of BPIC AD sites

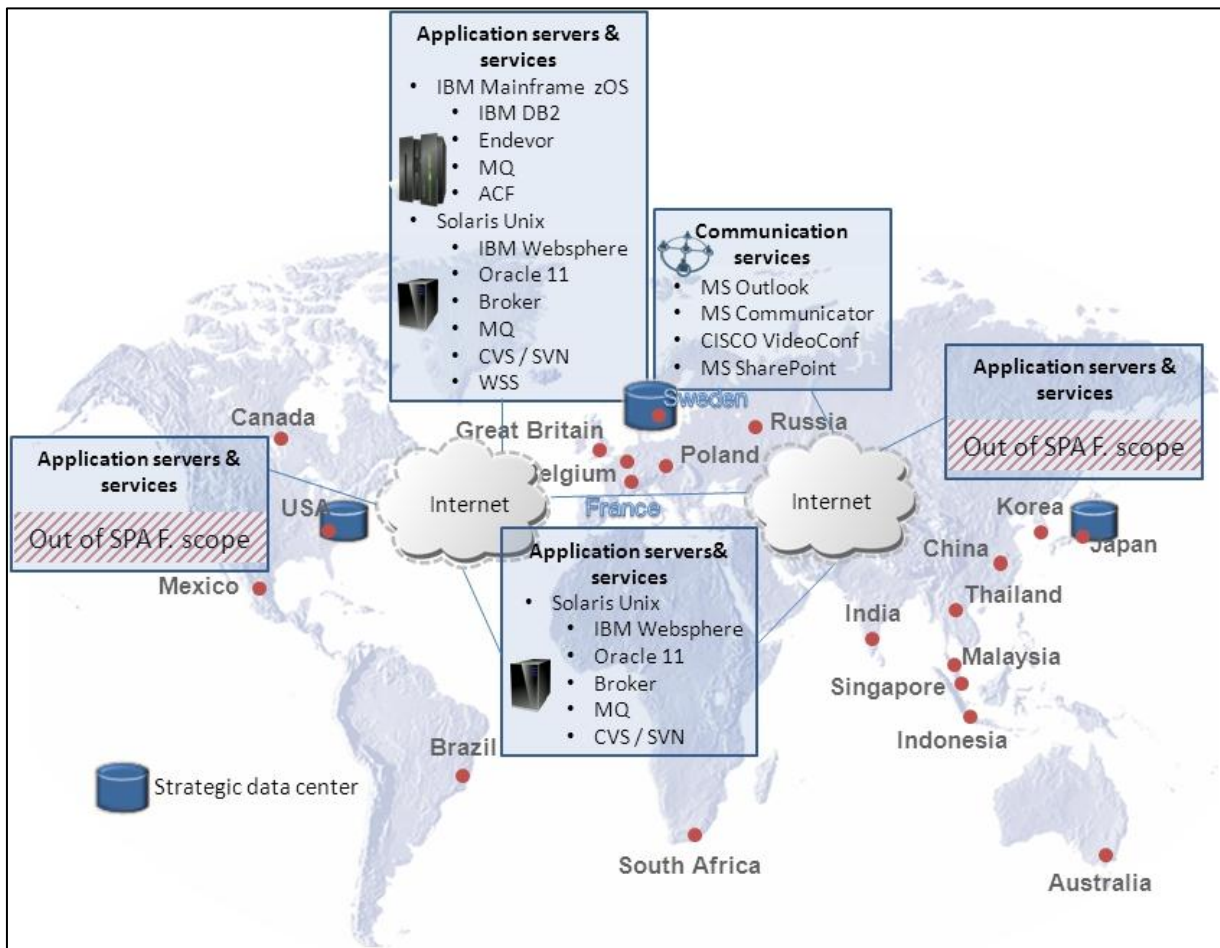
## 1.2. Volvo IT global infrastructure for SPA F.

Volvo IT provides its projects and programs with the resources they need to implement its global strategy.

It is first the availability of a specific support service called Global Infrastructure & Operations (GI&O). It proposes management and consulting professionals to assigns to projects. Its services' fields are Infrastructure platforms & operations (servers), Network and communication, Application management, Identity management and IS/IT security. Finally it can provide end user services such as mobility, desktop, telephony, messaging and end-user security. It is also a global organization with locations and resources distributed in the 5 continents to be able to address the support requests of their global partners.

Second, Volvo IT global infrastructure (Fig. 4) is about the availability of Volvo IT global hardware infrastructure itself. Every site around the world is linked up to the other sites through an internet TCP/IP network. There are private sub-networks for the biggest sites:

- Gothenburg hosts most of the global communication services and servers such as MS SharePoint portal server, MS Outlook server, MS Communicator, CISCO Visio conference.
- Development services and servers are also distributed worldwide. Regarding SPA F., they are mainly distributed between Sweden and France according to their technology and applications. All IBM Mainframe zOS are hosted in Gothenburg whereas according to their specific RT (Renault Trucks) application or not, Unix Solaris and Web Application Servers (IBM Websphere WAS) are distributed respectively in Lyon or Gothenburg. For database servers, it is the same rule as for development servers. All IBM DB2 are hosted in Sweden whereas oracle 11 DB servers are distributed between Lyon and Gothenburg.
- As for the development collaboration tools such as CVS (Concurrent Version System), SVN (Apache Subversion) for Web technologies and Endeavor for Mainframe ones, they are respectively hosted in France and Sweden.
- In respect to security, all servers ACF (Access Control Facility) for Mainframe technology and Web Security Service (SiteMinder WSS) for Web technology are hosted in Gothenburg.
- There are three strategic data centers in Gothenburg (Sweden), Greensboro (USA) and Ageo (Japan) in charge of the strategic data of the 3 world regions of the Volvo group (EMEA for Europe, Middle East & Africa, Americas and APAC for Asia Pacific)



**Figure 4: Global VIT infrastructure SPA F. focused**

With those services, software, hardware and networks directly available for Volvo IT (VIT) projects, VIT global infrastructure description section is completed. The next section is the presentation of the SPA Foundation program.

### **1.3. SPA Foundation program (SPA F.) at Volvo IT**

Following the SIRTAKI program (integration of Volvo Kola logic into the applications of Renault trucks) [SIRTAKI. 2008], SPA F. program for Renault Trucks (RT) kicked off in April 2011.

It was designed to coordinate the deliveries of the following 7 tracks (Fig. 5) addressing as much aftermarket businesses to serve RT's customers and dealers' interests. [SPA F(a). 2011]

- Service planning addresses maintenance planning management for the right maintenance at the right time and the benefits of RT trucks' customers.
- Diagnosis addresses problems identification management with easy, fast and reliable solutions for RT dealers.
- Quotation addresses price estimation management to provide reliable and immediate answers to customer requests.
- Warranty addresses management of customer claims for dealers with a lean, simple process and system solution.
- Connected addresses wireless communication solutions with the trucks at any time for customers as well as for dealers and head quarter.
- Hermes addresses truck health record solutions to provide all vehicle information during its whole lifecycle.
- Literature addresses truck documentation business.

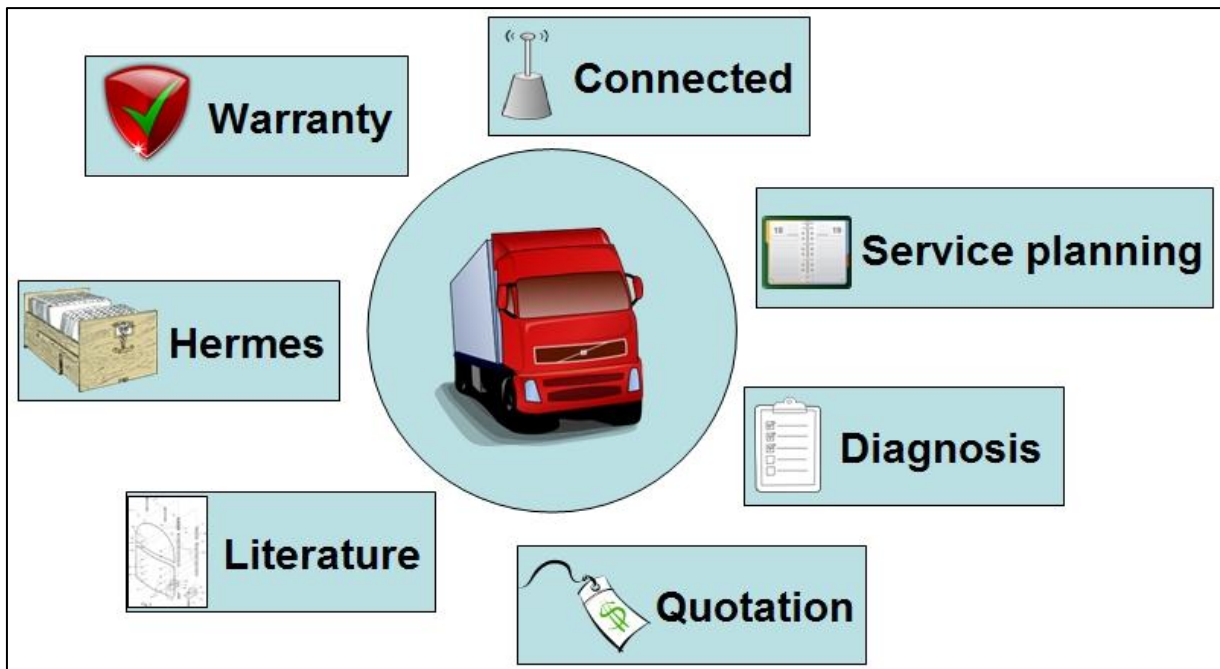


Figure 5: SPA F. project scope

For customers, the objective was to give them the solutions to manage the cost of ownership for their trucks, based on uptime commitment, repair & maintenance cost management and customer follow-up [SPA F(a). 2011].

For dealers, it was about giving them the solutions to support the expansion of after sales business relying on the increase of customer loyalty to the product and to the workshop.

Split into 3 parts (Fig. 6) “SPA1 After sales basics” (2011), “SPA2 Mandatory P2683 + Next basics” (2012) and “SPA3 Mandatory €6 + basics” (2013), the end target was set to the implementation of European Euro6 truck regulation [SPA F(a). 2011]

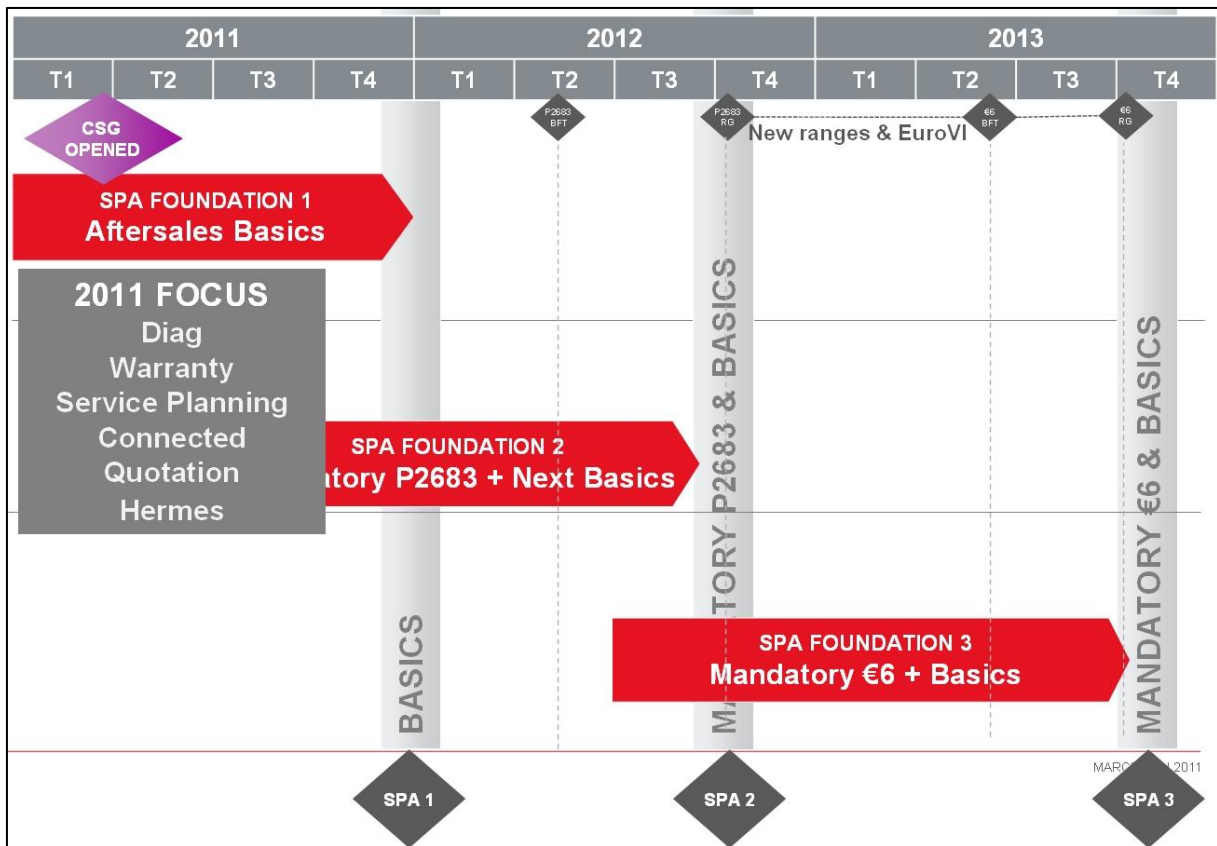
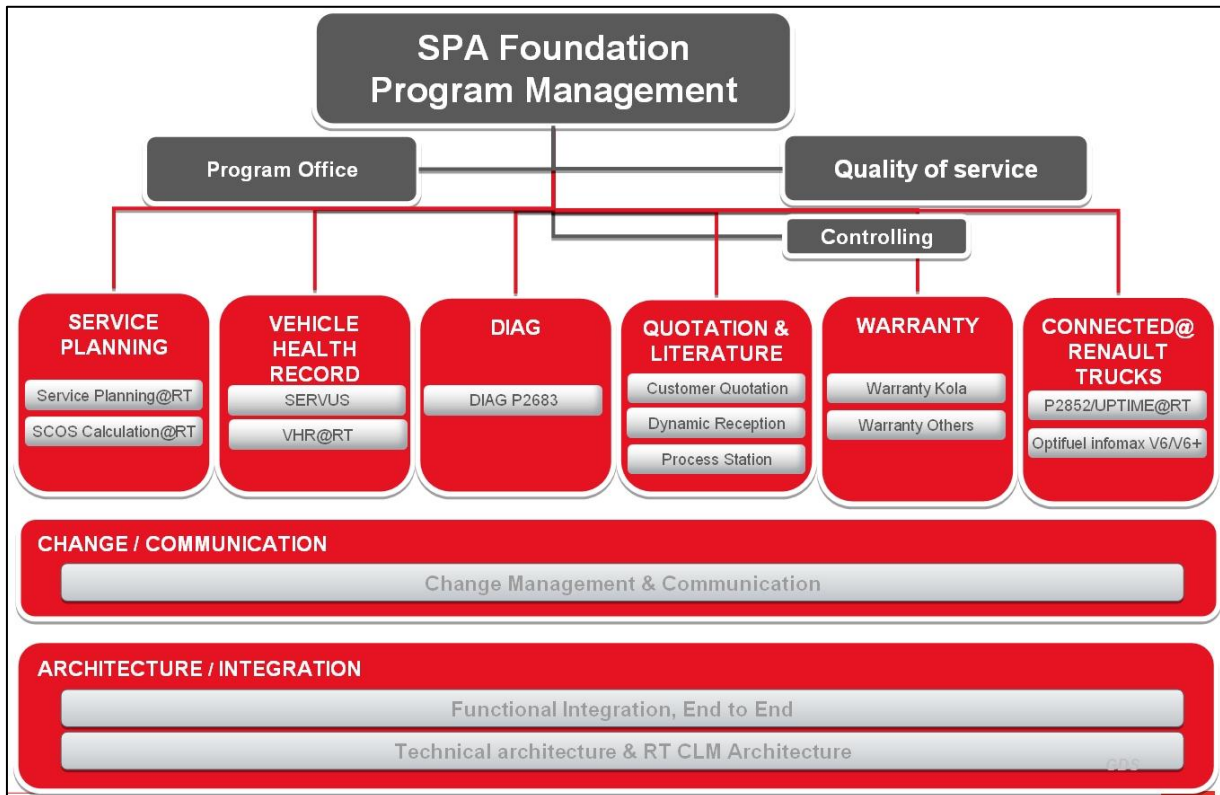


Figure 6: [SPA F(a). 2011]. SPA F. Overall program planning

Its organizational structure is presented in figure 7 with the central program management supported by program office, quality and controlling services. Its seven tracks are presented with Quotation and Literature grouped because of their common management. Finally

operational supports with change & communication and architecture & integration services are presented.



**Figure 7: [SPA F(a). 2011]. SPA Foundation organization chart**

This chapter described the context of this mission characterized by different levels of interlinked global organizations leading their specific businesses with the guidance and support of each other. The Next chapter is the presentation of SPA F. project to build a global distributed software factory.

## CHAPTER 2

# SPA F. GLOBAL DISTRIBUTED SOFTWARE FACTORY (GDSF) PROJECT

This chapter details the project of SPA Foundation (SPA F.) program to build its Global Distributed Software Factory (GDSF).

“In software engineering, a software factory is an organizational structure that specializes in producing computer software applications or components according to specific, externally-defined end-user requirements through an assembly process. A software factory applies manufacturing techniques and principles to Software Development to mimic the benefits of traditional manufacturing. Software factories are generally involved with outsourced software creation. Developing applications using a suitable software factory can provide many benefits, such as improved productivity, quality and evolution capability”. [Wikipedia. 2012]

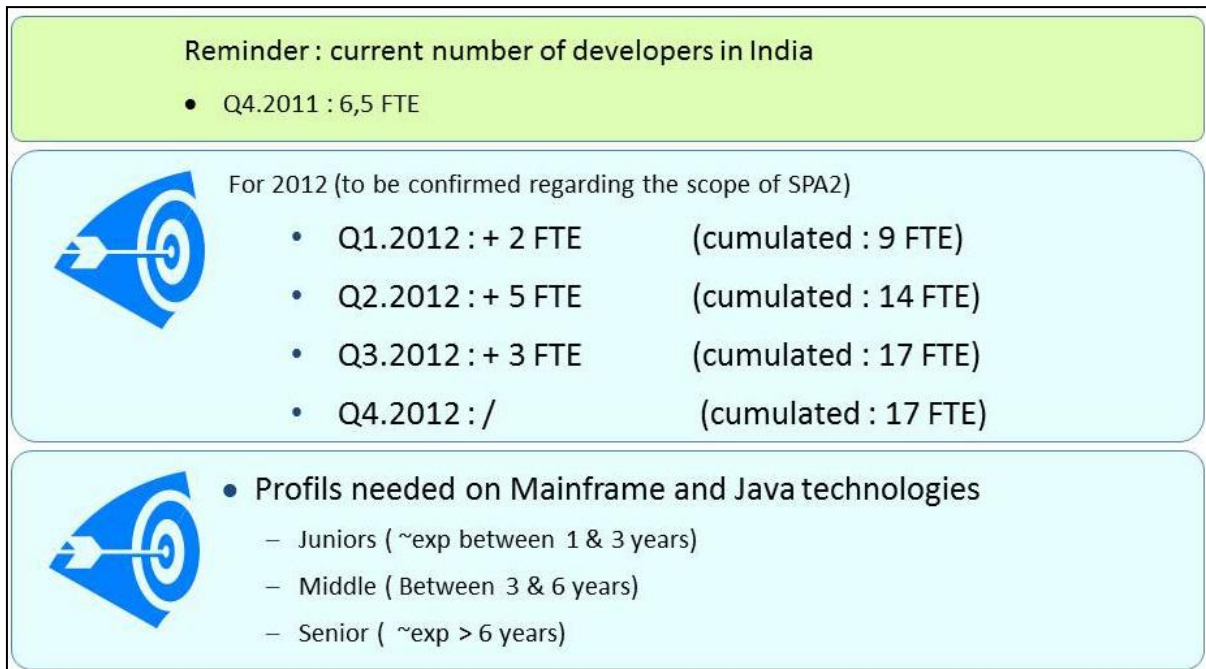
We completed the name of the project with the Global Distributed characteristic to specify that this organizational structure had to be distributed across several countries.

