UNIVERSITY OF TURKU

ABSTRACT

Abstract

This paper concerns the evaluation of the user-perceived performance of e-collaboration suites. The research includes a literature review explaining all the main concepts as well as theoretical frameworks that helped exposing the importance of the evaluation of user-performance perception. Additionally, a theoretical framework is conceived and supported by the application of a quantitative study.

Primarily, a questionnaire is created based on the literature called the Perceived Performance of Collaboration Suites Questionnaire (PPCSQ) in order to fully apprehend the evaluation of perceived performance of a tool. Afterwards, this method is tested on a case study in order to provide a wide framework to be reused for any type of tool or software. After the conduction of the quantitative research, the results are analyzed in order to comprehend some of the behaviors the users have towards each collaboration tools as well as the overall collaboration suite.

The aim of this study is to fill a gap left in the actual literature by providing a method to evaluate the user perception of the performance.

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USER-PERCEIVED PERFORMANCE OF E-COLLABORAITON SUITES

A post-implementation evaluation based on a case study

Master's Thesis in Information Systems Science

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1 INTRODUCTION

1.1 Research area

Due to the growing number of organizations during the past 10 years, the need to collaborate for companies has become more and more important and necessary for companies. Companies are more and more distributed around the world and are looking for effective and efficient ways to work from and with different locations.

Companies concerned by this situation started to implement different solutions in order to overcome the communication and management problems that can emerge. Lin et al. explain it as the "rapid development of technologies related to enterprise management, which can help organizations to keep up with the continuously changing business world" (Lin, Zhu, Zuo, Wu & Xiong, 2017, 1417). According to Basal & Steenkamp the shift towards emerging web application can be explained due to the rapid expansion of Platform-as-a-Service (PaaS) (2012).

These technologies helping organizations with their management and to maintain their market position as well as those new Platform-as-a-Service can take the form of collaboration tools.

Collaboration tools can exist under different circumstances; some are standard and available on the market while others are built by specialists in order to fit the needs of the organizations.

Exhaustively, the most relevant studies concerning e-collaboration presented in this paper were made by Ned Kock, a pioneer in the collaboration field in which he started studying from the beginning of this century. Kock provides a general definition of collaboration and specifically online collaboration but exposes also its challenges and opportunities as well as its boundaries. Additionally, Xu, Zhang, Harvey, & Young (2008) and Lomas, Burke & Page (2008) provide a deeper understanding of e-collaboration tools while McCabe (2010), Sperl (2009) and Fichter (2005) provide insight about collaboration suites.

1.2   Research gap

The measurement of collaborative tools and of their performance is important to survey its user satisfaction. The effective measurement of a tool after its implementation in an organization is one of the key objectives of the tool provider as well as the client. However, the measurement of a tool can be executed based on several metrics such as performance, quality or even usefulness and ease of use, just to cite few. In addition, perceived and actual measures are different as they are not measured the same way.

Perceived performance evaluation is seen as important as it can result in concrete opinion from users who in the case of collaboration tools are the end-users of the tool or software measured. The future ameliorations and developments of the tools will be drawn from these and have the objective to increase the user satisfaction. As a matter of fact, according to La et al., a link exists between perceived performance and client satisfaction which then can lead to a strong competitive advantage which explains the importance of its evaluation (La, Patterson & Styles, 2008).

As the technology is evolving, the adoption of collaboration tools increases in organizations mainly in order to manage projects. However, no previous studies have broached the subject of post-implementation evaluation of collaboration tools and specifically, the evaluation of users-perceived performance.

In the last couple of years, studies have shown different ways to measure perceived performance however none of those studies were focused on the collaboration field. Perceived performance indicators are not heavily present quantities in the present literature and are subjective as they depend on the author's choice to integrate them into its study and depend on the tool, software or instance measured. Several research methods were used in those different studies and a large amount of different results were provided.

To fill this gap, this paper proposes a model to measure the user-perceived performance of collaboration tools and suites after their implementation in an organization for management purposes.

1.3   Problem statement and research questions

Therefore, this research is focused around one main research questions and several sub questions. The research questions will be answered through the literature review as well

as through a quantitative study. The sub questions have been designed to help answering the main research question as well as diving deeper into the collaboration field. The main research question is derived as follow:

How are e-collaboration suites user-perceived performance measured?

As mentioned, the additional supplementary questions constructed to deepen the main one are the following:

Research question 1: **Why is user-perceived performance evaluation useful?**

Research question 2: **How to select items for a questionnaire?**

Research question 3: **From which item is there more knowledge from?**

As previously mentioned, the answers of the questions above will be answered by conducting a literature review of the related concepts as well as through the research method and application of this study. The results will also be summarized in the conclusion part.

1.4   Thesis structure

The first part of the thesis focuses on the literature review. This part is composed of different subsections leading to a full comprehension of the several themes addressed. All of the different themes are compared with the current researches in order to get a full understanding of what has been executed and researched previously and what this paper is focusing about. An in-depth description of collaboration tools was made with a specific attention on their features and what they are enable to do in order to be further used in the research. Importantly, the classification of previously executed researches about perceived perception is also presented in this part.

However, research papers sources do not fit perfectly our field, they still were considered as relevant in order to get an understanding of the subject.

The second part concerns the theoretical frameworks this paper is based on. A review of the different theories concerning the links between perceived performance and customer satisfaction was made. This link was reported in our field as a way to understand and improve collaboration suites in order to satisfy users needs and requirements.

The next part of the paper deals with the research methodology by exposing the research design followed during this research as well as the data management during its progress. The choice of the methodology was based on the perceived performance literature review.

The last part exposes the results obtained through the research via the questionnaire created and implemented for it. Specifically, the perceived performance of each tool will be evaluated in order to measure the overall perceived performance of the collaboration suite. In addition to that, the relationship between perceived perception and user satisfaction will be made. A discussion is also conducted in order to understand the scope of the results as well as the limitations of the study and future researches directions.

1.5   Study relevance

Reviewed academic literature gave the beginning of an understanding on what researchers started to investigate. Only a few studies in different fields treating about perceived performance were found but none concerning collaboration.

1.5.1   Theoretical relevance

Due to the very low number of studies focus on post-implementation user perception evaluation, a process to measure of user-perceived performance of an e-collaboration suite was decided to be determined. Importantly, this thesis will be considering various researches in relation to perceived performance, perception and collaboration separately in order to gather the most information possible to try to bridge the research gap.

