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Analysis Of The Success Factors In A WIFI Instalation On A Hospital

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Preface

This following Thesis is the report of the final project for completing the Universitat Politècnica de Valencia (UPV) Industrial Engineering Master. The project development has been done in the Norwegian University of Science and Technology (NTNU) Department of Mechanical and Industrial Engineering (IPM) during the ERASMUS study exchange program. The project aims to research about the success in IT projects focusing on a case of a concrete project "Installation of a WiFi system in a hospital".

Although I focused my efforts in the development of this work, it would not have been possible without the help and support of many individuals to complete it. I am using this opportunity to declare my gratitude to the companies who supported me during the research and those who decided to share their time providing us with valued information through interviews.

I would like to express my special appreciation and gratitude to Professor Bassam Hussain, who supported this researching throughout its development and trusted me during this work. He offered me the opportunity to join to this amazing project. I am thankful for his aspiring guidance and advice, which were vital to fulfil this project. He is a great professional who have taught me so many things I learn from him.

Finally, I would like to thank my parents Pilar Sala and Leopoldo Salinas and my sister Pilar for their support not only through my study but through my whole life, encouraging me not to give up and continue fighting for all I want to achieve. Especial thanks to Santos Perez the person who encouraged me to start at university when I didn't see myself capable.

Leopoldo Salinas

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Summary

Traditional definition of success in projects has been identified with project management success, but nowadays a differentiation between project management success, focused on time, cost and quality, and project success, with wider overall expectations is being widely studied as it has been seen that sometimes projects with a defective project management have resulted in a successful real project result and in other cases project outcome is clearly improvable in projects where project management has achieved planned success.

We have made a research work taking a general sight about the project factors that facilitate success for both project and project management approaches.

There is a lot of literature that examines the importance and application of critical success factors in projects, and show there are some specific factors that, if followed by the project and its stakeholders, may increase the likelihood of a successful project. Some studies focus on success factors for projects in general, while others look at specific project types, such as IT projects.

We have developed the research with a real case analysis and with the interview of the stakeholders finding the factors that made the project successful and compare with the literature to find when the case factors match the literature factors.

Finally, what we learn about this type of project to improve the execution in further projects to avoid the possible mistakes. Giving some tips about the team work, project management, stakeholder communication and importance of customer role.

Keywords: Project Success, Success Factors, Project Management

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1. Introduction

1.1. Objective

The objective of this work is to conduct an analysis to search:

- The changes occurred in IT project management.
- The factors that could result in success or failure of projects in this new and in future environments.
- What IT project stakeholders have learned to incorporate to future IT project management methodologies to be more successful.

1.2. Background

IT deployments inside bigger building projects have been usually executed as self-contained and not interrelated projects in which the environment conditions had to be met before the IT project could be launched. Initiation of an IT project without the correct conditions was known to lead to much higher occurrence of defects and hardware failures, shortened the life of the equipment and resulted in a much lower reliability.

The computing elements were installed and set to work, the applications were developed, installed and tested inside already reliable data centres and terminal equipment deployment outside them was not a restriction as it could be installed afterwards as a separate project depending on the cabling, network and power installation but with little technical complexity.

The evolution of technology towards mobility and IoT (Internet of Things) is taking IT to depend on elements distributed everywhere to be connected before applications can be deployed and tested. So, IT project management is a much more complex activity as its steps and actions depend on many other projects to be ready.

This situation has been increasing during last years and probably will keep growing as technology and its social uses evolve.

At the same time building project management has not usually taken a close care about IT projects as they considered they would happen without bothering to look after their evolution.

So, the way these projects are managed is in fact changing compelled by real necessities although the way they are designed has not evolved very much.

1.2.1. Scope

The work will be conducted with the method of the Case Study. We have selected the real case of the project of the WiFi solution deployment in a new hospital built from scratch in Valencia in 2017.

This WiFi Project started as part of the project of the building, equipping, staffing and set to work of a new hospital using the latest technologies to provide a high-quality health care, a high-level hospitality and a very efficient organization.

As a part of the general hospital creation project a subproject was created to implement the information systems the new hospital would use. This was assigned to the Hospital Group IT Department.

The IT Department of the Hospital Group made a high-level design of the IT solution and divided it as well in different some subprojects in different technologies areas. One of them was the implementation of a WiFi system and its integration with the rest of the Information Technologies project solution.

So, this was not an isolated self-contained project. It had to be carried out as other project allowed the actions to be executed, some of them had to be split in parts as the conditions in different parts of the hospital were met and its success depended on the quality of other related projects.

1.2.2. Project information

Last year a new 37.000 m2 three buildings hospital was built in Valencia (Spain) by the company of Hospital Group.

The company EFICIT was commissioned the design, supply and installation of the WiFi wireless network infrastructure of the whole hospital and its integration with Hospital Group information systems with the aim of providing mobile secure connection to the hospital users with the best supported standards and optimal features.

This common wireless infrastructure was intended to provide service to three kinds of users:

- Hospital professionals
- Hospital machines
- Hospital customers

Special focus was set on security of information which is especially critic in the health industry both for confidentiality reasons and for the importance of data integrity in the success of the healing process.

1.2.3. People involved (Stakeholders)

The people involved in the project called stakeholders are everyone with connection with the project in this case:

- EFICIT, is an engineering company born in 2011 to collaborate with it clients in selecting and implementing the best telecommunications solution.

It is constituted by engineers of competence and experience in technical responsibilities and directives widely recognized in the market.

Its objective is to understand the real business needs of its customers and, knowing in depth the options available in the market, implement with guarantee the optimal solution in cost, reliability and performance.

For that they form a team that works continuously in two foreheads:

1) Build competencies

a. Continue deepening in their ability to understand their client's business and the importance of ICT in it.

b. Increase their technical capacity to convert the huge and dispersed existing technological offer into simple, powerful reliable and efficient solutions.

2) Provide efficiency

a. Act every time without exception defending the interest of their client facing third parties.

b. To take care of the quality of their work both from the technical point of view and from its impact on the client's business. Go one step beyond is good.

- HOSPITAL GROUP is a regional health company which owns and manages several private hospitals being a referent in the region for good care to the patients.

Their centres are equipped with the most advanced technological means and deploy their own successful health model with the aim of providing first level health care based on medical innovation.

They decided to build a new hospital in the Valencian capital that would become the flagship of the group.

At the beginning of 2017 that Hospital (the executed project), was inaugurated,

The philosophy of the groups is characterized for:

1) Own medical team with prestigious professionals. This commitment to set up a group of professionals is a differentiating element in private healthcare. This

initiative allows them to have a trained, experienced and aligned with the management style and philosophy of the organization.

2) Personalized and comprehensive medical assistance, which incorporates the latest prevention, diagnosis and treatment technologies.

3) State-of-the-art facilities and equipment. Most advanced technological solutions are implanted in our centres in each moment. The building itself and the facilities are designed to facilitate the intelligent flow and well-being of people. The objective is the patients to have the best experience, offering always the best response to their health demand.

The group was one of the private hospital groups pioneers in the implantation of electronic clinical history.