### 2.1. SPA F. GDSF Targets

The first target was to manage the prospective offshore developer ramp-up of SPA F. (Soft Product and Aftermarket Foundation) program. As presented in figure 8, the program planned to increase the number of its offshore developers, from 6.5 FTE (Full Time Equivalent) at the end of 2011 to 17 FTE at the end of 2012.



The staffing processes of this GDSF (Global Distributed Software Factory) were expected to help the program achieve this target all along its three prospective ramp-ups (Fig 8) [SPA F(b). 2011].

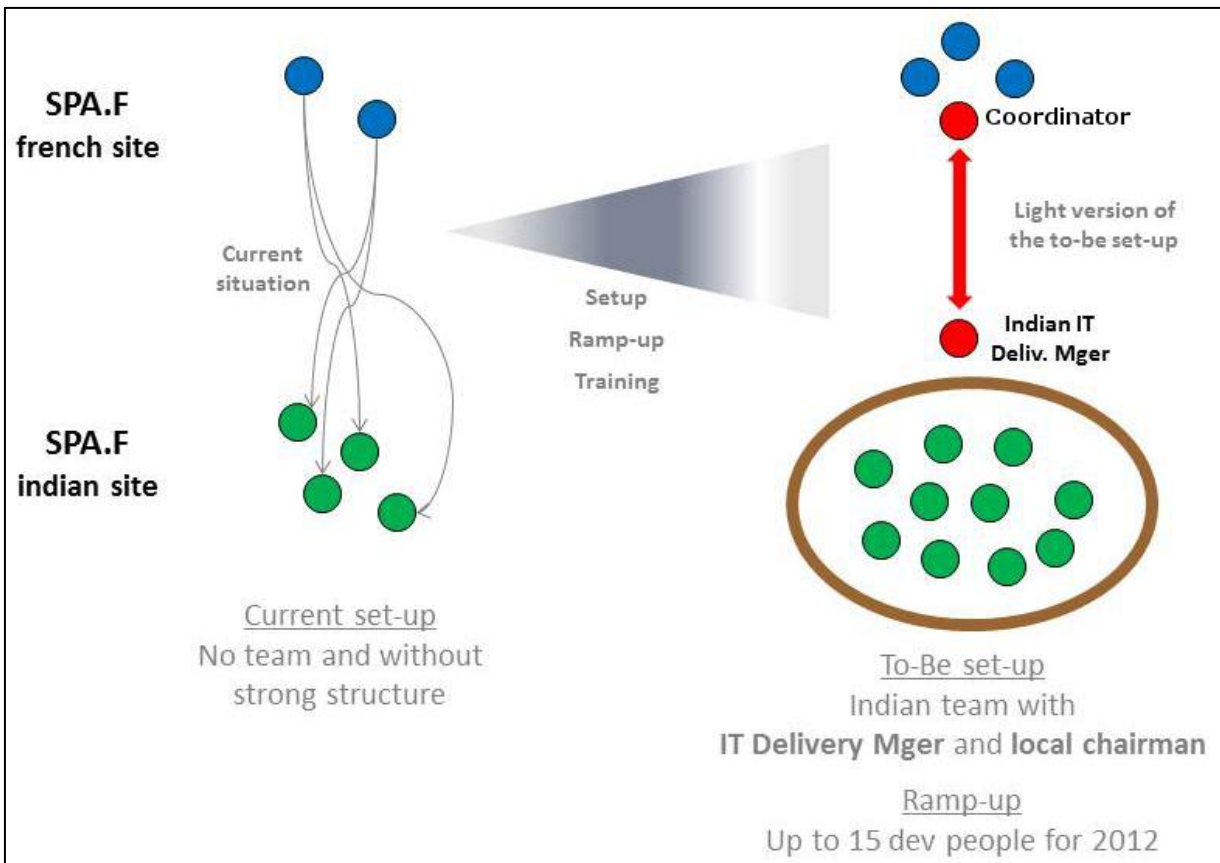


**Figure 8: [SPA F(b). 2011] End of 2011 SPA F. forecasted application developer needs**

Part of the benefits presented in the above software factory definition, the second target was to improve productivity and quality of software deliveries thanks to GDSF strong organizational structure.

Early in 2011, SPA F. program was already delivering globally software solutions in respect to Volvo IT strategy and according to its domain distribution among France, India, Brazil and Poland (AD distribution map Fig. 3). At that time, without a specific global delivery structure, productivity and quality of software deliveries were not satisfactory. Indeed, as pictured in figure 9, communications and tasks for those deliveries were multiplied, redundant and not coordinated [SPA F(b). 2011]

The strong and fine-tuned development and management processes of this GDSF associated with the program sourcing strategy to focus its offshore activities on one main site (Bangalore India) to reduce the costs from multiplied interfaces (Fig. 9) were expected to help the program achieve this improve productivity and quality target.



**Figure 9: [SPA F(b). 2011] Targeted offshore IT delivery structure for SPA F.**

As just described, prospective offshore developer ramp-up and improvement of software delivery productivity and quality were the main targets of the GDSF (Global Distributed Software Factory) project. The next section is the presentation of the related challenges that this project faced.

## 2.2. SPA F. GDSF Challenges

This section describes the situation faced by SPA F. program regarding its global software organization target. To the “usual” obstacles faced by collocated software projects (uncertainties, context changes), there are in global distributed projects additional challenges (communications, remote delivery and management) to tackle. We categorized those global distributed challenges in two parts and described them in the following sub-sections:

- The challenges already known or expected at the beginning of the project
- The challenges encountered on the ground during the setup of the project

### 2.2.1. Expected challenges

Even before the beginning of SPA F. (Soft Product and Aftermarket) GDSF (Global Distributed Software Factory) project, the following first issues to solve were identified. Related to Recruitment, Development and Methods, they were first identified at the end of the previous program named SIRTAKI and met again at the beginning of SPA F.

#### 2.2.1.1. Recruitment challenges

One of the assumed assets of offshore outsourcing is its ability to provide a large skilled resource pool.

Compared to the shortage of talented resources faced by our western countries, in countries such as India and China, hundreds of thousands of software engineers are produced each year [Conchuir. 2009]. In 2008, more than 14 million young university graduates with up to 7 years of work experience were available in India. The Indian pool is 1.5 times bigger than China’s and 2 times bigger than the US’. This pool increases every year by more than 2.5 million new graduates. Multinational companies consider that more than 25% of all engineering graduates in India are directly suitable to their expectations (language proficiency, quality of education and cultural adaptation) [Hendel. 2008]. Despite its position at the heart of India’s IT outsourcing, the Volvo IT office in Bangalore faced a lot of issues to provide SPA F. with the resources its projects requested.

**Shortage of internal resources**

The Volvo IT Bangalore office has the ability to provide resources from its own employees (internal or in-house) or from outside the company with subcontractors (external consultant or outsourced). One of the benefits of Volvo IT employees is their knowledge of the company strong methods and frameworks (see §2.2.2.2). That's why in most of the cases, onsite front office project managers prefer to assign internal offshore employee to their project.

The large pools of resources that were presented above are a reality for the country as a whole or for the biggest IT companies but for smaller ones such as Volvo IT Bangalore, it is not the case. For the latter kind, the number of resources fits more or less with their current projects' capacity (nearly no free resources). That's why we noticed that at the end of 2011, only 2 of the 7 offshore resources from Bangalore assigned at SPA F (Soft Products & Aftermarket Foundations) were internal ones.

**Remote and loose then slow staffing process**

Due to lack of close relationship between French project requestors and the staffing request office in Bangalore, staffing processing tended to be inefficient and too many times, the proposals were answered too late. Here is an example of inefficient SPA F staffing processing before its GDSF (Global Distributed Software Factory). A staffing request for a new team member was issued at the end of June 2011 for a critical assignment early in September 2011 and was only answered by the end of October 2011.

**Diverging qualification understandings**

Communication is a critical aspect of project management. To let someone knows that a major communication (specifications, contracts) is available is not enough, organizations have to make sure that those communications are understood to avoid misunderstanding. This is what happened with recruitment sources, considered to be shared references because they were company sources (Staffing request forms and Technical skill specifications) they ended misunderstood or understood in different ways in France and in India. For example, a communicative profile from a French point of view implied reporting skills whereas from an Indian point of view it only implied good level in English.

### **Program attractiveness**

Indian software industry keeps growing at high speed. There are a lot of opportunities for Indian IT engineers. W.Messner [2008] emphasizes that Indian companies often have to improve their job conditions to keep their employees in house. There are for example what he calls IT tourism opportunities and salary increases up to 15% like in 2006 and 2007. In that competitive environment SPA F. (Soft Product and Aftermarket) program had to work on its attractiveness to find and keep the resources it needed.

As just described in this sub-section, shortage of internal resources, remote staffing process, diverging qualification understanding and program attractiveness were the main recruitment challenges we expected to tackle for the setup of SPA F. GDSF (Global Distributed Software Factory). The next sub-section, presents SPA F. GDSF challenges related to software development stage.

#### ***2.2.1.2. Software development challenges***

At the software development stage, between the end of design stage and the beginning of integration test stage, we expected to tackle the following challenges related to commitment and estimations on workloads handed over to offshore side of SPA F. team.

### **Lack of commitment**

Regarding the Development phases, the first target identified was related to the lack of commitment of the offshore resources. The general assumption from France was that the commitment of their overseas partners to Workload, Delay or Quality was not satisfactory. In close relation with customers, French IT/Software resources had to demonstrate strong commitment which, because of distance, offshore resources could escape from.

### **Unspecified estimation method**

Offshore resources were expected to provide workload estimations for their assigned deliveries (coding and unit testing, man day volumes).

It appeared that even with the support of onshore teams, those estimations were never provided. There were misunderstandings between the French teams which thought that they had provided sufficient inputs to produce estimations and Indian teams which expressed their confusion in front of the task they were asked to perform.

With those descriptions of software development challenges focused on commitment and estimations, this expected challenges section that started with recruitment challenges, is now completed. The next section presents the challenges discovered during our works on the ground.

### **2.2.2. Challenges discovered on the ground**

This section describes the challenges we encountered and faced on the ground during the setup of SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory). Those challenges were related to administration, development model and one team management aspects.

#### **2.2.2.1. *Administrative proficiency challenge***

One of the trickier matters and one of the least expected, for a software project, was the management of legal settings required to organize face to face meetings between teammates in each country.

Business travels are very regulated by countries' authorities. Any request to move a worker from a country to another, even temporarily, has to strictly match cases specified by authorities.

In India, there are Business and Employment Visas that can be used for professional travels. The first one is limited to 30 days and can be renewed while the second one is for stays exceeding 6 months.

On the other side, in France, the business Visa is limited to 30 days as well but it cannot be renewed just after a previous one (this requires at least 1 month between 2 allocations).

Those limitations can be real problems for big organizations which usually need several months to setup their projects with key individuals from all around the world.

#### **2.2.2.2. *Compliance with internal models challenge***

Frameworks and models are certainly assets to structure and support organizations. Nevertheless, they involve compliance efforts to new or updated organizations that should not be underestimated. This section presents those frameworks and models we had to comply with in the building of SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory)

**An heritage to comply with**

The SPA F. program is the continuation of SIRTAKI program and is delivered by AD resources at Volvo IT which, for most of them, already worked in the previous program. This statement implied that SPA F. had to build its organization taking into account outputs from those former contexts.

IS-GDP4IT (Information System Global Development Process for Information Technology) is the mandatory Project Control & Application Management model (Fig. 10) established by Volvo IT to implement IT processes, One time (creation) as well as Run time (maintenance) projects. It matches IS-GDP which is the model used by the business in the Volvo group and then allows a better alignment and collaboration of the projects of those 2 parts (business and IT). It structures IT projects into 8 stages with as many gates to check if what is required to get to the next stage has been delivered:

- IT VG, Vision Gate where the project vision and diagnosis are defined
- IT CSG, Concept Study Gate where possible solutions are identified
- IT DG, Development Gate where one solution is selected in combination with technical concepts
- IT FDCG, Final Development & Contract Gate where all the solution details are specified and the contract to develop is signed
- IT ULG, User Launch Gate where the delivered solution is controlled before user approval
- IT RG, Release Gate where the delivered solution is approved by the end user and roll-out ready
- IT EG, End Gate where the delivered solution is approved in the operational environment

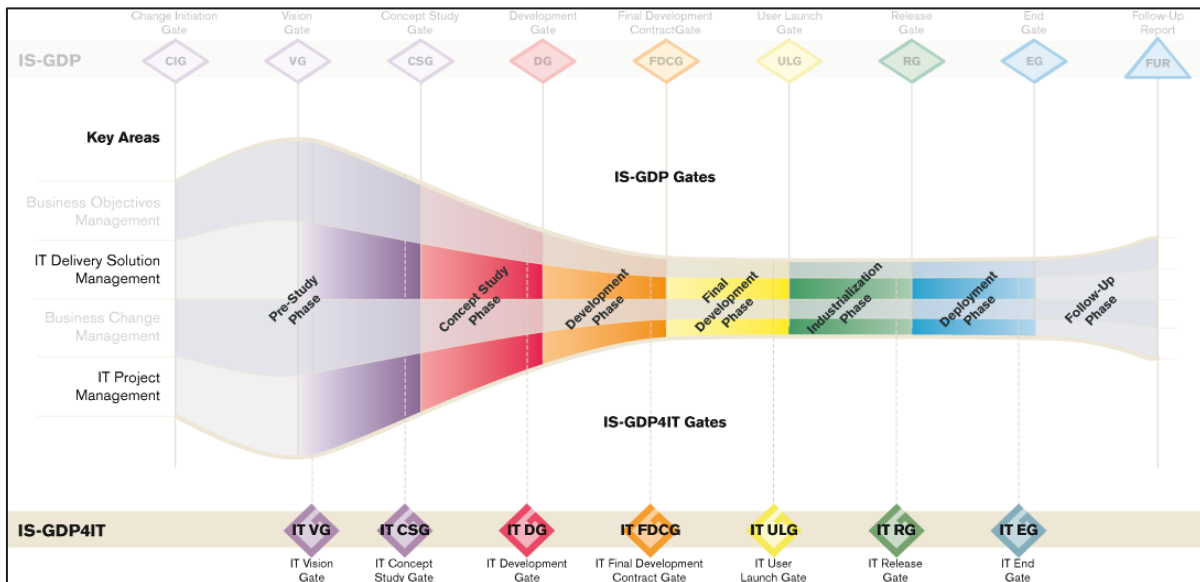


Figure 10: IS-GDP4IT, Volvo Project Control & Application Management model

From AD, there are strong promptings to implement ADT’s (Application Development Techniques) recommendations. ADT is an AD global function that supports, with its experts, Volvo IT’s functions to improve quality, efficiency and productivity on development methods, environments, tools and architecture.

With respect to the development model, ADT recommends their ADM (Application Development Model) (Fig. 11) which is a combination of activities and outputs, related to roles and mitigating the methodologies of the main IT lines of work (Test Management, Business Analysis, Requirements Management, Usability, Software Change & Configuration Management ) into one model.



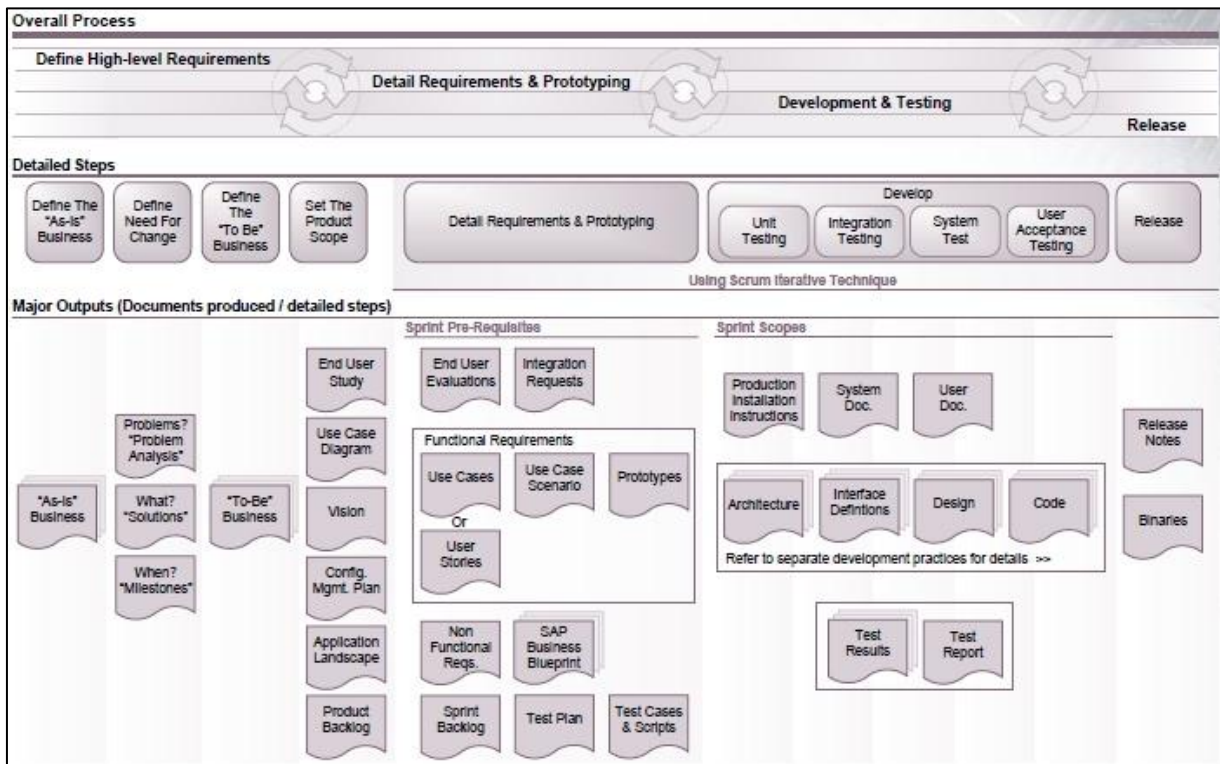


Figure 11: [ADT. 2012]. Application Development Model

At each level, entities of the Volvo group incorporate and adapt the recommendations of the previous or above one. SPA F (Soft Product and Aftermarket Foundation) program did the same with the materials inherited from SIRTAKI program. They were management tools, development processes, specification templates that could be used as basis for the SPA F. GDSF (Global Distributed Software Factory). Nevertheless, a special attention had to be paid to the fact that unlike at SPA F., SIRTAKI's offshore delivery was outsourced to an external Indian company (MindTree) which implies differences in the types of management required.