Each collaborative suite is composed of diverse and several collaboration tools with some of them displayed more frequently than others. Hereby, the creation of a general framework and process enabling the measure of any collaboration suite was missing in the current literature. This study fills the gap left by the lack of literature on the subject by providing a theoretical framework, a research method and a calculation method.

The aspect of e-collaboration suites will be dealt with in a very detailed way in order to fully explain how it is built, how it works and who is using it.

1.5.2   Practical relevance

The research conducted in this thesis acknowledges several practical outcomes. The first one concerns a full comprehension of the growing importance and presence of collaboration tools and suites in the corporate world nowadays. Then, the second one allows a theoretical framework which can be used to measure the perceived performance of any collaboration suite. This can be utilized by companies providing the collaboration tools as well as the client implementing it. Finally, the third one concerns the results of the research which is the practical use of the framework created previously. Those results should allow for a better understanding of user's satisfaction of the implementation of collaboration tools and suites.

Furthermore, the topic of this study was inspired by the author's internship within the company Diadeis which provides e-collaboration suites to their clients. The aim of this research is to provide a theoretical framework as well as a questionnaire to measure the user-perceived performance and is tested on the collaboration suite proposed by Diadeis. This will help the company identifying which tools are not well perceived and provide it with the actual behavior of users towards the tool. In addition, it is a firsthand evaluation for further researches to identify the future developments and corrections to put in place on the suite.

For users, this research is a way to bring up the positive and negative aspects of the suite in order to provide insights on the possible future improvements.

2 LITERATURE REVIEW

The following part concerns the different terms relevant for this research paper. Indeed, it is composed of four different sections exposing and explaining the relevant and essential information for the rest of the research about e-collaboration, e-collaboration suites and tools as well as exposing the current state of researches concerning collaboration and perceived performance.

2.1 E-collaboration literature

Collaboration has always existed in the human society and can take different forms like, among other things, a discussion between colleagues, sending an email or even taking part of a meeting. On an information technology context, Elliott considers collaboration as "Active participation between two or more people to achieve a common goal such as co-authoring literature" (2010, 30).

However, according to Kock (2001), the apparition of researches and literature introducing and dealing with e-collaboration started to emerge only from the 1970's. It coincides with the appearance of one of the first e-collaboration system: the electronic information exchange system (EIES), which was used and studied for asynchronous conferencing (Kock, 2001).

Furthermore, as stated by Kock (2001), nowadays, one of the main challenges when approaching the e-collaboration studies is the lack of theoretical researches. Due to this, it is difficult for empirical researches to be supported by literature. Always according to Kock, the solution can be for e-collaboration researchers to "be able to summarize large sets of related findings into theories or theoretical models" (Kock, 2001, 6).

2.1.1 Defining e-collaboration

E-collaboration has grown as an important topic over the past decades and documents treating this topic were published in some famous journals such as the IEEE TRANSACTIONS ON PROFESSIONAL COMMUNICATION. Due to this growing importance among researchers, new definitions of e-collaboration have emerged in the last couple of years. (Kock & Nosek, 2005)

Before defining e-collaboration, we first need to determine the term "collaboration. In the contemporary era, Hargis & Wilcox define collaboration as "a social structure in which two or more people interact with each other" (2008, 2). And, to go further, Xu et al. consider collaboration as the interaction among participants and collaboration tools as the way to ensure the communication to be "as easy and efficient as possible" (2008, 1182).

Therefore, in our study we consider collaboration as a wide term defining any exchange of information between two or more persons in everyday life or in professional circumstances.

With the apparition of the World Wide Web and the use of Internet, a new collaboration trend has emerged: e-collaboration (Munkvold & Zigurs, 2005; Rutkowski, Vogel, Van Genuchten, Bemelmans & Favier, 2002). E-collaboration is defined as "collaboration using electronic technologies among different individuals to accomplish a common task" by Kock (2006, 4) which considers this definition as the operational one. An interesting thing to note is the challenge of developing e-collaboration technologies for teams to be efficient from different places at different times (Kock & Nosek, 2005).

Therefore, in this study, e-collaboration is considered as a term defining any exchange of information between two or more persons by using electronic technologies.

Kock & Nosek (2005) define e-collaboration technologies as "the communication medium created by the technology" and the "technology's features that have been designed to support e-collaboration". (2005, 4) Therefore, in our study, e-collaboration technologies are considered as collaboration tools and their features enabling e-collaboration.

Importantly, in the following content of this study as well as in the actual literature, the term e-collaboration is generalized as collaboration even though the researchers are employing e-collaboration tools and e-collaboration technologies as collaboration tools.

Turel & Connelly (2011) argue with different e-collaboration challenges and benefits. They consider that the decision-making process is more fair where normally excluded people can participate. They support that other benefits would be costs reduction, faster decision process and increase of sales.

The challenges exposed by Turel & Connelly concern the distance and "the lean nature of media" the contrary of "richer media" (2011, 704). They consider emails and

instant messaging as lean media and affirm that their use can lead to several different challenges such as "unproductive conflict or conflict escalation, information suppression or low levels of knowledge sharing between team members, difficulty in building trust when low levels of trust exist initially, challenges in communicating and understanding the context and salience of information, and difficulty in developing a shared identity." (Turel & Connelly, 2011, 704).

Furthermore, in their paper *Expanding the Boundaries of E-Collaboration*, Kock & Nosek (2005) introduce the terms of theoretical, technical, use and conceptual e-collaboration boundaries. The theoretical boundary of e-collaboration is the implication of human presence and interaction; indeed, understanding and facilitating capacities are not the same for everyone and different theories deal with this subject. Technical e-collaboration boundaries deal with technological enhancements; it can include browser-based development or conceptualization problems, for example. Use e-collaboration boundaries deal with the actual use of a collaboration technologies but not at its fullest and how it can improve expectations of users. Finally, conceptual e-collaboration boundaries concern "individuals, groups, organizations, and even a field of study" (Kock & Nosek, 2005, 5) and is linked to the previous boundaries.

2.2   E-collaboration literature

Collaboration is often supported by different collaboration technologies (Kock & Nosek, 2005) which can take different aspects such as collaboration tools.

Collaboration tools are described as collaboration technologies enabling e-collaboration by Xu et al. (2008). They can exist individually as a software, an application or a web solution or additionally they can be embedded inside collaboration suites.

