Sistema de Informação e revisão da Arquitectura Informacional para o Ensino Superior: uma abordagem focada na relação Alunos-Docentes e a utilização das novas tecnologias de comunicação

(Organizational Management and Integrated Employee Context Information) (Relatório da Disciplina de Projecto de Dissertação)

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Abstract. Organizational management, focusing on the management of entities that have behavior within the environment of an organization, is a key feature for any organization to accomplish its mission efficiently. This thesis first identifies primary causes behind well known daily organizational management problems, such as excess of information traffic or lack of good quality real-time information for decision support, and then attempts to solve one of those causes: fragmented employee context information. A prototype of the solution will abide an experiment which serves to evaluate the proposal.

Key-words: organization, management, employee, context, activity, process, information, user, interface, mobility, value

1. Introduction

This project was first motivated by taking a look at the negative aspects of daily organizational management, such as excess of emails – or likely any other means/channels of communication in general –, information incoherence or lack of full information, and even processes that for some reason require an enormous amount of communication, such as managing meetings, and therefore end up costing time and resources uselessly.

Noticed must be, first of all, that as mobility became more and more available at both personal and professional levels, organizational managers, as well as employees in general, eagerly adopted it for their daily management tasks and it is definitely a growing trend [1], [2], [3]. Mobile devices are the new gate to existing IS

(Information Systems), allowing full time connectivity, almost wherever one may be. But still, they don't seem to answer the needs of organizational managers as many of the same problems from before still persist. Fact is, mobility is now a commodity and mobile application development is a rapid changing industry with many trends and a lot of space for innovation [4], but that commodity is a paradigm shift, in the daily life of the managers, that demands a greater effort - at least - in the transposition/adaptation of the support systems, as they are now in different environments, with different - now handheld - devices and with new variables at state (e.g. location has a stronger meaning).

So the initial thought fell over what could be the causes behind nowadays chaos in the daily activities of an organization manager, a manager that manages people and resources in activities that are part of processes that strive towards the mission of the organization. First, it was pondered if the current management mobile applications would be perhaps too much web-based, and therefore with derived limitations, such as not exploring efficiently the inbuilt features of handheld devices such as GPS (Global Positioning System), general touch interface or even connectivity capabilities such as Bluetooth, Wi-fi, and more. This were just initial thoughts that led the project to investigate both existing technologies on the field as well as trying to find the causes behind the known recurring problems of organizational management.

This initiative led to a set of interviews with organization managers from different enterprises and the results were there analyzed and the problem then well defined.

And so, from the diagnosing approach of this project, primary causes for organizational management recurring problems were identified. This feedback from the interviews gave another direction and helped to narrow the target objectives of this project, which now will propose and test a solution that solves fragmented employee context information, and that will take into consideration the design based as well on user needs instead of only process/activity requirements, in order to abide successful adoption.

This employee context information is, in sum, all the information that managers should have read/write access to regarding the past, present and future states of their employees. The availability of this information is nowadays highly questionable as it is totally fragmented and as well lacks on coherence, real-time delivery and quality. Due to such fact, it can likely damage the management tasks of the managers to a costly extent, such as work overload and taking wrong/not-the-best managerial decisions.

2. Thesis Problem

As mentioned, this project first focused on finding primary causes behind the organizational management recurring - derived - problems, and the final problem then is how to solve those primary causes with grounded realism. Organizational

management is here to be seen as the following phenomenon: organizational entities managing organizational entities.

Notice that these entities can both be people and/or machine alike and that each of them can be fully described as a dynamic cluster of information.

Once concluded the initial phase of diagnosis in this project, the problem of the thesis was narrowed to how much could mobile management benefit from integrated employee context information and how could such interaction play out. This consists in the availability of dynamic profiles of all managed entities for automation of managerial activities, such as calling someone to know where they are, or if not automation, at least full support for decision making, such as "when, as soon as possible, can most of my employees be gathered for a meeting".

2.1 Regarding Information

Fundamentally, it all circles around – and depends on – information. And to be more precise, for organizational management of people and resources, contextual information plays a greater role. Information is needed to know the past, present and future states of every entity; good quality real-time full information is needed to make the best decisions; information is required to derive more useful and concise information; and all this information is required, as a whole, to optimally conduct organizational management processes, namely for efficient decision making. So the main objective is to have this dynamic information continuously grasped, managed and delivered to the managers. Fact is, different information comes from different sources. Some contextual information is more or less static, like entities' names, IDs, and other profile entries; whereas other information is very dynamic, such as current location or activity, or even calendar, among others.

Giving some examples, location can be obtained from either APIs (Application Programming Interface) such as Google Latitude [15] or inbuilt GPS, assuming modern mobile devices. Visual/audio derived information can be obtained from the mobile device features such as photo/video camera and audio receiver, while information regarding presence, availability, state, activities, schedules, resources, etc., can be obtained through manual input, scheduled triggers, derived information and so on and so forth.

Nowadays most of this contextual information is captured and used. Fact is that each - mobile - application that is designed for a certain managerial task or group of tasks, holds, accesses and perhaps shares the information related to/required for that task. This implies that other managerial tasks applications will have to connectively adapt to the existing ones, so that the information can be shared in a proper way. Problem is this is not done, except within suites of the same application provider such as Microsoft's MS Sharepoint and MS Project [20]. This is yet an assumption to be verified further ahead.

2.2 Regarding Organizational Management

About organizational management, it must be considered the complexity - amount of generated issues to be solved and decisions to be made - associated with managing

meetings, managing enterprise fleets, managing employees and general issue management. Derived problems related to this complexity include for instance an enormous amount of information that needs to be processed and that is yet far from being processed efficiently, and as example of such, the amount of emails managers have to go through every day. And although “now they can answer their management emails while mobile", the interface/screen size limitation makes the corresponding managerial processes even slower, actually fatiguing.

The following story is a scenario that does not take into consideration the conceptual solution this thesis will fall upon. Its intent is to describe a scene of organizational management to better understand the problem.

Scenario Introduction: John is to schedule, for this week, five meetings with each of the five IT teams from his software company. Each has eight members, but six members belong to more than one team. He is as well in charge of assigning five special tasks to any of the IT workers for system maintenance at a specific client, and making sure such is accomplished.

(Without considering the solution TO BE)

1. *He wakes up and goes to work. On the train, he doesn't have patience yet to answer emails.*
2. *When he arrives at work he checks his email and finds over 30 mails regarding availability for the meetings, which he takes a good amount of time answering. Meanwhile, it’s lunchtime, which has to be hasted since the morning was wasted due to excess of emails.*
3. *As six of the IT workers are attending more than one meeting, since those are in two or more teams at the same time, there is induced chaos regarding scheduling the meetings.*
4. *Then he needs to know which worker is closest to the facilities of client A, so he calls those he thinks could be closest... and lucky him, the 4th one he calls was kind of close to it. He didn't know though that one he didn't call was right beside it and even had more competences and local knowledge about that client.*
5. *He then assigns a task to IT worker Bob, by email, so that he goes on an assistance assignment to client B, Thursday afternoon... but he forgets to add it to his Excel document that traces his employees’ activities because he just received three notifications of email from which one seemed to be important regarding some team’s project development.*
6. *He then manages to setup a team meeting to Thursday, with the team where Bob belongs to.*
7. *Because Bob was away on some other assistance task, he did not check his email until Thursday so either the meeting is canceled on the day or client B will not get his assistance.*
8. *At the end of the week, John has headache, Bob has headache and perhaps the client is not as happy as they would like.*

3. Related Work

3.1 Known Market Approaches

Companies such as Rove [11], among many others, provide solutions that are aiming at operational management level for mobile devices. But in this project, the aim will be set higher – organizational management level – focusing on the daily never-ending tasks that are required to manage an organization (people, resources, activities, time, etc).

Ootoweb [12], for instance, provides a solution that focuses on managing meetings, but it is not 100% mobile as only some related services are available on the mobile platform, meaning parts of the management process have no mobility. But furthermore, it will be logically separated from any other required tools such as to manage employees, projects or enterprise fleets. From this, one can easily predict managers having uselessly replicated (possibly incoherent) information as well as process delay, since other tasks will require information that is not shared, due to having no integration.

Microsoft provides managerial solutions of the same sort, focusing, for instance, on project development - MS Project -, or enterprise collaboration - MS Sharepoint [20]. But even here, although mobilized and easy to use on mobile devices like iPad, the two platforms are not integrated from root. They were made for different purposes yet they wield the same of some entries of the employee context information, such as paring activities and periods of time. Nevertheless, integration is in this case made possible, but it's something to be conducted by the user - a manual configuration that can go wrong and that certainly has a useless learning curve, which is time consuming -.

And many other separate solutions exist, such as the Google Docs [16], Google Groups [17], MeetingMade [18] or Doodle [19], all as well providing managerial tasks support, but in a very independent way, when the focus should be that all tasks fall upon full information of the organizational entities, instead of providing one lonely/independent application for each task. This is as well a strong assumption that should be confirmed later in the project.

3.2 Topics and Theories

This thesis will likely undertake various value adding theories, concepts and characteristics. The following listing is not exhaustive and there will be room to add more value to the solution. It shall solely provide theoretical support to different domains that the project is likely to reach, definitely having some with more weight than others. After is as well presented justification and critic analysis over these topics/theories.

Context Awareness and Context Information

First of all, what is context? *"Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is*

considered relevant to the interaction between a user and an application, including the user and the application themselves." [7].

And then what is to be context-aware? *"A system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task."* [7].

So resuming, context-awareness focuses on recognizing and taking into consideration the state of the involved entities and their environment through time, regarding information retrieval for all kind of uses (automatic use or retrieval to user). This can be used both for better efficiency in automated activities as well as non-automated (human driven).

Web 2.0 / Enterprise 2.0

Web 2.0 was coined by Darcy DiNucci in an article called Fragmented Future. It was further spread since forth a conference precisely called Web 2.0 in 2004, launched by Tim O'Reilly. It is a concept that consists mainly in a gathering of key principles/features that describe the result from the evolution of Web 1.0.

Web 2.0 was so listed and described through seven principles [8]:

1. The Web as platform
2. Harnessing collective intelligence
3. Data is the next 'Intel inside'
4. End of the software release cycle (permanent Beta)
5. Lightweight programming models
6. Software above the level of single device
7. Rich user experiences

In a more general view, Web 2.0 is the current maturing result of the Web as a phenomenon.

Enterprise 2.0 is a derived concept that focuses majorly on social networking and collaboration within enterprises.

> *"I use the term "Enterprise 2.0" to focus only on those platforms that companies can buy or build in order to make visible the practices and outputs of their knowledge workers." -- Andrew P. McAfee* [9]

User Interface Usability

This topic focuses on the easiness of usage (usability) of the user interface. It not only includes, in this case, heuristics on general interface design [10] but it will focus on how it can be provided in a specific type of interface: mobile handheld devices, where one of the most crucial facts is the screen size, which raises problems regarding visibility, selectivity, etc.

3.2 Critic Analysis on Topics/Theories

Analyzing the above mentioned topics/theories, it must be first of all stated that the main topic is contextual information and awareness, and its usage in the phenomenon given by organizational entities managing organizational entities.

Enterprise 2.0 phenomenon comes related to the contextual information availability, as collaboration - keyword for Enterprise 2.0 - is increased by sharing contextual information, since providing valuable use other than for organizational

management, and therefore adding value to the availability of such information. And precisely due to confirming other uses of the context information, it has to be taken into consideration when modeling and paring such information with organizational management alone. If this is not done, there is the risk of, in later development in the area, finding issues between the contextual information used for organizational management and the contextual information used and shared in enterprise collaboration, which would demand further mediation and synchronization, if not redoing existing IS.

User Interface Usability will be a minor topic, but it must not be discarded. The fact that mobility in managerial activity became a strong reality increased the already needed care for easiness of use (given reduction of screen size, touch-screen interface). It merely a factor to have in mind. Otherwise, for example, if a prototype is made to conduct a certain experience upon, the results can be greatly damaged if not developed with care for the interface.

4. Thesis Proposal

By applying negation to the problem of this thesis, it can be asserted that the hypothesis of the thesis consists in: integrated employee context information availability will have a strongly positive and relevant impact on organizational management, significantly reducing the amount of recurring problems of nowadays, and hereby having great value to almost any organization.

4.1 Conceptual Solution

This thesis will then attempt to create a conceptual solution that aims to work out the current organizational management recurring problems. More specifically, to abolish one of the causes of those problems, identified through interviews with managers from different companies (see Annex A), which is, again, to solve the fragmentation regarding employee context information. This decision, and narrowing, on this problem, is already an outcome of initial investigation, explained further ahead (see *8. Solution*). This proposed solution then focuses on how to collect, manage, deliver and use this information in a way that fits the needs of organizational managers.

The outcome of such proposal will be in the form of a management process reengineering, now based on the availability of integrated employee context information. As support for such, system specifications on how to provide such availability will be included.

In order to test the conceptualization, a prototype of an organization management mobile application that follows the system specifications above mentioned, in order to abide integrated employee context information, should be developed and experimentally tested in real environment, if possible, to verify if answering the assigned cause solves, or at least diminishes, the recurring known problems already mentioned.

The following story is a new version of the scenario presented in Section 2 - Thesis problem. It intends to depict the same scenario requirements but now answered by the solution to be conceptualized:

(considering the solution TO BE)

1. *He wakes up and goes to work. On the train he selects on his smartphone the members he wants to meet on each meeting, and finds which timeslots are best matching, without need of contacting any members.*
2. *When he arrives at work he checks his email and finds no emails regarding meetings.*
3. *Then he needs to know which worker is closest to the facilities of client A, so he simply takes his phone and sees where his employees are and assigns a task to one that he can see to be free and closest to client A facilities at that time.*
4. *He then assigns a task to IT worker Bob through his smartphone so that he goes on an assistance assignment to client B on Thursday afternoon but immediately the application warns him that both Bob and himself are attending a meeting at that time.*
5. *He then decides with anticipation which event should take place at that time (manager decision based on importance/prioritization).*
6. *He decides the assistance to client B can be done on Wednesday afternoon and changes Bob's assignment date on the fly.*
7. *At the end of the week, John has no headache, Bob has no headache and the client is happy enough.*

4.2 Envisioning Support for the Solution

Already thinking ahead, the conceptual solution will require a model for standalone mobile applications using a common remote server for each set of users (enterprise, departments, teams, individuals, etc). It will likely include mashups of existing APIs, usage of mobile device infrastructure characteristics such as GPS and camera, presence information capture/generation and its management, and of course the delivery of all this information. These models should, in further development and out of this thesis scope, form a valuable standard as it could bring not only suites of same company to be highly more efficient, but as well different applications could have an interface to receive and return context employee information from the same now more enriched information core.

4.2.1 Why Standalone?

Browser based applications have serious limitations and once regarding mobile devices [5] and require extra works and mediations to abide basic requirements such as interoperability or good interface experience [6]. First of all the main issue is that the application works even if the entity goes suddenly offline. This would not be possible if the application is purely remote. Furthermore, and as well crucial in this particular case, it would not be feasible to easily take full advantage of inbuilt mobile device characteristics such as GPS or camera. Therefore, it will be service based for remote access and interoperability, and will use cashing systems to reduce impact of offline situations and allowing offline work.

4.2.2 Mashups?

Many free APIs include presentation/interface, functionalities through web services and data delivery in order to generate new services at a very good cost/efficiency balance. APIs that might have added value include Google Maps [12], Google Latitude [13] and Google Calendar [14], perhaps others to be sorted out.

4.2.3 What information?

As organizational management is mainly around managing organizational entities, and as it has been discussed it all depends on information, each entity has associated context information that has great value to organizational management – among others such as strategy or human resources, but organizational management alone is the phenomenon under study – if it is provided in real-time, being complete (full information) and easy to acknowledge and search through. This contextual information includes entries such as:

- Connectivity (online, offline, high/low signal)
- Availability (occupied, away, idle, ...)
- Profile (name, ID, company ID, ...)
- Current Activities (ex.: "assistance, client A system, facilities A1")
- Scheduled Activities
- Logged Activities
- Resources (ex.: "access to application AppXPTO")
- etc.

An interesting fact to be denoted is that this information not only fits a human as it fits a computer. This fact will not be embraced for starters but it is a window of possibilities.

4.3 Considerations and Limitations

Since the solution will axiomatically include the usage of mobile connectivity, problems regarding entities falling offline must be answered. Cashing mechanisms should help for the offline entity to still have access to the information it needs, and the system should be able to find that the entity is offline, and therefore not synchronized, so that the required notifications and measures are automatically taken.

Worst case scenario is obviously if the battery of an employee's mobile device wears out or if the mobile is for some reason destroyed, and he goes permanently off the grid. But even then, it is possible to control/reduce the impact of the situation since the system can recognize the unexpected end of an entity, and thereafter notify who needs to be notified until that entity is restored, for instance by logging in the system using another mobile device, which change should be seamless.

Another topic to be seriously considered is employee's privacy. The manager should not know where the employee is, if this one is out of his working time... should he? Well this is a delicate issue and the decision of what information the employee's have shared, when it is shared, and what sharing control have both the employee and the manager over it, is for the organization to decide. Therefore the solution TO BE must support all different scenarios as these are requirements that can

easily vary from organization to organization. For instance, if we're talking about managing an emergency fleet, 24h location information is surely to be required.