### 2.2.2.3. One team management challenge

For a program with seven tracks (projects), developed in 4 geographical locations with more than seven technologies and as many types of management, one of the big challenges is to set up a common framework so that each and every part can work for the program in a consistent way. Without common delivery ground in this heterogeneous environment, deliveries can easily aim at the wrong global targets and go out of control.

This section presented the challenges we identified on SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory). Except for the point about compliancy with internal models, they were related to specific issues of global environments: recruitment, software development, administrative and one team management. The next section describes the last part of this GDSF project chapter which is the presentation of our mission in the project.

### **2.3. Work placement mission**

In respect to SPA F (Soft Product and Aftermarket Foundation) program management strategy about global software delivery, this mission's goal was to build up its GDSF (Global Distributed Software Factory) to be used by its projects from SPA2 deliveries (> mid 2012) onwards. As a core member of the SPA F. distributed delivery coordination team (see §4.1), this work placement was expected to carry out its part of the following SPA F. GDSF setup activities:

- Situation analysis
- Workshop leading
- Organization & process design
- Resource coordinating
- Resource training
- Result presentation

Among all the potential SPA F. GDSF setup deliveries, a special expectation was expressed by program management on staffing, development and quality matters.

This chapter presented SPA F. GDSF project, first with its targets to manage its offshore developer ramp-ups and to improve the productivity and quality of its software deliveries. GDSF project presentation followed with its challenges related to recruitment, software development, administrative, compliancy with internal models and one team management issues. It ended with the presentation of our mission in this project. The next chapter presents the state of the art of global software engineering that can be used to understand the solutions we implemented at SPA F. GDSF.

## CHAPTER 3

# GLOBAL SOFTWARE ENGINEERING, STATE OF THE ART

### 3.1. Global Software Engineering (GSE) characteristics

This chapter presents a general view of Global Software Engineering (GSE) built from review of specialized literature [Hendel. 2008; Carmel. 2006; Conchuir. 2009; Yalaho. 2009]. GSE is a specific field of the main software engineering area which is carried out in work environments distributed globally in several geographical locations.

The Software Engineering Body Of Knowledge (SWEBOK) part of IEEE (Institute of Electrical and Electronics Engineers) Computer Society defines this main area (software engineering) as the application or the study of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software [SWEBOK. 2004].

Global Software Development (GSD) is also a common title used to name this specific field of software engineering. GSE is preferred in this document because it covers a wider scope of software activities, because the main annual international conference related to this matter is called ICGSE (IEEE International Conference on Global Software Engineering) and because it appeared more suited for this master of software engineering thesis [ICGSE. 2012].

### 3.1.1. From outsourcing to GSE

According to A.Yalaho [2009], software outsourcing dates back to the 1960s with the “facility management” business model. It was a time-sharing contract system built up to allow several organizations to use the same, expensive at this time, mainframe server, in order to lower their infrastructure costs. Following hardware’s trend, the next decade (70s) saw the increase of software and application development costs leading organizations to develop new business models such as competitive “contract programming” to curb this inflation.

The 80s laid the foundations of new software engineering techniques and technologies to face the increasing demand of application development. They were from all kinds with structured analysis and design methods, object oriented programming, computer-aided tools and software components. With those new tools it was now possible to modularize and distribute software works.

At the end of the 90s, there was the emergence of Application Service Provider (ASP) business model based on the new capabilities of organization to buy, install and manage enterprise applications remotely through networks mainly Internet. Those business models built the foundations of software globalization.

In an economic point of view, it was because of the 80s and 90s economic crisis which led organizations to work on cost saving answers that GSE emerged as a solution.

### 3.1.2. GSE relies on Information and Communication Technologies (ICT)

Furthermore to specific economic and business contexts described in the previous section, GSE success is closely related to the diffusion, availability and decreasing cost of Information and Communication Technologies (ICT). [Yalaho. 2009]

Wikipedia (2012) presents ICTs as extensions of ITs (Information Technologies) emphasizing their special features: their unified communications role and their specific components which are telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.

In an offshore outsourcing perspective, A.Yalaho [2009], presents ICTs as technologies enabling or supporting IT functions such as hardware and software, computing networks and communication technologies. They also support their applications for data processing, storage, sharing and transmission, including any medium for recording, retrieving and distributing information.

ICTs are key to GSE (Global Software Engineering) because they are appropriate tools to face the following challenges of global distributed software activities. It is first, their ability to reduce the constraints of geographical distance, connecting in real time through networks (Internet, Visio conferencing ...) individuals all around the world. It is then, their property to increase coordination and management capabilities with collaborative tools (MS SharePoint, Atlassian Jira ...) processing large amounts of indicators which can be used locally, internationally, within the organization or with outside partners. Finally, in line with the global outsourcing target, they have the ability to reduce the cost of software development activities (speed up processing, automating, multi-threading ...).

### 3.1.3. GSE models

This sub-section presents the main models for sourcing and delivery in global software engineering.

#### **Global sourcing models**

There are two main forms of GSE (Global Software Engineering), one where the works are performed within the geographically distributed sites of one global company (Offshore In-House) and another one based on the collaboration between several companies located in different countries (Offshore Outsourced). The case described in this document (SPA F. GDSF) is related to the first one.

Another category of sourcing is based on the distance between sites. We refer to Near-shore where there is “proximity” of the offshore location that helps to mitigate problems such as time differences, coordination, cultural differences and communication problems that are characteristically associating with offshore sourcing [Yalaho. 2009]. The basic Offshore term is used when locations of the site countries are in different regions of the world. [Thun. 2008].

On-Site and On-Shore forms of sourcing will not be detailed in this document because of their non-international characteristic, not in line with the global specificity of GSE.

### **Global delivery models**

According to F.Thun [2008], there are two main delivery models that can be combined to deal with global software distributed organizations: The One Team model and the Factory model.

The One Team model is based on a detailed and strong relationship between individuals to face the challenges of their “common” delivery organization. Usually front-office organization is mirrored back-office and front-office team leaders take charge of the combined onsite/offshore resources. In this model, team spirit is built-up and strengthened to facilitate its main asset which is the knowledge sharing. It can be very useful in distributed environments where knowledge is divided between different locations (usually business matters at onshore side and technical ones at offshore side). One of its weaknesses is related to the risk of interpretations leading to different ways of performing activities according to the performer. [Thun. 2008]

The Factory model is based on industrialization of main stream of activities (staffing, analysis, design, development and testing). This implies dedicated factory organization with its own resources and management for each stream. In this model the distances between individuals (geographically, culturally and the ways of understanding and working) is acknowledged and the proposed solution is to detail the main activities in a way everyone can refer to the descriptions to understand and perform their activities in a same way. One of its weaknesses is related to the “silo” effect that resources can feel when they are kept isolated in their stream without any insight beyond. [Thun. 2008]

The mixed model is often implemented to balance those main models’ weaknesses and benefits. It is up to the organization to choose the appropriate one according to its situation and targets.

### **3.1.4. GSE Potential Benefits**

This sub-section presents 6 of the main potential benefits software organizations can expect adopting global software practices.

#### **Lowering development costs**

According to Conchuir [2009] “one of the most obvious reasons for organizations to embark on GSD is the potential to reduce the development costs. By moving parts of the development work to low-wage countries, the same work can be done for a fraction of the work”

**Leveraging Time-Zone effectiveness**

With a proper distribution of developers located in several time-zones, organizations can increase the number of daily working hours in a ‘follow-the-sun’ development model. By this way organization can decrease (or maximize) cycle time. [Conchuir. 2009]

**Cross-site modularization of development work**

Conchuir [2009] emphasizes that the ability of software development to be divided into modules is an asset to allow parallel developments across multiple sites. By this way, it is possible to reduce cycle time.

**Large skilled labor pool access**

According to Conchuir [2009] (western) software organizations face a shortage of sufficient developer talents whereas in emerging countries such as India and China, hundreds of thousands of software engineers are produced every year. Thus global organization has the potential to facilitate access to a large pool of highly skilled workers.

**Innovation through sharing of best practices**

The diversity of backgrounds in global organizations can lead to expand best practices sharing among teams and to increase innovation. [Conchuir. 2009]

**Closer proximity to market and customer**

By establishing subsidiaries in countries and on continents where customers of those organizations are located, more and better interactions are created. [Conchuir. 2009].

### 3.1.5. GSE Customers

Globalization of software development is most likely implemented in organizations with a large number of employees. According to KL.Kraemer [2010] study, for organizations with less than 100 employees, software offshoring only tops up to 40% of software activities whereas for larger organizations, it can go up to 90%. As pioneers in this area, USA still are the leaders of this approach, standing for 79% of this market, followed by Europe at 17% where UK stands for the biggest part then Nordic countries and the Netherlands [F.Thun. 2008].

### 3.1.6. GSE Destinations

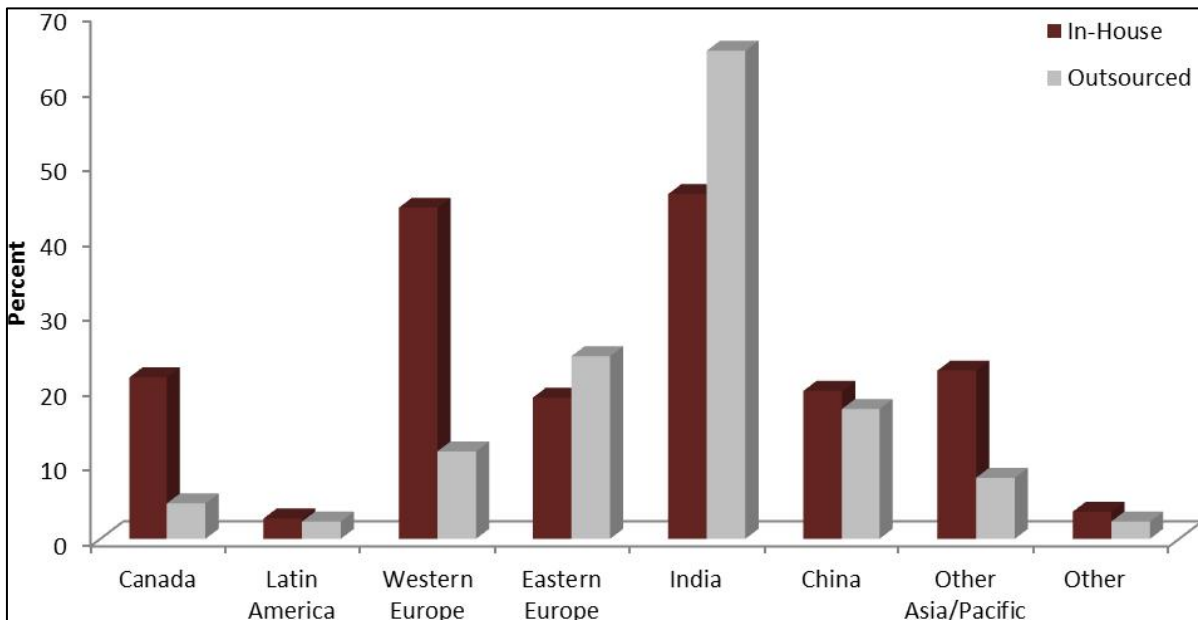
The “Big Three” destinations where software organizations use to make their global sourcing are India, China and Russia. Indeed, those countries all have large population, well-educated labour force in Science and Technology and low wage level compared to industrialized nations. According to E.Carmel [2006], their export volume of software products and services for 2003 are about 350 million USD for Russia, 1 billion USD for China which is roughly 10% of India’s (more than 10 billion USD).

Based on 150 US software companies that have (at least) some offshore (in-house or outsourced) development activities, KL.Kraemer [2010] study presents a broad distribution picture (Fig. 12) of those destinations. As always, India stands for the first place of in-house and outsourced (see §3.1.3 sourcing model) offshore destination. Two of the main outputs of this study are related to region weight and in-house destinations. Indeed, region-wide, Russia into Eastern Europe places at the second position just before china.

In an in-house perspective, it is interesting to notice that Western Europe places second (very close to India 44-46%) far away from the next ones Asia/Pacific & Canada and that Russia and China are not in the first positions.

PS: The relatively strong place of Canada in In-House offshoring is due to its near-shore status for US companies. A survey on Western Europe companies would have placed Eastern Europe in top places for the same reasons.





**Figure 12: [Kreamer. 2010] global offshore distribution of US companies**

In respect of distribution level (number of partners), D.Smite [2010] study emphasizes that most of the setups are between 2 and 3 sites. For intra-organizational collaboration (in-house) the great majority of the distribution setups involve only 2 sites (80%). For Inter-organizational collaboration (outsourced) setups are mostly shared between 2 and 3 sites (respectively 40% and 46%). Exceptionally those setups can get up to 15 sites.

### 3.1.7. GSE Status

This sub-section presents a status on global software engineering regarding its maturity, complexity and achievements.

#### GSE a young field

It is important to notice that, like D.Damian [2006], most of the specialized literature about this GSE matter qualifies its body of knowledge as immature or only crafted over time and that its art and science are still evolving. This immaturity leads companies to encounter a lot of problems and failures when going offshore with no other way than stick to their decision and eventually make it work. It is called by E.Carmel [2006] the “Stumble-and-then-Succeed” approach.

**GSE a complex field**

Comparing studies about problems in software projects, E.Carmel [2006] emphasizes that there is “only” 16% more problems encountered in offshored projects than in “traditional” ones. Out of his study D.Smite [2010] reports that GSE is marked as Problem for 54%, as Successful practices (specific points in a project) for 25%, Success story (all project) for 10%.

**GSE benefits for experienced organizations**

In theory, according to Deloitte Consulting [Carmel. 2006] an experienced organization that optimally implements all best practices and processes of offshore outsourcing could get total savings up to 47%.

In practice, this same consulting company reported that in the best cases, savings topped up at about 25% from “Fortune 50” US corporation kinds that have been offshoring for at least 5 years. Next, come with savings topped up at 15%, the companies of this same kind that “only” experienced 2 years in this field.

According to E.Carmel [2006] savings can be achieved relatively quickly in small, well-specified projects. Whereas for larger ones they can require from 1 to 2 years, sometimes even more and in some cases never achieved.

## **3.2. Impacts of GSE on software engineering**

GSE (Global Software Engineering) is a specific kind of software engineering, different from the traditional (collocated) one we used to know. It is emerging in line with the globalization of the world economies and causes major mutations to IT work forms, engineers and markets. Indeed, IT projects have to put in place specific organizations to face the new challenges that global distribution implies in this context, IT engineers need to evolve and IT market is already pushing forward to maximize its benefits.

**Impacts on IT projects**

A lot of project basics are no longer the same or are not even available in global distributed environments. For example, project management can no longer count on spontaneous relationships or team building that direct contact in the same work space allows. Another disappearance of project basic is related to informal communication (coffee breaks, lunch times, celebrations) between individuals which is considered to be a major source of answers, solutions in collocated projects.

On the changes side, we can refer to hierarchies which could be easily identified when working in the same place with some key signals like the size and the location of the office rooms or parking lots but are far less obvious in virtual teams. Furthermore, there are new challenges to tackle like the ones described in the previous chapter (§2.2 SPA F. GDSF Challenges).

For all those reasons, global distributed projects require specific organizations with specific ways of working built on specific backgrounds and references like the one you are reading.

**Impacts on IT engineers**

A guess could have been made that GSE (Global Software Engineering) is only a distribution of existing previously collocated profiles. It is not so simple. In fact, this specific software engineering requires specific IT profiles in general and engineers in particular. Where collocated software organizations could mainly rely on skillful generalized engineers, now in this GSE environment they need specialized ones to work under specific processes and rules.

Those mutations also affect, outside the technical level, the engineering management level. According to W.Messner [2008], in that specific GSE environment, project managers and team leaders have to extend their roles to more and more process managers. Indeed, they have to learn how to set up, maintain, control and fine tune production chains in which each of the deliverables they are responsible of are built.

One of the ways to deal with this matter is for education systems to train their future engineers accordingly to what is required in GSE. JD.Herbsled from Lucent Technologies emphasizes that many educational programs that include team-oriented work, also need to train their engineers with geographically distributed development in mind. It is certainly an educational issue in European and especially in France. According to S. Roche [2011] from IFGCNOF, French IT engineers usually are generalists, looking for projects with high conceptual value, far from the process ones, where 50 to 75% Americans and almost 100% of Indians are specialized.

From a French engineer's point of view, the solution is in the strengthening (not in the specialization) of its profiles to fit also in GSE requirements such as distributed and process skills. Indeed, French engineers skill that helps solving complex matters is recognized all around the world, they now need to be also recognized to fit in processed organizations.

### **On IT market**

Improvement in cost efficiency and profitability remains a major focus for most of the companies. Even when only a few of them achieve this cost efficiency offshoring their IT sources, it gives them a competitive upper hand forcing competitors to match their development or risk losing market shares. This whole process results in an increased competition for software companies and individuals.

With respect to employment from a western point of view, offshoring is mainly viewed as a threat. According to W.Messner [2008] related facts and figures are more balanced. There have been and are jobs lost in our western economies due to offshoring. Estimated at 400,000 in services in 2003, those figures keep growing year after year but actually account for less than 2% of all service jobs. Nevertheless, other figures show that, thanks to US ability of laid-off workers to be reemployed within a short period of time, for every dollar moved offshore a net gain of USD 0.12 to 0.14 flows back to the US economy. This requires flexible labor market regulations and the skill-set of unemployed to be upgraded to more complex and higher value positions.

This chapter presented the state of the art in global software engineering. Introduced as a specific field of the main software engineering area, it was linked to outsourcing and ICT (Information and Communication Technologies) developments. Then its sourcing (in-house, outsourced) and delivery (one-team, factory) models were presented before their potential benefits on cost, time, modularization, skills access, innovation and proximity to markets. Its customers mainly from the US, UK and Nordic countries as well as its destinations mainly to India, China and Russia were then presented. Finally, its status regarding its immaturity, complexity and partial achievements added to its impacts changing IT projects, IT engineers and IT markets completed this chapter.

The next chapter describes the implementation of SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory)

## CHAPTER 4

# SPA F. GLOBAL DISTRIBUTED SOFTWARE FACTORY IMPLEMENTATION

This chapter presents the details of our implementation of the Global Distributed Software Factory (GDSF) for SPA Foundation (SPA F.) program. It describes how we planned the project (planning, team, and work format), how we built up the GDSF structure and the solutions we have implemented for recruitment, software delivery, management and support aspects.

### 4.1. Project setting

This section presents the setting of SPA F. GDSF project starting with its planning specification and following with its team description.