Recently, steps have continued to be taken on the road towards the development of the "paperless hospital" idea. All their patients have the possibility of having access to a private area from which they can review their own reports and diagnostic test carried out in their centres.

- HEWLETT PACKARD ENTERPRISE(Provider), is an American multinational information technology company founded on November 2015 as a part of the splitting of the 1939 founded Hewlett-Packard company. HPE is a business-focused organization leading provider of computer servers, storage, **networking** and support.

- USERS, all medical staff of the hospital (doctors, nurses, administrative, etc.), patients and patient's companions.

1.2.4. Solution to be implemented

The next image shows a diagram the WiFi solution designed by Eficit for this project:

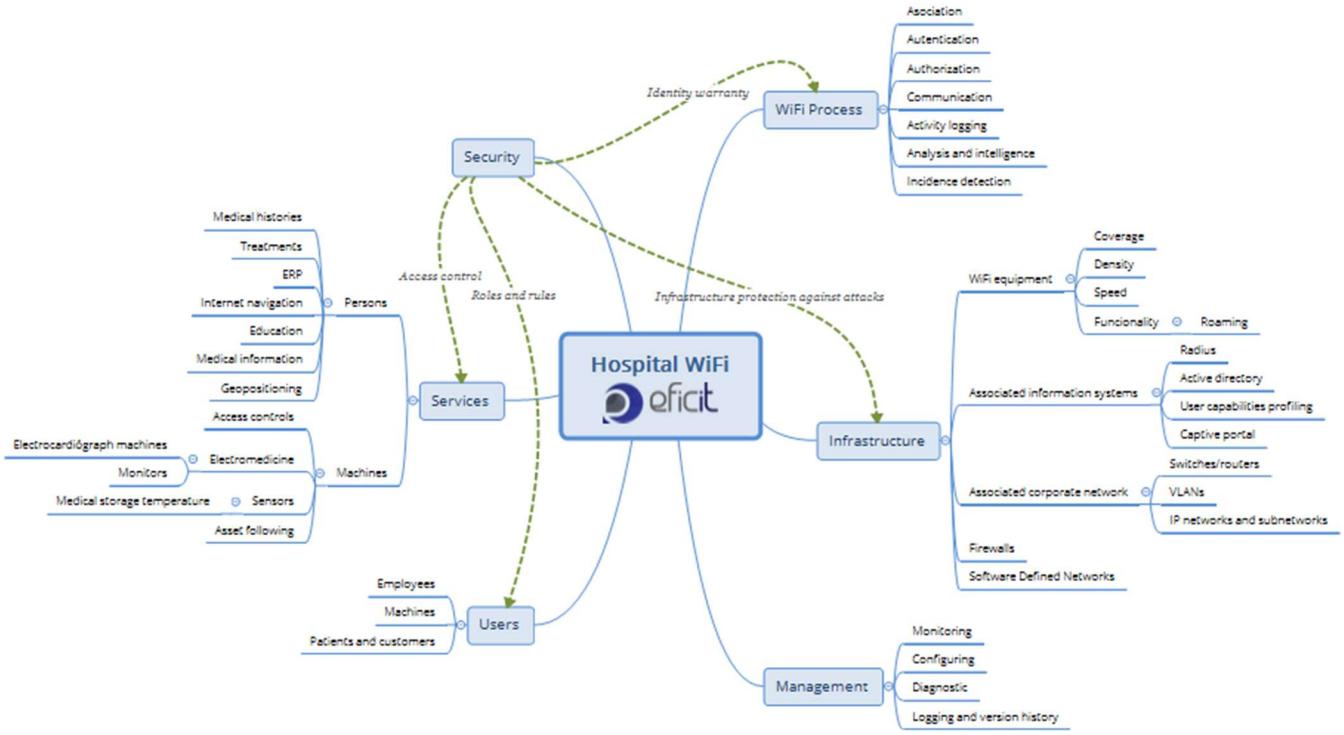

Figure 1 Project Planification

1.2.5. Project Plan

The WiFi project evolution was intended to develop in the following steps:

1. Needs assessment. Initial definition of the requirements. The future uses of the WiFi network were defined, the information architecture was designed, and hardware and software components were selected.

2. Theoretical coverage design at an early for budgeting purposes. Drawing WiFi Access Point (AP) locations over all the floors blueprints in the building provided by the customer. Estimating how many devices need to be used for complete coverage. This estimation was based on two principals, Eficit knowledge in the field of information communication technologies and the characteristics of the product.

3. Coverage study on the building site to verify accuracy of the previous blueprint design. The building was visited when it was almost finished to take measurements all over the place. The measurements were taken with a mobile access point and taking lectures at the most unfavourable point considering future obstacles that would be placed in the middle. The position of the access points was decided to assure perfect coverage and traffic density and documented in the blueprints for cabling

4. Definition of number and final positioning of the APs to be integrated in the constructive building blueprints so that convenient fixing surface and cabling be prepared by other hospital project teams.

5. Order hardware and software from HPE Aruba, the technology provider.

6. Specification of computing needs for WiFi applications for selective authorization policy enforcement, monitoring and guest control to provide them to the systems implementation project team.

7. Agreement and specification, working together with the software and applications implementation project team, of the protocols and parameters for the information interchange between WiFi application for selective authorization policy enforcement and the hospital directory application where each user profile is stored.

8. Specification of APs requirements for secure communications through the hospital's LAN to the firewalls, the information systems and between them. Provide the requirements to the LAN implementation project team.

9. Coordinate with the building project team and the cabling project team to attach AP mounts on the ceiling and then setting all APs on the mounts and connecting each one to its cable.

10. Initial WiFi network start up.

11. Verification of WiFi signal coverage both in 2,4 Ghz and 5 Ghz bands across the hospital buildings and correct any detected problem.

12. Setting of designed parametrizations across the WiFi network. Publishing of the selected SSIDs for device connections.

13. Verifying of the correct LAN configuration checking access to the required systems through the right VLANs, IP networks integrity, isolation from banned access networks and IP addresses assignations.

14. Creation of designed user profiles in the WiFi controller.

15. Management and monitoring application start up. Setting of network maps and documentation in it for easy management and troubleshooting. Setting of automatic network controls, triggers, alarms and actions on events.

16. Selective authorization policy enforcement application start up. Integration with the hospital directory application. Checking of the correct connection of different users through different devices and testing the correct work of WiFi connected machines.

17. Setting up of authentication and access control application for guest Internet access. Checking of the authentication through the captive portal, the expected Internet bandwidth and the correct logging of guest ids and activity for legal purposes.

18. General tests and detail tuning.

19. Close support from the project team for immediate problem fixing and customer help during the beginning of the activity of the hospital staff until a completely stable operation.

1.3. WIFI Uses

Among all the uses of the uses of the WIFI in this project the most important are:

- Connection of the medical staff tablets with Hospital group Information Systems to have all necessary information in every moment with minimum use of paper. One of the objectives of the hospital is to be a paperless hospital.

- Connection of hospital group professionals through corporate or self-owned devices with different limited access levels to information.

- Connection with mobile medical equipment such as electrocardiograph machines or medical monitors with very strictly limited access.

- Connection to different various non-cable connected equipment, sensors and other smart objects around the hospital.