A first definition of a collaborative suite is given by JournalDuNet.com (or JDN), a French online newspaper, as a "set of applications and software **provided by the same service and linked together**, which facilitates teamwork, by sharing information online, project management or communication tools efficient and innovative." (2019).

The main advantage with online collaboration tools and suites is that they are web-based. It means that the users don't need any installation of software or hardware. They just need to connect through a web-page with their login credentials to access to the suite (McCabe, 2010).

In addition, an online collaboration suite is described as "an integrated set of Web tools that span a range of collaboration needs" by McCabe (2010) in her article *What's a Collaboration Suite & Why Should You Care?*. She explains that every online collaboration suite is different and doesn't provide the same capabilities. It shows that every collaboration suite created doesn't display the same tools depending on the users' needs.

Furthermore, based on Kock & Nosek work and by assuming that collaboration tools are collaboration technologies, we can use as a wide collaboration suite the following definition: a set of tools "to support electronic commerce and supply chain transactions involving two or more organizations" (2005, 1).

As a matter of fact, there are different collaboration suites on the actual market and a company needs to evaluate each option before picking the one that suits it the best.

One way to differentiate between collaboration suites is the required initial investment that the organization needs to make. Therefore, according to Sperl (2009), there is a clear difference between free collaboration suites and subscription-based ones. For example, Zimbra is a monthly-subscription collaboration suite whereas Google and Microsoft propose free ones.

Free collaboration suites can be further categorized based on if they are chosen for daily or student use for example. However, in the business world, they can pose some privacy and security concerns. Other concerns such as the support availability and the need to rely on third-party applications were also raised (Sperl, 2009). In addition to Sperl (2009) categorization of collaboration suites, Fichter (2005) study, goes even deeper by classifying subscription-based collaboration suites into two categories: available on the market and built-in as displayed in Figure 1.
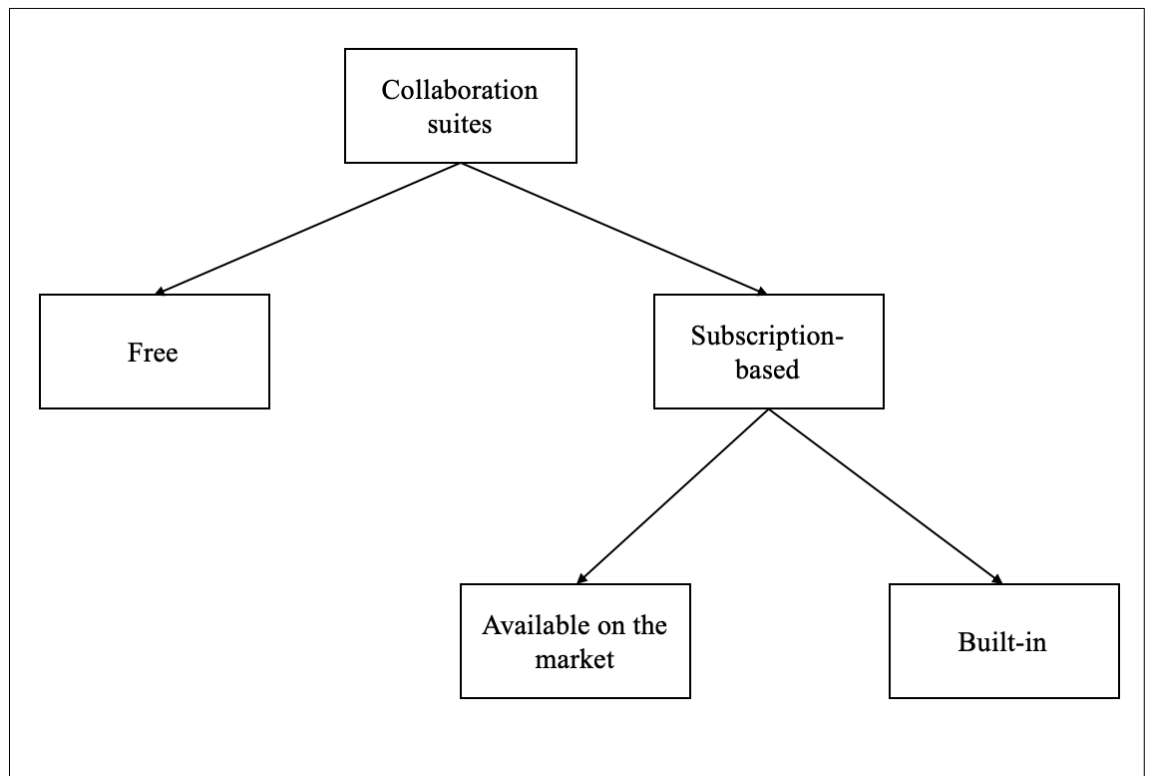
Figure 1. Classification of collaborative suites

Indeed, as claimed by Fichter (2005) sometimes companies won't need specific features or tools and will work with the ones already provided on the market but in some cases built-in collaboration tools or suites are the best fit to meet a company's needs. The main advantages of built-in collaboration suites are the agile management put in place for the users and the "personalization" of the service. However, the cost is higher than for suites available on the market.

In addition, Munkvold et al. categorize enterprise scale collaborative product suites as "an integrated e-collaboration technology available in the marketplace nowadays" (2005, 2).

In this study, built-in collaboration suites are considered as any collaboration suite provided by a company in exchange of a monthly, quarterly or annually subscription and which is specially customized and constructed in order to fit the company's needs.

One example of collaboration suite subscription-based and available on the market is explained by Noy & Musen (2003) in their study about the Prompt suite. According to them, a **suite** includes different tools, sometimes of different types, for different tasks and different uses. Additionally, in their research the Prompt suite includes: an interactive

tool, a graph-based tool, a comparison tool as well as an extracting tool. Interactions appear between the different tools present in the suite. Indeed, when an element is developed for one tool, another tool can benefit from it and it can improve its use as well. Some information can also be transferred and connected between the different tools (Noy & Musen, 2003). This statement is maintained by McCabe (2010) who confirms that collaboration suites can be composed of different web tools such as "business email, instant messaging, contact management, calendars, file sharing, document management, project management, portals, workspaces, Web conferencing, and social media tools such as forums and wikis".

Another example of collaboration suite available on the market is present in Sperl's (2009) paper about trainings for collaboration suites; it focuses on the Zimbra collaboration suite which is also mentioned in Xu et al. (2008) paper.