#### **Planning**

The planning (Fig. 13) we designed was built around the following four milestones:

- First, the kick-off of the project in December 2011, when Sylvain Dusserre, SPA F. IT program manager, presented during a specific travel to Bangalore, what was his vision and strategy for offshore software delivery for this program
- Second, the first face to face between the selection of French Indian key role-players planned in Bangalore around March 2012
- Third, the second face to face between the teams planned in Lyon around May 2012
- Last, the closure of the truck factory during French summer period

Between the 2 first milestones, we worked on the definition of the main software delivery topics in the same way.

First a study period to collect the material, understand the challenges and then a set up period in the form of brainstorming workshops with key role-players to build the best solutions.

- Delivery was related to activities between functional design and smoke testing (also known as assembly testing) through coding and unit testing
- Staffing was related to the activities that enable the recruitment of new team members according to the needs of the projects of SPA F. program
- Management dealt with organizational activities (planning, monitoring, reporting or steering) that led the delivery
- Support covered transversal subjects (communication, technical and functional training) that were real back-up for the delivery activities and their improvement

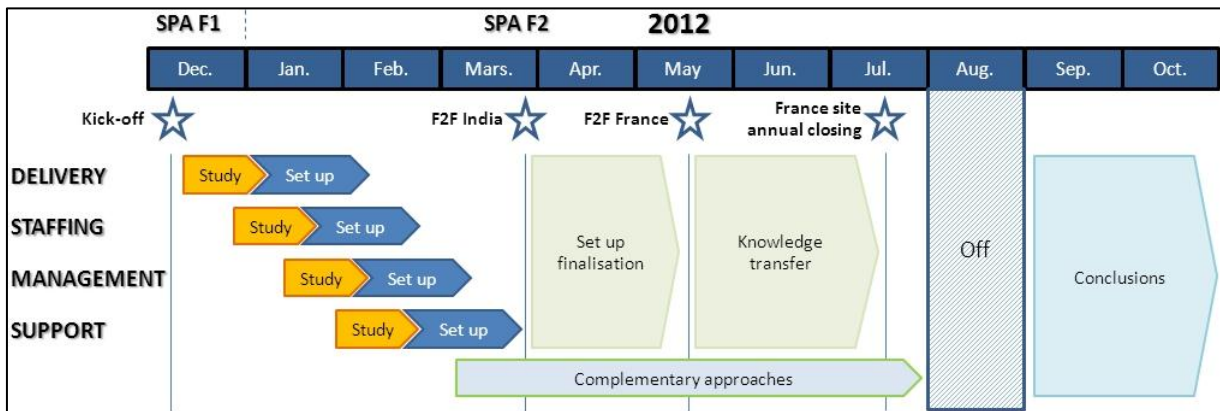
Our target with this first setting stage was to deliver a setup package of all topics related to SPA F. global distributed software development to work on during the French team stay at Bangalore.

Between milestones two and three, we planned a first face to face between French and Indian team representatives in Bangalore. The purpose of this face to face in India was to confront the setup package, which involved remote Indian key role-players, to the Indian perspective in its context.

Between milestones three and four, we planned a stay in Lyon for Indian key individuals to perform a knowledge transfer phase. During this period, they had the opportunity to be incorporated in different French teams to see how work is performed here and get another perspective.

From the end of the first setup package to the august break, I performed a complementary approach study. Its aim was to complete the SPA F. GDSF (Global Distributed Software Factory) setup with material from outside the program, in the company, the group or external organizations.

Finally, from early September to the end of October we led handover sessions. They were knowledge transfer sessions on SPA F. GDSF, addressed to project managements (project managers and assignment leaders), to SPA F. program management and to Volvo IT Lyon key global stakeholders (Request office, Consulting services)



**Figure 13: SPA F. GDSF setup planning**

### Team

Initiated by Sylvain Dusserre (IT program manager) we built up the core team which worked on SPA F. Global Distributed Software Factory (GDSF) setup and implementation with four representative groups of software delivery roles in the program:

- First group, the IT program management (see §4.2.2) representatives with Sylvain Dusserre IT program manager, Florence Dreno (PMO manager) and Pierre-Etienne Burte (End to end delivery manager) who took part, not only as sponsors but were architects of the strategy and solutions implemented.
- Second group, the IT distributed delivery coordination (see §4.2.2) representatives which led SPA F. GDSF setup, with Julie Soyer for her Indian experience of IT project delivery and myself for my software engineering skills and background.
- Third group, the IT front office (see §4.2.1) representatives which brought operational and management inputs with Florian Maurice for his French NTI background, Cyril Chamagne for his French Mainframe background and the managers / assignment leaders of the tracks which participated in the workshops.
- Fourth group, the IT back office (see §4.2.1) representatives which brought operational and management inputs with Meena Suryanarayanan, Back office delivery manager (BDM) for her Indian IT management background, Naziya Aboobacker for her Indian Mainframe background and Ramkumar Vailappully for his Indian NTI background.

This section presented SPA F. GDSF project setting with its 4 milestones (kick-off, Bangalore, Lyon and Closure) planning and its 4 group (program management, distributed delivery coordination, IT front office, IT back office) team were defined. Next section describes the organizational structure (architecture) of SPA F. GDSF.

## 4.2. SPA F. GDSF Architecture

In this section, the details of the organizational structure (Global Distributed Software Factory) we designed to organize and support the software deliveries distributed between France and India of SPA F (Soft Products & Aftermarket Foundations) program, are presented. Those details are related to the overall operating framework specifications, the one team structure, industrialization of staffing and development and structure of management and support.

### 4.2.1. SPA F. Overall stakeholder structure

To clarify for all stakeholders the overall framework of SPA Foundation we specified it using common concepts. Indeed, French teams were used to the MOA (Maître d'OuvrAge) / MOE (Maître d'OEuvre) organizational concept which was not familiar to Indian teams and could not carry the details of our global distribution.

We opted for the “offices” representation that is used in global software organizations [Thun. 2008] and implemented it as pictured in figure 14.

“Business” represents the end user of the solution who, at the beginning of the cycle, has a need for an Information System (IS) solution and at the end of it, runs it in his business.

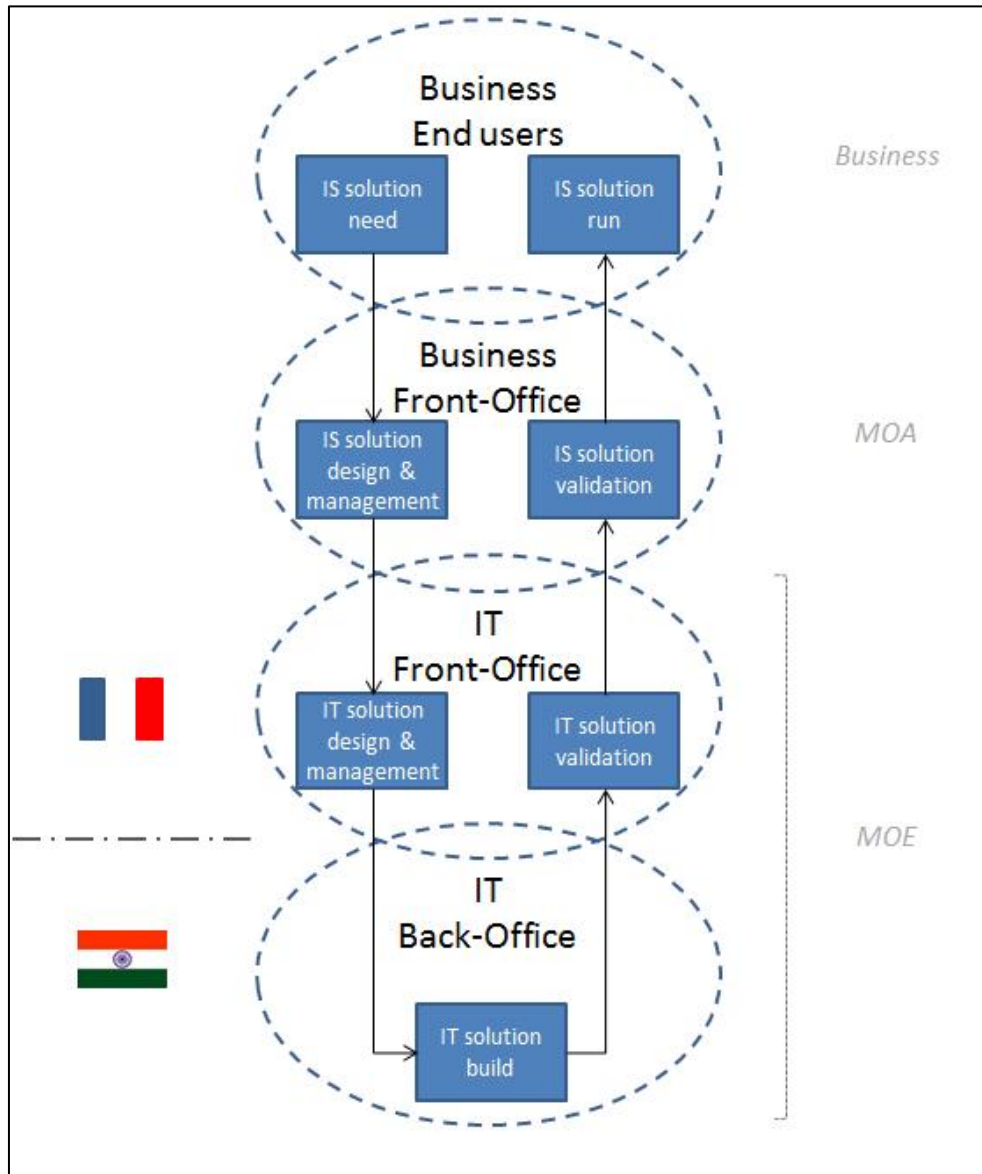
“Business Front office” represents the stakeholder, in this software delivery organization, in contact at one side with Business or end users to manage their IS needs and to design the related IS solution and at the other side with IT front office to coordinate delivery of the IT solution.

PS: IT solutions are components of IS solutions. In some cases IS solutions are full IT and some others no IT.

“IT Front Office” represents the stakeholder, in this software delivery organization, in contact at one side with “Business front office” to design and manage the IT solution and at the other side with back office (supplier) to coordinate delivery of the IT solution.

“IT Back office” represents the stakeholder, in this software delivery organization, in charge of software solution building.





**Figure 14: SPA F. overall stakeholder structure**

Now that the overall stakeholder structure in this SPA F. program was clear for everyone we could get into details of our one team organization and main activity streams (staffing, development) as presented in next sub-sections.

### 4.2.2.SPA F. GDSF One Team aspect

Our One Team approach was designed to address the three following challenges:

- To share a clear representation of the global team and hierarchy
- To place the specific roles in the common organization
- To emphasize the main communication channels

#### **Common global team**

According to the prospective rise of the number of offshore resources, the program had to set up a management organization at the back office side. A special attention was paid to the consistency of its structure compared to the front office one.

Steering (top) management was designed in the same way at the 2 sides (onshore/offshore) whereas there were differences in operational management. Indeed, back office operational teams were expected to be able to work as a resource pool for any of the program's projects. That explains why there is no project management level at back office side of the figure 15 that clearly presents the common global organization joining the 2 sides.

#### **Specific roles**

This new organization we designed for SPA F. GDSF (Global Distributed Software Factory) implied new roles that we had to define.

The first role we defined was the one of Distributed Delivery Coordinator (DDC) which is an organizational one, usually put in place in roll-out phases of global distributed organizations. He is a key role-player for the definition of process standards, templates and tools that will be used by projects. He takes part in projections of distributed activities such as capacity planning and profile clarifications. He finally works as a facilitator in the relationship between front and back offices.

The second role we defined was the one of Back office Delivery Manager (BDM) which is a steering (management) one. Put in place as soon as the roll-out stages, his main responsibilities lie in the management (planning, monitoring and reporting) of offshore resources during delivery stages. He is committed to building teams according to the front office project capacity planning, to monitor the staffing (recruitment and back up), to ensure knowledge sustainability according to the changes in his teams.

The third role we defined was the one of Technical Team Leader (TTL) which is an operational management one. They usually are assigned to experienced team members (developers) trained to manage small teams and to implement (onshore) the assignment leader's plans. Project knowledge (functional and technical) has been transferred to them so that they are able to answer directly to the first level of questions their team members could ask. They are committed to ensure that the work packages assigned to their team members will be delivered in proper time and with the required level of quality. For that they provide functional and technical support, monitor the deliveries and perform sample reviews.

We achieved with those roles specifications, the primary target of managing and supporting global distributed software delivery at SPA F. program. We also laid the foundations of an increased attractiveness of the program for new resources with those new role opportunities added to the existing opportunity to work on various scopes thanks to the different SPA F. projects.

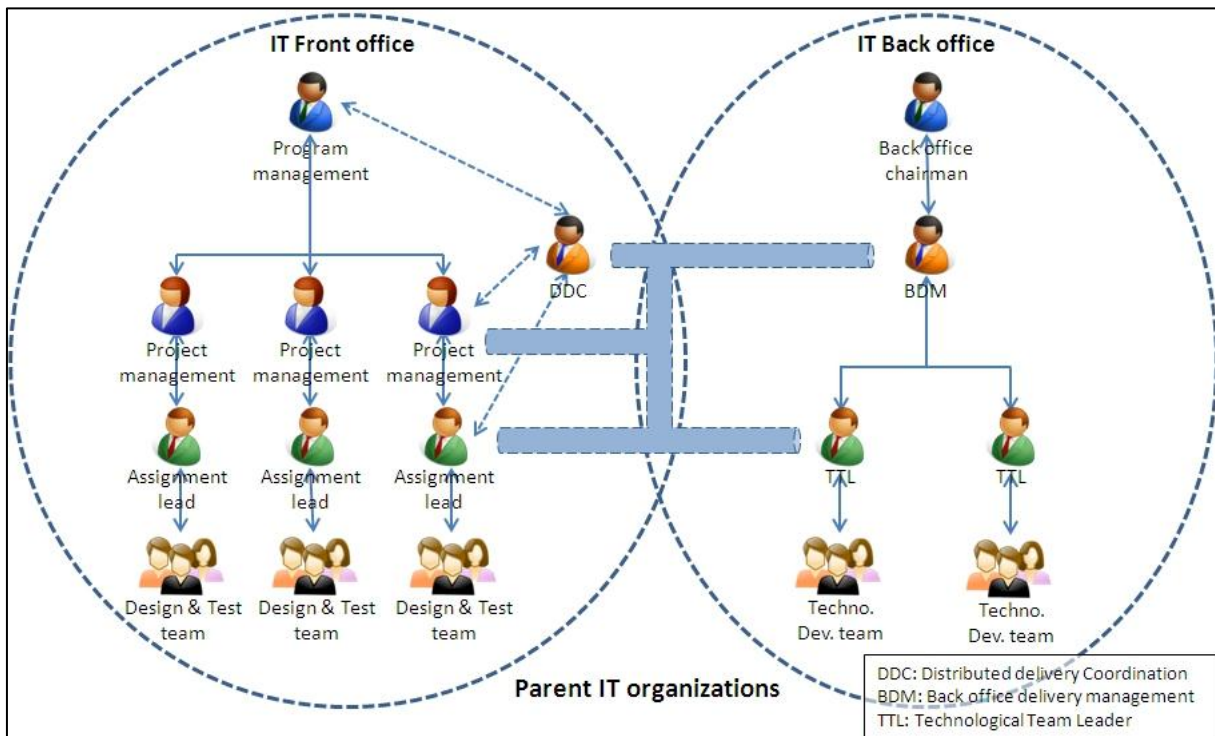
### **Strong communication channels**

As depicted in figure 15, we put in place specific communication channels to ensure knowledge exchange between the two sides of the global team.

They were first placed at management level, between the back office delivery manager and the distributed delivery coordinator as well as between the back office delivery manager and project managers.

At another level, operational management, a strong communication channel between project assignment leaders and technical team leaders was promoted.

This one team organization took place in a virtual team environment we called Teamplace. It is a space designed with Microsoft Sharepoint (Enterprise collaboration software) where documents (management, operational, communication ...) were shared for all program / project individuals and locations.



**Figure 15: SPA F. global one team organization**

With those specifications of global team, role and communication structure, we secured SPA F. global virtual team implementation. Next sub-section presents the detailed processes SPA F. GDSF (Global Distributed Software Factory) main activity streams (staffing and software delivery).

### 4.2.3. SPA F. GDSF Industrialization aspect

In this sub-section we describe our industrialization approach designed to detail and support the main streams of SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory).

First, SPA F Staffing process which specifies how to prepare, request, search and select new resources for the program.

Second, SPA F Software delivery process which specifies how to deliver software productions, from design to test stages.

Third, SPA F Management and support mechanisms which specify how to plan, report, monitor, escalate and support deliveries of the program.

Each of them designed to be effective in a multi projects (program) and locations (global distributed) environment.

#### **4.2.3.1. Staffing process**

Once our global organization designed and acknowledged by all the shareholders, the first matter we detailed in this industrialization approach was the staffing. Indeed, this priority put into the staffing and recruitment streams was for the program to make sure as early as possible that it is able to get the proper resources it needed in time.

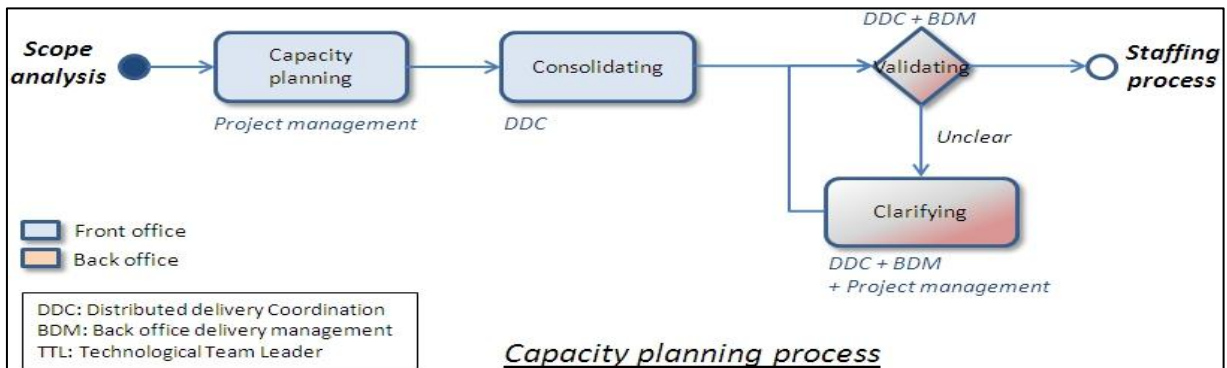
The solution we found for this matter was to split it in two parts: one to deal with future recruitment (forecast staffing) and one to deal with current recruitment (current staffing).

#### **Forecast staffing**

To tackle the shortage of resources, introduced in the recruitment challenges section (§2.2.1.1), we put in place forecast capacity planning activity. It aimed at guiding SPA F. project managers to provide the estimations (forecasts based on the pre-studies outputs of the next delivery scope to come) of their offshore resource needs at least 6 months in advance. Those figures were then updated on a monthly basis.