- Connection to Internet for patients or visitors own devices with total isolation from corporate information and health systems.

1.4. Disposition

This report is structured in five chapters that respond to the investigation`s objectives as follows:

- Chapter one is the Introduction in itself, where we introduce the background of the research, the scope, objectives and challenges of the study and one explanation of how the research is organized.

- Chapter two corresponds to the Literature Review. It is divided in two parts; the first one talks about the project management success, with success criteria and success factors. The second part it is focused in the success factors in this type of project, in IT projects.

- Chapter three develops the Research Methodology, research method that we have use to collect valued and reliable data.

- Chapter four develops the Findings obtained by the research. Within this chapter we will present the results obtained through the surveys and interviews that will be analysed to get the information about success factors.

- Chapter five explains the discussion of the thesis to find if the objectives were achieved.

- Chapter six presents the Conclusions trying to define the considerations that should be cared of when executing this type of project to achieve success.

- Chapter seven states the References; in other words, the sources of information and documents from which we have collected the existing knowledge about the subjects we have worked on.

2. Literature Review

2.1. Introduction

Maybe the most beloved word of any project is “success” because the world is changing continuously, and each project is unique. The need for methods and tools to define success may continue into the foreseeable future (Howsawi, Eager, Bagia and Niebecker, 2014) There are two main types of success when talking about projects: project success and project management success (De Witt, 1988). There are similarities, as well as differences, between these two project success dimensions. The main difference concerns with connection project success with result of evaluation of overall project goals achievement, while project management success relates to traditional measurements of time, cost and quality performance (Radujkovića and Sjekavicab, 2017)

2.2. Project management success

Project management is planning, organization, monitoring and control of all aspects of project, with motivation of all included to achieve project goals on safe manner, within agreed schedule, budget and performance criteria. It can be seen from the definition of project management, that it is focused on project performance, regarding short-term dimensions of project success – adherence to criteria of time, cost and quality. The “iron triangle” model itself was the very first model of project management success, which has later proven to be only a part of overall project success. From this point of view, it is clear to see how it is possible to have a successful project with unsuccessful project management, and vice versa. Namely, project can be successful despite unsuccessful project management because it has achieved higher and long-term goals. In the moment when management of project stops, short-term orientation can be unsuccessful, but long-term outcome can be successful, because wider set of goals are

satisfied, instead of narrow subset which project management consists of (Radujkovića and Sjekavicab, 2017).

Besides the “iron triangle”, and considering factors of project management success, it is possible to find many different approaches (Machado and Martes, 2015) Project manager is not responsible only for time, cost and quality management, but also integration, scope, human resource, communication, risk and procurement management (PMBOK,2013), so he or she is the most responsible person for project success.

Besides the “iron triangle”, and considering project management success, it is possible to find many different approaches. Project manager is not responsible only for time, cost and quality management, but also integration, scope, human resource, communication, risk and procurement management, so he or she is the most responsible person for project success. With this in mind, it is surely possible to broaden “iron triangle” model on models that anticipate management of stakeholders’ satisfaction, benefits to organization that owns the project and long-term impacts on project environment (Kerzner,2011).

How to measure if project management is successful? Project management success can be evaluated through already mentioned criteria of time, cost, quality, scope, resource and activity (Bryde,2003), but also through models of measuring success like PMPA – *Project Management Performance Assessment* (Westerveld,2003) or maturity models of management within organization like *Project Excellence Model®* (Thomas and Mullaly,2014) It is hard to answer the question of project management success evaluation precisely, because project management creates both tangible and intangible benefits (Westerveld,2003).

2.2.1. Success factors

Critical Success Factors have been used since 1961 in relation with strategic planning, project management, implementation processes and for individual pursuits (Howell, 2009). Initially, Critical Success Factors were developed by using a theoretic approach, and were not empirically derived (Pinto and Prescott, 1988). The lack of empirical reasoning and generalized research led to disagreements regarding CSFs (Pinto and Slevin,1987) Baker, Murphy and Fisher were of the few who conducted an empirical study on success factors. Their research revealed seven general factors (Pinto and Prescott, 1988)

2.2.2. Success criteria

“The iron triangle” consisting of cost, quality and time was first presented as success criteria about 50 years ago. Multiple writers agree that these three parameters can be considered as success criteria, but not exclusively (Atkinson,1999).

Müller and Turner (2007) show that project success criteria vary from project to project. What is acceptable in one project without impact on perceived success (for instance a five days delay in an IT project to achieve better functionality) is abject failure in another project (the same delay in building an Olympic village)

De Witt (1988) refers to P. W. G. Morris and G. H. Hough which has created a model based on three measures of project success, as presented in Table 1.

Table 1 Three measures of project success (De Wit, 1988, p. 169)

• **Project functionality** **Financially** **Technically** **Or otherwise**
• **Project management** **Budget** **Schedule** **Technical specifications**
• **Contractors commercial performances** **Short term** **Long term**

Hussein (2012) describes factors influencing success criteria along life cycle as you can see in Table 2, but there are 6 most commonly commented two in each phase: in planning- Use of unrealistic targets and Lack of ranking among the criteria, in the implementation Incompleteness (missing or omitted criteria) and Changing context, in the evaluation Subjectivity of measurement and Lack of long-term scheme for measurement after handing over.

Let's go to explain each of the commonly commented factors:

- Something that leads to the imperfect definition of success criteria is the (blown optimistic or pessimistic) expectation regarding the target of, for example, time, cost, or expected benefits (Chapman, Ward and Harwood 2006). This may lead stakeholders to perceive a project that was in fact successful in achieving near-optimal results as a partial failure.

- Lack of ranking among the criteria, could be attributed to the lack of full knowledge about the stakeholders and their precise expectations.

- Incompleteness, an additional factor that complicates the definition of project success criteria is uncertainty, or a lack of full knowledge about the range of project stakeholders at start-up (Young, 2006), or lack of knowledge about the full range of use of the product or system.

- Changing context, there is another dimension of uncertainty that might take place during exaction or at a later stage of the project. Such as, the impact of changing political factors, changing owners, changing state regulations, changing strategy or focus. Other changes may include suddenly urgent needs that force a project to change priorities or to add new criteria, or regulations, or new contextual conditions to meet these urgent needs.

- Subjectivity of measurement could be attributed to two factors from the initiation phase: ambiguity and lack of full knowledge about stakeholders. This is no conclusion but an observation in fact, the higher the use of ambiguous and incomplete criteria the more likely that measurement will also be based on subjective assessment.

- Lack of long-term scheme for measurement after handing over, seems to be linked to the subjectivity of measurements, that is, basing the entire assessment on using rhetoric and subjective interpretation of the outcome also contributes to failure to measure the long-term criteria.