As stated previously, Google and Microsoft both propose collaboration suites to their users and can be classified as free. JournalDuNet.com (2019) describes the G suite (Google suite) as very intuitive and simple and it is composed of different tools such as Google sheets which enables the creation and the use of spreadsheets, Google Drive which acts as a storage cloud, Google Doc which enables the creation, use and sharing of text documents, Hangouts Chat to communicate, Google Slide to create visual presentations and Google Site to create easily websites (JDN, 2019; Vogel & Cheung, 2013).

On the other hand, examples concerning built-in collaboration suites might be difficult to find because they are provided by private companies. The company ESKO provides a collaboration suite called WebCenter which helps for the packaging management of the company. A direct competitor which will be later induced and explained in this thesis is the Mediabox Independance suite which is provided by Diadeis a company from the worldwide SGS group which also enables a better packaging and design management.
.

Due to their increasing number, the selection of the best collaboration suite for a company might be challenging. In order to do so Fichter (2005) highlights the importance of defining the needs the future suite needs to fill. They often cover three main categories: communication, sharing and management which can be investigated by asking about the communication frequency, the types of communication necessary, the users rights (who can see what), the document creation process, the approval process and the number of users (Fichter, 2005).

2.3   E-collaboration literature

Nowadays, in the Web 2.0 era, e-collaboration can take different forms and can be facilitated thanks to what are called collaboration tools (Xu et al., 2008). As Riboulet and al. (2005) explain in their research, companies are more and more used in the corporate world by the growing level of urgency and demands from clients. In order to answer to that, they often decide to call on "experts" in their field who are regularly situated in distributed areas. Due to this geographical distance, experts and teams need to learn how to collaborate and very often it goes through collaboration tools and collaboration suites.

To confirm his claims, Xu et al. consider that the rise of collaboration tools is due to the current era and the emergence of Web 2.0. Nowadays, many advanced collaboration tools are existing but in the early age of the trend, they were defined by "e-mails, bulletin board, Internet Relay Chat (IRC), white board and desktop sharing" (2008, 1182).

The choice of considering various study fields for this paper was motivated by Kozlowska who stated that the need of collaboration tools by explaining that the rise of interdisciplinary projects requires thorough expertise in various fields "that are not always related" (2018, 118). It leads to interdisciplinary collaboration which feature the "active consulting, lifelong learning and direct application of a relatively new field" (Kozlowska, 2018, 118). In addition, Ebert, Lanubile, Prikladnicki & Vizcaíno argue that distance can cause "coordination and control problems, directly or indirectly, through its negative effects on communication" (2010, 52) which can be solved with the use of collaboration tools.

Indeed, collaboration tools are stated as an essential element to ensure a good collaboration in interdisciplinary, geographically distributed and electronically conducted projects. Ebert, et al. confirms the primary need for collaboration tools as they enable "the facilitation, automation, and control of the entire development process" (2010, 52).

2.3.1   Defining e-collaboration tools

As previously mentioned, collaboration tools are Information and Communication Technologies (ICT) enabling a good collaboration between companies, organizations, team, colleagues, etc.

Fichter (2005) describes e-collaboration tools, also called online collaboration tools, as means to enable the collaboration between teams but on the web. Additionally, they are described by Ebert et al. as "essential to collaboration among team members, enabling the facilitation, automation, and control of the entire development process" (2010, 52). In addition, they describe the use of collaboration tools as tightly linked to the product life cycle.

Lomas et al., on the other hand, proposes a wider definition of collaboration tools as "those that enable remote collaboration" and their main feature as allowing "interaction on a shared resource" (2008, 3-4).

According to Kock (1999), the appearance of the first e-collaboration tool goes back to the late 1960s when the "electronic emails" were created in order to allow the exchange of information through the ARPANET, the ancestor of our today's internet. Emails were "the first technology to be used to support e-collaboration work". (Kock, 2005, 2).

However, many different collaboration tools are currently existing and even more are emerging according to Riboulet, Marin & Leon (2002) and Lomas et al. (2008). Some examples of existing collaboration tools are presented by Lomas et al. (2008) which are well-known but not always acknowledged as Information and Collaboration Technologies (or ICT); they are displayed further in the literature.

One of the main reasons to adopt collaborative tool is **the gain of time**. In fact, it accelerates the creation and reviewing of tasks in project management for example and it also allows the migration of data through the system faster. Online collaboration tools can help teams collectively author, edit, and review materials in a group workspace (Fichter, 2005).

Kozlowska considers the optimum collaboration tool as "intuitive, available worldwide, multilingual and compatible with popular computer software as well as with different versions of itself" (2018, 119).

2.3.2   E-collaboration tools features

According to Fichter (2005), e-collaboration tools enable different basic and common services such as *communication, information sharing and sometimes the discovering of new members of the community*. Some additional services and features might be added

such as *calendaring, instant messaging, visio-conferencing, shared whiteboards and rec-ommender systems.*

The other current features of collaboration tools according to Lomas et al. (2008) are listed as followed: Strong Communication Capability, Easy-to-Understand Interface and Capability and Expectation of Collaboration.

A *Strong Communication Capability* in a collaboration tool enables a good interaction among participants, colleagues or teams. It can be through audios, videos, chat or even shared documents. Then, the *Easy-to-Understand Interface* feature concerns the user experience which should be intuitive and fluid. Finally, the feature *Capability and Expectation of Collaboration* means that an input is expected from the user in a collaboration tool and the expectation of this input must be clear to the user. Lomas et al. (2008)

According to Hargis & Wilcox, collaboration tools enhance collaborative environment due to their features enabling "voice, video, text, simultaneous editing, and immediate feedback" (2008, 1).

Lomas et al. (2008) explain that with the rise of Web 2.0 new tools have emerged and, with them, new features which they qualify as: Multiple Collaborators, Synchronous versus Asynchronous Collaboration, Role-Based Sharing, Discoverable Collaborators, Ownership of Contribution, Playful or Engaging, Social

The notion of synchronous versus asynchronous collaboration is supported by Xu et al. (2008) who classify collaboration tools into 2 different types: synchronous and asynchronous. They define a synchronous tool as a collaboration tool enabling teams to work together but at the same time or on the same time frame while an asynchronous tool enables teams to work at different times.

2.3.3 E-collaboration tools categories

In fact, those new tools often combine existing collaboration methods with brand new features. Lomas et al. (2008) and Xu et al. (2008) propose their own classification of those new features. Xu et al. (2008) classify those new features into four major tool functional categories explained below: communication, information sharing, group calendar, project management.