This stream was industrialized detailing each step and roles of the forecast capacity process as followed:

- One week before the end of each month, each project had to provide its capacity planning into the capacity planning tool (shared excel file available on the program Teamplace presented in §4.2.4.2 program management tools)
- Capacity plannings were then consolidated by distributed delivery coordinator and provided to back office delivery manager, the first week of each month
- A check step for agreement between distributed delivery coordinator and back office delivery manager was then performed which can lead to a clarification step including the interested project manager or leader to the processing of the staffing itself.



**Figure 16: SPA F. global capacity planning process**

### Current staffing

The staffing process designed for SPA F. was based on the basic one provided by Volvo IT. It has been strengthened to secure this activity which efficiency was not satisfactory (§2.2.1.1 slow staffing process)

- At SPA F. GDSF it was initiated by back office delivery manager with the creation the electronic request in the staffing information system (EDGE).
- Then in place of the former involvement of French Request office, it was at SPA F. GDSF up to Request office India to qualify the request and send the resumes to back office delivery manager.
- After its own on paper qualification of the proposals, back office delivery manager implements the practical qualification through those new steps we included at SPA F. GDSF which are the interviews and technical tests with candidates and team leaders.
- According to the results of interviews and tests, a new search cycle could be started or if any major compromise has to be made, project manager could be involved, else candidates were selected and then the end of SPA F. staffing process connects to the end of company's one (including 2 paths, for internals and for externals before ending at environment settlement step)

With this staffing process implementation we achieved to secure SPA F. GDSF recruitment activity streams. Nevertheless, those new interview and test stages we added were not well accepted by Indian teams because of the specificities of their competitive market where tests degrade attractiveness of companies.

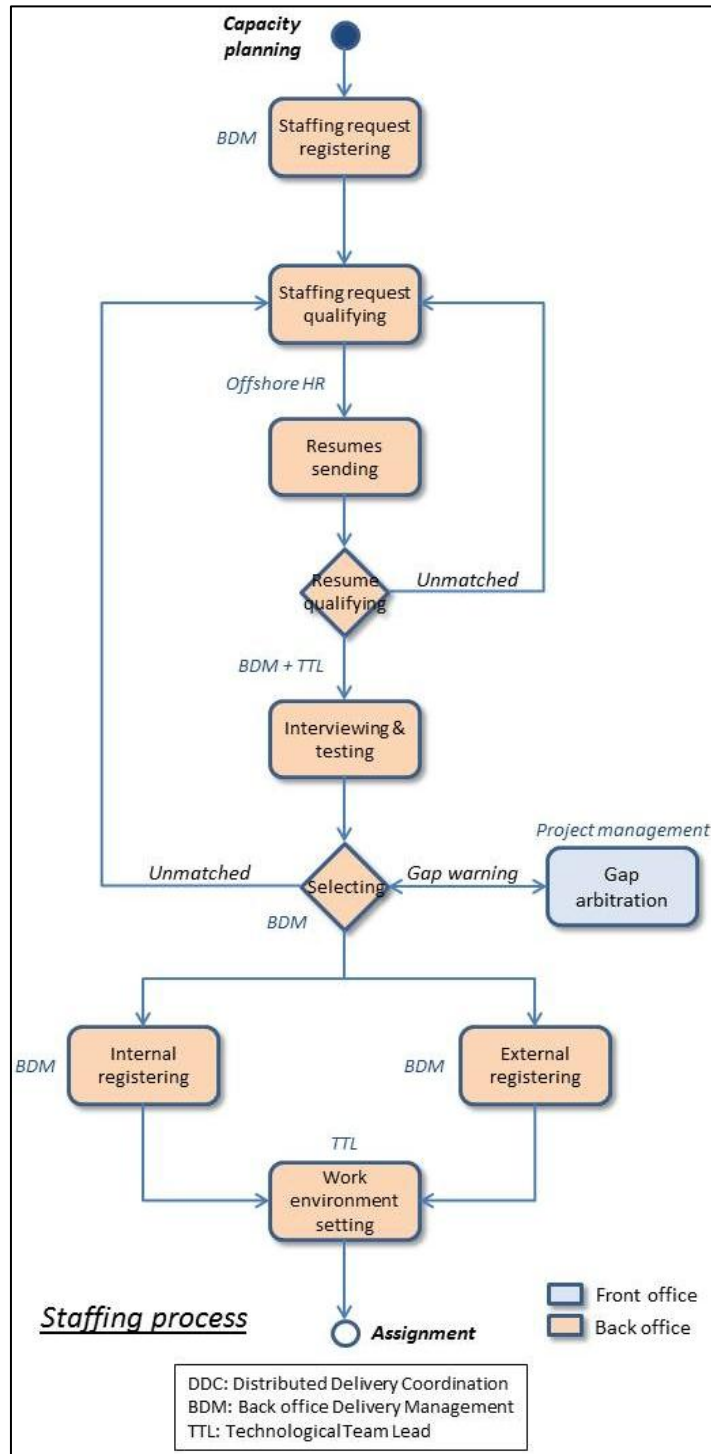


Figure 17: SPA F. offshore staffing process

With those staffing processes, first stage of SPA F. GDSF (Global Distributed Software Factory) deliveries, related to resources supply to the program, is secured. The next section describes how we secured software deliveries for the program.

#### **4.2.3.2. Software delivery process**

Once the staffing process secured we could get to the specifications of SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory) software delivery process to secure its software productions and deliveries.

The solution we found for this matter was built on the basis of the former SIRTAKI program software delivery process [SIRTAKI, 2008]. We strengthened this former model with new solutions for SPA F. specificities (in-house offshore development, advanced work packaging and sourcing) and rationalization of existing components (costing and test inputs)

#### **Innovations**

First innovation of SPA F. software delivery process compared to the former SIRTAKI one was that it clearly specified the need to package the works (“work packaging”) at business (business front office) and technical (IT front office) levels to secure manageability of the globally distributed deliveries.

Indeed, to allow works distribution, project contents were divided into business packages (BP) (groups of consistent and autonomous business functionalities) and technical packages (TP) (groups of consistent and autonomous technical components) that could be managed (prioritized, reported, monitored, tested) respectively by Business front office and IT front office (work packaging activity of the software delivery process Fig. 18).

PS: There was at least one (usually several) TP to implement a BP.

Second innovation of SPA F. software delivery process compared to the former SIRTAKI one was that it clearly underlined the need to challenge the sourcing (“sourcing allocating”) to onshore or offshore to secure the delivery of each work package.

The following work package properties were used by project managements to decide during this “sourcing allocating” stage where to build the solution (onshore or offshore):

- A risk level (related to its consequence on the overall organization) set to high implied an onshore allocation to the build of the work package



- A complexity level set to high implied a recommendation (not mandatory depending on the maturity of the offshore resources) to allocate the build of the work package onshore
- A workload size under 2 man days implied a recommendation (not mandatory depending on the volume the other work packages to send) to allocate the build of the work package onshore

Third innovation of SPA F. software delivery process compared to the former SIRTAKI one is that it focused on the need to produce specific “test inputs” with the specification package delivered by IT front office teams to secure IT back office teams ability to test their builds.

Furthermore to the detailed functional concepts described and provided in the functional design, back office teams needed more specific inputs to perform their tests. For example, it could be easy for an IT front office designer to find one truck identification of a specific type, for a specific test, but very tough for an IT back office developer who hardly understand the details of the functional concepts to find this same identification without support. Those test inputs we proposed aimed at completing the functional test inputs from functional design with very specific information (identifications, wordings, navigation paths) to secure test activity (Unit testing, Smoke testing) of IT back office developers.

With those new specifications in SPA F. GDSF software delivery process, we secured those critical stages, limiting the risk to miss some of them as it could happen in former setups.

### **Rationalizations**

In terms of rationalization from the former SIRTAKI software delivery process model, we first proposed for SPA F. to group the two different costing estimation stages, previously performed before and after design stage but most importantly before and after contract (commitment) stage (FDCG see §2.2.2.2), in one common cost estimate (“common costing”) performed with onshore and offshore key role-players together.

This rationalization brought the following improvements for our SPA F. software delivery process:

- Restored compliancy to Volvo IT project control & application management model, IS-GDP4IT (Information System Global Development Process for Information

Technology). Indeed, one of its rules is related to the fact that neither study nor cost material should be produced after FDCG (Final Development & Contract Gate) stage.

PS: Despite this common estimation stage, there was still a back office costing challenge but performed at the beginning of this stage between onshore and offshore key role-players.

- No more diverging evaluations between IT front and back offices and a real commitment shared between the two sides of the team. In that way, we secured this cost estimation activity with different kind of profiles (analysts and developers) in different places and grounds.

PS: The tools (estimation grids) we designed to perform this activity and maintain its consistency whatever the context are described in section §4.2.4.3.

The other parts of the core software delivery process have been kept from former SIRTAKI setups.

They were first, functional and architectural designs supplied by IT front office to IT back office to structure the needs and put them in technical context.

Then, they were related to technical design built by back office in order to technically describe for validation the solution which is going to be coded.

Then, came the coding and unit testing stages produced at back office. Smoke testing is for back office to check that coding assembly is working.

Three main check and handover points are performed at input with functional, test and architectural designs, after coding and after assembly.

We finally specified for SPA F. software delivery process, the management and support distribution with a global and consolidated part allocated to onshore side and a detailed one allocated to offshore side.

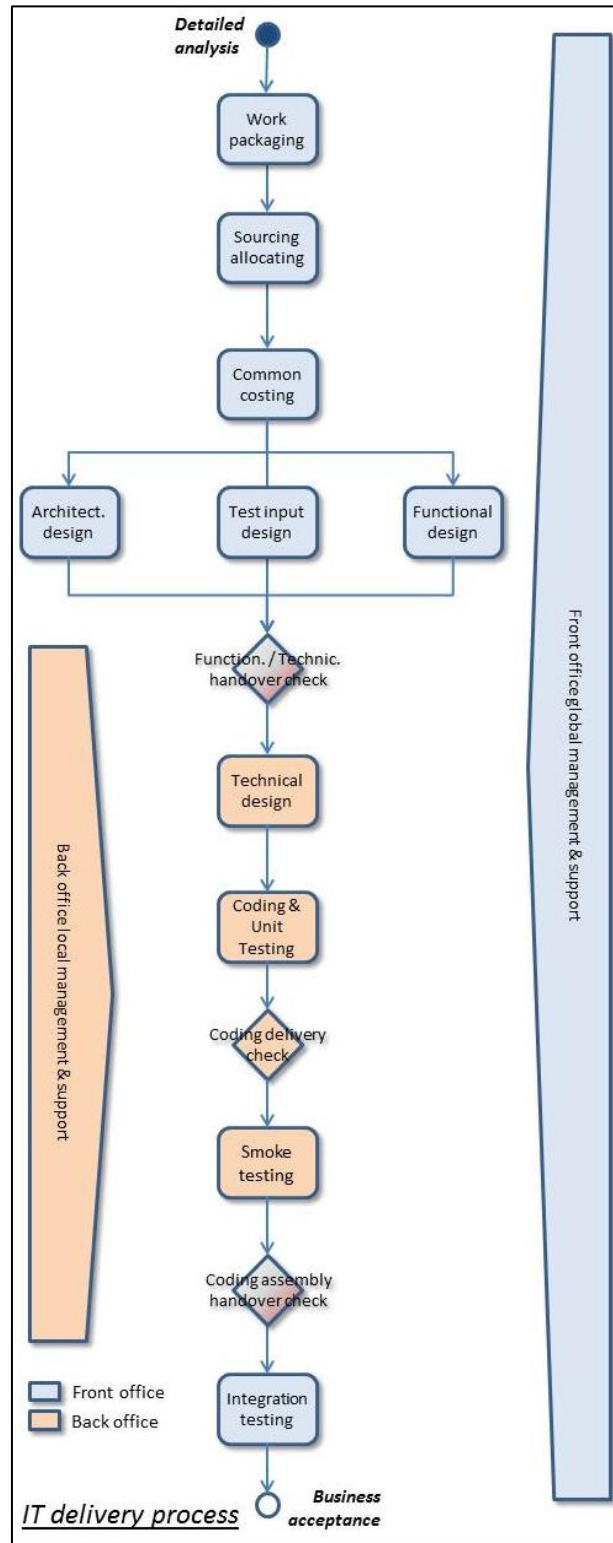


Figure 18: SPA F. software delivery process

Industrialization in SPA F. GDSF (Global Distributed Software Factory) is embodied by its staffing and software delivery processes presented in this sub-section. Those key streams of the GDSF have been detailed in order to secure their respective deliveries (forecast and current staffing, software developments with advanced packaging, test inputs and common estimation). The next sub-section is the presentation of SPA F. GDSF management and support solutions for those deliveries we just secured with the processes.

#### **4.2.4. SPA F. GDSF Management & Support aspect**

The areas we worked on to support SPA F. global distributed delivery were related to its chain of command, to its monitoring and reporting tools and to the operational tools provided to team members to deliver in good quality.

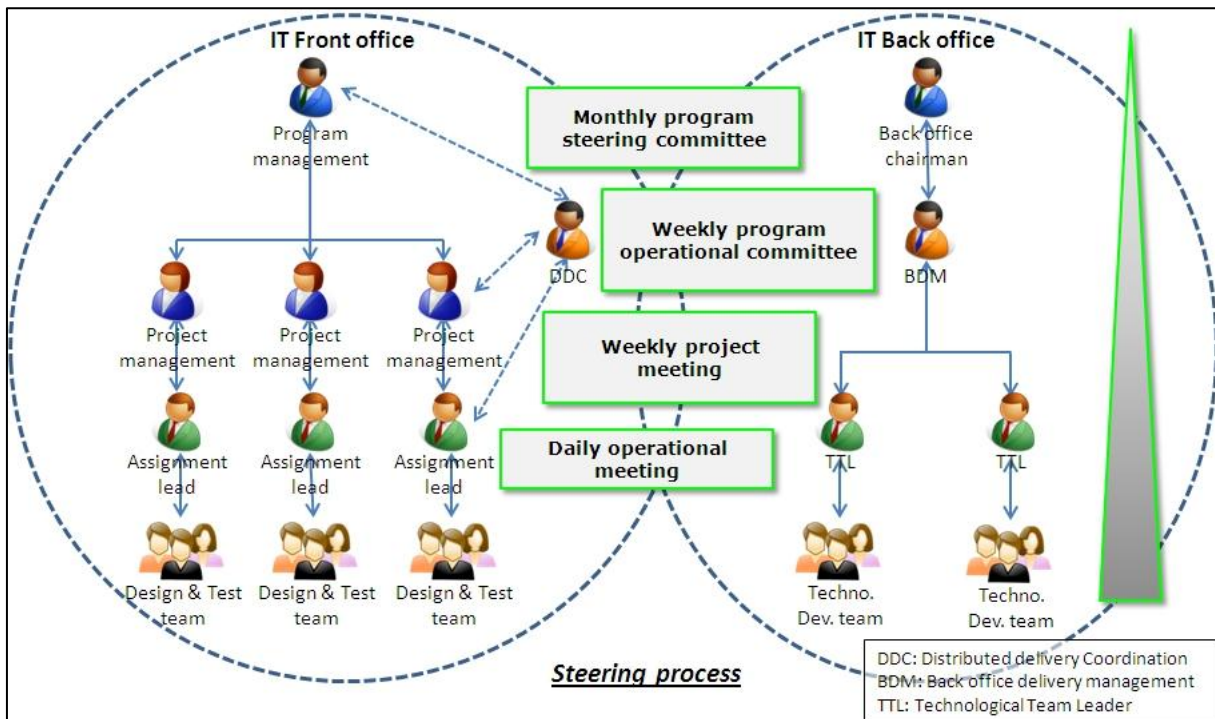
##### **4.2.4.1. *Steering process***

In the same way, we described one front & back office team (see §4.2.2), we detailed the common management and steering chain of command to follow deliveries at SPA F. global distributed software factory (GDSF)

Starting from operational management to executive steering of the program, SPA F. steering process (Fig. 19) specified the following levels:

- Daily operational management represents the coordination meeting performed at operational management level on a daily basis between project assignment leaders (front office) and technical team leaders (back office) to follow and clarify any operational issue on a daily basis.
- Project weekly meeting represents the coordination meeting at project management level which involves at IT front office side, all IT project roles and at IT back office side, technical team leaders, to share business and technical updates on the scope and to arbitrate operational issues that have not been solved in operational management on a weekly basis.
- Program weekly operational committee represents the coordination meeting at program operational management level which involves at IT front office side, program and project managers, distributed delivery coordinator and at IT back office side, back office delivery manager, to share business and technical updates program wise and to arbitrate project issues that have not been solved in project management on a weekly basis.

- Program monthly steering committee represents the coordination meeting at the program top management which involves at IT front office side, program management, distributed delivery coordinator and at IT back office side, site executive and back office delivery manager to share highlights of business and technical updates program wise and to arbitrate program issues that could not be solved at program operational committees, on a monthly basis.



**Figure 19: SPA F. global steering process**

With this steering process we secured the chain of command and the management escalation mechanism at SPA F. global distributed software organization. The next sub-section presents the supporting tools implemented at SPA F. GDSF.

#### **4.2.4.2. Reporting & Monitoring**

As just described, information was communicated from specifics (technical then project) to common (program and executive) levels. This situation of common destination (program management) of every information required usage of common management tools to report and monitor progress of deliveries. For that goal, we had implemented four tools (Capacity planning, MasterPlan, Monitoring tool and Delivery status) classified in two levels (Program management and Operational/Project management).

**Program management tools**

For this program management level we relied on the capacity planning tool for staffing matters and on the MasterPlan tool for delivery matters.

**Capacity planning tool**

Capacity planning tool was an excel file (Fig. 20) we designed and provided to project managers onto SPA F. program Teamplace. Its purpose was to present the past, present and prospective Full Time Equivalent (FTE) capacity needed by each project of the program.