Table 2 Factors influencing project success criteria along life cycle phases (Hussein, 2012, p.568)

Risk factor influencing the criteria	**Phase**
Use of unrealistic targets (conservative or optimistic)	Initiation/planning
Use of ambiguous/soft criteria	Initiation/planning
Narrow focus (covering only project management success)	Initiation/planning
Diversity (balancing conflicting or competing criteria)	Initiation/planning
Lack of ranking among the criteria	Initiation/planning
Incompleteness (missing or omitted criteria)	
Lack of organizational commitment (in the form of resources, support to achieve the objectives)	Implementation
Lack of alignment in the preforming organization	Implementation
Changing context	Implementation
Lack of scale of measurements	Evaluation
Subjectivity of measurement	Evaluation
Lack of long-term scheme for measurement after handing over	Evaluation

2.3. Success in IT projects

IT systems have become very important because most companies depend on them and the operations of these companies and organizations have become increasingly automated and computerized. To develop, improve and maintain these systems, large amounts of money have been invested in Information Technology (IT) projects. It is very important for businesses to be able to manage IT projects successfully. Despite how important IT projects are, The Standish Group (Hastie and Wojewoda,2015) revealed in the latest version of their CHAOS report that IT projects share that exceeds budget and time or does not meet the basic requirements of the systems is continuously high.

Based on a document made for hotels (Collins,2015) and the similarities with a hospital we assume that the factor are equal for the planification.

Planning factors

Based on a review of vendor and research literature and interviews of hotel and technology professionals at the property and corporate level, there are 11 key planning factors to consider in ubiquitous hotel Wi-Fi deployments:

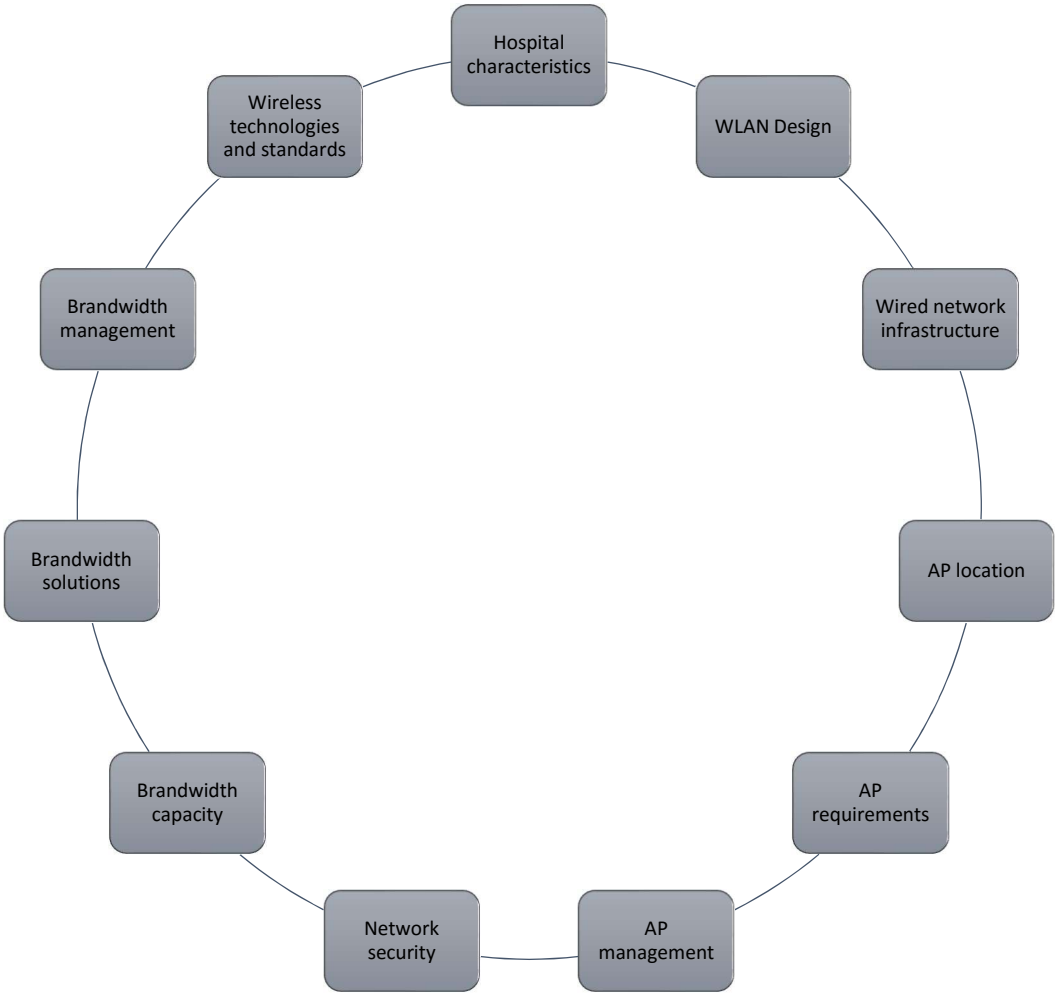

Figure 2 Planning Factors

1. **Hospital characteristics**. The hospital type, size, layout, construction and geographical location affect the cost and complexity of a Wi-Fi system and the degree of expertise required to design, install, maintain, monitor and support it.

2. **WLAN Design**. Conduct a wireless survey to determine the design parameters for a wireless local area network, or WLAN, and quality-of-service requirements. This might entail an inspection of the facility, an analysis of Wi-Fi usage patterns and building floor plans and the use of site survey tools. WLAN design requires a thorough understanding of coverage and capacity objectives, and coverage-capacity trade-offs in balancing traffic loads to maintain acceptable levels of performance.

3. **Wired network infrastructure**. Evaluate the existing network infrastructure (e.g. cabling, switches, routers, network drops, etc.) and its expansion capabilities. For example, a WLAN solution might not be able to scale to meet future wireless needs without replacing costly throughput bottlenecks, such as slow switches (gateways to the wired network) and low-capacity cabling connected to the access points, or APs.

4. **AP location**. Validate in a post-implementation wireless survey the optimal locations for APs to maximize range and minimize channel interference from surrounding electronic devices and physical objects. To ensure adequate signal strength, locate APs away from known sources of interference and as close as possible to where guest devices will be used. One study found that a microwave located 25 feet from an AP degraded throughput by 64%.

5. **AP requirements**. Determine the AP capacity, coverage and throughput optimization requirements based on the guest population (devices and applications) occupying specific spaces (e.g., meeting room, guestroom, lobby, etc.) throughout the day and night. For example, one hotelier installed 70 dual-band APs (supports both 2.4 GHz and 5 GHz channels) to cover several large meeting room and ballroom spaces located on the first few floors of the hotel. Client load balancing, a mechanism that prevents wireless guest devices from associating to an AP that has reached its maximum capacity, was used for optimizing performance.

6. **AP management**. Determine the need for standalone APs (typically in small-scale networks) or controller-based APs (typically in mid- to large-scale networks) based on the deployment scope and cost and the desired network management and security capabilities. Standalone APs, unlike controller-based APs, are all managed individually. Utilizing them at a large resort would be time consuming and tedious, often resulting in misconfigurations, security vulnerabilities and compromised performance.

7. **Network security**. Identify the type of equipment (e.g. switches, routers and firewalls) and tools (e.g. authentication, encryption and intrusion) required to mitigate identified security threats given the hotel environment. For example, measures can be taken to detect and mitigate rogue APs, which are unsecured APs on the hotel network that are not authorized. Guests who attach their devices to rogue APs can be exposed to unauthorized access and have confidential information stolen.