Communication concerns the exchange of messages or ways to share information. It can include tools like emails, instant messaging or even chat rooms. Emails are currently

the most used in the everyday life as they formalize the communication compared to instant messaging which is useful to get an information quickly. An example of instant messaging would be Microsoft Teams or Skype which both enable video calls and creation of groups in order to address directly to several people (Xu et al., 2008).

Information sharing, as its name indicates, enables the sharing of various types of information. The information sharing feature is different from the communication one as its main goal is to share data such as files or statistics or even news to several people. Discussion threads and shared folders are often use in order to distribute information but the use of cloud is also becoming a trend. Microsoft Teams and Google Drive are both information sharing tools as they enable shared folders with documents inside available to restricted groups of collaborators (Xu et al., 2008).

Group calendar is used very frequently by companies in order to plan some meetings and keep an eye on everyone's schedule. In general, when an event or upcoming meeting is planned, an email is sent to the participants. Automatic notification and shared calendar are the features the most used in collaboration tools. Outlook Calendar is an example of collaboration tool using this category feature as it enables the sending of a notification (mostly in the form of an email) to invited persons for a meeting (Xu et al., 2008).

Project management includes common features such as tasks assignment, timesheet, Gantt chart and KPIs. Project management is a very wide and complicated process which can have different features. E-Groupware and ZOHO project are two project management collaboration tools using tasks, timesheet and Gantt chart features (Xu et al., 2008).

In contrast with Xu et al. (2008), Lomas et al. (2008) classify those new tools emerging through Web 2.0 within different categories based on "the activities and the opportunities they enable: Immediacy, Enhanced voice communications, Ambient communications, Image sharing, Document construction, Social interaction and Geographic richness". (2008, 5)

To go deeper in those terms, *immediacy* refers to the rapidity information can be spread and shared through the help of some common collaboration tools such as Gmail or Yahoo. Then, *enhanced voice communication* categorizes the tools enabling phone calls integrating for some of them the option of videoconferencing, more than one person speaking or even recording such as Skype while *ambient communications* integrates tools enabling the ability to ask a question or information about something at any time. Social networks such as Twitter or LinkedIn are categorized as Ambient communication tools.

Then, *image sharing* enables the instant share of images from individuals to other individuals or to other groups. Social networks such as Pinterest or Flickr are considered as Image sharing tools. In addition, *document construction* regroups collaboration tools such as Google Docs enabling different individuals to create and modify simultaneously a document. Then, *social interactions* concern collaboration tools enabling creating a network and maintaining links between individuals. Facebook is an example of tool enabling social interactions. Finally, *geographic richness* concerns collaboration tools using geographical location to create spatial connections between users such as Google Earth (Lomas et al., 2008, 8).

In addition, a collaborative tool very often displays a client-server architecture but they can also display a peer-to-peer architecture or a hybrid one (Xu et al., 2008). A client-server architecture means that "the collaboration related-data are stored on the server" (Xu et al., 2008, 1183).

In conclusion, "the best collaboration tool is the one that meets users' needs. This study helps readers in making the right choices" (Xu et al., 2008, 1187).

What implies collaboration and collaboration tools was the primary question needed to be elucidated before measuring the perceived performance of collaboration suites.

The main objective of this user research is to set up several baselines features so as to achieve to determine the perceived performance and effectiveness of an e-collaboration suite and how much its tools are impacting project management.

2.4   Perceived performance literature

Here, the objective of measuring user-perceived performance of a collaborative suite is to measure if a collaboration suite is correctly functioning according to the features previously planned for each collaboration tool. More in detail, it concerns judging the ability of the suite to achieve the tasks it is employed for but also, judging if they are completed within a tolerated and admissible amount of time (Mainkar, 1997). Furthermore, with the help of a user satisfaction analysis, it is possible to identify the users' attitude and preferences (Grigoroudis, Litos, Moustakis, Politis & Tsironis, 2008).

However, the main objective of this paper is to provide to companies having implemented a collaboration suite or tool a method to assess its user-perceived performance.

Over a longer duration, the main benefit targeted for studying user-perceived performance is a future optimization of the collaboration suite to better satisfy the user (Mallik, Cosgrove, Dick, Memik & Dinda, 2008).

As a matter of fact, Kumar states that "both management and IS professionals recognize evaluation of the applications as one of the important unresolved concerns in the managing computer resources" (1990, 203).

Fontoynont (2002) confirms this statement by comparing it to refurbishment for buildings by stating that user-perceived type of studies could be used before refurbishment of buildings in order to implement the most important changes for the client. In this research, it corresponds to using a user-perceived study before implementing new developments on the suite asked by the users.

Fontoynont (2002) declares that performance can be judged over two durations: instantaneously or in the long term. In this study, we consider the instantaneously duration as the research is done at one point in the time and not over a long period. In addition to that, Enrech-Xena (1999) exposes the importance of the relation between the actual environment and the expected one. Comparing to our study, the difference between the actual use and possibilities of a collaboration suite is different from its expected use, however they are tightly linked.

Consequently, evaluating the user perception of the performance of a collaborative suite is different from evaluating the actual performance of the suite. However, this evaluation can help implementing the next evolutions and developments of the software and expose the relation between the actual situation and the expected one by the users.

Literature about collaboration suites is at its beginning; in the business world, considering collaboration as a tool and a potential strength to grow and increase company's performance is recent. Many different existing researches about collaboration suites concern their implementation which is perceived as one of the main challenges for e-collaboration technologies (Munkvold et al., 2005) but none of them was found to measure their user-perceived performance post-implementation.

Indeed, a great number of previous researches focus on the pre-implementation of collaborative technologies such as their adoption, implementation and choice, where, in this study, we consider the post-implementation perceived performance evaluation.

This is why, we decided to take into consideration papers dealing about the post-implementation evaluation of computer-based information systems, the actual performance evaluation of a system and user-perceived quality as well as papers related to the present research but in a different field.

2.4.1 Defining perception

According to the Cambridge Dictionary, perception is defined as "a belief or opinion, often held by many people and based on how things seem" or "the way that someone thinks and feels about a company, product, service, etc.". Perception therefore implies the "human" factor and is difficult to measure as it depends partly on past experiences which are different for every user.