5. Research Method

The project follows a research method called Action Research (AR) [23]. This method focuses on taking planned actions within an environment, than evaluate its impact. Such actions will not only provide knowledge and understanding through the evaluation of its impact, but as well will try to aim at and solve primary problems immediately, which in itself is of great value to the testing environment (organization).

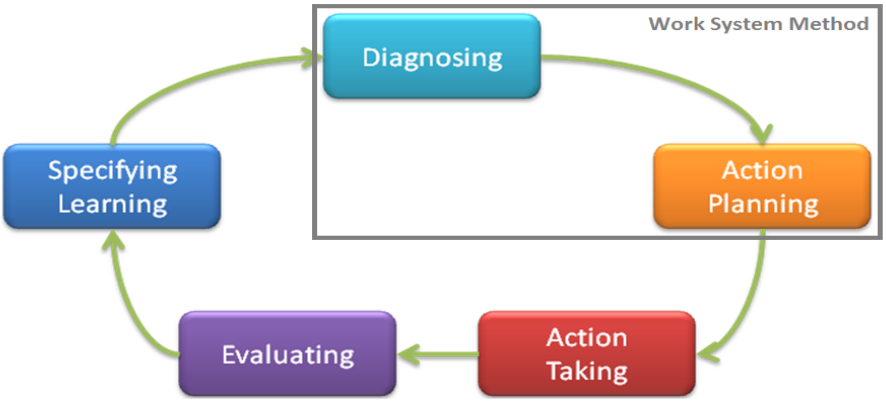

Diagram 1 - Action Research Cycle

Furthermore, as you can see in Diagram 2, the first two steps of the AR will follow the Work System Method which provides an organized, but flexible, framework for analyzing a system from a business viewpoint, identifying possible changes, and then justifying a design recommendation [21].

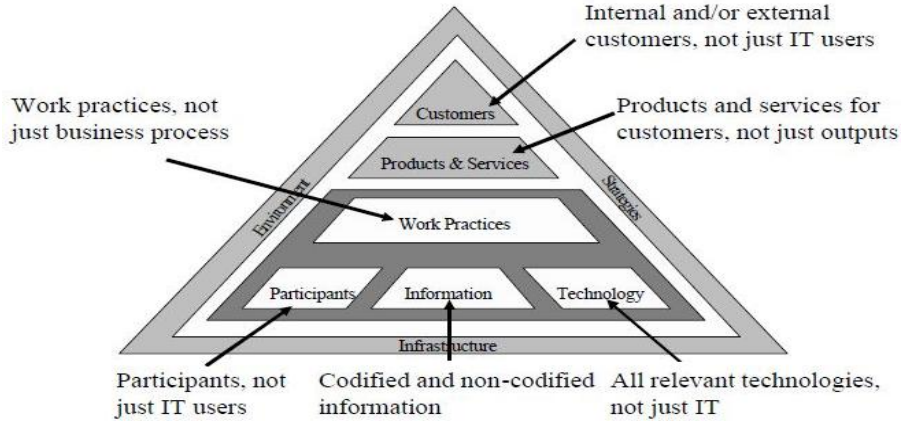

Diagram 2 - Work System Framework

The Work System Method consists in a three steps approach described in the table below. Those steps consist in: System and Problem (SP), Analysis and Possibilities (SP), Recommendations and Justification (RJ).

	First step in WSM	***Second step in WSM***	***Third step in WSM***
Headings in Level One	**SP**: Identification of the work system that has the problems or opportunities.	**AP**: Analysis of current issues and identification of possibilities for improvement.	**RJ**: Recommendation and its justification.
Questions in Level Two	**SP1** through **SP5**: Five questions about the system and problem.	**AP1** through **AP10**: Ten questions related to analysis and possibilities.	**RJ1** through **RJ10**: Ten questions related to the recommendation and its justification
Topics and guidelines in Level Three	Checklists, Templates, & Diagrams	Checklists, Templates, & Diagrams	Checklists, Templates, & Diagrams

Table 1 - Work System Method steps

This research method (AR using WSM) will be applied to a phenomenon given by people managing people - in a general view - through time, in an organization (where people are entities that have behavior). Follows then a description of each step of the research method used:

Diagnosis: intends to bring an understanding on the primary problems within a certain context.

The interviews mentioned on Related Work section will abide this phase. The knowledge than obtained in this step (local knowledge) should complete the theoretical knowledge of the researcher in order to provide a good local understanding/perspective.

As mentioned above, the Diagnosis phase will be instantiated according to the WSM. And so, the interviews will be guided by the level two broad questions in the SP step of the three steps of the WSM, presented as follows [21]:

- SP1: What is the **system**?
- SP2: What are the **problems or opportunities**?
- SP3: What **factors** contribute to the problems or opportunities?
- SP4: What **constraints** limit the feasible range of recommendations?
- SP5: Summarize the work system using a **work system snapshot**.

In Annex A, the interviews guideline consists in a mapping of the above presented questions and the specific questions that instantiate the interview, which intends to qualitatively answer the SP step of the WSM.

It must be noticed that there has to be a natural filter of information throughout the interviews, as not every problematic process is relevant for this thesis context, and therefore a on the fly filtering must take place based on generalization and intuition. The interviewer must realize which problematic processes that are found could easily be common in other organizations and as well abide an opportunity to be solved with this thesis approach to the solution, as based on mobile technologies.

Thereafter, the analysis of the qualitative results takes place, still within the diagnosis phase, and going accordingly to the AP step of the WSM. The level two of the AP step consists in framing ten questions, presented below [21]:

- AP1: Who are the **customers** and what are their concerns related to the work system?
- AP2: How good are the **products and services** produced by the work system?
- AP3: How good are the **work practices** inside the work system?
- AP4: How well are the roles, knowledge, and interests of work system **participants** matched to the work system's design and goals?
- AP5: How might better **information** or knowledge help?
- AP6: How might better **technology** help?
- AP7: How well does the work system fit with the surrounding **environment**?
- AP8: How well does the work system use the available **infrastructure**?
- AP9: How appropriate is the work system's **strategy**?
- AP10: How well does the **work system** operate **as a whole**?

These questions intend to analyze and derive further knowledge regarding the previous SP step. This will be achieved through a context recognized hermeneutical analysis of the qualitative results obtained from the interviews.

It must be understood though that there has to be a narrowing of the focus of the WSM. The organization as a whole must be recognized for contextual recognition,

certainly, but the phenomenon under study is much less broader then that (being people managing people). Therefore, the analysis of the interviews towards the questions above of the AP step shall take into main consideration the part of the work system that relates to the phenomenon under study.

Action Planning: make use of the understanding obtained on the previous step, in order to plan a set of actions (applied changes). These actions have an expected outcome on the environment to which they are applied. These actions intend to both obtain knowledge on their efficiency (so they can be revised) and to fix immediate problems that they target.

And here follows the RJ step, last step of the WSM, intending to converge from the previous analysis and possibilities onto a final list of recommendations and justifications that can be translated to the actions intended to plan in this step [21]:

- RJ1: What are the **recommended changes** to the work system?
- RJ2: How does the **preferred alternative** compare to **other alternatives**?
- RJ3: How does the recommended system compare to an **ideal system** in this area?
- RJ4: How well do the recommended changes **address the original problems and opportunities**?
- RJ5: What **new problems or costs** might be caused by the recommended changes?
- RJ6: How well does the proposed work system **conform to work system principles**?
- RJ7: How can these recommendations be **implemented**?
- RJ8: How might perspectives or **interests of different stakeholders** influence the project's success?
- RJ9: Are the recommended changes justified in terms of **costs, benefits and risks**?
- RJ10: Which **important assumptions** within the analysis and justification are most questionable?

Modeling a conceptual solution will instantiate this action taking step. Such solution, when instantiated (even if partially), would imply changes to the environment where it is deployed, changes which should then be evaluated.

Action Taking: implement the solution (or part of) as an action and insert it in a real environment in order to after evaluate its impact.

Apply the conceptualized solution (likely modeled in Business Process Modeling Notation v1.1 (BPMN1.1) [22]) supported by the development of an application prototype, using the best practices of software engineering. Though not yet given as certain, the prototype could follow the following technologies:

- Java EE 6 SDK + Android SDK (application development on Eclipse 3.5)
- XML (data simplicity and usability)
- SQLite and MySQL (local "offline" database and remote master database)

- Web Services (remote interface connection, reusability, modularity)

Evaluating and Specifying Learning: consists on collecting data (impact as result) that is outcome from the actions taken and analyze it in order to obtain new knowledge. That new knowledge is then redirected not only to the researcher but as well to the testing environment (organization) in order to provide immediate value. This new knowledge will then be feedback to the research cycle.

In this project this will form the testing phase as well as result analysis and comparison. If within time, the results should feed a further iteration of the AR, although then problems could emerge and therefore broadening the focus of the thesis, unless it would incur improvements on the already developed actions.

Along the Thesis and its related Project, various theories (seen as theoretical knowledge in AR) will be used to provide a robust scientific base. Some specific fronts of that theoretical knowledge were already stated in the Related Work section. But the macro-issue embraced is MIS (Management Information Systems), which includes various key concepts such as: behavioral entities, processes and activities, management, information, IT and even requirements such as real-time information availability and efficient communication.

6. Preliminary Results - Diagnosing

The diagnosing phase, as desired, consisted in a set of three interviews with distinct organizations. Luckily, each company, along with each representative interviewee, consisted in a very rich experience and source of information. The different contexts and history experience of all three managers was a boon to better consolidate the project. The three interviewees are presented as follows:

- **Casper Kandelsdorff** from **Agitect** [25], an IT Infrastructure consulting company in Denmark that holds a framework for adaptation to cloud-based architectures. Casper is the CEO of the company and has had a long experience within the IT markets in general, namely as development manager in Microsoft. The interview, although predicted to take only thirty minutes, went up to four hours as the topics discussed generated very interesting debates.

- **John Rizzo** from **Aplix Corporation of America** [26], a multi-national mobile devices/embedded systems software company (US, Germany, Japan, China). John is the Technology Strategy Vice-president and has had a long experience in the field of mobile applications as well as knowledge by experience on managing people.

- **Kenneth Thue Nielsen**, from **Danmark Radio** [27], a government funded company that broadcasts TV, Radio and Web media content to all Danmark. Kenneth current job focuses on his statistical analysis capacity but he still manages people. On his previous job he was over 2000 employees with high-level business management responsibilities.

NOTE: as general reference, all assertions regarding these companies and these interviewees presented in this section are derived from information provided by the interviewees themselves.

As it can be asserted, each company represents very different contexts. Agitect is yet a young and small company, providing local organizational management knowledge associated with Casper's earlier external experience; Aplix Corp. abides support on oversea management and its associated problems, and which as well is within the market of mobile applications, providing very good insight from John Rizzo's perspective; and finally Danmark Radio is a company that relies much on both journalists as well as non-mobile teams for content creation/management, all of which take part in a mission that is crucial for the country itself, and adding that the company has a very old and enrooted culture that hardly accepts change.

First of all, each company was described using the Work System Snapshot (Annex A.1, Tables 4, 6, 8) - already during interviews - in order to better depict the context where further questions would take place. Once a clear understanding of the company was obtained the interview took place (Annex A.1, Tables 5, 7, 9).

6.1.1. Interview at Agitect

It must be first noted that Casper is a daily user of iPad and iPhone for both his professional and personal life and so are his employees attached to the same. All the virtual interfaces he has to the company's environment are running on these mobile devices and, at first glimpse, he says he is satisfied with the current system.

It was clearly understood that mobile devices represent a must for nowadays physical interface to the enterprise information systems, as mobility (mobile connectivity) is now a commodity. Furthermore, the inbuilt connectivity technologies (Radio, Wi-Fi, Bluetooth) already allow an extremely good connectivity flexibility and good range of possibilities of seamless usage, such as himself mentioned, "indoors" localization for finding people inside the complexity of big buildings such as a large enterprise's headquarters can be. Of course based on the assumption that an employee always carries with him his, or one of his mobile devices.

An interesting note to be taken was that he pointed that although using Microsoft Exchange and Microsoft Sharepoint for his managerial tasks, there was no linear integration of these two systems, of the same provider, and although perhaps possible to make such integration, it would have to be done by the client at a certain extra cost, and not something that comes enrooted in the product, as well not allowing to efficiently use other managerial applications. He affirmed that providing better integrated information about all that is to be managed would certainly at the same time both speed up and lower down error probability on managerial tasks that require such information for decision making. He also added that having all that information manually inputted in a system would be way too heavy for the employees, even more then such already is, so automating the changes of the associated contextual information would certainly be a boon.

6.1.2. Interview at Aplix Corporation of America

John Rizzo clearly stated that the work system, AS IS, is sufficient. Nevertheless, he mentioned that there is always space for improvement but that it would be very hard to implement and use any means of real-time communication given the time-zone difference and cultural differences, due to Aplix Corp.'s worldwide enterprise condition. Anyhow he did strengthen the idea that integrated employee context information would be a plus, although when the employees from US would like to see contextual information on the employees in Japan, their activity at that moment would likely be "asleep", or they wouldn't see it at all since the work time periods do not go hand-in-hand. But other than that, such information would definitely be useful.

It is to be noted that he highlighted the importance of email as a way to go around the problem of time-zone difference and cultural clashes, as one has time to sit, think and answer, having in mind the different culture on the other side of the line and time to ponder over such knowledge, whereas in a real-time communication - or short interval for answer, such as IM (Instant Messaging) - that pondering would not be possible and could seriously damage the communication quality. As quality was chosen over speed, email is the solution at the moment.

But although currently satisfied with the work system of Aplix Corp., John did point five key concepts he would like to see improved:

- Global collaboration;
- Timely communication (response time);
- Accountability;
- Lighter weight approval process (bureaucracies level);
- Presence based communication.

Despite of the impossibility, or likely hardness, of having improvement on many of these factors when overseas, they still are points of focus for improvement on each of the sub organizations of the large enterprise, that do not suffer from oversea distances, and where there is total fragmentation of employee context information, lack of collaboration (Enterprise 2.0), lack of response time from excess of incoming information and then other typical organization problems such as lack of accountability and level of bureaucracies on approval processes.

6.1.3. Interview at Danmark Radio

It came fast to sight that DR is a good example of a large (national) company whose culture is heavily enrooted, both in the - sort of - static environment that is content management and delivery units, as well as in the very chaotic mobile environment that is where journalists fit in. Again, given its culture, the organization is very reluctant to change and although the systems currently used "do their job", employees' workload has increased immensely, especially since the company's crisis - company was forced to fire hundreds of employees but maintain workload - three to four years ago. Furthermore the company's mission is crucial

to the country, which means that making moves/innovations is something to be taken at the lowest risk possible, often resulting in very late adoption, or no adoption at all, of newer systems, infrastructures or any other relevant innovations. The organization waits for other less country-wide mission-critical competitors to take innovation steps and then go for late product adoption. Among this adopted systems are collaboration systems that are misused, if used at all, by a great majority of employees.

Actions are than to be taken very carefully towards the problems in organizational management that Kenneth denoted. For example, they do not know at all the location of their employees, but "they have an idea". This is again the culture of the company working its ways out of rationalized processes and recent technological support. Definitely location information, along with all other sorts of contextual information, would be a bonus for the managerial staff, and as well increased efficient collaboration between employees would create synergies that would definitely bring a positive outcome, Kenneth pointed.

The organization core, where the mission is directly assessed, constitutes a matrix that relates orthogonal competences, being those: Content Channels (TV, Radio, Web, Teletext) and Content Categories (Crime, Entertainment, Politics, etc.). Each employee has different competences and qualitative capacities from one another, regarding those matrix entries. The management of the core needs to make sure that the best employees are assisting the most important issues where their competences have greater mean. In order to manage this, one single man that serves as router needs to know – more or less, by heart – which employee is good at what. He manages around fifty people, and while this is doable it clearly would be better if he could monitor those competences, as well because they are dynamic over time and he does not get to know everyone so well, and for the company's mission his decisions are the key point for success.

Furthermore, the different employees dispersed over that dynamic matrix work with common contexts every time two employees are placed on the same row or column. This means they are using, at that time, similar knowledge, and they should be sharing their experience and expertise with one another. Kenneth states that that would be definitely a major bonus: collaboration.

He as well stated that he believes that if this opportunities are taken, meaning improving employee context information availability and enhancing collaboration, people will have, again, less work/less stress, because they can share problems and knowledge and have everyone's issues better attended, at socializing level. It would as well help employees to better know the environment and persist more like one single group rather than several separated individuals which as well helps the company "to row" altogether in one same direction.

6.1.4. Interviews discussion

The interviews' main objective was to discover and define organization management problematic tasks and the causes to those derived problems, which could be common to various/any enterprises. Nevertheless, from the interviews

results, one can conclude from the SP2 and SP3, of the WSM SP step, that the following causes are likely behind all managerial tasks problems (again see Annex A.1, Tables 5, 7, 9):

- The support systems are wrongly used by the employees (wrong information inserted, not updated real-time) and/as are not well adopted (using other/older means instead for example). Not only managers suffer from this since receiving bad quality information to support their decisions, but as well the collaboration systems are heavily damaged as the network effect fails to happen [29] due to this lack of adoption, hence reducing the information and real value of the system.
- The support systems do not share employee context information (related information is kept apart and read apart, e.g. project tasks and schedule of meetings or other events).