8. **Bandwidth capacity**. Determine bandwidth capacity requirements based on targeted Wi-Fi experiences, property needs and/or corporate/franchise mandates. Bandwidth factors, such as the average number of devices per guest (e.g. 2.7 devices per person), the take or utilization rate (e.g. 60%) and the amount and type of traffic will vary from property to property. If the average circuit utilization in a hotel environment is 30% to 40%, for example, the peak utilization might reach 80%.

9. **Bandwidth solutions**. Evaluate the flexibility, scalability, cost, reliability, burstability and robustness of available bandwidth solutions. Combining different types of circuits (e.g., cable, DSL, T1 and fibre optic) from multiple providers, for example, can increase throughput, eliminate dependence on a single ISP for Internet connectivity and cost-effectively increase the amount of bandwidth available to guests.

10. **Bandwidth management**. Consider implementing bandwidth management policies, such as bandwidth caps and tiered bandwidth and pricing, for providing guests with predictable and proper network resources more cost effectively. A bandwidth cap limits the bandwidth available to any one guest to prevent bandwidth hogging. If one guest is downloading multiple large files, for example, it can bring the network to a crawl for everyone else. Tiered bandwidth and pricing enables free basic Wi-Fi access to all guests with the option to upgrade to higher bandwidth for a fee. This enables the hotel to generate additional revenue for partially offsetting the financial impact of delivering high-quality and reliable Wi-Fi service. Offering a tiered pricing model is a marketing decision.

11. **Wireless technologies and standards**. Assess the impact of existing and emerging wireless technologies and standards on wireless access architectures to avoid obsolescence and wasted capital and to leverage opportunities for creating efficient, versatile and cost-effective Wi-Fi networks. For example, Hotspot 2.0, an interoperable Wi-Fi authentication and handoff technology, allows a mobile device to automatically discover APs that have a roaming arrangement with the user's home network. This enables cellular-like roaming among Wi-Fi networks and between Wi-Fi and cellular networks as well as establishes a Wi-Fi connection that is secure, automated (no entering of passwords) and conforms to user/operator policy. Consequently, the complexity of roaming and getting connected is transparent to guests as they traverse the hotel. The Hotspot 2.0 initiative opens future opportunities for unique inter-vendor antenna designs for evolving capabilities, such as precision location-based and context-aware services (e.g. adapting service options based on the customer's location). Hotspot 2.0 also might enable hoteliers to wholesale their leftover WLAN capacity to cellular carriers (e.g., Verizon) who are increasingly looking to Wi-Fi to ease the strain on their mobile networks and give users better speed and coverage.

Petter, DeLone and McLean (2013) identified seven postimplementation systems criteria to measure the success of a system.

- System quality

As a measure of success, System Quality considers the technical aspects of a system, including convenience of access, system functionality, reliability, response time, sophistication, navigation ease, and flexibility, among others. Several antecedents have been studied as predictors of System Quality with mixed results.

The most widely studied predictors of System Quality are the characteristics of the users of the system, specifically, “attitudes toward technology”, “technology experience”, and “self-efficacy”.

- Information quality

IS are designed to generate relevant and accurate information. The definition of information quality encompasses measures of accuracy, precision, currency, timeliness, sufficiency, understandability, conciseness, among others. These measures capture how well systems assist users in making business decisions.

The most common variables are “IT infrastructure” y “Management processes”

- Intention to Use

If a system is to be considered successful, it must be used in the work environment for which it was intended. Although use can be measured directly, this is not to say that a direct measure of use is always possible or ideal. For this reason, it can be helpful to consider Intention to Use, or the users’ belief about their likelihood to use the Information System, as a measure of IS success.

The most common intention to use is “attitude toward technology”.

- Use

The construct of System Use has been measured with a variety of approaches within the literature (Petter, DeLone and McLean, 2013). The use can be measured by considering the frequency of use, depth of use, duration of use, appropriateness of use, system dependence, actual use, and self-reported use.

System Use is influenced by multiple variables across several categories, including task, user, organizational, and project characteristics.

- Users satisfaction

In many contexts, System Use may be, if not mandatory, then at least necessary for users' performance of their job functions. In such contexts, it may be helpful to measure User Satisfaction with a given Information System to understand IS success (Hsieh, Rai, Petter and Zhang, 2012).

There is strong support for "task compatibility" being a determinant of User Satisfaction. "Attitudes toward technology" is also supported as a strong determinant of User Satisfaction.

- Individual impact

An Information System is implemented to achieve various objectives for the organization, with many of these objectives specific to the individual using the system. Individual Impact has been measured in a variety of ways, including improvements in productivity, quality of decision making, and work practices.

There is strong support for "task compatibility" as a determinant of Individual Impact. "Task compatibility" was found to be less relevant in improving productivity during the initial implementation of a system but became more important as the system was adapted over time to better fit work practices and requirements (Leonard-Barton and Sinha, 1993).

- Organizational impact

When an organization commits to implementing, using, and supporting an Information System, the organization often does so because some type of positive organizational impact is desired, such as improved profitability or productivity.

The relationship between the sophistication of the “IT infrastructure” and the Organizational Impact of an IS.

3. Methodology

This chapter aims to describe the chosen methodology which has been applied to complete the objectives. The first section explains the different research methods which are applied. In the last section of this chapter, the limitations of the methods are disclosed, and the actions initiated by the author to reduce the limitations and uncertainties are described.

3.1. Research methods

The term research methods include all methods, or techniques, applied when conducting research (Kothari, 2004). According to Kothari, research methods can be classified in three different groups:

1. *"In the first group we include those methods which are concerned with the collection of data. These methods will be used where the data already available are not sufficient to arrive at the required solution;*

2. *The second group consists of those statistical techniques which are used for establishing relationships between the data and the unknowns;*

3. *The third group consists of those methods which are used to evaluate the accuracy of the results obtained."* (Kothari, 2004, p. 8)

In this report were interested in the first group, methods of collecting data, Kothari presents several different methods including interview method, survey and schedule method, case study method and some other less common methods for data collection. For the second and third group, different statistical methods can be applied.

The chosen methodology in this research is a mixed approach, which implies that multiple methods and techniques are applied during the research. The main methods applied are case study and interview. These methods are elaborated on in the following subsections.

3.1.1. Case study method

To achieve the objective proposed of the success factors of an installation of WiFi System in a hospital, the case study method was applied to collect relevant data. The case study method is a qualitative analysis, where the researcher, through observations, focuses on every aspect of an individual, a group or an institution (Kothari, 2004).

The process of conducting a case study can be divided in five major phases, according to Kothari (2004, p. 114):

1. *"Recognition and determination of the status of the phenomenon to be investigated or the unit of attention.*

2. *Collection of data, examination and history of the given phenomenon.*

3. *Diagnosis and identification of causal factors as a basis for remedial or developmental treatment.*

4. *Application of remedial measures i.e., treatment and therapy (this phase is often characterized as case work).*

5. *Follow-up programme to determine effectiveness of the treatment applied."*

The research conducted in this report includes the first three phases listed above. The time aspect did not allow the researcher to apply the measures found valid, nor was there sufficient time for follow-up to determine the effectiveness of these measures.