In the existing literature, perception is very used to measure different types of elements in different fields such as, for example, Motivational Climate in sports (Fry, Duda & Chi, 1993), Political Considerations in performance appraisal (Tziner, Latham, Price & Haccoun, 1996) and Human-Robot Collaboration (Liu, Hamrick, Fisac, Dragan, Hedrick, Sastry & Griffiths, 2016).

However, perceived performance is hardly ever used in order to assess collaboration technologies, including tools and suites. According to that, it is considered that the literature concerning perceived performance is tenuous.

In the current literature, the studies measuring the perceived collaboration performance exist but are not common and use different methods explained further. Mainly, in researches concerning perceived performance, a quantitative method is used in order to submit a questionnaire to the target respondents. However, some researches also include a qualitative method such as in-depth interviews before distributing the questionnaire. (La et al., 2008; Frédouet & Le Mestre, 2005)

In their research *Explaining perceived performance of the World Wide Web: uncertainty and the task-technology fit model*, D'Ambra & Wilson (2004) analyzed the impact of information technologies on organizations. To do so, they used several items for different categories. To measure the performance impact, they used the items directly from D'Ambra and Rice (2001, 379) work. Those items are found to be well-grounded in measuring perceived performance impact of collaboration suites. Brought back on the collaboration suite field, the items corresponding would be **the ability to work, the quality, the gain of time and the ability to take better decisions**.

Because the literature about collaborative suites perceived performance is tenuous, we decided to investigate different researches where user's perceived performance is measured in different fields in order to create the best clusters and items to evaluate a collaboration suite perceived performance. The following sections divide the several researches selected based on their research methods.

2.4.2   Quantitative research method

Convertino and al. built their research *Board-Based Collaboration in Cross-Cultural Pairs* (2006) on a quantitative research method via a questionnaire organized by clusters. Every item (74 in total) was stored in one or several of the following clusters: common ground, awareness, cognitive consensus, perceived satisfaction, and performance. Additionally, the Likert scale from 1 ("strongly disagree") to 7 ("strongly agree") was used in order to weight every item and every cluster.

The use of the Likert scale is very often used in order to measure perception as it is submitted via questionnaires to full-fledged people with their own opinions and experiences (Liu et al., 2018).

Syarnubi, Sembiring, Siswaya & Zuraida (2018) discuss in their paper *Performance, productivity, and safety & health among employee of oil & gas company in Qatar* the perception of performance, productivity, safety and health at workplace by operators and managers/supervisors. To do so, just like Convertino and al. (2006), they used a quantitative research via a questionnaire, this time, with questions related to performance, productivity, safety and health. The questionnaire was then divided into three main categories (or clusters): work performance, work productivity and OSH and each of them was composed of different items.

In addition, Syarnubi et al. (2018) define work performance as "quality and quantity of work achieved by an employee" but insists it's different from productivity. Even if those two subjects are tightly linked, the present study focuses on performance and this is why, only the category work performance of this study will be considered.

To assess the questions in the survey, a Likert scale was used as well but this time only from 1 to 5 compared to the Convertino and al.'s (2006) questionnaire. In the cluster, the items Quality, Quantity, Reliability, Attendance and Work as a team were evaluated through different statements for each of them.

Davis (1989) also used a questionnaire constructed with different items expressed in statements in order to measure the perceived usefulness and the perceived ease of use for the Technology Acceptance Model (Chuttur, 2009).

On the author's opinion, all of the previous items found in the literature are enabling to measure the technical capacities of the tools of Mediabox suite. However, none of them is providing metrics about the overall Mediabox performances as a software neither the topic of page delay was approached.

In our research, we discovered that Kaasila (2018), in his blog entitled *How to Measure Mobile App Performance Metrics That Matter*, provides useful items in order to monitor the overall performance of a mobile application and the loading delays. Kaasila's (2018) metrics are *the total availability* concerning the ease of access to the service provided (e.g. ease of connection to the collaboration suite through the day and over a long period of time), *the Time to First Byte* (or TTFB) which measures the speed the backend server sends the first responses (e.g. when connecting to the collaboration suite). Then, the *reaction time,* different from the TTFB, concerns the speed at which the Mediabox reacts to user inputs (e.g. when searching for a keyword or a document, the speed it starts showing the results, for example) and finally, the *time to load* concerns the time it takes between the connection to the Mediabox and the moment you can start using it for your job.

The notion of page delay in order to measure user-perceived performance is also supported by Shankaranarayanan, Jiang & Mishra (2001) as well as Lomas et al. (2008) with their notion of Immediacy explained in the previous literature.

Grigoroudis et al. (2008) present in their research an "analysis of user-perceived web quality through a pilot customer satisfaction survey for the major cellular phone service providers in Greece" (2008, 1347). Their research method is divided in five phases which are the following: Phase 1, selection of quality criteria to assess their website thanks to the literature; Phase 2, summarization of the quality aspects found into different categories or dimensions; Phase 3, selection a set of satisfaction criteria only to be able to reflect all the different aspects of user quality perception to be assessed; Phase 4, creation and naming of a Customer satisfaction survey distributed among three different companies in the same field in Greece; and finally, Phase 5, execution of a satisfaction benchmarking

analysis and with the help of an extension of the MUSA model, they identified some satisfaction criteria appearing as competitive advantages

In the present research paper, the comparison between different collaboration suites isn't exploited. Indeed, Grigoroudis et al. (2008) fifth phase doesn't apply to this paper but will be considered as future research directions.

In order to evaluate the user-perceived performance of algorithms of three different applications in Mallick et al. (2008) research, a questionnaire was submitted to the users in so in order to obtain a satisfaction level from 1 to 5 for each application. However, Mallick et al. (2008) main goal was to measure user-perceived performance-based frequency scaling which doesn't correspond to what the present thesis wants to approach. Therefore, the exact same questionnaire will not be used but can be a point of inspiration.

Kumar (1990) focused his study on the post-implementation evaluation of Computer-Based Information Systems (or CBIS). To do so, he used a quantitative method with a questionnaire submitted to different organizations. In his study, the respondents identified five main criteria asked during a post-implementation evaluation process which are "the accuracy of information, timeliness and currency of information, user satisfaction and attitudes towards the system, internal controls, and project schedule compliance" (Kumar, 1990,207).

In order to sort the different criteria used in his study, Kumar (1990) divided them into three main categories: Information criteria (regrouping the five ones mentioned above), System Facilitating Criteria and System Impact Criteria.