Now, these key points are actually the cause of various problems as it was debated during the interviews. All organizational management tasks (such as scheduling meetings, managing tasks, issues, fleets, etc.) suffer from these causes. Derived problems include information incoherence, lack of decision support, excess of emails (or any other sort of incoming untreated information), among others. This was found to be in all three interviewed work systems.

It is clear that these causes must be answered first, in order to provide a better environment for the information systems to succeed.

It must be as well denoted that main barriers against improvement of organizational management systems consist in organizational culture, time-zone difference and across-the-globe cultural clashes.

Therefore, the problem regarding employee context information availability is passed as primary problem to the Action Planning phase of the AR, with a keen note that system adoption and all above mentioned barriers have to be taken into heavy consideration during the planning of actions.

But before proceeding to any planning, the AP step of the WSM, still within the Diagnosing phase of the AR, has been conducted (see Annex A.2). It turns out to support the conclusions here presented in the interviews discussion, regarding employee context information fragmentation and systems adoption.

7. Preliminary Results - Action Planning

7.1. Recommendations and Justifications

In order to complete the WSM steps, the last step, RJ, is presented in Annex A.3. It intends to both set forth and defend the actions to be considered to solve the problem(s) detected.

7.2. Regarding System Adoption and Barriers to Development

This theme embraces a large scope within ISs development. First of all the first reaction to change is well known to be only for enthusiasts, just like in the life cycle of a product. As a matter of fact, an IS solution developed for a certain organization is a product. And not only all together, but each individual, separately, from that organization, is a potential client. The problem is that for the issue of adoption, and now specially focusing on organization management support systems, habits and organization culture in general are a major frontier that forces most "new products" to fall in an early chasm of product life cycle. And although it is widely known that mobile technology impacts business processes positively, even if alone for all the rewards of mobility [3], by itself this will not assure system adoption, as one can deduct from the interviews results.

Actions that aim towards system adoption swipe the entire process of system development, from the very reasoning and purpose of the system, through requirement specification based on user needs and cultural issues above activity needs, through interfaces that provide the best user experience and even assuring that there are no negative factors such as system crashes already in maintenance phase.

Furthermore, as previously mentioned, heavy factors have a say on this matter, being those:

- Information privacy and control issues;
- Organizational culture;
- Time-zone relevant differences;
- Worldwide cultural clashes.

These factors are assessed individually in Annex D, and, altogether, shall be taken into consideration in every related decision made regarding the development of the solution, but they will not be studied deeper, as the focus of this project relies on the availability of real-time full employee context information for organizational management.

7.3. Regarding Context Information Availability

An organization is composed of processing entities that have behavior. Regardless of how these entities are structured, each and every single one of them can be seen/described at any moment in time, as dynamic information. Either being people or computers, it is possible to delineate a configurable dynamic context profile with various fields which can be read/written by processes that require so. These profiles combine all sorts of information that describe, to the best, the entity within the organization. As mentioned, this information is dynamic and constantly capable of changing. Either because these entities do things, change contexts of work, change their location, obtain/loose resources along with many other events.

Nowadays this is hardly done. Common scenario is information, stored in the form of data, being kept per application. Then services are provided to allow other applications to interact with that stored information. Each application stores its own data, which frequently means replicated information, even if not direct, within the

same system. As an example, and even being across applications of the same suite provider, Microsoft Sharepoint and Microsoft Project [20] require manual integration which is not linear and, although possible, it requires a learning curve from its users as well as time loss for the effect, which again goes against system adoption rate. And it must not be seen only between two applications but all. All applications for Organizational Management, general rule, do not work over the same instance of information, often encountering replications and incoherence which damages organizational management efficiency. This has been pointed during the interview with Casper Kandelsdorff from Agitect. And the problem here consists in the information being assigned per application, which is aimed to support a specific process! When different processes will obviously need to access the same information.

This has not been concretized, so far, at the Organizational Management level, regarding the dynamic information that each entity is, assuming that the interviewees had close to full knowledge on the advancements on managerial applications.

So this point falls down to: what action(s) must be taken to make this full context information properly available and meeting the needs of each enterprise's organizational management entities?

First of all it is irrelevant, except for performance issues, to know the physical location of the information. What matters is that the information is obtained/updated real-time, kept, organized/processed and distributed.

If each entity is seen as a dynamic context information profile that changes over time from various triggers, a snapshot of it – at a given moment in time - can be described as an event or circumstance that can be depicted with the 5W+1H, an old formula which has its origin from the ancient Greek rhetorician Hermagoras of Temnos. Nowadays this formula is used for excellence in describing a situation, either by journalists, police or researchers.

Table 10 in Annex E maps the 5W+1H formula with macro Information Clusters that shall fully depict any organizational entity in any moment in time.

These fields are merely an approach to what each profile could look like. Some fields are almost never updated (such as name or ID) while others are highly dynamic (such as Current Task or Location). Now the ideal model is that each and every mobile application developed for Organizational Management that is used within one organization executes synchronized reads/writes on these profiles with real-time precision.

This context can actually be seen in parallel with Social Network profiles such as Facebook's. The difference here, at first, is that this is targeting a totally private and secure environment. And then of course, on Facebook, users edit manually nearly all their profile, while here it is intended to include the most automated updates.

For example, every time an application for meeting management is being executed, the meeting manager using it will be able to see and/or be notified of any conflicts with the attendees' schedules. Furthermore he will be able to create the meeting as a task, which is placed automatically onto all the attendees' schedule, who

are notified regarding the change. Each task can be related to multiple actors and it holds all the information/documentation related to itself as well. In this case, the meeting will hold information regarding general meeting information, agenda, minutes, signatures, etc. Several of these functionalities indeed already exist in the mobile applications for managing meetings but the information they hold is based on the application and on the task of managing meetings, and not on the organization entities.

Therefore, another manager (team project) can be assigning a task to one of his employees and be notified that that employee has just been assigned to a meeting with the manager from the first example, for that precise time-slot/period. The team project manager will be prompted with the issue immediately by being told that he can either reschedule the task or call/IM the manager in charge of that conflicting task/meeting, and then solving the problem. This way, the employee never knew there was a conflict, the meeting manager and the team project manager can agree in good time and solve the issue.

The truth is this availability of context-information demands reengineering of the related management processes so that the activities that require context-based decisions are automated and organized in order to better exploit this boon. This automation – or partial automation by providing already derived information – will reduce the number of activities, the number of instances of activities and the remaining activities will likely be improved, which might allow further optimizations.

7.4. Regarding Support for Context Information Availability

In Annex B can be found sequence diagrams that consist in some of the specifications of the support system/infrastructure for context information availability. These specifications were modeled to abide testing on this project but noticed must be that organizations with standardization experience would be a better, if not the ideal, developer of such support.

The system is simple to understand, as it works as central database for various applications, but as well with server side processing and ado. Different applications, for different purposes, will access it - not in the applications contexts in specific, but in the context of the employee's information - in order to read/write information onto the employee's dynamic context information. Obviously security, stability and reliability, and even performance, must be taken into consideration as in any other system, but given this project's time and resources limitation, this system will be answered on the simplest way.

7.5. Meeting Management

Managing meetings is a very delicate issue. It has been verified in all three interviews that meetings tend to derive more meetings, and it was even pointed that meetings become more an unstructured social debate then a structured decision taking point. The ideal situation would obviously be to have only the meetings that are actually needed, only with the people that are actually needed and removing all useless activities that can be nowadays automated such as solving conflicts regarding who can be present where/when or even distributing the minutes of the meeting

among its stakeholders after the meeting/concluding the minutes, among many other small automations or partial-automations that in sum compose a greater improvement in the life of a manager and consequently in his work. This improvement is to be tested.

It must be noted that it is very relevant the only partial rationalization of this process. From the interviews results, and as discussed before, it is plausible to conclude that each manager has its own way of doing his job, and forcing a rationalization of what he does would almost certainly only help to decrease his efficiency. So in Annex C it is presented the process of managing a meeting, now based on employee context information, and process which struggles to maintain the control on the manager side, instead of forcing linear activity sequences. The reason why the process was not first modeled without being based on employee context information is precisely because there was no real rationalization of the process, but mere guidelines, such as the one used to guide the new process [28].

Although separated into three steps - pre, during, pos - the meeting is a continuous gathering and altering of information since it is created. And even though the meeting event itself will start and end at premeditated times, the meeting as information starts when the manager first creates it and, theoretically, never ends.

It can be though divided into two steps:

- **Process Initialization:** the initialization is a very linear phase and there are no unexpected issues to solve within the scope of the meeting in this step. The manager decides here first of all what the meeting is for, knowing that he should be able to delineate who are the related stakeholders, and further depicting what type of meeting should be and who shall be present, the agenda, date, etc (see Annex C - Diagram 1). Now these decisions have impact in the success of the meeting. As it was discussed during the interviews, a meeting that is not well defined from root will fail. Either there is too many people from which little would be added to the interview at the cost of their time and work interruption; or even the purpose itself could be settled with a short casual talk over whatever means/channels are preferable/available and would not need a meeting.

- P**rocess Management:** After initialization (meeting creation), and as mentioned before, the process must been seen as much *ad hoc* as possible and it will focus uniquely on solving conflicts along with some other activities (again see Annex C - Diagram 1). The reason for this is that these activities are capable of being rescheduled on the fly by the one who has to attend them, as long as they are attended before the meeting. This means the manager must be allowed to prioritize incoming issues according to his own schedule, at his own pace/way. Then of course comes the meeting itself which is even less in the hands of the system, just merely supported, and which is trusted to all attendees. Finally, after the meeting is concluded, there is only (or should be only) a giving

feedback activity from each attendee, activity which should be somewhat schedulable but imposed under a certain time limit, by either the manager or the department/organization rules.

Now the major focus here is how this process can benefit from integrated employee context information. Fact is, in the process initialization it was mentioned that there are no unexpected issues to solve within the meeting's scope. This is due to the fact that the manager has information availability that abides the decisions required for starting the meeting without obtaining, in the moment he decides any conflicts.

It can be then assumed that, as soon as the initialization is concluded, there is a valid meeting scheduled at, so far, lowest time consuming, without removing any decision capacity/control from the manager. In the meantime, between creation and the date of the event, conflicts can pop-up. A normal scenario nowadays is that the manager is "somehow" notified from a communication channel (email, phone call, SMS, etc.), if notified, about the conflict, and then he must go over some of the initialization steps, such as rescheduling the meeting. These events will always be there and there is no way around them, so the focus must be on the capacity to answer them. Now some of these steps are based on employee context information, often based on the question "*When will you be available?*". This has been asserted to be, as is, either highly time consuming or not efficient at all, because the manager did not reach to perceive all proper information in due time. The integrated employee context information allows the system to provide the manager information, and derived information, that is crucial for him to make those decisions efficiently within seconds. It is assumed for now that the context information is complete, in a later development of the project questions such as "What if there is information that the system doesn't know (yet)?" will be analyzed and answered.

Noted must be that instead of logging into a system, going to the proper folder and searching for the meeting information to update it and then send any kind of message to the attendees, or even all stakeholders, regarding the changes, the manager would only receive a pop up in his mobile device that a conflict exists and would solve it on the fly with just a few clicks.

A failure of nowadays management support systems is that they are based on supporting the activities, instead of supporting the managers that conduct those activities. This is definitely a factor against system adoption and it can be solved by thinking what the managers need, as activities don't make decisions, people do (and as well computers, to some extent). Follows a scenario that depicts solving a conflict with such care:

1. *John and Bob are managers in two development teams that have three members in common.*
2. *It is Wednesday and John wants to schedule a status update meeting so he can know better what his team members are doing and how well are they doing, but he soon finds that that information is available in his mobile device and relates the*

project itself with all employees and what are they doing at the moment, what they did, and he even sees notes that employees left at their own pace regarding their status, difficulties, etc.

3. *He notices that two of his members are a bit ahead of schedule and each has left a note regarding having a great idea that should be discussed in person to be better explained and explored.*
4. *John instantly creates a meeting of a casual type with a duration of approximately 30 minutes, for Thursday, the day after, at 09.00, since his mobile device says that that is the next time the two members are available simultaneously. He sets quickly all the information that defines the meeting, even leaving blank certain not mandatory fields such as refreshments.*
5. *As soon as he signs the meeting to be ready the employees, wherever they are, receive a pop-up saying a meeting has been scheduled and confirm that they've read it. If they're busy and will not be distracted by the message they will mark it as read later on.*
6. *Meanwhile, Bob, the other manager, is having great issues with his development team and wishes to gather all members to make a radical change of direction and he needs all present as soon as possible and before next Friday.*
7. *The system tells him that the next time available for all members would be only Friday 09.00.*
8. *He wants it earlier and asks the system when, between then and Friday, are most of the employees free. The system tells him that Thursday at 09.00 all are free except for two that are having a casual meeting with John.*
9. *He immediately schedules a meeting of the type Very Important for that time and sets all his employees, including the two that would be occupied, as participants.*
10. *The system identifies immediately the existing conflict and asks Bob if he wants to solve it of he wants to forward it to the manager in charge of the conflict's other end, which is John. He chooses to forward it to John with a note that he really needs that slot and those two members are essential.*
11. *John receives the forwarded conflict pop-up in his mobile device and as the meeting is casual and not so urgent as Bob's, he decides to ask the system to tell him what the next slot available is for the two members. The system then says Friday at 09.00, which he accepts.*
12. *Both members receive a pop-up that they should again confirm as read regarding meeting schedule changing.*
13. *Bob receives a conflict eliminated pop-up and gets his meeting on due time.*

This scenario would have been rather more complex if employee context information would not be present, as they would have had to go through applications with different contexts, mentally gathering and compiling information to guide their decisions as best as they could.

8. Evaluation

In this section it is intended to present a retrospective of the different phases of the project work until now conducted, inclusively of its results, along with expected evaluation indicators for future work.

8.1. Evaluating the Action Research in multi-sampled research

The Action Research method is typically applied to one organization at a time and it aims at solving the primary problems of that specific environment which are obtained over qualitative analyses which is context dependant. An arguable fact on this project lies on the usage of Action Research over three totally different companies, simultaneously, and combining the results from each of them in order to derive a small set of primary problems.

The reason for such is based on the fact that the phenomenon under study is the same whatever organization we look at: the same entities and with similar behavior. It is still, though, highly affected by context, and as a simple example such can be seen in the difference between the managerial work of Casper Kandelsdorff from Agitect and John Rizzo from Aplix Corp., where respectively one is emerged in the phenomenon in a small "easily" controlled environment whereas the other faces the phenomenon across both time-zone and cultural differences.

Regardless of this disparity, Action Research resulted as expected, bringing to the spot light the primary and most relevant problems within the study context, and furthermore, that proved to be common to all interviewed companies. It can be even assumed that many other organizations share the same problem.

8.2. Evaluating the interviews and data collection/analyses

A very important aspect to be alike evaluated is the credibility of the data obtained as well as pos-analyses derived information, as it consisted in qualitative analyses over a small cardinality of samples (three). But, if the samples are adequate along with high quality data collection efforts, it can output even more reliable, valid, and generalizable results, then for greater number of samples, where efforts wouldn't be, perhaps, as good [23]. It must be noticed as well that for the duration of the project this component was strictly limited by time.

Assuming that the interviewed companies consist in adequate samples as they include the phenomenon in its totality, enriched by the fact that these companies embrace very different contexts for the same phenomenon, and further verifying a valid thorough application of the Work System Method for guiding both the Diagnosing and Action Planning phases of the AR, hereby comprising high quality efforts on both data collection and further analyses, it can then be asserted that the data and derived information from the interviews is credible enough.

8.3. Evaluating the meeting management process reengineering

The process of managing a meeting was modeled in this project having in mind two key factors:

- Automation and/or support for managerial decisions through employee context information;
- Low rationalization of the process in favor of adoption;

The context information based automation/support is present as it can be verified in Annex C. The modeling process of such went through five iterations where it evolved from being a most linear approach of meeting management - already here automated and supported, where possible, by employee context information - to a separation of a linear startup and a pool of *ad hoc* post-startup activities, allowing managers to have full control over their order, prioritization and times of execution.

Regarding the rationalization, it can be discussed to a certain extent how much *ad hoc* can the process be, and still be efficient. In the extreme *ad hoc* case of setting all activities with no sequenciality, the responsibility of guiding the meeting management process properly would fall entirely in the manager's hands. But it was instead modeled based on the logical evolution of the information that composes a meeting. The initialization phase is here, as shown before, a linear sequence of steps that conclude an initial representation of the meeting. The rest, conflict solving between initialization and meeting date/time arrival, is *ad hoc*. Usually, nowadays, meeting management is driven more or less by this model.

The difference lies on the fact that now the decision making is aided in such a way that that sequenciality will find no conflicts what so ever. From this project's perspective there are no more improvements here unless deeper specification of each activity.

8.4. Evaluating the support system for integrated employee context information

Technology already exists that allows an easy to manage integrated environment. The problem will be certainly evolution towards this integration as most of nowadays management applications have their own ontologies, and such a change wouldn't happen so sudden.