The first step, the status of the phenomenon to be investigated, was given during all the time of the research.

For the second phase of the case study method, the interview method was applied. This method is described in the following subsection. For step three, the information gathered through literature review and the interviews, was analysed and compared with each other, to define the casual factors and the final result.

3.1.2. Interview method

Like survey is the most popular method for quantitative analysis, interviews are also popular for qualitative analysis. Interviews may be used to collect data in both quantitative and qualitative research approaches. Interviews applied in qualitative research, like in this report, are designed in a more generalized matter so that the interviewee's perspective is in focus. Another characteristic of the qualitative interview is that rich, detailed and explanatory responses are desirable, as with quantitative interviews, more concise answers are desirable (Bryman and Bell, 2015).

Furthermore, interviews as a research method can be conducted in different manners: structured, semi-structured and in-depth interviews (Bryman and Bell, 2015). For this research, the semi-structured approach was used. Semi-structured interviews consist of a list of topics that shall be addressed during the interview, and these topics are usually written as questions, commonly referred

to as an interview guide. The interviewer will often improvise responses and follow-up questions, depending on the response from the interviewee. Questions that are not in the interview guide may be asked if the interviewer discovers topics of interest which are relevant to pursue, and some questions from the interview guide may be left out. This freedom facilitates natural and freely formulated answers (Bryman and Bell, 2015). These characteristics were the main reason for the choice of the semi-structured interview method. It was desirable to let the interviewees answer freely as each interview. At the same time the cases had to be comparable and they should thus have a similar structure.

An interview guide was created before the interviews, to help the researcher to cover all relevant topics in an appropriate order. This guide was also sent to the interviewees some time before the interview so that they got the time to think over the topics to be discussed. The same interview guide was used for all the interviews to see the impression about the case.

Table 3 Interviewee Information

Informant	Informant 1	Informant 2	Informant 3	Informant 4
Stakeholder	Project management	Project management	Project management	Client
Title of interviewee	Project manager	Senior engineer	Junior engineer	Chief of IT Department
Experience of interviewee	28 years working in multinational IT companies 7 years in his own company	Working in the sector for 25 years	1 year of experience	20 years working in IT departments

3.2. Limitations of design and counter measures

In this point the limitations of the applied techniques are discussed. The actions should take to reduce the limitations are presented according to the three tests Yin (2013) presents: construct validity, External/Internal validity and reliability. These tests are commonly used to judge and measure the quality of a research design.

Limitations related to practicalities in this research are mostly concerning resources, in the sense of available time and personnel from the case. The researcher's contact people in the case company was available throughout the research process, but it turned out to be challenging to receive the answer to the interview. One of the limitations is the amount of people to interview about the case, the project management company is small. And in the client only one-person answer because is who was in contact during all the development of the project.

All the informants who have contributed to the research, are educated engineers, and are thus interested in the technological aspects of each project. During the interviews, some time was spent to shift the focus away from technical solutions, and over to organizational factors, strategies, project processes and so on.

3.3. Interviews

The interview guide to the different people, one to the project management and other to the client.

PROJECT MANAGEMENT

- Do you consider the project a success?
    - Why? Which factors contributed to the success of the project?
- Did you find any trouble during the project? How did you solve it?
- What challenges did you face? How did you manage?
- What was the implication of the client?
    - Only in directive level?
    - Involvement in the processes? What extent?
- The Project was delivered on time?
    - What were the factors that made difficult?
    - What were the factors that made easy?
- What were your expectations before starting the project?
    - What expectations were fulfilled?
- What do you think are the keys of success of a project?
- Do you think the Project has the specified quality?
- Thinking in the past, would you have done something differently?

CLIENT

- What were your expectations before starting the project?
- Were your expectations fulfilled?
- Are you happy with the project management?
- Do you consider the Project a success?
- Looking back at the past, what would you have done different?

4. Findings

4.1. Challenges

Now we are going to talk about the challenges and troubles found during the process of the project

- Order hardware and software from HPE Aruba, the technology provider.

The client didn't have a good planning about the project, the project was delayed because the customer didn't sign the hardware and software order for HPE Aruba on time. Delivery time of the provider was not fast enough for the forecasted installation time. An escalation had to be made to get HP to deliver the order directly from their European logistic hub with a dedicated transport.

- Coordinate with the building project team and the cabling project team to attach AP mounts on the ceiling and then setting all APs on the mounts and connecting each one to its cable.

Because of a lack of communication between the different subprojects involved at the constriction project. It was impossible to start hanging the Access Points at the planned moment. A big part of the hospital ceilings was not yet set in place and the cabling had not been executed as it had been designed. So, what should have been done in 3 days work lasted a week and a half with Eficit having to detect each problem and fix it if possible or push the cabling project team to fix it.

- Initial WiFi network start up.

It was a handicap to continue if the previous project didn't check his finished tasks and didn't ask to be checked the tasks that are going to affect you. The initial WiFi start up could not be done at once and had to be made as the WiFi Access Points were being installed. In that moment we found many of the Access

Points not having a real connection. Eficit kept troubleshooting each one of them finding three kinds of problems.

- A few cables were not correctly installed and there was no continuity in them.
- The patching in the interconnection racks had not been done correctly by the IT team for some APs and the cable was not connected to the correct switch port.
- The switch port where the AP was connected had not been configured correctly by the LAN switching project team.

  Because of this the WiFi system did not work at all. The only solution was to disconnect the patch cables of all the APs a start connecting one AP at a time and checking if it started correctly and joined the network. If it didn´t work, we checked correct patching and switch port configuration for that AP.

  This showed as a very hard work for 120 APs but at the end the WiFi network was working except 10 APs whose cable had to be fixed later.

  This process ended the Sunday before the Monday when the newly hired staff of the hospital came to start training needing the WiFi system for their work.

  While this process was taking place, the possible actions of steps forecasted to be done after the WiFi had initially started up, had been implemented so that a provisional service could be set up quickly.

- Verification of WiFi signal coverage both in 2,4 Ghz and 5 Ghz bands across the hospital buildings and correction of any detected problem.

As the whole network was not working the coverage verification was made for each individual AP instead. The design done in the definition of number and final positioning of the APs showed correct and no shadow area was found.

- Setting of designed parametrizations across the WiFi network. Publishing of the selected SSIDs for device connections.

As soon as the WiFi network was up and running the two desired SSIDs (service set identifiers) for hospital staff and for guests were configured and published and the service started working correctly

As the surrounding conditions of related projects prevented “Initial WiFi network startup” task to be ready on time most of the subsequent tasks in the project had to be redesigned and rescheduled as a contingency plan to be able to meet deadline.

The following tasks had to be started with no working WiFi deployment to integrate with:

- Management and monitoring application start up. Setting of network maps and documentation in it for easy management and troubleshooting. Setting of automatic network controls, triggers, alarms and actions on events.
- Selective authorization policy enforcement application start up. Integration with the hospital directory application. Checking of the correct connection of different users through different devices and testing the correct work of WiFi connected machines.
- Setting up of authentication and access control application for guest Internet access. Checking of the authentication through the captive portal, the expected Internet bandwidth and the correct logging of guest ids and activity for legal purposes.