Furthermore, performance metrics for Grid workflows, "scientific workflows involving high performance" (Altintas, Birnbaum, Baldridge, Sudholt, Miller, Amoreira, … Ludaescher, 2004), are not based on the user perception but are a good indicator for criteria to be used in perception-based questionnaires. The recurrent metrics categories are: execution time, counter, data movement, synchronization and resource (Truong, Dustdar & Fahringer, 2007).

2.4.3   Mixed research method

Runeson, Host, Rainer, & Regnell consider "mixed methods" as "a combination of qualitative and quantitative data often provides better understanding of the studied phenomenon" (2012, 15).

As seen previously, quantitative methods are the most used to measure user's performance perception. However, Sharma, Sharma & Agarwal (2016) released a paper about the measure of employee perception of performance management systems (PMS) effectiveness using mixed-methods methodologies including interviews and literature reviews in order to identify three main and emergent themes among employees: the effectiveness, the accuracy and the fairness of PMS; and then, they conducted a quantitative research in order to demonstrate the employee perception of each theme related to PMS.

This is also the research method choice made by Frédouet & Le Mestre (2005) and La et al. (2008) respectively in their studies *La construction d'un outil de mesure de la performance des réseaux interorganisationnels : une étude des réseaux d'acteurs portuaires* and *Client-perceived performance and value in professional B2B services: An international perspective*.

3 THEORETICAL FRAMEWORK

In our study, we are concerned about the user's perceived performance, which has already been measured in different studies in several different fields. However, because of the lack of existing literature about the perceived performance of collaboration tools and in order to measure the users perceived performance of e-collaboration suites, any research considering performance perception related to softwares, processes or systems has been considered.

Therefore, in this study, unlike La et al. (2008) it is not about measuring customer satisfaction but user satisfaction. Moreover, the evaluation of user satisfaction will be done only based on perceived performance and not perceived value.

In conclusion, customer satisfaction, or user satisfaction in this study, is defined as the measure of how e-collaboration suite performance meet or surpass users' expectations.

This part focuses on the different theories made about the perceived performance and how it is linked to the user satisfaction and to potential future improvements. It shows the importance of perceived performance and therefore, the relevance of this study.

3.1 Perceived performance theory

As stated previously, the need to distinguish actual performance and customers or users' performance perception is essential and has been presented by several authors such as Holbrook, Morris & Corfman (1985); Iacobucci, Grayson & Ostrom (1994); Parasuraman, Zeithaml & Berry (1985) and Yi (1990) (Burton, Sheather & Roberts, 2003). In fact, Burton et al. (2003) states that the actual performance has an impact on the evaluation of the perceived performance.

In their study *Client-perceived performance and value in professional B2B services: An international perspective*, La et al. (2008) expose the role of perceived performance as an important step to achieve customer satisfaction. In fact, they explain that in order for a company to gain a competitive advantage, its value needs to grow and so as to achieve it, some criteria like customer satisfaction are the key. **Figure 2** explains La et al.'s (2008) links between competitive advantage and client satisfaction and shows how perceived performance is a key step to increase the company's value.
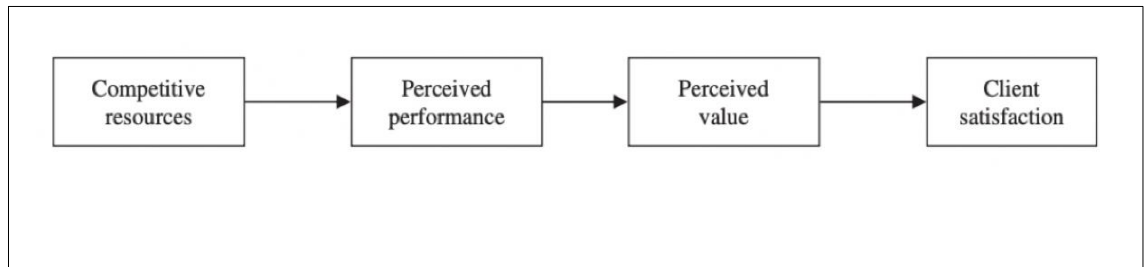
Figure 2. Key linkages of La et al. (2008)

Indeed, perceived performance is considered by La et al. as tightly linked to the perceived value and they consider customer satisfaction as client satisfaction "a direct function of perceived performance and value" (2008, 3). They also argue that "there has still been much debate and calls for better ways to conceptualize and measure customer satisfaction" (La et al., 2008, 3). In accordance to that, Zhang & Von Dran (2001) explain that understanding the various quality elements affecting user expectations is the first step in order to achieve high quality software and then, the second step being the association of those elements to specific features of your software.

To corroborate those key linkages, Burton et al. (2003) propose a model in order to explain the central role of perceived performance as well as the effect on the customer satisfaction and the intention of use.
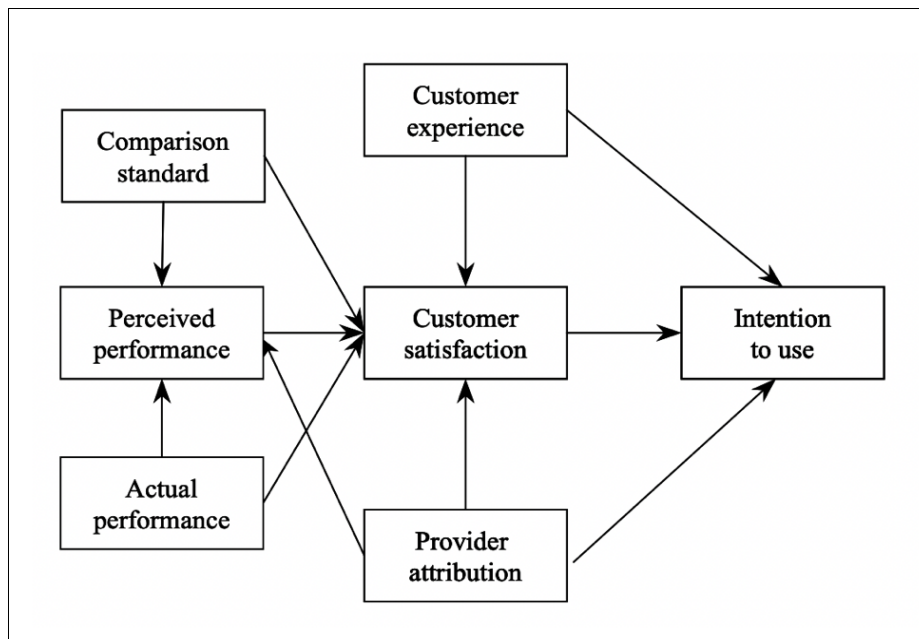
Figure 3. Proposed model of Burton et al. (2003)

Indeed, the **Figure 3** exposes the impact of the actual performance on the perceived one which has in turn, an impact on the customer satisfaction. Furthermore, it indicates the ramifications between the customer experience and the customer satisfaction.