The specifications made are only a part of a possible support system, but better in-depth specifications/improvements can certainly be made. This will be attended but it is not the purpose of the project, just a mean to properly test the thesis.

Nevertheless, it must be understood the value of such implementation as a partial key to success. As a matter of fact, such system specifications should come in the form of a standard, which would guide not only private suites to provide a better information integrated environment but as well across systems from different companies. The only real issue here lies on which business models will each organization possess, and further down, asking "Who holds the integrated information?". Certainly having the core of such system would incur extra costs, or perhaps its ownership would be unfair to companies who offer integrated employee context information under the standard. Collaboration for instance would be one of the key aspects to unlock this path, but it is a road with many possibilities and, although it should be discussed later on this project, it will be stale for now.

Another evaluation issue that can be brought up is what are the expected limitations of such system, and to what degree of complexity can it reach. Looking for instance at the following hypothetical question:

"What if the manager workload is simply too much even if being aided by the system and its integrated employee context information?"

Well, if there are so many conflicts to solve that the manager cannot attend all of them, even when provided all the information he needs to take decisions to solve those conflicts, then the problem lies in the organization structure. Likely, he would be doing the job of two managers, which is a fault from the organization and independent on the managerial support system. Regarding automation of activities for reduction of workload, that is where such system would have the biggest impact, mainly focusing on abolishing all activities related to gathering and/or providing contextual information (calling, messaging, etc.). Such forms of contact should only occur to solve issues that go beyond the system, such as for instance, and obviously, a system failure.

Another possible question could be:

"But how exactly will the system collect all this information?"

Again specifications were not yet made, but were thought over. If taken as example Table 10 (see Annex E), we can add two columns and define where such information fields could be filled from and how dynamic would they be (see Table 11 in Annex E).

As it can be seen the most managerial decision-driving information (assuming from tasks to with whom) has High dynamism but at the same time it is either fully or partially automated. This is just an assumption, as example, of how it could play out, holding no further scientific meaning.

8.5. Testing the Proposal

The future work will consist in strengthening existing contexts that could be better supported - such as the technological support for integrated employee context information - and, of course, testing the hypothesis of the project which consists in improving managerial performance through integrated employee context information availability.

To test, a mobile application prototype will be developed for managing meetings, but taking into consideration the facilitation of the now reengineered management process. For the purpose of enriching the testing, the information core should be simulated. This will form an experimental step with the purpose of testing the thesis.

The fact is that integrated employee context information is richer - to a certain extent - the more applications both feed it and feed from it. Given the time and resources limitation of this project, that potential won't be able to be explored in its full extent but, through simulation of context information from other hypothetical sources, it should be able to prove its worth.

Nevertheless this sort of testing won't be able to be conducted in real environment, as it would not be able to include fictional information, and manually inserted real

information would take the purpose away from testing efficiency improvement as it would steal managers' time, since they would have to be the ones inserting such only for the purpose of testing.

So two different tests should be conducted with the same prototype:

- *Fictional information testing*: test conducted out of the environment but for the purpose of verifying the utility on having a rich and dynamic core of employee context information.
- *Field testing*: test conducted within the environment, with managers from one or more organizations (likely among the interviewed during Diagnosis phase), for the purpose of verifying system acceptance/possibility of adoption having in consideration that only the meeting management is using integrated employee context information, but which could still be tested as there are different managers, different employees and certain issues/conflicts to be worked out by using the prototype system.

8.6. Evaluating Project Realism

An interesting debate would be to evaluate what such solution can bring, in reality, to the management applications/services providers as well as all organizations in general. In a fast glimpse, the introduction of such solution could play out in one of two ways:

- New companies with an innovative business model as a core mediator for management applications/services/systems, as the following image describes:

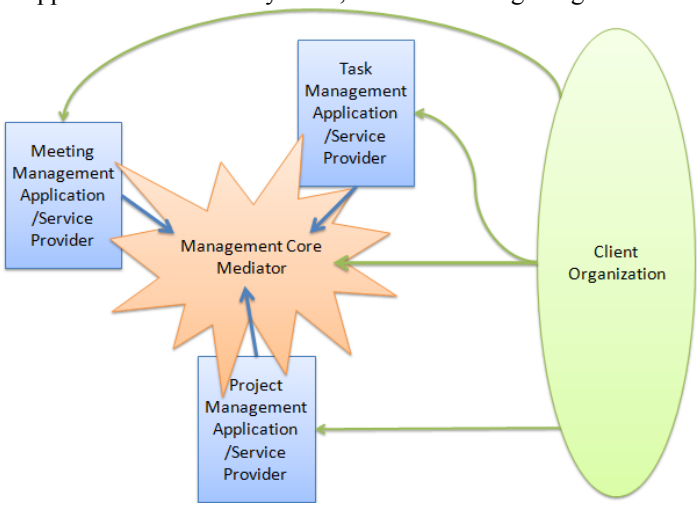

Figure 1 - Management Core Mediator abstract illustration of stakeholders

- Collaborations between existing management applications/services/systems providers in order to compose a strengthen business model:

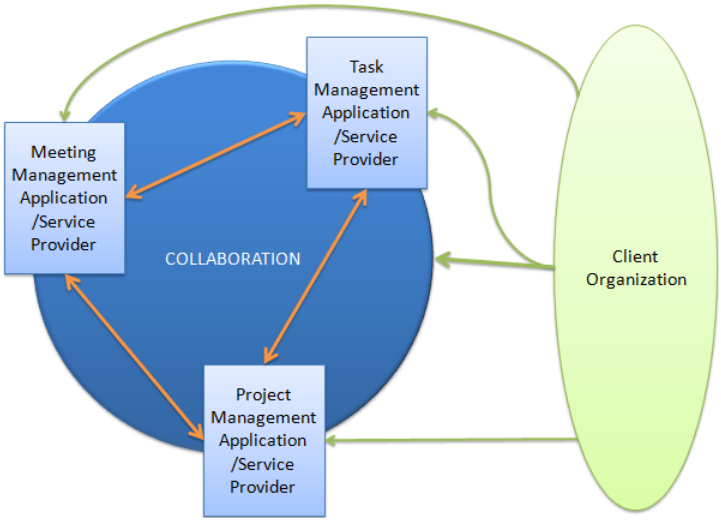

Figure 2 - Providers Collaboration abstract illustration of stakeholders

Comparing both examples, the difference lies on who should own/control the core because although these illustrations might appear rather different they impose the same:

- Providers have to change/adapt their external interface to a standard, either agreed between them, or published by any standardization organization or imposed by a mediator such as represented in Figure 1. This can be achieved by either redoing the interface, or mediate with wrapping/unwrapping the I/O of their system onto the core. A plausible monopolistic scenario for Figure 1 would be a management applications/services provider that already embraces all different pillars (meetings, projects, tasks, calendars, etc.) such as Microsoft, and create Core Mediator internal to the company itself.
- The Client Organization will use the existing systems in a more unified way or, hypothetically, a best solution would be to redevelop a general system that embraces all these organizational management tasks and that is focused on integrated employee context information.

There are certainly many possible trends for such development and this project will not go further, for now, into this evaluation. It just states clearly that there is value in the results of such research and that its usability and integration is realistic, given the capacity of interoperability between providers and a greater need to solve the known organizational issues present in organizations worldwide.

9. Conclusion

As intended on this first approach to the project, the objectives were concluded with effectiveness, as the problem has been well defined and sustained, the proposal has been properly justified and initialized and the relevant issues were attended with a good degree of care.

It is conclusive that organizational management faces daily general problems that are rooted in causes yet to be solved, being those lack of integrated employee context information along with lack of system adoption. There are tries of reducing the impact of those problems but they are not sufficient, as they're mere mends, and not proper solutions.

Asserted can be as well that the interviews provided a profound in-field knowledge that otherwise could have passed unnoticed were the research only based on case studies, or worse, only theoretical knowledge. But as the Action Research demands, local (organization's) knowledge is essential to enrich the research, and that was checked to be correct, by obtaining such insight from the interviews.

This project not only has proven to be extremely interesting and diversified from a scientific perspective, but as well could compose a start for a new type of business model, either through mediating organizational management applications to sustain integrated context employee information across suites from different providers, or by motivating collaborations between the very providers, either way bringing forth better conditions for organizational management and improvement in, general case, every organization.

NOTE: in Annex F it can be found the schedule planning of the project.

14. References

1. Verify the relevance of mobile services from management to operational levels. This example is from the tourism industry but in the context of organizational management it can be extended to any organization: Yu, CC., Chang, Hp.: Value-based Mobile Service Classification for B2E Applications in Tourism Industry. In: The 9th International Conference on Advanced Communication Technology, pp. 752--757. IEEE (2007)
2. To reinforce the meaningfulness of nowadays mobility: Boretos, G. P.: The future of the mobile phone business. Tech. Fore. and Soc. Ch. 74, 331--340 (2005)
3. Regarding benefits of mobility and positive impact on business processes. Thurnher, B.: The Impact of Mobile Technology on Business Processes - Results from 5 Case Studies. In: 2nd IEEE/IFIP International Workshop on Business-Driven IT Management, 2007. BDIM '07, pp.108-109. IEEE (2007)
4. Mahmoud, Q. H., Popowicz, P.: Toward a Framework for the Discovery and Acquisition of Mobile Applications. In: 2010 Ninth International Conference on Mobile Business / 2010 Ninth Global Mobility Roundtable, pp. 58--65, IEEE (2010)

5. Regarding security, compatibility and interoperability issues of Web Browser applications. Taivalsaari, A., Mikkonen, T., Ingalls, D., Palacz, K.: Web Browser as an Application Platform. In: 34th Euromicro Conference Software Engineering and Advanced Applications, pp. 293--302. IEEE (2008)
6. Islam, N., Zhou, D., Shoaib, S., Ismael, A., Kizhakkiniyil, S.: AOE: A Mobile Operating Environment for Web-based Applications. In: 2004 International Symposium on Applications and the Internet (SAINT'04), pp. 15-24. IEEE (2004)
7. Anind, K. D., Gregory, D. A.: Towards a Better Understanding of Context and Context-Awareness. In: Proceedings of the 1st international symposium on Handheld and Ubiquitous Computing, pp. 304--307. Springer-Verlag (1999)
8. O'Reilly, T.: What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software. O'Reilly Media, Inc. (2006)
9. McAfee, A. P.: Enterprise 2.0: The Dawn of Emergent Collaboration. (MIT Sloan Management Review). vol. 47, no. 3 (2006)
10. Nielsen, J.: Applying discount usability engineering. In: *IEEE Software 12*, 1 (January), pp. 98--100, IEEE (1995).
11. Regarding RoveIT, http://www.roveit.com/ (last accessed 21/12/2010)
12. Regarding Ootoweb, http://www.ootoweb.com/ (last accessed 21/12/2010)
13. Regarding Google Maps, http://maps.google.com/ (last accessed 21/12/2010)
14. Regarding Google Latitude, http://www.google.com/latitude (last accessed 21/12/2010)
15. Regarding Google Calendar, http://www.google.com/calendar/render (last accessed 21/12/2010)
16. Regarding Google Docs, https://docs.google.com (last accessed 21/12/2010)
17. Regarding Google Groups, http://groups.google.com (last accessed 21/12/2010)
18. Regarding MeetingMade, http://www.meetingmade.com/ (last accessed 21/12/2010)
19. Regarding Doodle, http://www.doodle.com/ (last accessed 21/12/2010)
20. Regarding Microsoft MS Sharepoint and MS Project, http://technet.microsoft.com/en-us/library/cc750953.aspx (last accessed 21/12/2010)
21. Alter, S.: The Work System Method: Connecting People, Processes and IT for Business Results. Work System Press, Larkspur, CA (2006)
22. OMG: Business Process Modeling Notation, v1.1. Object Management Group (2008)
23. Regarding Action Research and relevant references by the Association for Information Systems, http://www.aisnet.org/ (last accessed 21/12/2010)
24. Bartlett, E. B., Kotrlik, J. W., Higgins, C. C.: Organizational Research: Determining Appropriate Sample Size in Survey Research. Inf. Tech. Learn. Perform. J., vol. 19, no. 1, pp. 43--50. Organizational Systems Research Association, Spring (2001)
25. CEO Casper Kandelsdorff, Agitect, 11 November 2010.
26. V.P. Technology Strategy John Rizzo, Aplix Corporation of America, 1 December 2010.
27. Analyseredaktør Kenneth Thue Nielsen, DR Nyheder at Danmarks Radio, 1 December 2010.
28. Meeting Process Recommendations. Common Ground: The Center for Cooperative Solutions, UC Davis Extension
29. Shapiro C., Varian H. R.*:* Information Rules: A Strategic Guide to the Network Economy. pp. 173--225. Harvard Business Press (1998)

Annex A - WSM related artifacts

General Interview

Organization Name	
Customers	**Products & Services**
Work Practices (Major Activities or Processes)	

Participants	**Information**	**Technologies**

Table 2 - Work System Snapshot Template

WSM step 1 level 2	***Mapped Interview Questions***	***Motive***
SP1: What is the **system**?	What is the **mission** of the organization?	Know the **phenomenon environment**.
	What is the **structure** of the organization?	Know the **phenomenon environment**.
	What are the **information systems** of the organization?	Know what **underlies** the **phenomenon**.
	What processes do **ISs support**?	Know the **link** between what underlies and the phenomenon.
	Could you tell me about **yourself**?	General insight.
	What **tasks** do you perform?	Focus on the **actor/user/client**.
	What **ISs support** you in those tasks?	Know what **underlying supports** the **actor**.
	Do you already use **mobile devices** as your daily mean of task conducting?	Obtain **specific system information**.
SP2: What are the **problems or opportunities**?	Which of the tasks you mentioned you are **not satisfied** with?	Identify **known problems**.
	(regarding each task) **Why not satisfied**?	**Specify** identified known problems.
	What **difficulties** do you face the **most**?	Delineate the **primary problems** for AR diagnosis.
	Any other **difficulties**?	Recognize **secondary problems**.
	What **difficulties** do you believe those you manage or those who manage you face?	Obtain **local perspective** of **problems of others**.
	What would you see yourself doing with **mobile devices** to help with	Obtain **local assessment on research context**.

	your tasks?	
SP3: What **factors** contribute to the problems or opportunities?	What do you believe to be **causing** your problems?	Obtain **local causal knowledge**.
	Can you identify **positive and negative factors** of your work environment towards the tasks you perform?	Obtain **local causal knowledge**.
	If you had to choose five words/**concepts** related to your work to focus on and **improve**, which would they be?	Obtain **primary local causal knowledge**.
	Do you have **issues regarding information** quality, completeness, coherence, real-timing, access delay and/or access facilitation? (multiple questions)	Make a **bridge** between **local knowledge** and **theoretical knowledge**.
SP4: What **constraints** limit the feasible range of recommendations?	Is the organization used to **changes** in its **processes**?	Know organization **history regarding changes**.
	Is there anything the company wanted to accomplish that is impossible due to **external causes**? (legislation, patents, etc.)	Recognize **external** influencing **actors**.
SP 5: **Work System Snapshot**	*SEE ABOVE (to be fulfilled)*	*SEE ABOVE (to be fulfilled)*

Table 3 - WSM SP step based Interview Questions

A.1 - Interviews
A.1.1 - Interview with Casper Kandelsdorff from Agitect

Organization Name		
Agitect		
Customers	**Products & Services**	
Any company that requires IT infrastructure	Adaptive IT infrastructure consulting	
Work Practices (Major Activities or Processes)		
Initialization: Getting to know Rationalization: Agile Resource Management Automating: Automated Resource Management Modularization: Adaptive Resource Management Leverance: Plan, Build, Run		
Participants	**Information**	**Technologies**
CEO Delivery Sales and marketing Other project contract employees	Technology, Process, Organization Cost, Agility, Quality Employees, Financial	Sharepoint/intranet (mobile) Exchange/email Skype --- iPhone/iPads

Table 4 - Agitect WS Snapshot

WSM step 1 level 2	***Mapped Interview Questions***	***Motive***	***Answers***
SP1: What is the **system**?	What is the **mission** of the organization?	Know the **phenomenon environment**.	Guide the change to Adaptive IT infrastructure (for instance to effectively use Cloud Computing)
	What is the **structure** of the organization?	Know the **phenomenon environment**.	1 CEO 2 Delivery 1 Sales and marketing + Agitect Connect (28 employees)
	What are the **information systems** of the organization?	Know what **underlies** the **phenomenon**.	Intranet with MS Sharepoint, MS Exchange for communication.
	What processes do **ISs support**?	Know the **link** between what underlies and the phenomenon.	Excel/Exchange for tasks. MS Project for projects. (tasks vs. scheduling conflict)
	Could you tell me about **yourself**?	General insight.	Long experience in the market.
	What **tasks** do you perform?	Focus on the **actor/user/client**.	- Task assignment - Meeting scheduling

			- Client contact - Financial tasks
	What **ISs support** you in those tasks?	Know what **underlying supports** the **actor**.	Intranet with MS Sharepoint, MS Exchange for communication.
	Do you already use **mobile devices** as your daily mean of task conducting?	Obtain **specific system information**.	Yes (iPads/iPhones)
SP2: What are the **problems or opportunities**?	Which of the tasks you mentioned you are **not satisfied** with?	Identify **known problems**.	- Entities behavior (not scheduling all activities) - Project contract employees work time registering - Uncontrolled minutes from sales meetings - Intranet not used efficiently
	(regarding each task) **Why not satisfied**?	**Specify** identified known problems.	- People don't use the systems as expected - People don't write down their time spent working which goes against project/costs management.
	What **difficulties** do you face the **most**?	Delineate the **primary problems** for AR diagnosis.	All mentioned before.
	Any other **difficulties**?	Recognize **secondary problems**.	---
	What **difficulties** do you believe those you manage or those who manage you face?	Obtain **local perspective** of **problems of others**.	- Response delay (some use email as instant messaging) - Unstable tools and/or platform - Hunted to update the systems - Competence management issues on assignment - Different competences between junior/senior - Dynamic competences
	What would you see yourself doing with **mobile devices** to help with your tasks?	Obtain **local assessment on research context**.	- The same, with better real-time information. - The problem relies mostly on how people use the systems.
SP3: What **factors** contribute to the problems or opportunities?	What do you believe to be **causing** your problems?	Obtain **local causal knowledge**.	- Lack of education and self-discipline over systems' usage - Some lack of systems integration (space for improvement)

	Can you identify **positive and negative factors** of your work environment towards the tasks you perform?	Obtain **local causal knowledge**.	Positive: - Creative environment with stimulation (funny theme) - Meeting place (socialize) - Game environment (motivate) - Know preferences, dislikes Negative: - Usual (antipathies, bad facilities)
	If you had to choose up to five words/**concepts** related to your work to focus on and **improve**, which would they be?	Obtain **primary local causal knowledge**.	- Registering - Learning tools - Optimizing
	Do you have **issues regarding information** quality, completeness, coherence, real-timing, access delay and/or access facilitation? (multiple questions)	Make a **bridge** between **local knowledge** and **theoretical knowledge**.	Always all, except access delay.
SP4: What **constraints** limit the feasible range of recommendations?	Is the organization used to **changes** in its **processes**?	Know organization **history regarding changes**.	Yes, biggest management issue.
	Is there anything the company wanted to accomplish that is impossible due to **external causes**? (legislation, patents, etc.)	Recognize **external** influencing **actors**.	No
SP 5: **Work System Snapshot**	*SEE Table 3*	*SEE Table 3*	*SEE Table 3*

Table 5- Agitect WSM step 1 level 2

A.1.2 - Interview with John Rizzo from Aplix Corp.