Management and monitoring were installed during the delays in previous steps. Final integration and configuration tuning with the actual network was done smoothly after hospital staff launch.

Internal and guest applications were also installed during the delays in previous steps but integration through them of the WiFi operation with the hospital information systems could not be done without a real working WiFi deployment.

So, it was decided to create a lab WiFi deployment in parallel with the delayed hospital one. This lab WiFi was used to develop all the integration and testing of selective internal authorization system and for guest authorization system as well.

With this redesign of the project it was possible to set the whole WiFi system up the day after the real WiFi infrastructure deployment was finally set to work.

4.2. Success factors

Table 4 Success factors and criteria found

Success factors	Success criteria
• Early project understanding and definition. • Close team work with the customer. • Correct cost budgeting • Determination. Quick and strong decision making and handling of unexpected circumstances. • Skilled team focused on quality. • Right expert support hired • Willingness solve any problem proactively • Fluent project and inter-project team communication.	• Full desired functionality of the WiFi environment. • Client satisfaction • Budgeted cost achievement • Time deadlines met. No delays caused to dependent projects. • Reliable and stable operation of the WiFi solution. • Right environment, tools and training for customer staff to manage the WiFi solution easily

- Early project understanding and definition.

  Beginning the WiFi project definition at an early stage of the general hospital project when information technology concepts are being settled allows a deep understanding of the future functionality required by the customer and a clear view of the overall information systems. So, the project and the expectations from related projects can be thoroughly prepared, the vision and ability to overcome difficulties is bigger and cost foreseeing and budgeting is easier.

- Close team work with the customer.

  In a project with so many dependencies the team work is a key factor to adapt plans to situation and to make results converge to needs. Especially when customer action is so often required as circumstances forced in this project.

- Correct cost budgeting

  The accurate evaluation of project current costs and the risk analysis to reasonably foresee extra ones streamlines project flow, avoids conflicts and enables result quality focus.

- Determination. Quick and strong decision making and handling of unexpected circumstances.

  During this project unexpected internal (team failures) and external (related projects misbehaviour) events appeared that could have ruined or delayed the project success. One of the keys of success was the quick teamwork to find alternate feasible ways to get to the objective and the assertive streamlined communication with the decision owners to get actions quickly allowed and done.

- Skilled team focused on quality.

  The contractor company selected was qualified both in skills and experience in successful complex WiFi projects. The way project was managed cared result quality in each step taking actions to correct weak results or to get corrections for weak results of other projects affecting WiFi project quality. This was also very important to close the project assuring quality of every part of it up to the end including customer training, solution supportability and support to the initial running of the solution until stable.

- Right experts support hired

  Where an innovative solution was needed the provider searched and contracted external deep expert help to assure excellence in the design and implementation.

- Willingness to solve any problem proactively

  The team was highly motivated and committed with the desired result with total dedication and positive spirit which resulted in very creative overcoming of difficulties

- Fluent project and inter-project team communication.

  Key to success was early and complete sharing of information across the project stakeholders during the toughest moments of the deployment so that efforts were aligned and effective.

5. Discussion

In this part we are going to find how important each success factor is, searching how often same factors are stated in interviews and match this information with project management knowledge coming from literature.

Most common success factors perceived by stakeholders were:

- "Early project understanding and definition" and "Willingness solve any problem proactively". Stakeholders always mention together so these factors seem to be correlated.
- "Correct cost budgeting", was mentioned in two over 3 interviews done to the project team. The third one was the junior engineer's one. He wasn't concerned about the budget.
- "Determination. Quick and strong decision making and handling of unexpected circumstances" and "Close team work with the customer", is stated in all the project team and client interviews,
- "Skilled team focused on quality" and "Fluent project and inter-project team communication", is stated in two over 3 interviews done to the project team
- "Expert support hired", this is commented in the project manager interview and aimed to ensure a very good technical functionality.

When correlating the case project with the different success factor models described by the authors we find that:

According to the traditional "project management success factors and criteria" approach, the "iron triangle" of project management success factors consisting of cost, quality and time was achieved:

- They delivered on time the day the hospital opened to start staff training,
- They delivered in budgeted cost and
- They delivered with the technical specifications stated with the client.

Nevertheless, this achievement was not reached through a traditional planning and execution method but with a "service" approach. They adapted to the changing and not easy to predict environment while tightly managing risks, communication and changes.

We are going now to study the case project according to the "project success factors and criteria" approach.

First, we are going to analyse if the case project was a success. Let us check with the factors of an IT project identified by Petter, DeLone and McLean (2013).

- *System quality:* in that criteria the client says everything is working properly because the staff and patients did not complain about it, this are the people who are in touch with the system closely.

- *Information quality:* according to the information collected the IT infrastructure and management processes were carried out well.

- *Intention to Use:* WiFi communication is a key tool for hospital internal processes and for patient's satisfaction. So, it has been used intensively by the hospital staff and by their customers since the beginning.

- *User's satisfaction:* the interview with the client states this criterion was achieved. All the services work since inauguration.

- *Individual impact* and *Organizational impact* in this case is the same, the client was satisfied with the system, providing information quality, process enablement and velocity of decision for the hospital staff.

Looking at the six main risk factors affecting the success criteria according to Hussein studies we find:

- *Main risk factors during planning:* "Use of unrealistic targets" and "Lack of ranking among the criteria".

Thanks to the large experience of the project manager, targets were negotiated to be realistic and even some "unexpected" problems that appeared in the execution regarding mismatching with other related projects had been foreseen, it's risk had been evaluated and possible workarounds had been drafted in advance.

The work in project assessment with the customer was early, deep and close to him so the project manager had a very good knowledge about the needed WiFi project outcome and of the circumstances around the hospital building. That previous work was key to state the correct priorities and manage not to miss the real purpose of the project.

- Main risk factors during the implementation phase: "Incompleteness" and "Changing context".

As said before the project had been correctly prepared and so the desired results fit completely customer's needs and were planned to be achievable as they were finally achieved.

As explained in interviews, "Changing context" was by far the toughest risk factor to deal with and the one that put in biggest danger the success of the project. Although context had been foreseen to be unstable, the circumstances exceeded by far the evaluated risk and really stressed the project deployment. The key for factors for success in this environment were unanimously stated by all project members: "Determination. Quick and strong decision making and handling of unexpected circumstances" and "Close team work with the customer" along with creativity and tough work. As said by one of them they had to "run the extra mile" to avoid failure.

- Main risk factors during evaluation: “Subjectivity of measurement” and “Lack of long-term scheme for measurement after handing over”.

The close teamwork with the customer IT Director which was really involved in project follow up and demanding in results facilitated continuous criteria matching forcing negotiation to objectify measurements and avoiding deviation towards subjective individual evaluation.

The customer had experienced problems with WiFi solutions in other hospitals that were designed for a short-term specification compliance which seemed complete but showed unsatisfactory in the long term. Learnings from that past experiences were considered in this project that is seamlessly working since project completion.

Other of the objectives of this thesis is to define what the stakeholders have learned from the project to incorporate to future IT projects.