						Nb FTE												
						6,2	4,2	2,7	5,3	6,0	8,7	12,0	12,8	16,0	10,8	7,6	4,0	
						Nb day / billing month >>												229,0
						Man days / Month >>												2956
Release	Track	Profile	Staffed	Techno	Site	Jan	Feb	March	April	May	June	July	August	Septem ber	October	Novemb er	Decemb er	Total man.d
SPA2.2	Literature	Application Developer	No	Java	India	0	0	0	0	12	25	15	9	20	20	0	0	101,0
SPA2.1	Literature	Application Developer	No	Java	India	5,3125	0	0	0	0	0	0	0	0	0	0	0	5,3
SPA2.1	Warranty	Application Developer	Yes	Mainframe	India	15	18	0	0	0	0	0	0	0	0	0	0	33,0
SPA1	Warranty	Application Developer	Yes	Mainframe	India	7	2	0	0	0	0	0	0	0	0	0	0	9,0
SPA1	Warranty	Application Developer	Yes	Mainframe	India	7,5	6,5	0	0	0	0	0	0	0	0	0	0	14,0
SPA2.2	Warranty	Application Developer	No	JAVA	India	0	0	0	0	5	15	13	20	20	0	0	0	70,0
SPA2.2	Warranty	Application Developer	No	JAVA	India	0	0	0	0	0	0	0	13	20	5	0	0	35,0
SPA2.2	Warranty	Application Developer	No	JAVA	India	0	0	0	0	0	0	0	0	20	5	0	0	25,0
SPA1	Warranty	Application Developer	Yes	JAVA	India	13,5	3	0	0	0	0	0	0	0	0	0	0	16,5
SPA1	Warranty	Application Developer	Yes	Mainframe	India	6	18	11,5	9	7,5	10	0	0	0	0	0	0	62,0
SPA2.1	Warranty	Application Developer	Yes	Mainframe	India	8	0	5	0	0	0	0	0	0	0	0	0	13,0
SPA2.1	Warranty	Application Developer	Yes	JAVA	India	15	3	0	0	0	0	0	0	0	0	0	0	18,0
SPA2.2	Warranty	Application Developer	No	Mainframe	India	0	0	0	0	0	5	15	10	20	2	0	0	52,0
SPA2.2	Warranty	Application Developer	No	Mainframe	India	0	0	0	0	0	0	0	10	20	2	0	0	32,0
SPA2.2	Warranty	Application Developer	No	Mainframe	India	0	0	0	0	0	0	0	10	20	2	0	0	32,0
SPA2.1	Warranty	Application Developer	Yes	JAVA	India	15	19	0	0	0	0	0	0	0	0	0	0	34,0
SPA2.2	Quotation	System Analyst	No	India	India	0	0	15	20	15	20	15	9	20	10	18	0	142,0
SPA3	Quotation	System Analyst	No	India	India	0	0	0	0	0	0	0	0	10	10	10	10	30,0
SPA2.2	Quotation	Application Developer	No	JAVA	India	0	0	15	19	17	25	15	9	20	10	10	5	145,0
SPA2.2	Quotation	Application Developer	No	JAVA	India	0	0	0	19	17	25	15	9	20	10	5	0	120,0
SPA3	Quotation	Application Developer	No	Java	India	0	0	0	0	0	0	0	0	0	10	15	25	50,0

**Figure 20: Extract of SPA F. offshore capacity planning report**

As described in section §4.2.3.1 capacity planning reporting was performed every month by project manager and consolidated by distributed delivery coordinator.

Project managers had to fill the following data into this capacity planning tool:

- Release of the program when the resource was planned
- Name of the project (or Track) for which the resource is needed
- Profile of the needed resource (System Analyst, Application developer, Tester)
- Status of the record (resource staffed or not)
- Technical skill of the resource (Java, Mainframe)
- Site where to staff the resource
- Volume of FTE by month for this resource

As first outputs, to monitor capacity planning, we could get the sum of FTE and the average of man day for each month, as well as the sum of man day for each resource.

As second output to monitor capacity planning, we could get histogram charts (Fig. 21), for program and project managers to present staffing progression (by profiles, tracks or locations) in committees.

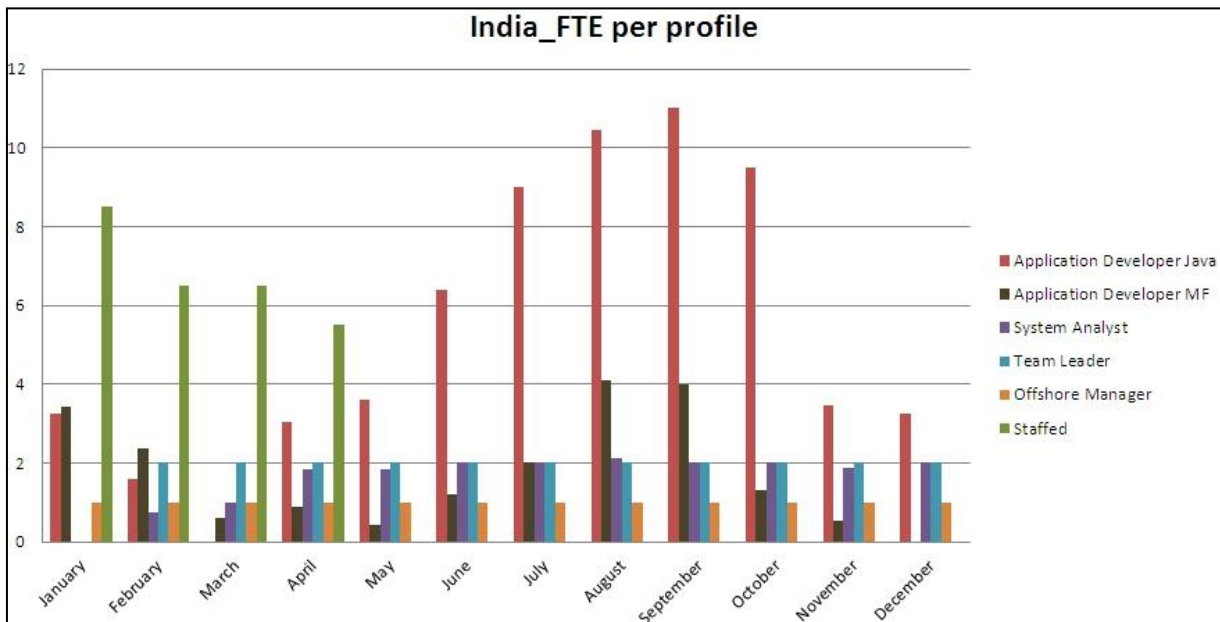


Figure 21: India capacity planning graph

**MasterPlan**

MasterPlan is the software delivery management tool we initially developed to allow Business & IT front office teams, to report and monitor their work progress in the same way. To allow this same way of reporting and monitoring we had to define the following common BP (Business Package) / TP (Technical Package) scale which presents progress level according to status of packages (Fig. 22). It reproduces the succession of activities in a software project with first the Business front office starting status (need specifications to ED for detailed studies) and related percentage of progress, then the IT front office status (functional design specifications to integration tests) and related progress, and finally back to Business front office end status (user acceptance tests to maintenance handover) and related percentage of progress.

Business Package				38%	Technical Package				73% 55% 64%	64%
Gate	Date	Code	Status	Progress	Date	Code	Status	Progress	TP/B	
		00	00-Listed	1%					0%	
		01	01-Related Needs expressed	2%					0%	
		02	02-Workshops global planning done	3%					0%	
		04	04-Requirement list & Business Case	4%					0%	
		06	06-EP-Version 0 initialized	6%					0%	
CSG	Y	10	10-Start Impact analysis w/ MOE & EP-Version 1 produced	7%		00	00-Listed	1%	7%	
		14	14-Final MOA/Business validation workshop	10%						
		16	16-EP-Version 2 produced	14%						
DG	Y	20	20-EP validated by Business & shared w/ MOE teams	15%						
		26	26-ED completed /MOE & BP Defined & Scheduled	25%		05	05-Defined & Scheduled	5%	25%	
FDCG	Y	30	30-Build can start: ED validated /MOA & BP prioritized	35%		10	10-FDS Started	10%	35%	
						15	15-FDS Delivered	20%	38%	
						20	20-FDS written & validated	25%	39%	
						30	30-Detailed Schedule	30%	40%	
						31	31-CUT started	35%	41%	
						32	32-TDS written	36%	42%	
						35	35-TDS audit OK	37%	42%	
						40	40-TDS validated	40%	43%	
						50	50-CUT completed (code review included)	65%	49%	
						51	51-Assembly Tests completed	70%	50%	
		35	35-TI & UAT scenarios written & Data ready	38%		52	52-TI scenarios written	72%	51%	
						53	53-TI scenarios validated /MOA	73%	51%	
						56	56-TI MOE started	75%	51%	
		39	39-TI MOA started	55%		60	60-TI MOE completed	90%	55%	
						61	61-Cross Tracks Integration Tests completed	95%	55%	
						65	65-UAT environment Macro Planning defined	96%	64%	
						66	66-RT-RMO AS IS Specifications completed	97%	73%	
						67	67-RT-RMO TO BE Specifications completed	97%	73%	
						68	68-AS IS Applications installed in TZ	97%	73%	
						69	69-Installation Detailed planning TO BE completed	97%	73%	
		40	40-TI MOA completed	73%		70	70-UAT environment Installation Started	98%	74%	
ULG	Y	50	50-Build delivered	75%		75	75-UAT environment Installation Completed	99%	74%	
						80	80-Environment available for UAT	100%	75%	
		51	51-BP installation on TZ checked	76%						
		52	52-UAT started	77%						
		60	60-UAT validated	80%		90	90-Performance Tests completed			
		62	62-E2E started	82%						
		70	70-E2E validated	85%						
RG		71	71-Warmup completed	87%						
		72	72-Go Live done	88%						
		75	75-Rollout readiness	89%						
		77	77-Pilot(s) started	90%						
		80	80-Pilot(s) completed	92%						
		85	85-Rollout started	95%						
		90	90-Rollout completed	99%						
EG		99	99-Maintenance handover	100%						

Figure 22: [SPA F. 2012] Work package status scale

Each week project managers could report (create or only update if record exists) the status of their packages through MasterPlan with the following data:

- Reference of the package
- Title of the package
- Package status level
- Date for initial definition and scheduling of the work package
- Date for start of design
- Date for validation of design
- Date for the end of Coding and Unit Testing (CUT)



- Date for the end of integration testing
- Date for the start of user acceptance environment installation
- Date when user acceptance environment is available
- Delivery lot
- Release of the program
- Technology of the built
- Complexity of the package
- Maturity of the developer
- Back-office site
- Related application

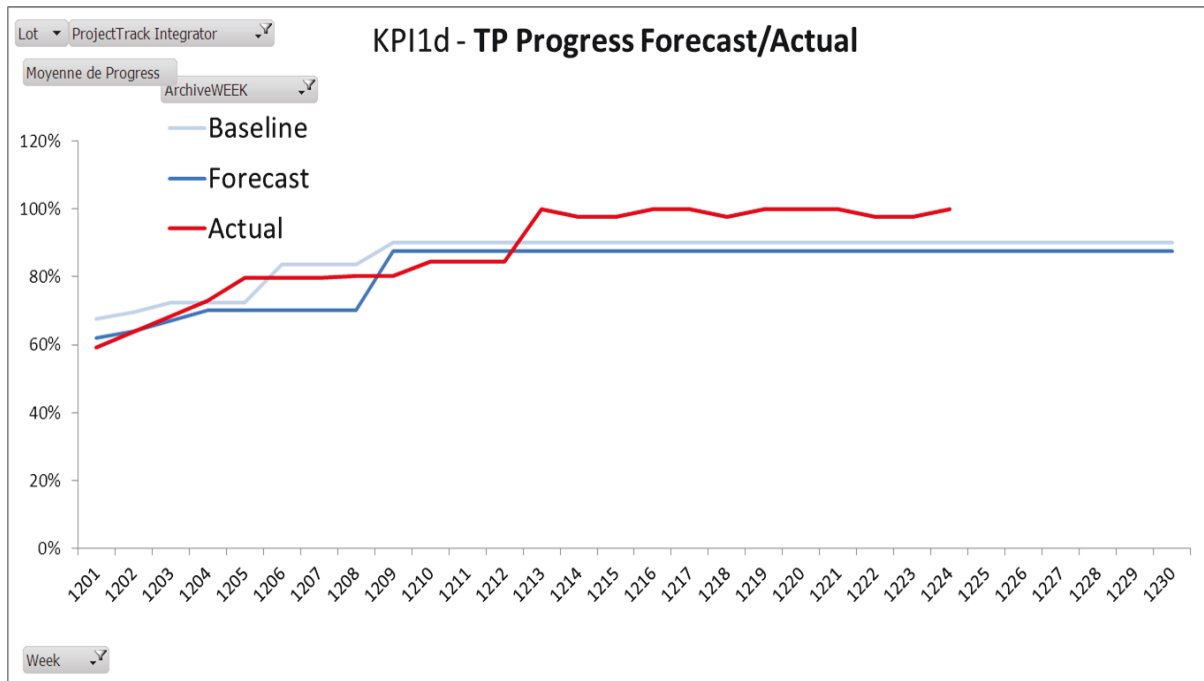
NB: We only describe here the technical package structure, the one directly related to our global distribution

Technical Package																
TP	TP Title	Stat	05 Definc	10 FDS Sta	20 FDS Val	50 End CUT	60 TI Comt	70 UAT Ins	80 UAT Env	Lot	Relea	Techno	Complex	Dev Team	Offshi	Application
TP009	Warranty Claims Control	22	06/07/2011	16/09/2011	11/11/2011	28/11/2011	02/03/2012			SPA 2.1-J		Java	Middle	Middle	Yes	Warranty
TP010	Warranty Claim Particular OP	22	06/07/2011	07/10/2011	11/11/2011	05/12/2011	02/03/2012			SPA 2.1-J		Java	High	Middle	Yes	Warranty
TP011	Warranty Claims Mixed / Group	22	06/07/2011	14/10/2011	11/11/2011	20/11/2011	02/03/2012			SPA 2.1-J		Java	High	Middle	Yes	Warranty
TP012	Warranty claims control / Reple	22	06/07/2011	14/10/2011	11/11/2011	20/11/2011	02/03/2012			SPA 2.1-J		Java	Low	Middle	Yes	Warranty
TP013	NFR Warranty	24								SPA 2.1-J						Warranty
TP014	Warranty Access Management	23	06/07/2011	09/09/2011	16/09/2011	19/11/2011	02/03/2012			SPA 2.1-J						Warranty
TP015	New datas purge	22	06/07/2011	14/10/2011	11/11/2011	20/11/2011	02/03/2012			SPA 2.1-J		Mainframe	Middle			Warranty
TP016	Common Module TM Feeding	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	05/12/2011	16/01/2012	SPA 2.1-J	SPA 2.1					Common Moc
TP017	SID TM Feeding	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	05/12/2011	16/01/2012	SPA 2.1-J	SPA 2.1					SID Interface
TP018	DVD NetConsult	24	12/10/2011													NetConsult
TP019	WebNT Mailing Tool	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					WEBNT
TP020	WebMT Mailing Tool	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	12/12/2011	16/01/2012	SPA 2.1-J	SPA 2.1					WEBMT
TP021	SIPRE WID RT@	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					SIPRE
TP022	Docprod via Parc WID RT@	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1	Mainframe				PARC APRES V
TP023	Makadam WID RT@	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					Makadam
TP024	Makadam Snotes filter	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					Makadam
TP025	Makadam Admin Snotes filter	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					Makadam
TP026	WebMT TM Broadcast	27	12/10/2011	07/07/2011	27/10/2011	18/11/2011	16/12/2011	23/01/2012	30/01/2012	SPA 2.1-J	SPA 2.1					WEBMT
TP027	MT for RT-DMS TM broadcast	27	12/10/2011	07/07/2011	27/10/2011	18/11/2011	16/12/2011	23/01/2012	30/01/2012	SPA 2.1-J	SPA 2.1					MT for DMS
TP028	Common Module TM broadcast	27	12/10/2011	07/07/2011	27/10/2011	18/11/2011	16/12/2011	23/01/2012	30/01/2012	SPA 2.1-J	SPA 2.1					Common Moc
TP029	Basket TM broadcast	27	12/10/2011	07/07/2011	27/10/2011	18/11/2011	16/12/2011	23/01/2012	30/01/2012	SPA 2.1-J	SPA 2.1					Panier
TP030	CDM NetConsult improvement	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					NetConsult
TP031	NetConsult improvements	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					NetConsult
TP032	NetConsult deletion of access	27	12/10/2011	07/07/2011	27/10/2011	01/11/2011	11/11/2011	09/01/2012	16/01/2012	SPA 2.1-J	SPA 2.1					NetConsult
TP033	Price valorization	22	18/10/2011	31/10/2011	16/12/2011	20/12/2011	02/03/2012			SPA 2.1-S					Yes	Warranty
TP034	Contract type management	22	18/10/2011	17/10/2011	02/12/2011	25/01/2012	02/03/2012			SPA 2.1-S						Warranty
TP035	Global valorization - Aligillage	22	18/10/2011	17/10/2011	02/12/2011	25/01/2012	02/03/2012			SPA 2.1-S						Warranty
TP036	Import / export discount	22	18/10/2011	30/11/2011	12/12/2011	27/01/2012	02/03/2012			SPA 2.1-S						Warranty
TP037	Labour valorization	22	18/10/2011	10/10/2011	07/11/2011	05/12/2011	02/03/2012			SPA 2.1-S					Yes	Warranty

Figure 23: Extract of technical package status recording

To monitor delivery progress, we could create charts for program and project managers to present progression of deliveries in committees. Figure 24 presents the delivery progress of the Technical Packages (TP) of the Warranty project. At each week of the year (horizontal axis), there is a progress level (percentage in vertical axis) that corresponds to the average of the TP progress values (related to TP status presented Fig. 22) recorded by the project manager this related week. The succession of TP progress averages week after week forms the TP delivery progress of the project.

This representation also allowed to compare current progression (red line) based on the last recordings, with forecasted progression (blue line) based on the 2 weeks ago recordings and baseline progression (light blue line) based on the kick-off recordings.