<table>
<tr><th colspan="3">Organization Name</th></tr>
<tr><td colspan="3">Aplix Corporation of America</td></tr>
<tr><th colspan="2">Customers</th><th>Products & Services</th></tr>
<tr><td colspan="2">All top mobile device manufacturers;
CE vendors in Japan</td><td>General: Java technology in mobile devices

Business Services: Research, development and sales of software for mobile and embedded systems. Research, development and sales of software for personal computers.

Specific products and other services: see Aplix Corp webpage at: http://www.aplixcorp.com/en/</td></tr>
<tr><th colspan="3">Work Practices (Major Activities or Processes)</th></tr>
<tr><td colspan="3">Product development process (engineering processes, eXtreme programming) Rational Unified Process (RUP)</td></tr>
<tr><th>Participants</th><th>Information</th><th>Technologies</th></tr>
<tr><td>All sub organizations:
Aplix Corporation of America;
iaSolution Inc.;
Aplix Korea Corporation;
Zeemote Technology Inc.;
G-mode Co., Ltd.;
[As of the April 27, 2010]
(note: each has its own structure and culture)</td><td>Products information (specifications, code, notes, etc);
Customer information;
Strategic information (decisions, planning, etc.);
Employee's general information;
General communication;</td><td>Custom Systems in China and Japan (e.g. JIRA);
email;
Intern-twitter;
Intern-wiki;
CORAL (specifications site);
CYBOZU (groupware);
Employee profile page;
Employee month letter.</td></tr>
</table>

Table 6 - Aplix Corp. WS Snapshot

WSM step 1 level 2	*Mapped Interview Questions*	*Motive*	*Answers*
SP1: What is the **system**?	What is the **mission** of the organization?	Know the **phenomenon environment**.	Provide best software products for mobile and embedded systems.
	What is the **structure** of the organization?	Know the **phenomenon environment**.	167 Employees *Aplix Group*: - Aplix Corporation of America - iaSolution Inc. - Aplix Korea Corporation - Zeemote Technology Inc. - G-mode Co., Ltd. [As of the April 27, 2010]
	What are the **information systems** of the organization?	Know what **underlies** the **phenomenon**.	Custom separate IS depending on region (ex.: China and Japan). Separate IT for separate activities/reasons.
	What processes do **ISs support**?	Know the **link** between what underlies and the phenomenon.	- *JIRA*: from strategic planning to technological problems - *email*: most of communication - *Intern-twitter*: Enterprise 2.0 - *Intern-wiki*: Knowledge sharing for project support - *CORAL*: Specifications site; official knowledge. - *CYBOZU*: Web-based groupware for calendaring - *Profile Pages*: Enterprise 2.0 - *Employee month letter*: Enterprise 2.0
	Could you tell me about **yourself**?	General insight.	V.P. Technology Strategy
	What **tasks** do you perform?	Focus on the **actor/user/client**.	(does/did) Planning, Advising, Managing, System Architect
	What **ISs support** you in those tasks?	Know what **underlying supports** the **actor**.	All
	Do you already use **mobile devices** as your daily mean of task conducting?	Obtain **specific system information**.	Yes (smartphone, laptop)
SP2: What are the **problems or opportunities**?	Which of the tasks you mentioned you are **not satisfied** with?	Identify **known problems**.	None, but there is always space for improvement.

	(regarding each task) **Why not satisfied**?	**Specify** identified known problems.	---
	What **difficulties** do you face the **most**?	Delineate the **primary problems** for AR diagnosis.	- Introducing new technology takes long time (learning curve, integration), risks and costs. - There is space for improvement regarding integrating currently separated employee information.
	Any other **difficulties**?	Recognize **secondary problems**.	Lack of adoption/usage of existing systems such as Intern-twitter and Employee profile page.
	What **difficulties** do you believe those you manage or those who manage you face?	Obtain **local perspective** of **problems of others**.	None significant.
	What would you see yourself doing with **mobile devices** to help with your tasks?	Obtain **local assessment on research context**.	Everything. At the moment some managerial tasks still are done in the office.
SP3: What **factors** contribute to the problems or opportunities?	What do you believe to be **causing** your problems?	Obtain **local causal knowledge**.	(again, space for improvement, not so much problems)
	Can you identify **positive and negative factors** of your work environment towards the tasks you perform?	Obtain **local causal knowledge**.	- *Negative*: cultural difference, time-zone difference (West US, East US, Munich, Japan, China) - *Positive*: email, since it allows avoiding cultural clash and gives time to answer.
	If you had to choose up to five words/**concepts** related to your work to focus on and **improve**, which would they be?	Obtain **primary local causal knowledge**.	- Global collaboration; - Timely communication (response time); - Accountability; - Lighter weight approval process (bureaucracies level); - Presence based communication
	Do you have **issues regarding information** quality, completeness, coherence, real-timing, access delay and/or access facilitation? (multiple questions)	Make a **bridge** between **local knowledge** and **theoretical knowledge**.	None, it's just not integrated.
SP4: What **constraints** limit the feasible range of recommendations?	Is the organization used to **changes** in its **processes**?	Know organization **history regarding changes**.	Very difficult cultural clashes between US culture and Asian (again, email is best as it goes around the problem)

	Is there anything the company wanted to accomplish that is impossible due to **external causes**? (legislation, patents, etc.)	Recognize **external** influencing **actors**.	All the time, very difficult (frontiers issues slow time, i.e. green cards, etc.)
SP 5: **Work System Snapshot**	*SEE TABLE 6*	*SEE TABLE 6*	*SEE TABLE 6*

Table 7 - Aplix Corp. WSM step 1 level 2

A.1.3 - Interview with Kenneth Thue Nielsen from DR

Organization Name		
Danmark Radio		
Customers	**Products & Services**	
Public sector Government/Politicians	Broadcasting media content: Radio TV and Web	
Work Practices (Major Activities or Processes)		
Content Generators Content Providers		
Participants	**Information**	**Technologies**
Ritzau (content broker); Any content generators; Content producers and managers; Journalists;	Media content; Performance indicators; Organization information (finance, employees, infrastructure, resources, etc.)	Facebook and iPhone Applications; *Workspace*; *MS Exchange*; *Inline;* Smartphones, desktops, laptops; Infrastructure core.

Table 8 - DR WS Snapshot

WSM step 1 level 2	***Mapped Interview Questions***	***Motive***	***Answers***
SP1: What is the **system**?	What is the **mission** of the organization?	Know the **phenomenon environment**.	Hold Denmark together as one by providing well managed content to all different regions.
	What is the **structure** of the organization?	Know the **phenomenon environment**.	Various DR facilities hold region content production sub organizations. There is one man that routes incoming all information to the best places in the organization matrix (content types X content channels)
	What are the **information systems** of the organization?	Know what **underlies** the **phenomenon**.	- *Workplace*; - *MS Exchange*; - *Inline*.
	What processes do **ISs support**?	Know the **link** between what underlies and the phenomenon.	- *Workplace*: monitor arrival/leaving employee times. - *MS Exchange*: all management and communication. - *Inline*: enterprise
	Could you tell me about **yourself**?	General insight.	Information Management (statistical) (previous job: Head manager with more than 2000 employees)
	What **tasks** do you perform?	Focus on the	"Work the numbers";

		actor/user/client.	Manage people; Manage meetings.
	What **ISs support** you in those tasks?	Know what **underlying supports** the **actor**.	All.
	Do you already use **mobile devices** as your daily mean of task conducting?	Obtain **specific system information**.	Yes.
SP2: What are the **problems or opportunities**?	Which of the tasks you mentioned you are **not satisfied** with?	Identify **known problems**.	- CCed Emails for coverage; - Meetings collapsing mail traffic; - Lack of adoption of "Enterprise 2.0"
	(regarding each task) **Why not satisfied**?	**Specify** identified known problems.	- Receiving a lot of useless information and lack of good information; - Employees lack in usage of systems.
	What **difficulties** do you face the **most**?	Delineate the **primary problems** for AR diagnosis.	Making meetings decision points instead of social debate meetings.
	Any other **difficulties**?	Recognize **secondary problems**.	Short period decision capacity for scheduling.
	What **difficulties** do you believe those you manage or those who manage you face?	Obtain **local perspective** of **problems of others**.	Paradigm shift: less people, more work, cultural change.
	What would you see yourself doing with **mobile devices** to help with your tasks?	Obtain **local assessment on research context**.	What I already do, just with less spam and with better/useful information.
SP3: What **factors** contribute to the problems or opportunities?	What do you believe to be **causing** your problems?	Obtain **local causal knowledge**.	- Employee's reaction and cultural change to the recent economic crisis in the company (paradigm shift) - Lack of efficient systems. - Lack on employee information (no clue where they are unless contacted)
	Can you identify **positive and negative factors** of your work environment towards the tasks you perform?	Obtain **local causal knowledge**.	*Negative*: lack of knowing people in order to create synergies between competences.
	If you had to choose up to five words/**concepts** related to your work to focus on and **improve**, which would they be?	Obtain **primary local causal knowledge**.	- email - Meetings - Culture (habits, journalism education, house tradition, flexibility)

	Do you have **issues regarding information** quality, completeness, coherence, real-timing, access delay and/or access facilitation? (multiple questions)	Make a **bridge** between **local knowledge** and **theoretical knowledge**.	Quality and real-timing are hard because of the entire information traffic and work load.
SP4: What **constraints** limit the feasible range of recommendations?	Is the organization used to **changes** in its **processes**?	Know organization **history regarding changes**.	No, very old strict culture.
	Is there anything the company wanted to accomplish that is impossible due to **external causes**? (legislation, patents, etc.)	Recognize **external** influencing **actors**.	Totally dependent on government budget and therefore dependent on their wishes/guidelines/desire.
SP 5: **Work System Snapshot**	*SEE TABLE 8*	*SEE TABLE 8*	*SEE TABLE 8*

Table 9 - DR WSM step 1 level 2

A.2 - Analysis and Possibilities (WSM AP step)

This section aims to hermeneutically analyze the answers from the WSM SP step and answer the questions from the Analysis and Possibilities step for each of the conducted interview in order to provide a general analytic insight that might bring further knowledge to the research.

A.2.1 - WSM AP step of the interview with Casper K. from Agitect

AP1: Who are the **customers** and what are their concerns related to the work system?

- As depicted in the Work System Snapshot, Agitect's customers are any company that requires IT infrastructure, from small companies to large enterprises. Their concerns with the work system, and for the purpose of these project narrowing down to those related with managerial efficiency, they:
    - Do not tolerate delays as it is crucial for their company;
    - Expect the results to be optimal as the lack of such can easily be critical;
    - Will prefer to know/be notified with some frequency how things are going.

AP2: How good are the **products and services** produced by the work system?

- As it is a small start-up company and their main product evolves large period processes (changing/rearranging infrastructures) this is yet not possible to answer.

AP3: How good are the **work practices** inside the work system?

- Being only few employees and having an acceptable system adoption rate the managerial tasks can be conducted efficiently as any issues that might incur from, for example, misusage of the system (like a file that is emailed instead of shared within the proper site of the intranet), can be solved by normal means. It is to be pointed that at a larger scale these efficiency is greatly put into risk.

AP4: How well are the roles, knowledge, and interests of work system **participants** matched to the work system's design and goals?

- The managerial participants know their roles well and share knowledge and interests on work system (easy since they are few) but the operational participants have their roles and knowledge confined to projects they have been contracted to participate at, hence not acknowledging the work system as a whole, but being able to uniquely focus on their contractual purpose. Nevertheless this is not an issue for the current model of the company.

AP5: How might better **information** or knowledge help?

- For the managerial participants the more real-time full information is available regarding the operational participants the better their decisions and tasks can be sustained. For the operational participants it seems clear that what they require is easy to understand coherent information regarding the tasks they have to accomplish.

AP6: How might better **technology** help?

- Can't. They already use top level mobile devices (iPads and iPhones) and well established intranet with good access speed.

AP7: How well does the work system fit with the surrounding **environment**?

- So far it seems successful, but it is a brand new company.

AP8: How well does the work system use the available **infrastructure**?

- Well enough, there is space for scalability but it is not underused.

AP9: How appropriate is the work system's **strategy**?

- Innovative, there is not much competition as far as it was understood as it is a relatively recent business model. So far it seems to be promising.

AP10: How well does the **work system** operate **as a whole**?

- All participants are satisfied with the current situation but it is recognized space for improvement regarding system adoption and employee context information.

A.2.2 - WSM AP step of the interview with John R. from Aplix Corp

AP1: Who are the **customers** and what are their concerns related to the work system?

- As depicted in the Work System Snapshot, Aplix Corp's customers consist in all top mobile device manufacturers and consumer electronics vendors in Japan. Their concern is that the products are developed and delivered on time and with the expected quality.

AP2: How good are the **products and services** produced by the work system?

- Successful. Customers are satisfied in general.

AP3: How good are the **work practices** inside the work system?

- The management and development processes used are manipulated well enough. There is however always space for improvement and it is pointed that employee contextual information would definitely be an improvement ground.

AP4: How well are the roles, knowledge, and interests of work system **participants** matched to the work system's design and goals?

- There is lack of collaboration which is fed by cultural and time-zone differences. It is "ok" as is, but it suffices to say that the goal is better collaboration, which requires actions that shall face the cultural and time-zone differences. This shall be always extremely hard.

AP5: How might better **information** or knowledge help?

- Better information from collaboration would definitely help decision-making on all levels of management as well as it would soften the cultural clash because people could learn from, and get to know, each other, across frontiers.

AP6: How might better **technology** help?

- Can't. The improvement is on how it is used as technology nowadays already allows so much.

AP7: How well does the work system fit with the surrounding **environment**?

- Hard to manage the over frontiers issues which delays mobility and issues regarding foreign affairs are constantly brought up.

AP8: How well does the work system use the available **infrastructure**?

- The infrastructure is rather chaotic and not easy to define if looking to the organization as a whole. Each sub organization has its own infrastructure and apparently there are no big know issues there.

AP9: How appropriate is the work system's **strategy**?

- Intending to be a worldwide leading example, the work system seems to work well. There is, again however, space for improvement, which is an opportunity to be mandatorily explored.

AP10: How well does the **work system** operate **as a whole**?

It manages to work itself out, though the main barriers are definitely on the communication across countries and world regions/time-zones.

A.2.3 - WSM AP step of the interview with Kenneth T. N. from DR

AP1: Who are the **customers** and what are their concerns related to the work system?

- Danmark is the main customer although DR has to balance that with the government wishes that come through a media agreement every four years, along with the budget assertion. DR's mission is crucial to keep Danmark together.

AP2: How good are the **products and services** produced by the work system?

- All customers are satisfied and that has to be maintained at all costs.

AP3: How good are the **work practices** inside the work system?