One of the things the project team learned is that project scope needs to keep increasing and considering additional circumstances and relations. Information stakeholders and information sources keep increasing and so has the global sight of an information project to grow to cover the whole picture and minimize the risk of performing incomplete or unfocused projects.

Another thing customer learned is that IT infrastructure subprojects inside bigger building projects are much more complex than just tasks to schedule. IT project manager needs to be inside the bigger project manager team and fluently collaborate with him.

The project team learned as well about being ready to face off the uncertainties. Uncertainty is an inevitable aspect of the projects, even the most proficient managers have difficulty handling it, but proactivity, creativity and quick decision making is key to success.

Another thing learned by the client and the project team is that teamwork between providers must be promoted. In this project the customer was the only communication hub. Information only went in vertical direction but no cross communication between projects existed. Communication must be horizontal and vertical like shown in the figure 3 to streamline decision making of small aspects and increase the vision of all the stakeholders. This was one of the things the team project would strongly demand in future assignments.

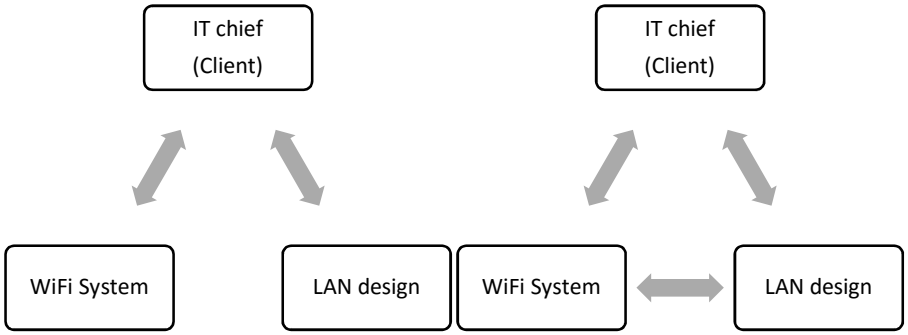

Figure 3 Communication diagram

6. Conclusions

The recommendations that should be considered to work in an IT project of this type which is part of a much bigger project are:

→ During the assessment, be careful to state relevant facts since the early stages of the project so as not to be misled by subjective sight of different non-expert stakeholders.

→ Be sure to know the point of view of all relevant stakeholders.

→ Set a clear agreement on relations and dependencies from other related projects so that your requirements from others become an evaluated milestone requirement for them as well.

→ Maintain a fluent teamwork relation with the teams of related projects.

→ Select reliable providers with ability, capability and availability to fulfil your requirements. Push and make sure you get very strong commitments from them.

→ Study real project evolution risks and foresee likely “unexpected” problems. Search a safe way to fulfil project expectations flexible enough to be able correct unexpected events at the most.

→ Nominate an internal IT representative inside the big project team to improve communication, facilitate planning, avoid waste of resources and improve results.

→ Adapt to the real circumstances being able to redesign, reschedule and rework for the better in an honest agreement with the rest of stakeholders.

→ Have provider contracts agreed and signed with enough time in advance.

7. References

Atkinson, R. “Project management: Cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria”, *International Journal of Project Management.* 17(6) (1999), pp. 337-342.

Bryde, D.J. Methods for managing different perspectives of project success, British Journal of Management. 16(2) (2003) pp. 119-131.

Bryman, A. and Bell, E. (2015) *Business research methods*. New York, USA: Oxford University Press Inc.

Chapman, C.; Ward, S. and Harwood, I. (2006) Minimising the effects of dysfunctional corporate culture in estimation and evaluation processes: A constructively simple approach, International Journal of Project Management, vol. 24, pp. 106-115.

Collins, G. “11 factors for successful Wi-Fi implementation”,2015. (online). Available: http://www.hotelnewsnow.com/Articles/26368/11-factors-for-successful-Wi-Fi-implementation

De Wit, A. Measurement of project success, International Journal of Project Management. 6 (3) (1988) pp. 164-170.

Hastie, S. and Wojewoda, S. “Standish group 2015 chaos report - q&a with Jennifer Lynch,” 2015. (Online). Available: https://www.infoq.com/articles/standish-chaos-2015.

Howell, M. T. “Critical Success Factors Simplified: Implementing the Powerful Drivers of Dramatic Business Improvement”. New York, NY: Productivity Press. (2009)

Howsawi, E.; Eager, D.; Bagia, R. and Niebecker, K. The four-level project success framework: application and assessment, Organisational Project Management. 1 (1) (2014) pp. 1-15.

Hsieh, J.J.P.-A.; Rai, A.; Petter, S.; and Zhang, T. Impact of user satisfaction with mandated CRM use on employee service quality. *MIS Quarterly, 36,* 4 (2012), 1065–1080.

Hussein, B. Factors Influencing Project Success Criteria. In Proceedings of the 2013 IEEE 7th International Conference on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS): IEEE conference proceedings (2013), 566–571

Kerzner, H.R. Project management metrics, KPIs, and dashboards: a guide to measuring and monitoring project performance, John Wiley & Sons, New Jersey, 2011.

Kothari, C. R. (2004) Research Methodology: Methods and Techniques. New Delhi New Age International Pvt. Ltd., Publishers

Leonard-Barton, D. and Sinha, D.K. Developer–user interaction and user satisfaction in Internal technology transfer. *Academy of Management Journal, 36,* 5 (1993), 1125–1139.

Machado, F.J. and Martes, C.D.P. Project management success: a bibliometric analysis, Proceedings of 12th International Conference on Information Systems & Technology Management – CONTECSI, São Paulo, CONTECSI, 2015.

Müller, R. and Turner, R. The influence of project managers on project success criteria and project success by type of project, *European Journal Management*. 25(4) (2007), pp. 298-309.

Petter, S.; DeLone, W.H.; and McLean, E.R. Measuring information systems success: Models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17,* 3 (2008), 236–263

Petter, S.; DeLone, WH and McLean, ER, Information Systems Success: The Quest for the Independent Variables, Journal of Management Information Systems, 2013, 29(4), 7-62

Pinto, J. K. and Prescott, J. E. "Variations in Critical Success Factors Over the Stages in the Project Life Cycle", *Journal of Management*. 14(1) (1988), pp. 5-18.

Pinto, J. K. and Slevin, D. P. "Critical Factors in Successful Project Implementation", *IEEE Transactions on Engineering Management*. EM-34(1) (1987), pp. 22-27.

Project Management Institute, Project Management Body of Knowledge (PMBOK) Guide, 5th edition, Project Management Institute, 2013.

Radujkovića, M. and Sjekavicab, M. Project Management Success Factors, Creative Construction Conference (2017) pp. 1-3.

Thomas, J. and Mullaly, M. Researching the value of project management, Project Management Institute, 2008 according to F.A. Mir, A.H. Pinnington, Exploring the value of project management: Linking Project Management Performance and Project Success, International Journal of Project Management. 32(2) (2014) pp. 202–217.

Westerveld, E. The Project Excellence Model®: linking success criteria and critical success factors, International Journal of Project Management. 21(6) (2003) pp. 411-418.

Yin, R. K. (2013) Case study research: Design and methods. Sage publications.

Young, R. (2006) Project requirements: a guide to best practices. Vienna, Va.: Management Concepts.