**Figure 24: Warranty track TP progress**

### **Project management tools**

For this operational management level addressed to project managers, assignment leaders (operational managers in charge detailed work assignments to the team) and technical team leaders (see specific roles section in §4.2.2) we relied on Delivery status tools for delivery date variance matters and Monitoring tool for delivery workload variance matters. As for the program management tools related to delivery (MasterPlan) the tools of this level were built around work packages (Business packages and Technical packages are the links between every representation of the delivery)

Delivery status tool (Fig. 25) was designed to report and monitor details of delivery planning. Compared to MasterPlan, it is more detailed. Indeed, it added the following details required by operational management:

- Date variance details (expected / committed / actual) at the phase level (related to MasterPlan status)
- Accountability details (identification of the analyst or developer)
- Quality details (delivery appreciation, number of defects and delivery date precision)

Phase	Rel	g	BI	TP	Subject	Domain	Iss	Anal/Ex	Develop	Deliver	Appr	Number of	Comme	Expected	Committed	Actual	Expected	Committed	Actual	Status
1.FDS	SPA1	JA	BP08	TP01_IS		IS_Parc	LMN	External	NAR					7/19/2011	7/19/2011	7/19/2011	29	29	29	On time
2.FDS OK	SPA1	JA	BP08	TP01_IS		IS_Parc	LMN	External	NAR					7/20/2011	7/21/2011	7/21/2011	29	29	29	On time
3.Costings	SPA1	JA	BP08	TP01_IS		IS_Parc	LMN	External	NAR					8/4/2011	Never	Never	31	#VALUE!	#VALUE!	#VALUE!
4.TDS	SPA1	JA	BP08	TP01_IS		IS_Parc	LMN	External	NAR	4.Good	6.N/A	0		8/8/2011	8/8/2011	8/8/2011	31	31	31	On time
5.CUT	SPA1	JA	BP08	TP01_IS		IS_Parc	LMN	External	NAR	4.Good	6.N/A	0		8/17/2011	8/17/2011	8/16/2011	33	33	33	On time
6.AT	SPA1	JA	BP08	TP01_IS		IS_Parc	LMN	External	NAR					9/2/2011	9/2/2011	9/2/2011	35	35	35	On time
7.IA	SPA1	JA	BP08	TP01_IS		IS_Parc	LMN	External	NAR					10/5/2011	10/5/2011	10/5/2011	40	40	40	On time
1.FDS	SPA1	JA	BP02	TP01_RTL		RTL_Parc	BDK	External	RVY					8/1/2011	8/1/2011	8/1/2011	30	30	30	On time
2.FDS OK	SPA1	JA	BP02	TP01_RTL		RTL_Parc	BDK	External	RVY					8/1/2011	8/1/2011	8/1/2011	30	30	30	On time
3.Costings	SPA1	JA	BP02	TP01_RTL		RTL_Parc	BDK	External	RVY					8/3/2011	8/4/2011	8/4/2011	31	31	31	On time
4.TDS	SPA1	JA	BP02	TP01_RTL		RTL_Parc	BDK	External	RVY	4.Good	6.N/A	0		8/12/2011	8/8/2011	8/16/2011	32	31	33	2 weeks late
5.CUT	SPA1	JA	BP02	TP01_RTL		RTL_Parc	BDK	External	RVY	4.Good	6.N/A	0		8/12/2011	8/8/2011	8/16/2011	32	31	33	2 weeks late
6.AT	SPA1	JA	BP02	TP01_RTL		RTL_Parc	BDK	External	RVY					9/2/2011	9/2/2011	9/2/2011	35	35	35	On time
7.IA	SPA1	JA	BP02	TP01_RTL		RTL_Parc	BDK	External	RVY					9/2/2011	9/2/2011	9/2/2011	35	35	35	On time
1.FDS	SPA1	JA	BP08	TP01_RTL		RTL_Parc	BDK	External	RVY					8/1/2011	8/1/2011	8/1/2011	30	30	30	On time
2.FDS OK	SPA1	JA	BP08	TP01_RTL		RTL_Parc	BDK	External	RVY					8/1/2011	8/1/2011	8/1/2011	30	30	30	On time
3.Costings	SPA1	JA	BP08	TP01_RTL		RTL_Parc	BDK	External	RVY					8/3/2011	8/4/2011	8/4/2011	31	31	31	On time
4.TDS	SPA1	JA	BP08	TP01_RTL		RTL_Parc	BDK	External	RVY	4.Good	2.Poor	6 lot of mod		8/12/2011	8/8/2011	8/16/2011	32	31	33	2 weeks late
5.CUT	SPA1	JA	BP08	TP01_RTL		RTL_Parc	BDK	External	RVY	4.Good	3.Average	3 some incc		8/12/2011	8/8/2011	8/16/2011	32	31	33	2 weeks late
6.AT	SPA1	JA	BP08	TP01_RTL		RTL_Parc	BDK	External	RVY					9/2/2011	9/2/2011	9/2/2011	35	35	35	On time
7.IA	SPA1	JA	BP08	TP01_RTL		RTL_Parc	BDK	External	RVY					9/2/2011	9/2/2011	9/2/2011	35	35	35	On time
1.FDS	SPA1	JA	BP06	TP02_IS		IS_Parc	LMN	External	NAR					7/13/2011	7/13/2011	7/13/2011	28	28	28	On time
2.FDS OK	SPA1	JA	BP06	TP02_IS		IS_Parc	LMN	External	NAR					7/13/2011	7/13/2011	7/13/2011	28	28	28	On time
3.Costings	SPA1	JA	BP06	TP02_IS		IS_Parc	LMN	External	NAR					7/28/2011	Never	Never	30	#VALUE!	#VALUE!	#VALUE!
4.TDS	SPA1	JA	BP06	TP02_IS		IS_Parc	LMN	External	NAR	4.Good	4.Good	1		8/1/2011	8/1/2011	8/1/2011	30	30	30	On time
5.CUT	SPA1	JA	BP06	TP02_IS		IS_Parc	LMN	External	NAR	4.Good	4.Good	1		8/2/2011	8/2/2011	8/2/2011	31	31	31	On time
6.AT	SPA1	JA	BP06	TP02_IS		IS_Parc	LMN	External	NAR					9/2/2011	9/2/2011	9/2/2011	35	35	35	On time
7.IA	SPA1	JA	BP06	TP02_IS		IS_Parc	LMN	External	NAR					9/30/2011	9/30/2011	9/30/2011	39	39	39	On time

Figure 25: Extract of SPA F. delivery status

Monitoring tool (Fig. 26) was designed to report and monitor details of workload spending. Operational management could track in detail the following data related to their work packages:

- The forecasted amount of workload for their work packages
- The amount of workload spent
- The amount of remaining workload
- The identification of the teammate accountable
- The distribution of those workload in the planning (planning variance was not available here but in Delivery status)

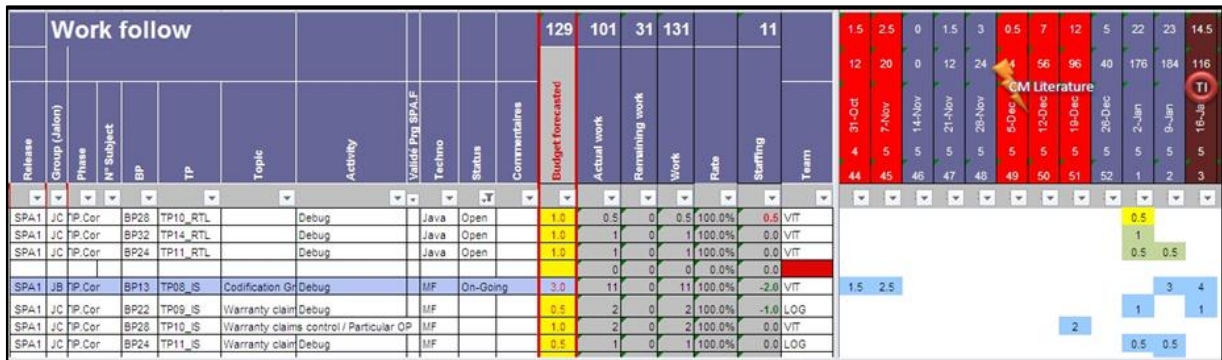


Figure 26: Extract of SPA F. monitoring tool

With those tools we provided to SPA F. program and project managers. We secured their reporting and monitoring of staffing and development activities, respectively with Capacity planning, MasterPlan, Delivery status and Monitoring tools. The next sub-section is a presentation of the support provided on methods and quality of the deliveries of SPA F. GDSF.

#### 4.2.4.3. Methods & Quality

To support delivery quality we put in place support services addressed to study, development and staffing resources of our SPA F. GDSF (Global Distributed Software Factory).

For study resources (system analysts) we worked, with representatives of the different types of software delivery roles (system analyst, developer, architect), on best practices and study reviews.

Outputs of the study best practices workshops pointed to improvements on the following areas:

- Higher level of functional context inputs
- More usage of diagram views for specifications
- More functionally than solution (technically) details

In regard to study reviews, we appointed the program software architecture team to this activity and defined a set of trigger criteria to specify when to perform it. Selected from operational management tools (see previous sub-section), those criteria were related to:

- Analyst/designer (source) and developer (destination) maturity

- Coding and Unit Testing (CUT) forecasted workload
- Strategic criticality of the work package

The study reviews were triggered when:

- A junior resource (analyst/designer or developer) was assigned to the work package
- The workload of the work package exceeded the maximum limit (8 days)
- The work package was tagged as critical

Between study and development teams, we worked on estimation methods. From a situation where analysts and developers had to produce, respectively at the end of studies and before coding, fully subjective workload estimations (in man day) of the upcoming coding and unit testing (CUT) activities, that most of the time appeared to be different and far from one to another, we proposed to build the following common estimation grids. One for each main types of technology applied at SPA F. (NICT and Mainframe).

For New Information and Communication Technologies (NICT) we proposed to structure its coding and unit testing (CUT) estimation grid through technical architecture layers (Fig. 27)

- Web layer where presentation aspects (user interface) of the software solution are coded.
- Business layer where business and technical rules and behaviors are coded in the software solution.
- Data layer where software application data accesses (Created, Read, Updated, and Deleted) are coded.
- Script layer where out of user server (on user personal environment or on dedicated servers) processing are coded.
- There is an Other category to estimate the very simple pieces of coding that cannot be categorized in the previous layers.

For the four first coding and unit testing (CUT) estimation categories, there was the same weighting mechanism related to the complexity Simple, Medium or Complex that respectively multiplies the values by 1, 3 or 5 into the total. On the total workload we applied a confidence ratio between Low, Medium and High respectively multiplying the result by 2, 1.5 and 1.

Name	Confidence	Web Layer			Business Layer			Data Layer			Script			Other	Calculation of the total workload ==> AUTOMATIC			60.25	
		Simple	Medium	Complex	Simple	Medium	Complex	Simple	Medium	Complex	Simple	Medium	Complex	Very Simple	Confidence Coefficient(CC)	Workload (WL)	Total workload (-WL * CC)		
TP 1 - Example																			
Task 1	2-Medium			2			2					2			1			48.6	60.25
Task 2	3-High	1					6				2				4			23.50	35.25
																		25.00	25.00

Figure 27: NICT estimation grid

For Mainframe technology we built up from experience an abacus of detailed coding and unit testing (CUT) workload values by types of programs, type of action, complexity and evolution level (Fig. 28)

Modif / New dev	Evolution C	Current complexity	Type of Program	search key (type of program/development)	No of days
New	1-Simple	0-New	Screen(TP)	New1-Simple0-NewScreen(TP)	3
New	2-Medium	0-New	Screen(TP)	New2-Medium0-NewScreen(TP)	5
New	3-Complex	0-New	Screen(TP)	New3-Complex0-NewScreen(TP)	8
Modification	1-Simple	1-Simple	Screen(TP)	Modification1-Simple1-SimpleScreen(TP)	1
Modification	2-Medium	1-Simple	Screen(TP)	Modification2-Medium1-SimpleScreen(TP)	2
Modification	2-Medium	2-Medium	Batch	Modification2-Medium2-MediumBatch	4
Modification	3-Complex	2-Medium	Batch	Modification3-Complex2-MediumBatch	5
Modification	1-Simple	3-Complex	Batch	Modification1-Simple3-ComplexBatch	4
Modification	2-Medium	3-Complex	Batch	Modification2-Medium3-ComplexBatch	6
Modification	3-Complex	3-Complex	Batch	Modification3-Complex3-ComplexBatch	8
New	1-Simple	0-New	StarpasREQ	New1-Simple0-NewStarpasREQ	2
New	2-Medium	0-New	StarpasREQ	New2-Medium0-NewStarpasREQ	3
New	3-Complex	0-New	StarpasREQ	New3-Complex0-NewStarpasREQ	4.5
Modification	1-Simple	1-Simple	StarpasREQ	Modification1-Simple1-SimpleStarpasREQ	2

Figure 28: Mainframe workload abacus

Thanks to the details of its abacus (Fig. 28) mainframe estimation grid (Fig. 29) allowed its users the selection of values where NICT required their input manually (Fig. 27). User could specify its estimation selecting the following fields:

- Confidence at Low, Medium or High level respectively multiplying the total workload by 2, 1.5 or 1.
- Creation or modification of code (New, Modification)
- For modification activities, complexity of current and evolution code (Simple, Medium, Complex)
- Type of program (Screen, Batch, Starpass)
- Number of component of this type of program

Name	Description of the development Choose in the drop down list					Enter the number of modification		Workload from Abacus AUTOMATIC		Calculation of the total workload AUTOMATIC		3
	Confidence	Modification or new development	Current complexity	Evolution Complexity	Type Of Program	Number of Components	Number of Day for One Component	Confidence Coefficient (CC)	workload (WL)	Total workload (-WL * CC)		
TP 1 - Example									2.00	3.00		
Task 1	2-Medium	New			DB2	1	2	1.5	2.00	3.00		

Figure 29: Mainframe estimation grid

For development resources we put coding reviews and trainings in place to support development activities.

The first level of coding review was the one performed by technical team leader when receiving coding results from his or her teammates.

The second level was performed by the program software architecture team and triggered according to the following criteria set:

- Developer maturity
- Coding and Unit Testing (CUT) workload
- Number of request for information logged (request for more information from developer to designer)
- Strategic criticality of the work package

The study reviews were triggered when:

- First coding delivered by a junior developer
- The workload of the coding exceeded the maximum limit (8 days)
- The number of request for information logged doubled the current average
- The work package was tagged as critical

For staffing resources we set up a competence matrix (Fig. 30) based on the company's model and updated in common with key roles (system analysts, application developers, project managers, assignment leaders, technical team leaders and software architects) from every sides of the team in order to share and confirm the understanding of the profiles to staff.

In this document, requestor (project that asked for a new resource) could specify the required level for the candidate on each specific skill (left column Fig. 30):

- 0: No skill on this item
- 1: Some knowledge
- 2: Some experience
- 3: Experienced
- 4: Expert

This document was also used by back office delivery manager to report on the skill level (result of the interviews and tests. See §4.2.3.1) of the selected candidates.

Technical Area	Required Skills 0-4 ==> Data blank means 'no need'	Comments	Selected Candidate skills
<b>JavaEE</b>			
1) Multi-tier architecture and JavaEE technology			
2) JavaEE technologies			
JSP + HTML, XHTML			
JavaScript (Jquery)			
CSS			
JSTL			
3) Design Patterns			
Singleton			
Factory			
Model View Controller			
Business Object			
Facade			
Data Access Object			
Transfer Object			
Other			
5) Integrated Development Environments (IDE)			
IBM Rational Application Developer (RAD)			
Eclipse			
6) Issues/bug tracking			
ClearQuest			
Atlassian JIRA/Confluence			
7) Technologies to build distributed applications and system integrations			
Webservice (AXIS, JAX WS, JAX RPC, ...)			
Queues (WebSphere Message Queue)			
Java Messaging Service (JMS)			
Java Naming and Directory Interface (JNDI)			
Websphere Message Broker			
Java Connector Architecture (JCA)			
IMS connect/ Vimsconn			
8) XML General Knowledge			
XML Parsing			
JAXB			
XSL / XSLT / FO Transformations			
9) Application Servers			
Web Sphere Application Server			

Figure 30: Competence matrix

With this description of the methods and quality supports we designed for study to development resources through staffing ones with reviews, templates (estimation grids, competence matrix) and trainings we completed this section related to management and support aspects, started with the description of SPA F. steering process and continued with reporting and monitoring tools for program and project management levels. The next chapter presents the complementary solutions SPA F. could implement for future updates of its GDSF (Global Distributed Software Factory)



## CHAPTER 5

# PROSPECT FOR FUTUR SPA F. GDSF UPDATES

In this chapter, complementary solutions for future updates of SPA Foundation program (SPA F.) global distributed software factory (GDSF) are presented.

They have been collected from outside SPA F. program resources and even beyond the Volvo group, thanks to the opportunities this work placement allowed. On top of the specialized literature about this subject [Hendel. 2008; Carmel. 2006; Conchuir. 2009; Yalaho. 2009] which brought key information, experienced professionals from recognized organizations in this global software engineering field have been interviewed. They were Architect, Project manager from specialized distributed development entities in Volvo group [ADT, 2012] and from some of the most recognized software companies such as IBM, Cap Gemini.

They helped us identify complementary challenges and solutions we may not have included in this thesis. Those complementary challenges were related to global distributed development scope to extend from CUT (Coding & Unit Testing) focus to above (studies and tests) and related to maturity management of the GDSF.

To describe those complementary solutions, we applied the same structure we used for implemented solutions. Indeed, we start by presenting the details of the specific challenges related to those complementary solutions. Then we describe the solutions and their prospective benefits.

## 5.1. Complementary challenges

This section describes the complementary challenges that future SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory) updates could cover. Those challenges are related to SPA F traditional model (sequential) shifting with the requirements of those new global distributed environments and related to the requirement to secure the maturity of its GDSF.

### 5.1.1.1. *Transition to new models challenge*

Except for Diagnostic track that delivered under Scrum (Agile methodology), all SPA F. projects applied the traditional sequential delivery model of software development (example: analysis sequence with its resources, then design sequence with other resources, then development sequence with again other resources and test sequence with its own resources).

Under this traditional model and global distributed environment, track deliveries suffered from this organized separation between resources of the different sequences.

- Constraints on virtual team building because of this organized separation of resources
- Misunderstanding of expectations between first resources (analysis) and last ones (development and test)
- Long time between first stages (analysis) and software deliveries to find out too late that they have taken the wrong direction.

### 5.1.1.2. *Maturity management challenge*

Even if Volvo IT AD (Application Delivery) strategy (see §1.1) is, since 10 years now, to deliver more and more global with its BPIC (Brazil Poland India China) sites, its maturity in this mode of delivery is still low compared to traditional (collocated) mode of delivery.

SPA F like most of other programs or projects of Volvo IT intended to rely on feedbacks and lessons learned of former global programs and projects to design its global organization. The weakness in this approach is that it is specific to the program or project that performs it.

- Some lessons learned qualified as key to one project could have been omitted by another one
- One project could have given priority to One team efforts to the expense of industrialization whereas another one could have given the opposite priority.

Under those diverging situations it is difficult to evaluate what is working and what it is not, to define a common best practices and improvement mechanism. This situation is widespread on global software organizations and presented in specialized literature:

- “Despite its popularity, no research could specify the precise recipe for effective outsourcing performance” [Loh. 1995]
- “Although it is true that a body of knowledge on global software development has been crafted over time, the art and science of organizing and managing globally distributed software development is still evolving” [Damian. 2006]

## 5.2. Complementary solutions

In this section, complementary solutions for future SPA F (Soft Product and Aftermarket Foundation) program GDSF (Global Distributed Software Factory) updates are presented.

First complementary solution intends to improve virtual team performance by working on a shared base of references (common ground) in study and design matters for all member of the global team.

Second complementary solution intends to improve virtual team performance by sharing a wider perspective (overall beyond coding area) on the delivery model.

Third complementary solution intends to improve GDSF performance by managing (reporting, monitoring, evaluation) its setup maturity with a standard tool.

### 5.2.1. Common study ground aspect

According to ADT (Application Development Techniques)’s “Distributed Development & Maintenance” entity, two of the fundamental principles to support global distributed organizations are “Common way of working” and “Collective ownership of deliverables”. [ADT, 2012]

#### Common study ground

Because coding quality is also a result of studies and designs ones, it is important to get above CUT focus and to emphasis on how common study ground could benefit global delivery. To get to a good level of common study ground sharing, the solution lies in common training of the different delivery profiles of our global project. Indeed, according to profiles (analyst, designer, developer, tester, and project manager), cultures (European, Indian, and American) and personal backgrounds (employee, subcontractor) there are different ways of processing and understanding study deliverables.