- There are two areas here. On the content management and delivery side there is efficiency but there should be more collaboration and get to know each other to abide synergies. In the content generation side (journalists) there is no real order of things, because journalists are not rational thinkers and rather have their own way of doing things, therefore don't like to be monitored hence lack of employee information, such as their location, which would allow to better manage them.

AP4: How well are the roles, knowledge, and interests of work system **participants** matched to the work system's design and goals?

- There is lack of understanding the direction of the company and how things must go. Knowledge is not shared as efficiently as it should and the role of each employee stays too much inside the box (lack of collaboration and no innovation) except for the journalists, which stay so much outside the box that do not accept any rationalization of their processes.

AP5: How might better **information** or knowledge help?

- Social information about one another within the work place would be great and could allow synergies of competences that at the moment are not known/explored. Knowledge regarding news as well should be shared only to those that require it at the moment, instead of as is, spammed to all.

AP6: How might better **technology** help?

- Only on the infrastructure core of the company there is the issue of scalability regarding broadcasting technology. Given the importance of the company mission it only adopts new technology when the product has passed the product life cycle chasm and it has been accepted and well adopted by a significant amount of enterprises. The company is, by nature, always 3 to 4 years delayed in terms of core technology.

AP7: How well does the work system fit with the surrounding **environment**?

- It's the country's main public media provider and it seems to be well adapted to the environment.

AP8: How well does the work system use the available **infrastructure**?

- The IT infrastructure is quite simple so it is well used, except for the *Inline* site, but not sufficient to solve the existing problems therefore its usage is limited AS IS. However, improving/changing the infrastructure to better fit the needs of at least the rationalized processes on content management and delivery would be a hard task given the very old rooted culture of the organization.

AP9: How appropriate is the work system's **strategy**?

- The main mission is being accomplished successfully and therefore there are no issues here.

AP10: How well does the **work system** operate **as a whole**?

- Although the mission is being accomplished, employees are "too" busy with work which certainly affects the direction of things. More stress implies holding even stronger to the culture and not taking risks for innovative approaches and certainly this shall be a hard issue that needs solving.

A.3 - Recommendations and Justification (WSM RJ step)

This section aims at generating recommendations and plausible justifications that aim to solve the problems/possibilities previously depicted within the work system, and more specifically, a part of it: the organization management. The result from this section shall generate an overview of the solution to be. Although the WSM focuses on one work system at a time, this step will include an approach to all three work systems studied through the interviews for the purpose of this project as its aim has to be general and conceptually environment independent.

A.3.1 - WSM RJ (for all interviews, as general recommended system)

RJ1: What are the **recommended changes** to the work system?

- The management processes must be adjusted to having full employee context information available in real-time. If not rationalized and yet *ad hoc* to each manager, it would likely come natural as long as that information is accessible in a full information organized environment.
- The context employee information availability and completeness can be improved by developing dedicated technology (system) for such purpose. Standardizing application models that abide integration of that information would assure further applications to support management processes solving this issue.
- The participants must be led/motivated to better accept and use the new systems. This can be achieved by developing the system for them (and not for each activity separately) and by taking actions such as prizes for usage and punishment for misusage or no adoption.

RJ2: How does the **preferred alternative** compare to **other alternatives**?

- The other alternative composes a duality with the preferred, consisting on the fragmentation of the context employee information which lowers the information available for organization management decision support.

RJ3: How does the recommended system compare to an **ideal system** in this area?

- It consists of an approach towards the ideal system but there will always be space for improvement. The problems to be fixed are only primary and are causes of derived problems that should be resolved with the recommended system, but more problems shall always be unveiled.

RJ4: How well do the recommended changes **address the original problems and opportunities**?

- Very directly. The recommended changes address the primary problems at their root. It is not a mend but a restructuring of the system application layer

logic. Intern transaction costs are reduced and organization management decision support is better sustained so less derived costs associated.

RJ5: What **new problems or costs** might be caused by the recommended changes?

- The only problems or costs that might be caused are firstly associated with adoption guidance expenses (education, motivation, new system learning curve).

RJ6: How well does the proposed work system **conform to work system principles**?

- The work system is not changed entirely, only partially. The changes affect specially the technology, participants and work practices, and above all, information, but all in the context of organizational management.

RJ7: How can the recommendations be **implemented**?

- Pilot test in small environment for start, then expanded by clusters throughout the enterprise span. An action plan shall be devised per organization.

RJ8: How might perspectives or **interests of different stakeholders** influence the project's success?

- The most important perspective that can influence the project's success is the employee's reaction to the amount of information about them that is available to the corresponding manager(s). The privacy issue, as stated, is delicate and should be reviewed per organization that intakes these changes so that it stands clear in the employee's contract that they allow the managers to access the information required.

RJ9: Are the recommended changes justified in terms of **costs, benefits and risks**?

- Yes. The risk is little because the processes are at most improved where the managers would need to scoop information and now they would have this information available and processed first hand and real-time. The cost of the system transformation would be compensated in mid-long term but the risks are low as long as there is a strong effort for system adoption as well as a decent approach to the privacy issues.

RJ10: Which **important assumptions** within the analysis and justification are most questionable?

- When the phenomenon under study reaches inter-time-zone (at a relevant distance) and inter-cultural real-time relations it is very questionable if the recommendations given shall suffice.

Annex B - Employee Context Information Support System specifications

This section aims at providing few of the key features demanded from a system that makes possible reading/writing integrated employee context information across different managerial applications. These features consist in sequence diagrams that are some of the specifications such system would require, but certainly not exhaustive.

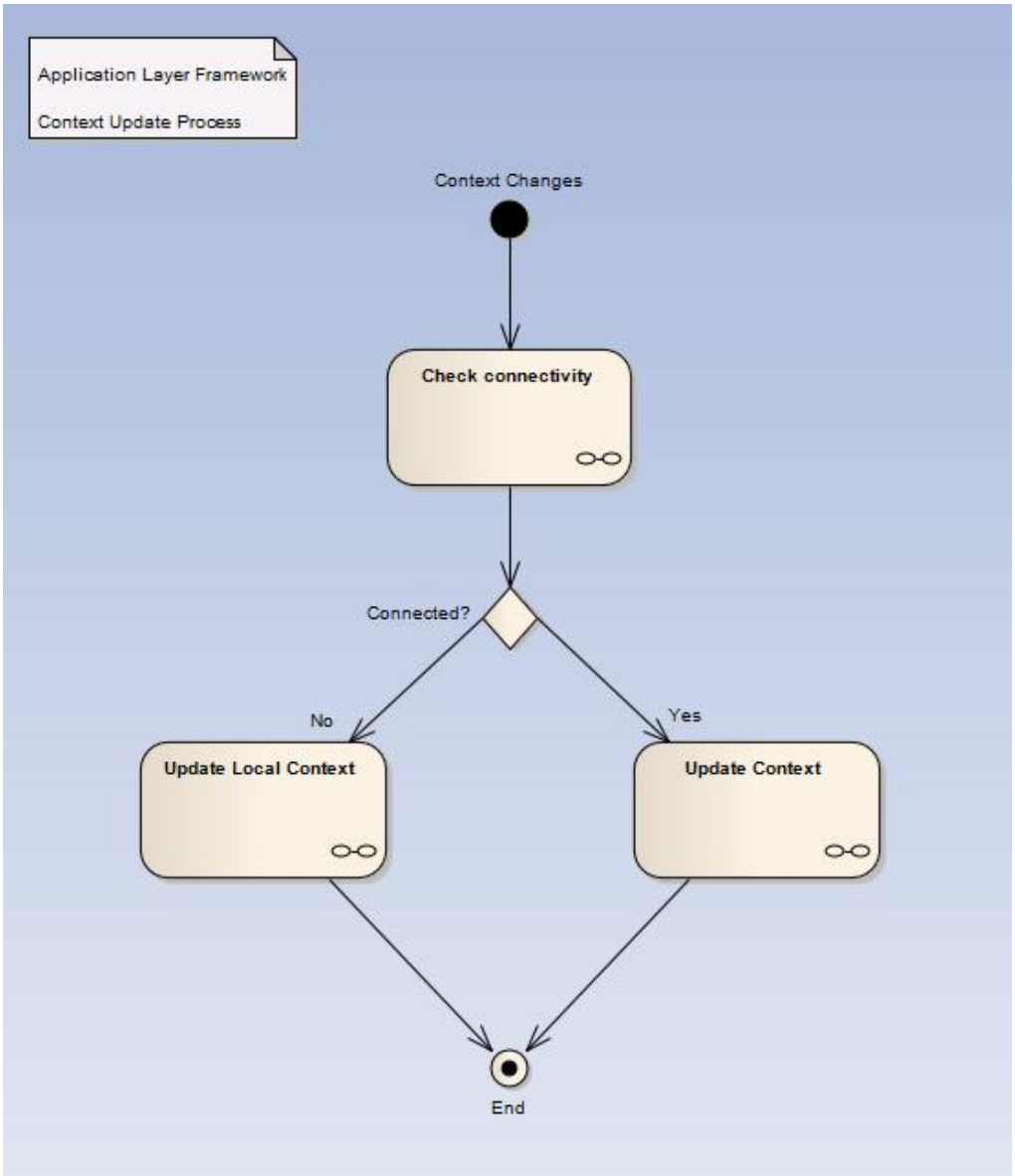

Diagram 3 - Context Update process

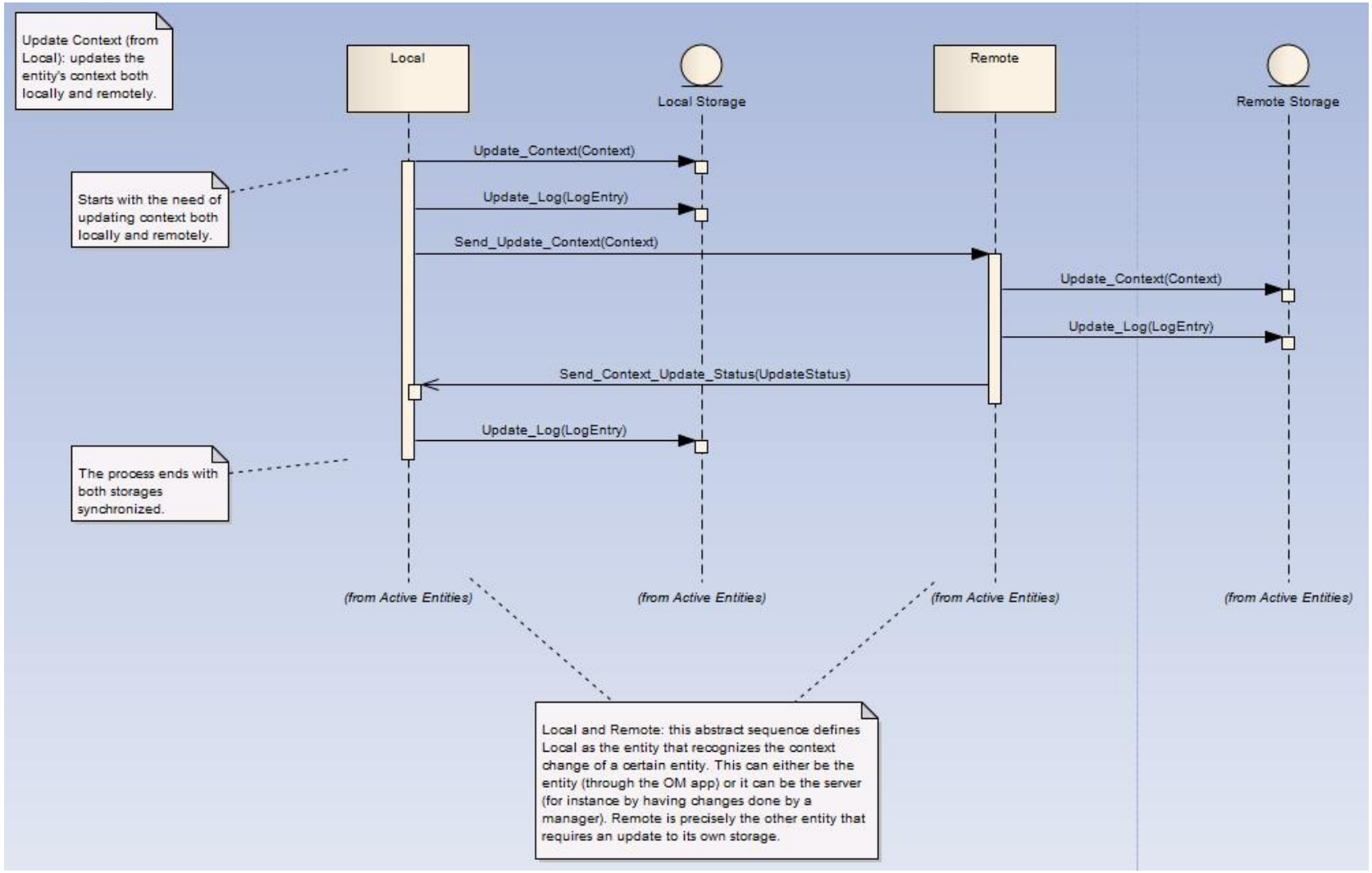

Diagram 4 - Update Context (local and remote)

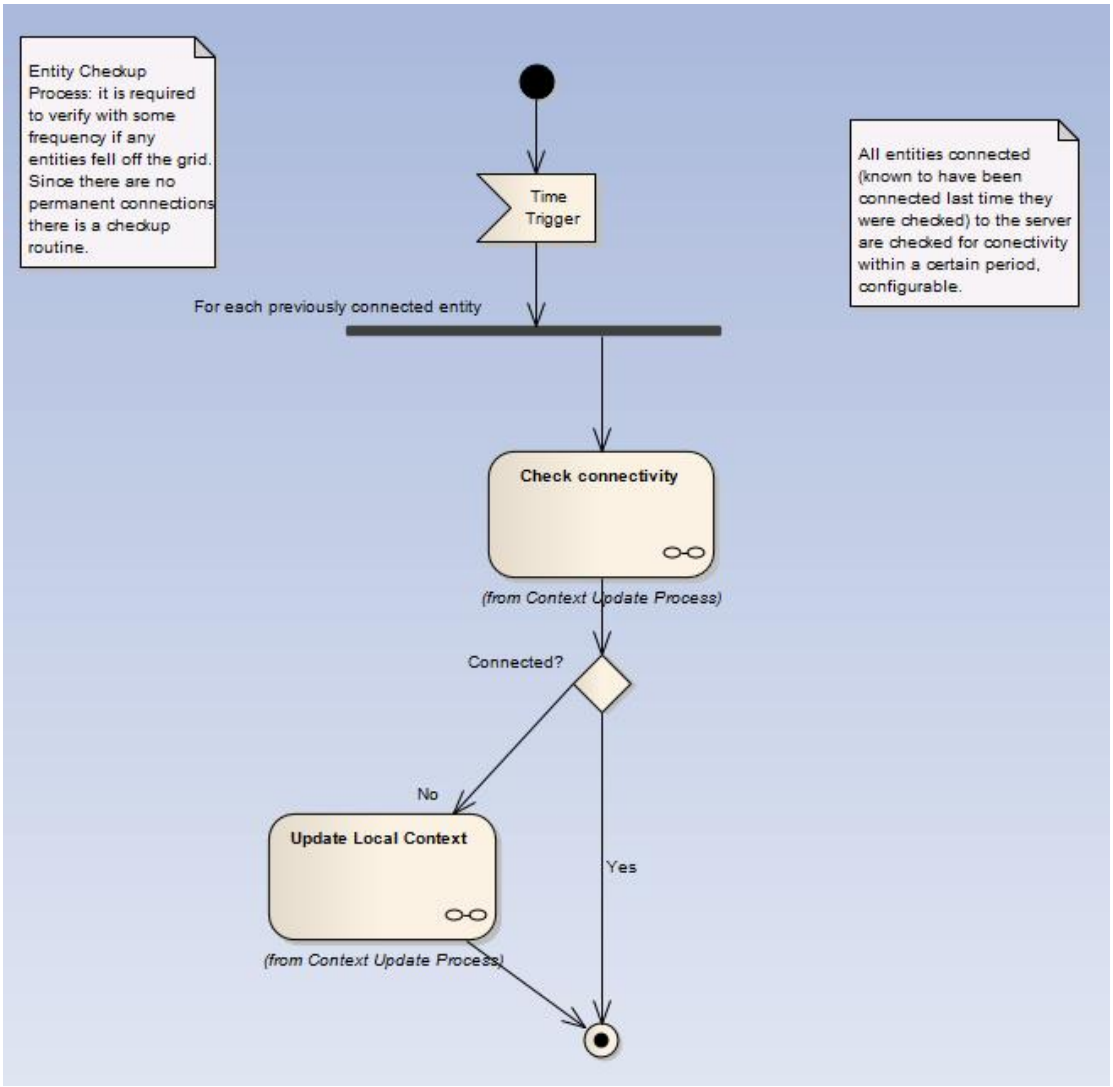

Diagram 5 - Entity Checkup Process

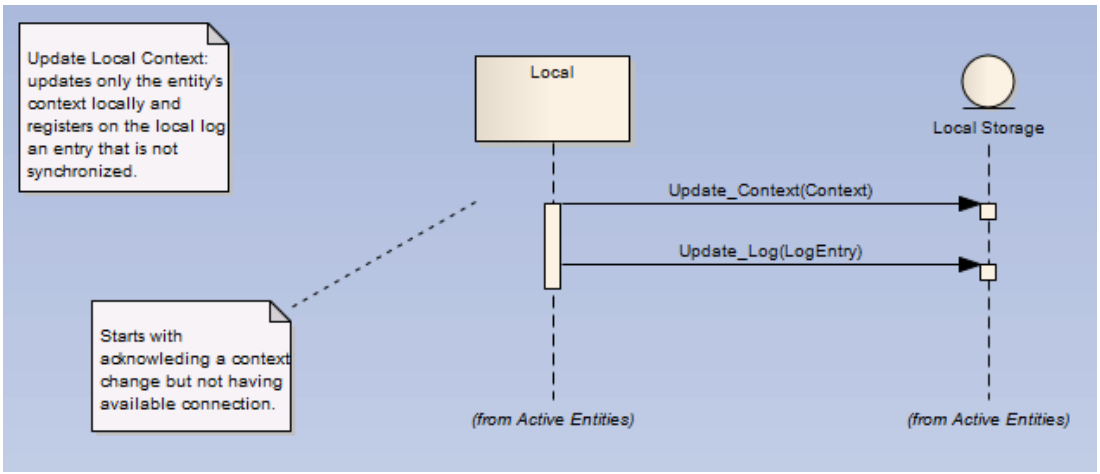

Diagram 6 - Updating local context

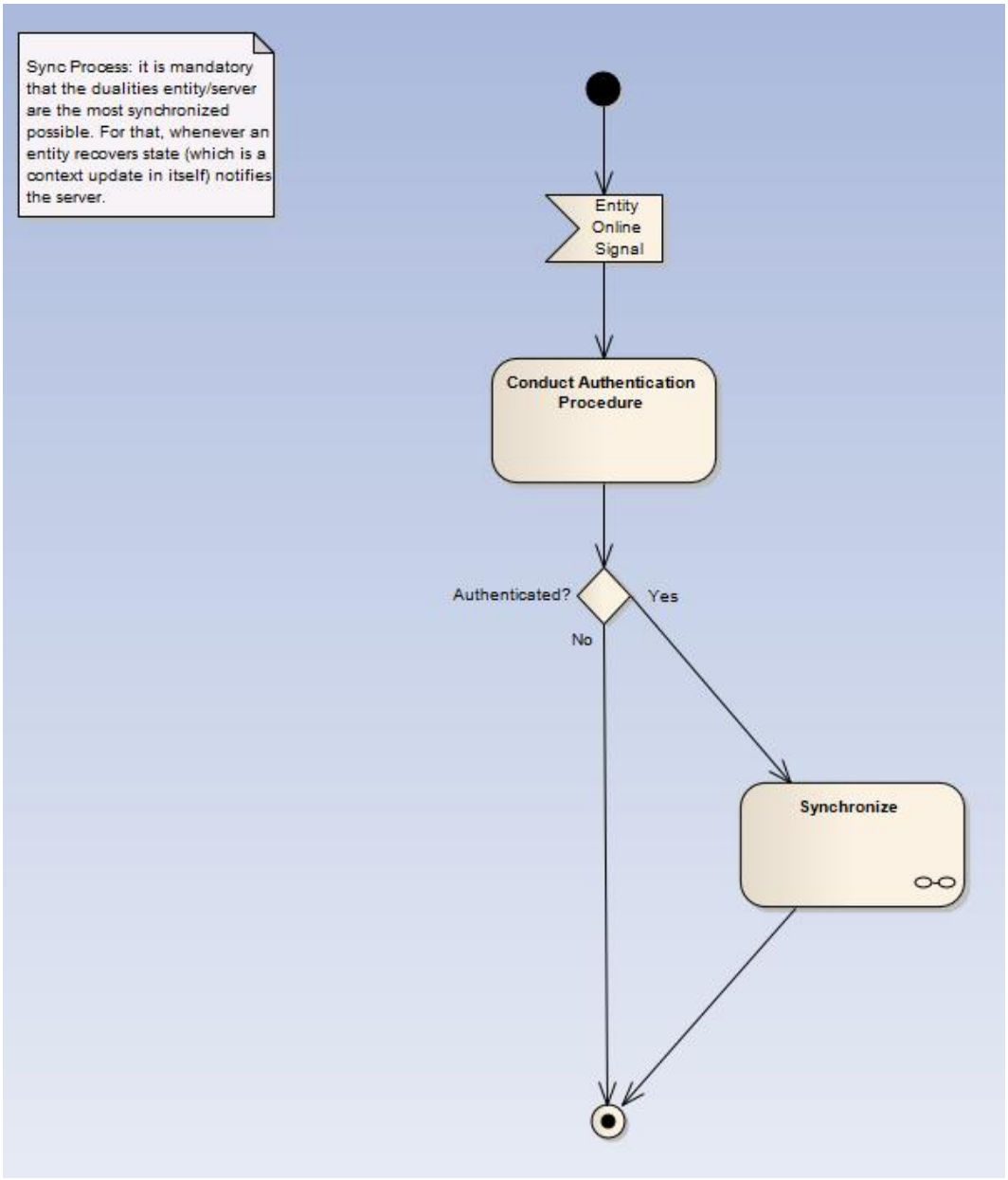

Diagram 7 - Synchronization trigger

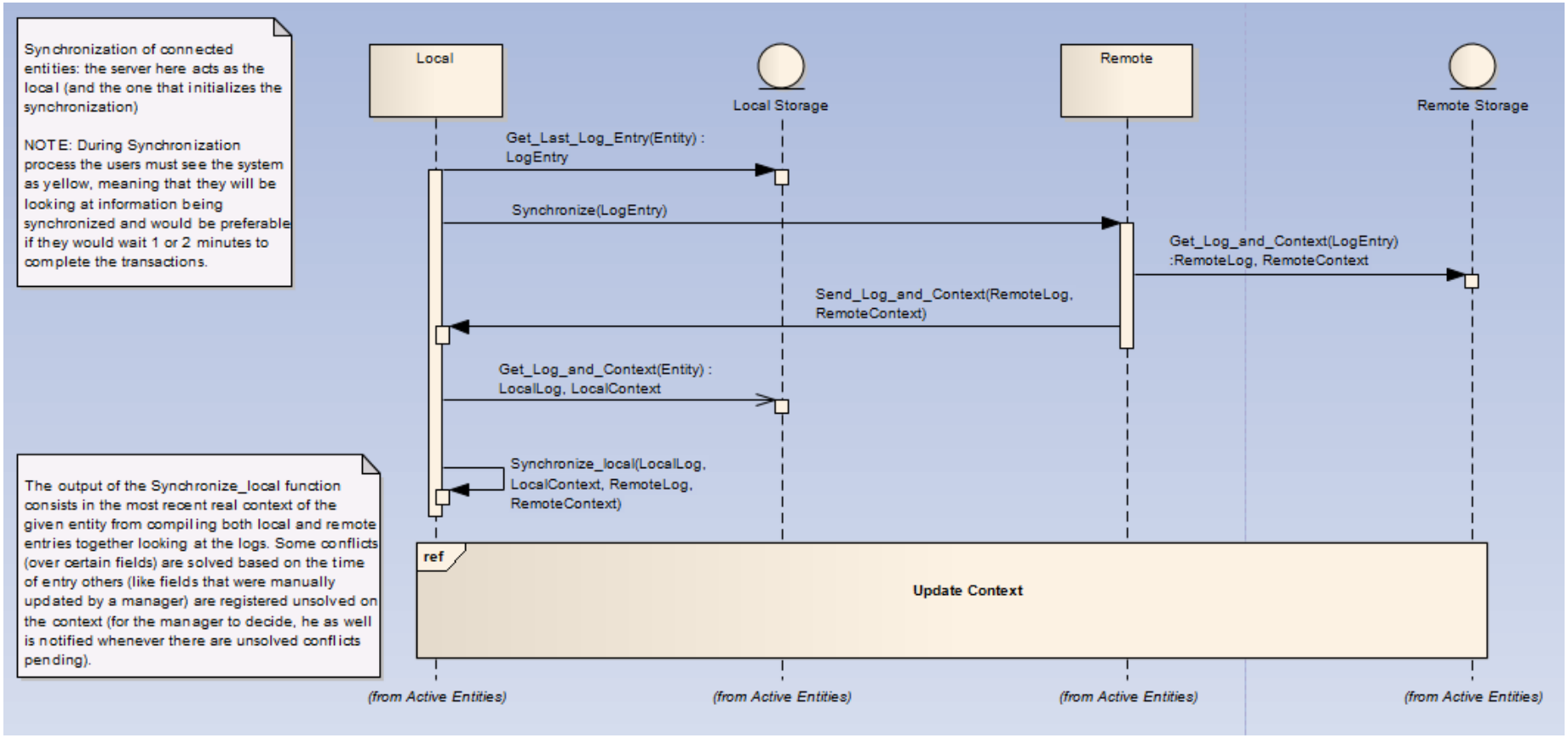

Diagram 8 - Synchronization of connected entities

Annex C - Meeting Management Process based on Employee Context Information

This section aims at providing the reengineering of meeting management process now based on the availability of full employee context information.