This common study training exists in ADT’s catalogue. It is called CAMP (Change Analysis Methods for Prestudies) [ADT, 2012]. We recommend that future updates of SPA F. GDSF

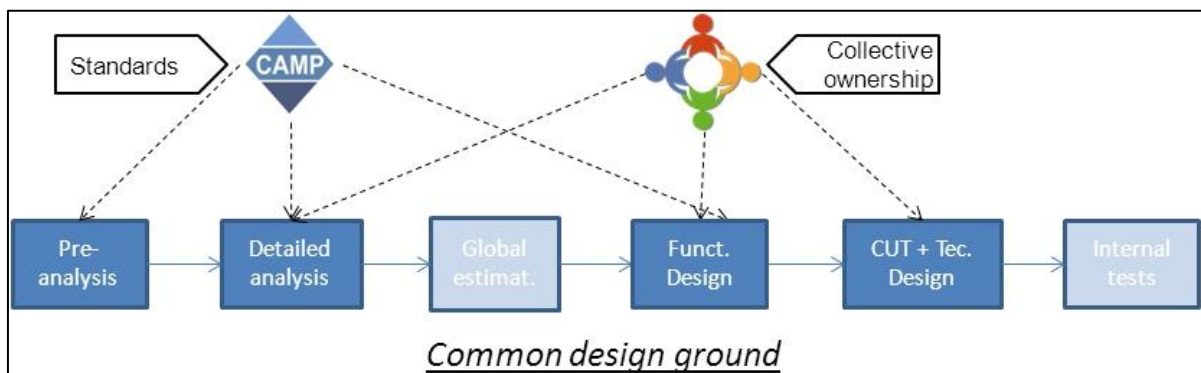
include trainings of their key role-players of different profiles to this CAMP training. In that way, project members, globally distributed, can share common study ground for a better study then coding and testing delivery quality.

### Collective design ownership

In section §2.2.1.2, we reported the lack of commitment noticed in previous distributed environments. The solution we propose here is to get to a shared delivery commitment based on ADT's collective ownership principal. Indeed, the idea is to strengthen shared commitment through involvement, as soon as possible, of key role-players from the different profiles to each main stream stage (analysis, functional design, technical design and test design).

In that way, every stakeholder in the global project:

- Access to the inputs it needs early on to get ready for its core delivery
- Can contribute to and benefit from status and practices sharing to improve its core delivery



**Figure 31: Complementary solution – Common study ground & collective ownership**

### 5.2.2. Overall delivery model aspect

According to F.Thun [2008], stream (study, development, testing) delivery processes need to be well described and will not succeed on any major projects if not first supported by strong tools and then integrated in a detailed overall delivery model. This overall delivery model is another tool to support ADT's "Common way of working" and "Collective ownership of deliverables" principals. It is finally the tool we propose to include in future updates of SPA F. GDSF to give even more meaning to its distributed members on what they are doing in the overall processing.

In that way, we have collected the different stream processes applied at SPA F., identified the main deliverables and owners, put these in perspective with offices and IS-GDP4IT (see §2.2.2 An heritage to comply with) gates to build the following overall model.

It presents in an overall format:

- Main deliverables
- Under the scopes of Business, IT front and Back offices
- Focused on the 5 stages most related to IT delivery in IS-GDP4IT (CSG, DG, FDCG, ULG, and RG)
- Specifying roles (Business analyst, System analyst, Test team, Team management, Team lead, Developer and architect)

The result reproduces (Fig. 32) the standard software development V cycle, integrating IS-GDP4IT structure (close to the PMBOK one), program organization with Business, IT front and Back offices, program roles and their deliveries.

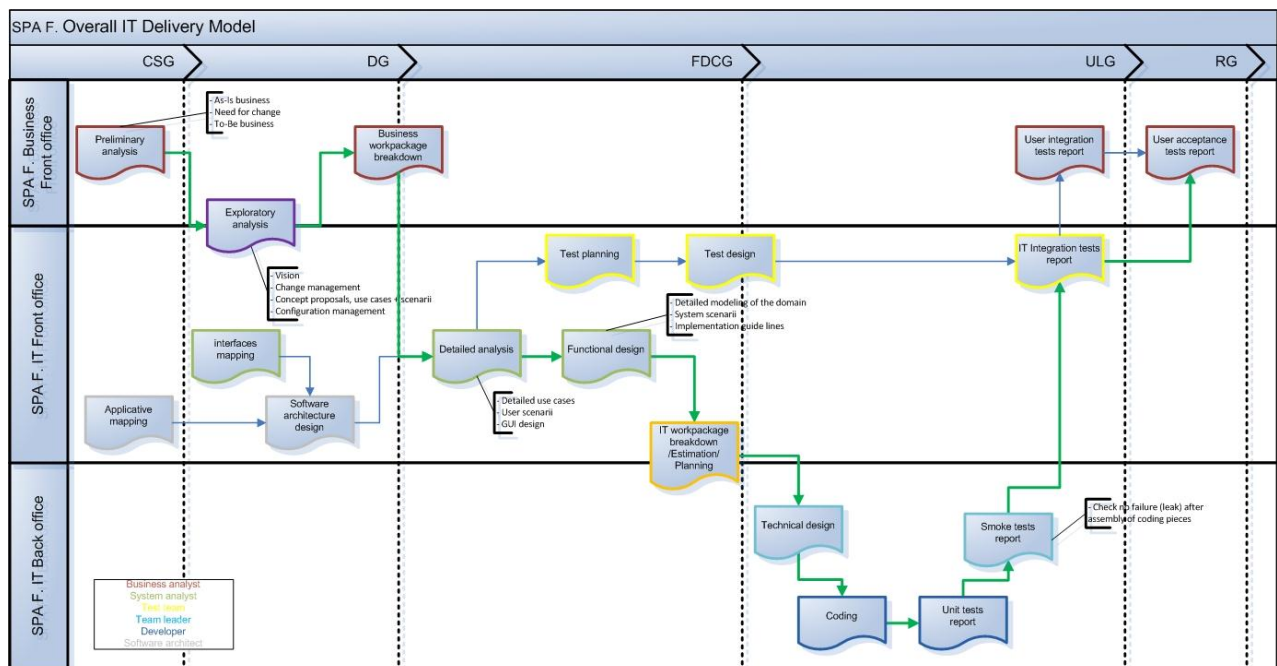


Figure 32: Complementary solution – Overall software delivery process

### 5.2.3. Maturity management aspect

According to N.Ramasubbu [2005], specific key process areas (KPA) of global distributed delivery are not addressed by generic maturity models such as CMM or ISO 9001. They focus more on continuous improvement in code development processes than address capabilities for managing distributed software projects, such as establishing mutual knowledge and managing geographically dispersed social networks.

SPA F. had the will to capitalize on previous global distributed backgrounds, taking into account SIRTAKI and SPA1 feedbacks and lessons learned as they came. Improvement we proposed for this matter was to organize status analysis (backgrounds, challenges) of each global distributed project of SPA F., through a standard global software organization maturity scale (Fig. 33) based on N.Ramasubbu [2005] model. In that way, thanks to this scale during setup stages, project management limit the risk to forget to backup weak points of their global software organization backgrounds (in order to maintain its maturity level) and they can focus on improvement on clear targets.

This scale is composed of three levels, Initial, Consolidated and Maximized with their respective KPAs (Key Process Areas). Basic KPAs from Initial level are mostly related to collaboration governance (blue background) and common ground (purple background) aspects. Second level is related to work packaging (grey background) and common ground matters. Third level is mostly related to collaboration governance. There is a piece of collaboration technology (red background) in each level. To get to the next level, all KPAs of the previous ones should be at least orange (uncertain) and for the 2/3<sup>rd</sup> green (good).

In the following schema (Fig. 33) presenting a personal SPA F (Soft Product and Aftermarket) program GDSF (Global Distributed Software Factory) status of the Warranty project, we can see that most of this maturity scale KPAs for global distributed organizations have been worked out (green background arrows) in SPA F. setup. In regard to average of green status (green background smiley), we could position SPA F. GDSF maturity levels to Consolidated. Nevertheless some basic KPAs (of the initial level) have been omitted (work on belief & will of players and intercultural trainings), so their status gets from orange to red (bad) what should drag down SPA F. GDSF (Global Distributed Software Factory) position to first level (Initial) according the above rule.

	Level	Global Distributed KPA	Wk.	Stat.
Maximised	3	Shared best practices of distributed development across global organization	↗	😊
		Mutual involvement in the settings early on vision stages	↗	😞
		Managed improvement of management skills, in distributed environment	→	😞
		Common monitoring of individual development center performances	↗	😊
		Strategic planning to assign mapped core competences of development centers	↗	😊
		Long term partnership & contract management	↗	😊
		Policies for cross-location innovation management defined and practiced.	→	😞
		Mapping of product/service/team modularity (complexity management)	→	😞
		Continuous infrastructure improvements to facilitate informal communications	→	😞
Consolidated	2	Policies for common-knowledge transfer framework established and practiced.	↗	😊
		Shared tools and processes for project management/staffing/monitoring/reporting	↗	😊
		Communication channels from operational to top management implemented	↗	😊
		Detailed allocation of work packages to owners and responsables	↗	😊
		Guidelines for division and distribution work packages and tasks	→	😞
		Shared delivery tools and processes for studies, development and test	↗	😊
Initial	1	Managers trained for communication methods and remote management	→	😊
		Intercultural trainings to understand work and cultural differences	→	😞
		Basic communication skills of team members	↗	😊
		Proficiency (support) in distributed logistical and legal matters	↗	😞
		Business goals shared to distributed teams	↗	😊
		Critical team size reached in all locations	↗	😊
		All stakeholders believe and are willing to work in distributed-development model	→	😊
		Budgeting and cost structures for distributed development managed	↗	😊
		Mapping of core competences and goals of development centers	↗	😊
		Distributed technology infrastructure available and used for operational tasks.	↗	😊

**Figure 33: Complementary approach – Global software organization maturity scale**

This description of the complementary solution for the management of future updates of SPA F. GDSF (Global Distributed Software Factory) maturity, thanks to the use of a standard scale, ends this chapter started with common study ground solutions based on ADT[2012]’s “Common way of working” and “Collective ownership of deliverables” principles and completed with overall delivery model solution aiming at giving even more meaning to global team members to improve delivery.

## CONCLUSION

From a light overall idea about what we used to call offshore development, I developed a strong knowledge of global software engineering in general and its implementation at a global program of a global company, Volvo IT / SPA Foundation.

It was about specificities but also about similarities to traditional (collocated) organizations and projects in particular. Indeed, they all are software project forms with software resources and activities bearing the typical project uncertainty. One of GSE challenges is to limit this uncertainty increase due to its additional specificities.

In line with globalization of the world economies, it is an increasing trend in software engineering led by the US and India but with growing key players all around the world (Europe, China, Russia ...). It is also a diverse one with different forms and targets (offshore, near-shore, in-house, outsourced). As an emerging and not yet mature field, it requires experienced professionals in this field to achieve benefits.

For SPA F. it was also a matter of perspective of offshoring increase that led to this global distributed software factory setup project.

Based on the ramp up target provided by the program management and the delivery plannings of its projects we have built the GDSF (Global Distributed Software Factory) project planning around four milestones (kick-off, face to face in India, face to face in France and summer break)

We have studied the outputs of the current and previous setups to identify the best practices to keep or adapt and the challenges to face. They were mainly about how to tackle problems created from understanding and performing differences of geographically distributed teams, in areas such as staffing and development processes, management and support tools and organization and development models.

We opted for the key role-players' workshop format to work on the different topics. It is the solution we found to get to a large and common agreement, with different software development and management professionals from every location, on how activities had to be performed in our GDSF (Global Distributed Software Factory)



We successfully implemented the global team building aspect and industrialization aspect on the main activity streams (staffing and software delivery), in the global software organization we built for SPA F. program. Both of those aspects aimed at supporting activities of individuals at each and every location. One by developing their awareness of a common organization and knowledge of players (global one team structure), decision and communication channels (steering process) they can use to find support. The other one by detailing main offshore activity streams (staffing and delivery) in processes individuals can rely on to secure the performing of their activities.

We managed to put into operation, the global infrastructure of the company and of the program, allowing live team collaboration between players at different locations. They were virtual team tools such as MasterPlan for management, SharePoint for project collaboration, CSV/SVN for technical collaboration.

We measured how important was face to face contacts to clarify and strengthen global software organization setups. It also underlined the requirement for logistical and legal support, specific in global projects.

We finally completed the solutions for future updates of SPA F. GDSF gathering and selecting complementary inputs about GSE from external Volvo IT/SPA F. sources (key global companies, reference publications and experienced professionals). In their vast majority, they confirmed our choices. Some of them helped us identify progress areas for next setups (overall perspective beyond coding with study and test, GDSF maturity management)

This work placement was a great opportunity for me to put in practice the software engineering education I received from CNAM and to complete it with the specificities of global software engineering. I could express its management part, planning the project, monitoring and reporting the progress of its deliveries. I could use its methodological part to organize the project components to achievement. I could apply its architectural part, designing organizations and processes, insuring consistency and integrity to the setup we put in place.

## BIBLIOGRAPHY

### Volvo communications

SPA F(a), 2011. SPA FOUNDATION Communication Kit  
SPA F(b), 2011. SPA FOUNDATION Offshore purpose  
SPA F, 2012. SPA FOUNDATION Master Plan V4 KPI  
Volvo, 2012. Volvo group presentation  
Volvo IT, 2012. Volvo IT company presentation  
AD, 2012. AD presentation  
ADT, 2012. Distributed development principles  
SIRTAKI, 2008. Offshore tool kit

### Books

Project Management Institute, 2004. Project Management Body of Knowledge, Third edition  
Hendel A, Messner W, Thun F, 2008. Rightshore!: Successfully Industrialize SAP® Projects Offshore. Springer  
Carmel A, Tjia P, 2006. Offshoring Information technology – Sourcing and Outsourcing to a Global Workforce. Cambridge university press  
IEEE Computer Society, 2004. SWEBOK. Guide to the Software Engineering Body Of Knowledge.

### Scientific journals

Smite D, Wohlin C, Gorschek T, Feldt R, 2010. Empirical Evidence in Global Software Engineering: A Systematic Review. In the journal of Empirical Software Engineering Vol. 15  
Conchuir EO, Agerfalk PJ, Olsson HH, Fitzgerald B, 2009. Global Software Development: Where are the benefits? In the magazine of Communications of the ACM - A Blind Person's Interaction with Technology Vol. 52  
Damian D, 2006. Global Software Development: How Far Have We Come. IEEE Computer Society  
Ramasubbu N, Krishnan MS, Kompalli P, 2005 A Process Maturity Framework for Managing Distributed Development. IEEE Computer Society

Loh L and Venkatraman N, 1995. Empirical Study of Information Technology Outsourcing: Benefits, Risks, and Performance Implications. International Conference on Information Systems 1995

#### University publications

A.Yalaho, 2009. Managing Offshore Outsourcing of Software Development Using th ICT-supported Unified Process Model. Academic publication of University of Jyvaskyla

Kraemer KL, Dedrick J, Dunkle D, 2010. Offshoring of software development: Patern and recession effects. In Irvine university of California,

#### Internet publications

IEEE, 2012. ICGCE. <http://www.icgse.org>. October 2012.

Roche S, 2011. Réussir l'externalisation de ses projets informatiques. <http://experts-entreprises.ifgnof.com/reussir-externalisation-de-ses-projets-informatiques>. May 2012.

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## ACRONYMS

AD:	Application Delivery
ACF:	Access Control Facility
ADM:	Application Development Model
ADT:	Application Development Techniques
APAC:	Asia PACifiC
BDM:	Back office Delivery Manager
BPIC:	Brazil Poland India China
CNAM:	Conservatoire National des Arts et Métiers
CUT:	Coding & Unit Testing
CVS:	Concurrent Version System
DDC:	Distributed Delivery Coordinator
EMEA:	Europe Middle-East Africa
FTE:	Full Time Equivalent
GDSF:	Global Distributed Software Factory
GI&O:	Global Infrastructure & Operations
GSD:	Global Software Development
GSE:	Global Software Engineering
IEEE:	Institute of Electrical and Electronics Engineers
IS:	Information System
IS-GDP4IT:	Information System Global Development Process for Information Technology
IT:	Information Technology
KPA:	Key Process Area
MOA:	Maître d'OuvrAge
MOE:	Maître d'OEuvre
NICT:	New Information and Communication Technologies
PMBOK:	Project Management Body Of Knowledge
RT:	Renault Trucks
SPA F.:	Soft Products & Aftermarket Foundations
SWEBOK:	Software Engineering Body Of Knowledge
Volvo IT:	Volvo Information Technology
WAS:	Websphere Application Server
WSS:	Web Security Service

## GLOSSARY

**Program:** A program is a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually. It is the centralized coordinated management of a group of project to achieve the program's strategic objectives and benefits [Project Management Body Of Knowledge. 2004]

**Program management office:** A program management office is an organizational unit to centralize and coordinate the management of projects under its domain. It focuses on the coordinated planning, prioritization and execution of projects and subprojects that are tied to the parent organization's or client's overall business objectives. PMO can operate on a continuum, from providing project management support functions in the form of training, software, standardized policies, and procedures, to actual direct management and responsibility for achieving the project objectives. It can receive delegate authority to act as an integral stakeholder and a key decision maker during the initiation stage of each project [Project Management Body Of Knowledge. 2004]

**Business Front office:** It represents the part, in a software delivery organization, in contact at one side with customers (usually called Business) or end users to manage their IS needs and design the related IS solution and at the other side with IT front office to coordinate delivery of the IT solution.

PS: IT solutions are components of IS solutions. In some cases IS solutions are full IT and some others no IT.

**IT Front Office:** It represents the part, in a software delivery organization, in contact at one side with Business front office to design and manage the IT solution and at the other side with back office (supplier) to coordinate delivery of the IT solution.

**IT Back office:** It represents the part, in a software delivery organization, in charge of software solution building.

## ABSTRACT

SPA Foundation is the Volvo group program carrying information system solutions that add values to its affiliate Renault trucks' soft products and aftermarket services. Built up as a program with its management and resources, it coordinates seven projects and a transversal support team. In line with the recommendations of the group, program resources are globally distributed between France, India, Brazil and Poland.

In the prospect of a major ramp up of its offshore resources (mainly Indian ones), program management decided to secure this upcoming growth with the setup of a proper global distributed software organization. This software engineering work placement was settled into the heart of this global distributed software factory setup project. This thesis describes the approach followed, situations encountered, tackled challenges, solutions split in implemented ones and proposed ones for future developments.

## KEY WORDS

Global Software Engineering; Global Software Development; Offshore Software Development; Offshore Software Outsourcing

## RESUME

SPA Foundation est le programme du groupe Volvo chargé de porter le développement des solutions de system d'information valorisant les services du domaine après-vente de sa filiale Renault Truck. Organisé en programme avec son management et ses ressources, il coordonne sept projets et une cellule de support transverse. En ligne avec les préconisations du groupe, les ressources de ce programme sont distribuées globalement entre la France, l'Inde, le Brésil et la Pologne.

Dans la perspective d'une importante montée en charge de ses ressources offshores (indiennes principalement), le management du programme a souhaité sécuriser cette évolution par la mise en place d'une structure appropriée de développement informatique distribué à l'international. C'est au cœur de ce projet de mise en œuvre d'une usine de développement informatique distribué à l'international que ce stage d'ingénieur en informatique est intervenu. Ce mémoire décrit la démarche entreprise, les situations rencontrées, les challenges relevés, les solutions mises en œuvre et celles proposées pour de futures initiatives.

## MOTS-CLES

Génie logiciel distribué à l'international; Développement informatique distribué à l'international; Développement logiciel offshore; Externalisation informatique offshore