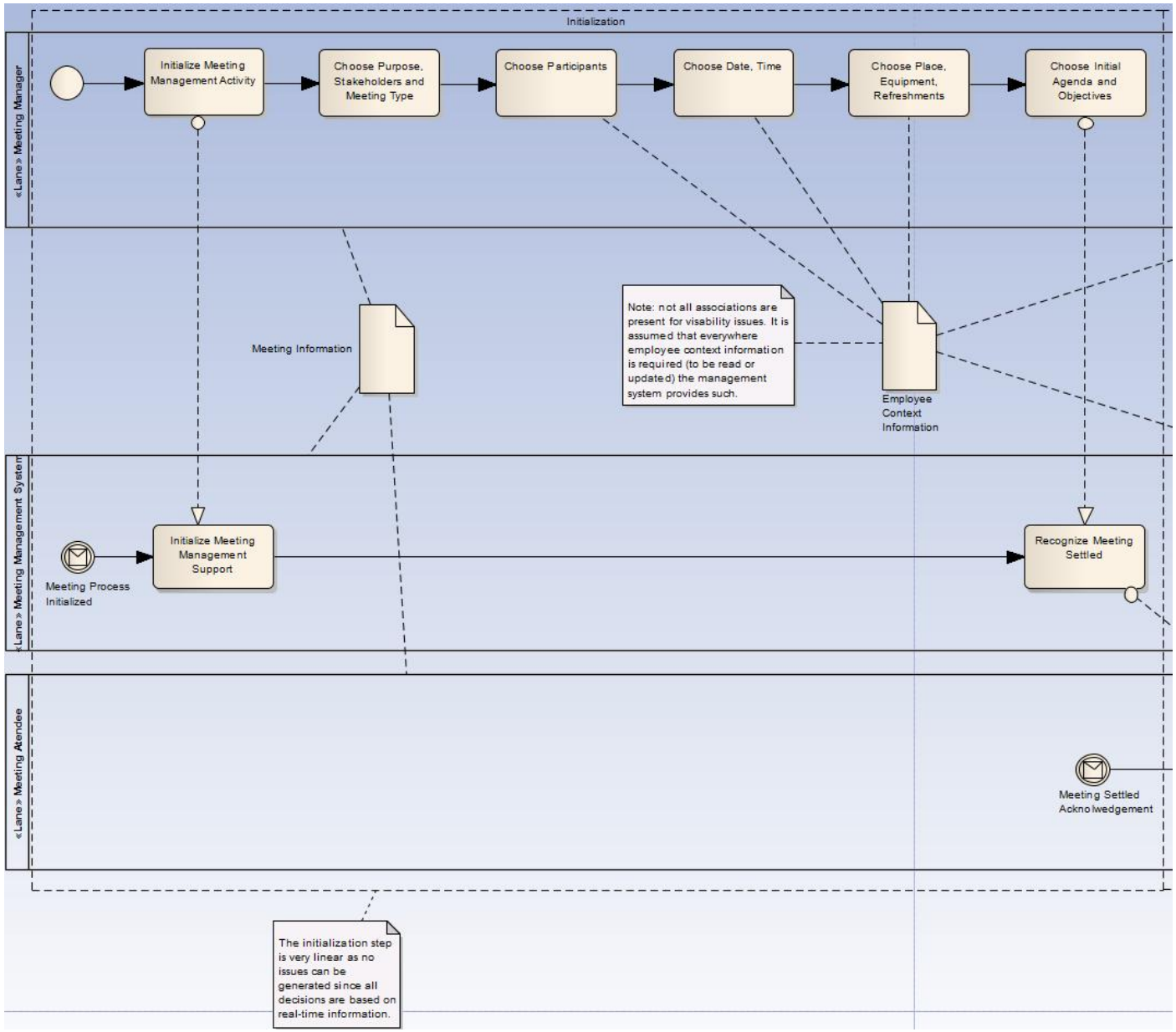

Diagram 9 - Initialization of Meeting Management Process

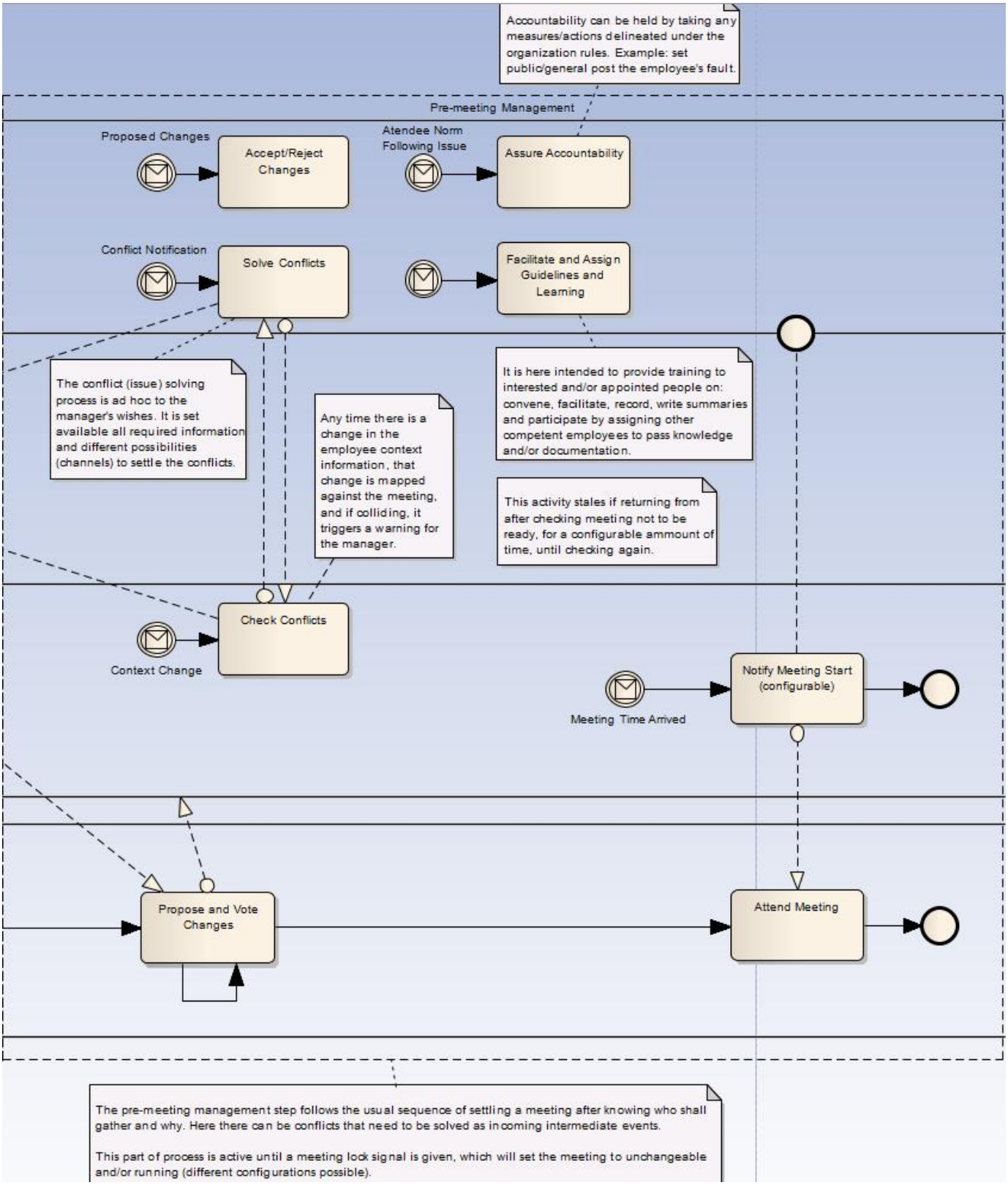

Diagram 10 - Pre-meeting Management Process

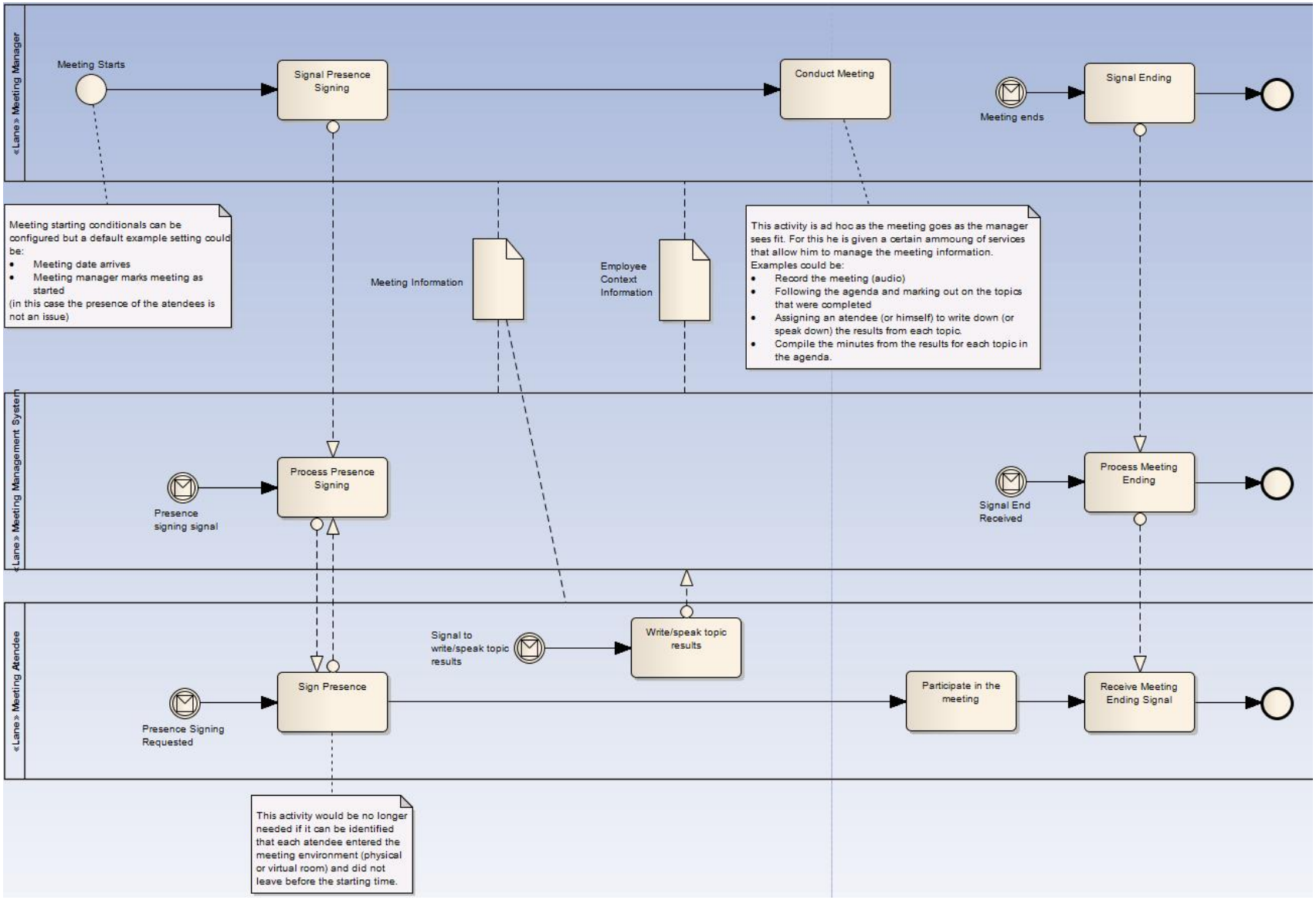

Diagram 11 - During Meeting Management Process

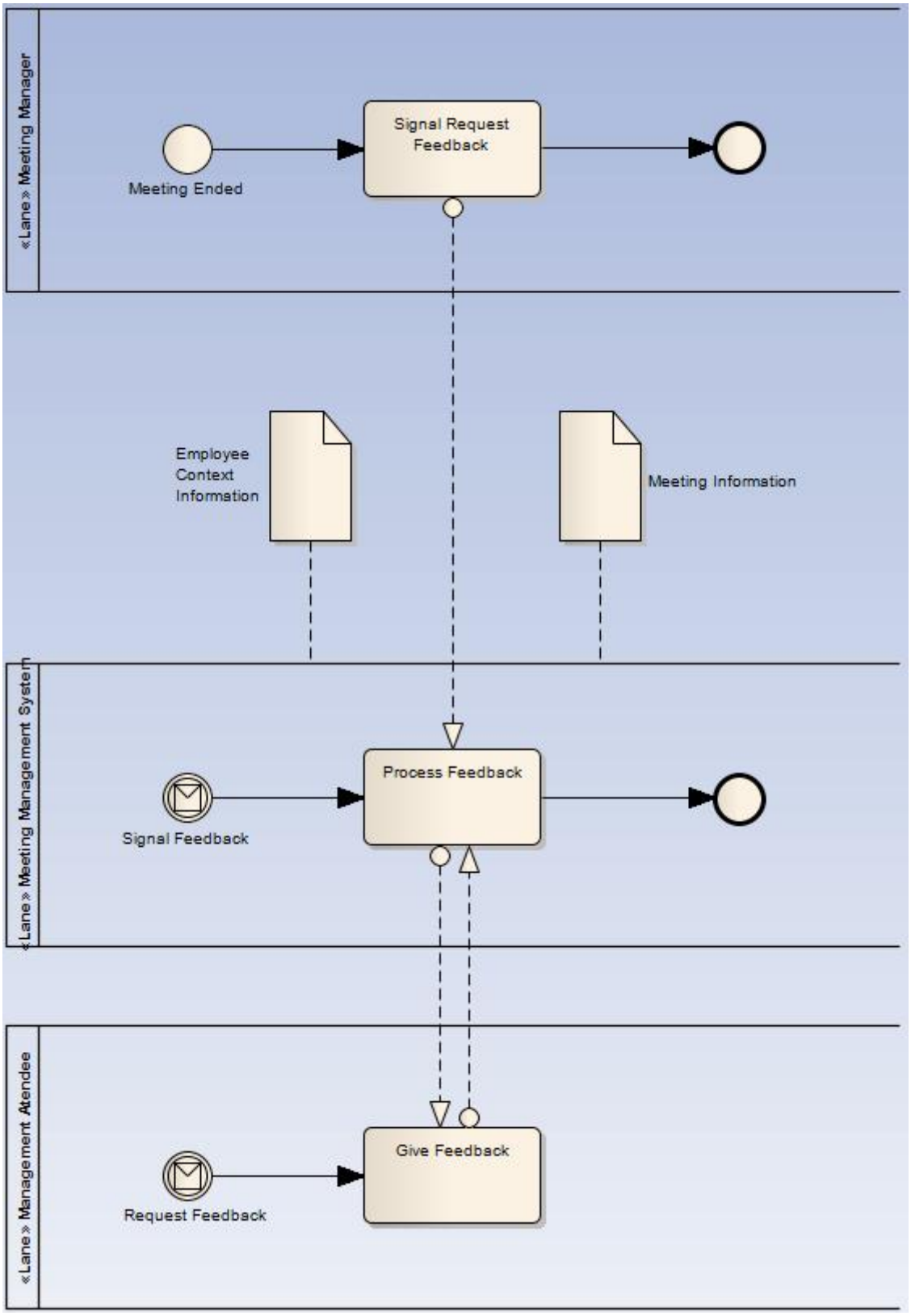

Diagram 12 - Pos Meeting Management Process

Annex D - Assessment of the factors regarding System Adoption and Barriers to Development

Information privacy and control issues
When a user browses the Internet, and furthermore uses systems there available where it has personal profiles among other information, information privacy is a known issue. There, the questions "Who can we trust?", "How and what can I control of what describes me?" or "What are my context information rights?" are well put and with Web 2.0 those became increasingly important and frequent debate issues.

But the scenario within an organization, merged in the Enterprise 2.0 phenomenon, is definitely easier to handle, and the reason for that is that the clients of the product have almost full – if not full – control the product and the information within their system, and as well the only stakeholders involved, in a large perspective, is the client organization and the managerial services/application providers, hence not including third parties, such as in Web 2.0. The rules and settings, resulting in a system configuration, about what information can be displayed to/accessed by whom, is for each organization to define within its frontiers, and then an agreement must be obtained between all entities of the work system. It is as well added, naturally, the wish of not wanting to be monitored all the time, from the employees' side. But it is up to the organization to ensure a monitoring that is not imprisoning the employees.

This project will not go further into this subject, other than having in mind the need for full capacity of configuration in accesses control (read/write, privacy of different fields, etc.).

Organization Culture
Every organization has its own culture, being that one of the strongest influences for lack of adoption of new systems and new ways of doing things, even if proven better, as concluded from the interviews. Now approaching this issue from this project's perspective, managerial tasks are even worse dealing with then typical operational tasks.

The reason for this is that operational tasks have a certain degree of/flexibility for change, as the - in broad terms - typical evolution of a firm requires process and product/service innovation, which usually demands a greater revision over its operational processes and respective activities. Organizational management, on the other hand, always had the same objective of managing people and resources over time - same service/product - though it does evolve to meet higher and higher key performance indicators, which managers tend to try to adapt by themselves, either by using the latest mobile devices with the best managerial applications as they see fit, or falling back to *post-its*. For this fact, managers can be asserted as the hardest to deal with actors when it comes to changes. They do what they must in their own way, different from manager to manager, even when using the exact same support system and configurations, and contrasting with the rest of the organization. They redraw their own processes to their liking and comfort. The actions derived from this phase shall have in consideration this managers' need of self-management.

So the project will have this issue in mind, as adoption was seen as one of the primary problems during the AR, and although not the focus of the thesis, it is as well mandatory to answer it properly in this instance to accomplish a good testing environment. Having "this issue in mind" can be translated to thinking on the managers' side, and then giving them what they miss, to actually meet the efficiency and effectiveness pointed by key performance indicators, while slightly adjusting their self managed processes to fit the new support systems (in this project, integrated employee context information).

Time-zone differences
As pointed by John Rizzo from Aplix Corp., a manager that has employees on the other side of the globe can barely have direct contact time with them, as while one sleeps the other works. Nevertheless, and in a broad terms presumption, this does not have relevant impact on the benefits from the availability of integrated employee context information, as it only shrinks the number of channels managers/employees can use to communicate.

For this reason this project will have this issue only minimally in mind to facilitate research on the essential, as it is not clear that this could be a threat for this project's context.

Worldwide cultural clashes
Added to the previous issue, time-zone differences, there is cultural clashes. As example, between Aplix Corp. in USA and Aplix Corp. in China, there coexist two completely different cultures (values, accents, communication, habits, etc.) and therefore John Rizzo stated that it was not a possibility to keep daily management over communication channels such as VoIP (Voice over IP). He clearly stated that email, forum or any system that is based on non-instant text communication were still, and by far, the best answer against this worldwide cultural clash issue, as one from each side can take time to answer properly and adequately, easily removing emotional reasoning or other habits/factors highly more present in instant communication.

Again, this does not appear, at first sight, to directly impact the benefits from managing based on integrated employee context information. It appears, again, as a reduction in the communication channels availability, and should be once more be kept in mind as a minimal issue within the project's context.

Annex E - Context Information Dynamic Profiles

5W+1H	Information Clusters	Example
Who (actor)	Title	Web Developer
	Name	Bob
	ID	123456
	Quote	Why is it raining?!
	Mood	Tired
	Status	Online, Busy
	Competences	Java / Java script / HTML / XML / Project ABC
	Others	(configurable)
Is doing **what, when and where**? (activity)	Tasks	Log: see list of Tasks or <Calendar> Current: Managing Website of Project ABC, ... Scheduled: see list of Tasks or <Calendar>
	Location	Current: Build A, Room 1.1 Per task: see <Tasks>
	Calendar	...
	Others	(configurable)
How is it doing? (method)	Resources	Car, Laptop, Smartphone, Connectivity, ...
	With Whom	111111 John, 222222 Mary
	Others	(configurable)
Why is it doing it? (mission)	Objectives	Per task: see <Tasks>
	Others	(configurable)

Table 10 - 5W+1H depicting Employee Context Information

Information Field	Example	Dynamism Level	Information Input
Title	Web Developer	Low	Manually
Name	Bob	Low	Manually
ID	123456	0	Manually
Quote	Why is it raining?!	High	Manually (employee)
Mood	Tired	High	Manually (employee)
Status	Online, Busy	High	Manually (employee) /**Automated** (configurable device triggers)
Competences	Java / Java script / HTML / XML / Project ABC	Low	Manually (employee/manager)
Tasks	Log: see list of Tasks or <Calendar> Current: Managing Website of Project ABC Scheduled: see list of Tasks or <Calendar>	High	Manually (employee/manager) /**Automated** (calendar and task integration subsystem)
Location	Current: Build A, Room 1.1 Per task: see <Tasks>	High	**Automated** (location APIs)
Calendar	...	High	Manually (employee/manager) /**Automated** (associated with Tasks)
Resources	Car, Laptop, Smartphone, Connectivity, ...	High	**Automated** (NFC, RFID, etc)
With Whom	111111 John, 222222 Mary	High	**Automated** (NFC, RFID, etc)
Objectives	Per task: see <Tasks>	Low	Manually/ (employee/manager) (associated with

Table 11 - Mapping Information Fields, Dynamism and Input

Annex F - Project Schedule

	Task Name	Weeks	Duration	Start	Finish
1	**Diagnosis**	**8**	**47 days**	**Fri 01-10-10**	**Fri 03-12-10**
2	Schedule Meetings with 3 organization managers	3	47 days	Fri 01-10-10	Fri 03-12-10
3	Design the meetings	3	15 days	Wed 06-10-10	Mon 25-10-10
4	Conduct Meetings with organization managers	7	41 days	Mon 11-10-10	Fri 03-12-10
5	Hermeneutical analysis of the meetings results and problem ass	7	35 days	Tue 19-10-10	Fri 03-12-10
6	**Action Planning**	**7**	**31 days**	**Sun 21-11-10**	**Sat 01-01-11**
7	Model Meeting Management Process based on Employee Contex	4	20 days	Sun 21-11-10	Fri 17-12-10
8	Model Integrated Employee Context Information support system	6	31 days	Sun 21-11-10	Sat 01-01-11
9	Define Integrated Employee Context Information SS requirements	6	31 days	Sun 21-11-10	Sat 01-01-11
10	**Action Taking (iterating)**	**21**	**86 days**	**Mon 10-01-11**	**Fri 06-05-11**
11	Develop of Prototype following conceptual solution	21	86 days	Mon 10-01-11	Fri 06-05-11
12	Test Prototype in real environment	16	81 days	Mon 17-01-11	Fri 06-05-11
13	**Evaluation and Specifying Learning (iterating)**	**18**	**91 days**	**Mon 24-01-11**	**Fri 27-05-11**
14	Analyse testing results and obtain new knowledge for iteration	18	91 days	Mon 24-01-11	Fri 27-05-11
15	**Conclusion**	**18**	**91 days**	**Mon 14-02-11**	**Fri 17-06-11**
16	Final Report	18	91 days	Mon 14-02-11	Fri 17-06-11

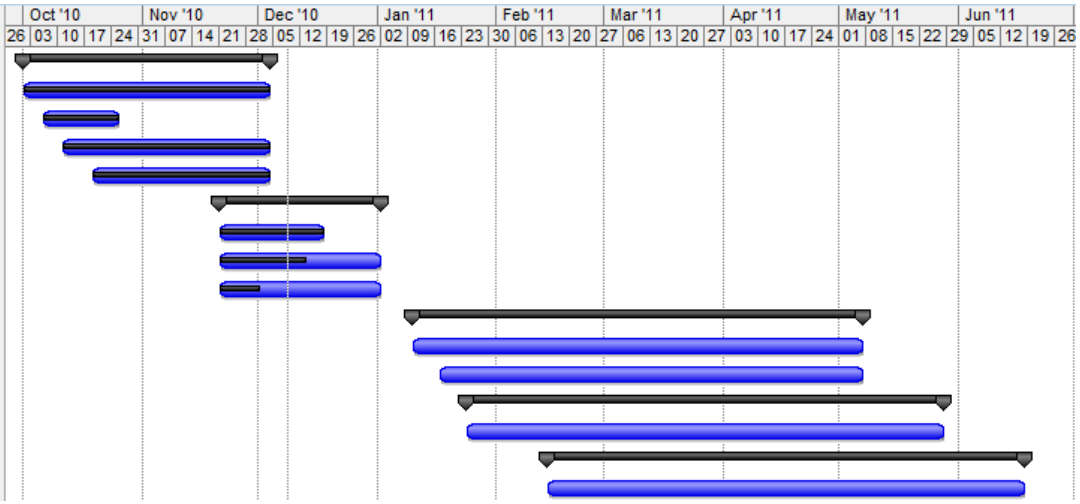

Table 12 - Project and Thesis Gantt Chart

NOTES:

- This Gantt chart intends to be managed and adjusted throughout the work to be carried and the values registered are of speculation. The last three phases (Action Taking - Conclusion) will be subdivided in a later stage as such division is dependent on the results from the previous phases.
- The interval in January corresponds to exam season.

Regarding Conferences

It is intended to submit an initial paper of the project to the CENTERIS conference (1).

(1) Regarding CENTERIS' Call for Papers, see: http://centeris.eiswatch.org/index.php?p=call