In order to summarize this model, we would consider the tight link between the perceived performance, the user satisfaction and then its intention to use.

As a matter of fact, by evaluating the perceived performance from the users point-of-view, the e-collaboration suite provider is able to measure the user satisfaction. On account of this, the provider has all the cards in hand to modify and improve the suite according to the users' satisfaction to enhance its performance.

To be sure, according to Kumar, benefits deriving from post-implementation evaluation can be "the improvement of systems development practices, decisions to adopt, modify or discard information systems and evaluation and training of personnel responsible for systems development" (1990, 203).

Other benefits stated by Green & Kiem are the insurance of the respect of users' objectives, "improvements in the effectiveness and productivity of the design, and realization of cost savings" (1983, 203).

3.2   The Technology Acceptance Model (TAM)

In continuation of the model proposed by Burton et al. (2003), the following model utilizes user perception to explain the decision to use the system or not.

The Technology Acceptance Model (or TAM) is a well-known theoretical model in the IS field. It is deriving from a previous model called the Theory of Reasoned Action by Ajzen & Fishbein (1980). The TAM was introduced by Davis (1986) in order to identify how a user is accepting and using the new technology studied; or, in other words, "explaining and predicting the use of a system" (Chuttur, 2009, 1). It is based on two major factors influencing the acceptance and the use: Perceived Usefulness (PU or U) and Perceived Ease of Use (PEOU or E); and two more variables are often added: Behavioral Intention (BI), and Behavior (B) (Lee, Kozar & Larsen, 2003).

The TAM went through different modifications over the years with the only objective of being more precise and efficient. According to Chuttur (2009), the final version of the Technology Acceptance Model was released by Davis & Venkatesh in 1996, which is presented in **Figure 4**.
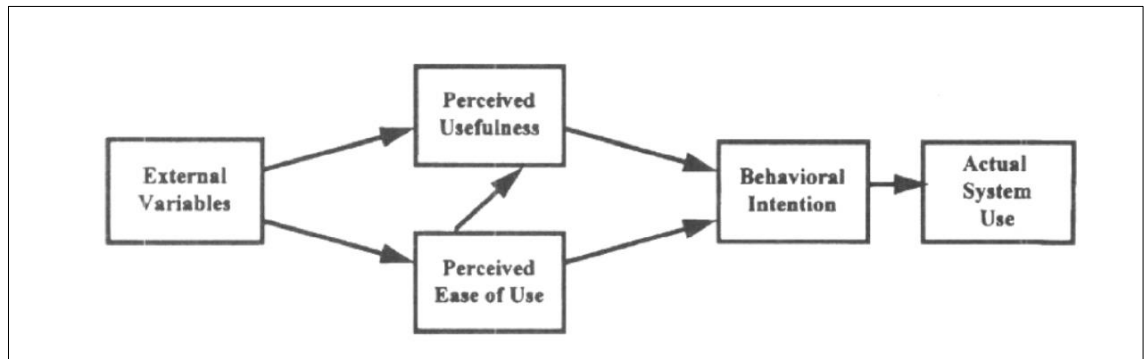
Figure 4. Final version of the Technology Acceptance Model (TAM) by Davis & Venkatesh (1996)

Figure 4 illustrates the last version of the TAM and it clearly shows the links between the Perceived Usefulness and the Perceived Ease of Use and the decision to use the technology.

Our study focusing on the perceived performance, the decision to present the TAM was made to explain the link between user perception and Behavioral Intention to Use.

Indeed, this study doesn't focus on the acceptance of a e-collaboration suite, however, it focuses on the perceived performance and then, as seen earlier, on the user performance satisfaction.

3.3   The importance of perceived performance

In our study, we assume that the perceived performance, on the same level as perceived usefulness and perceived ease of use, is also a key aspect to reach the user acceptation; we illustrated it by refining the TAM in order to prove the importance of the perceived performance for e-collaboration suites and other softwares and we combined it with Burton et al. (2003) model in **Figure 5**.

The objective of our proposed model displayed in **Figure 5** is to combine existing models dealing about the key role of perceived performance (Burton et al., 2003) in order to reach a complete acceptance and use (Davis, 1986) of e-collaboration suites and e-collaboration tools.
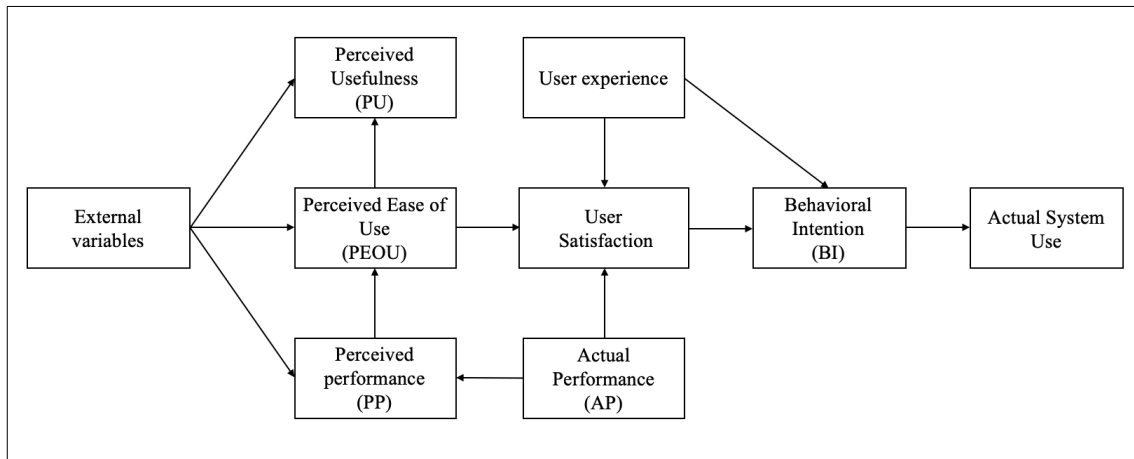
Figure 5. Proposed model of the importance of perceived performance

Figure 5 also provides a comprehension of the role of perceived performance into the lifecycle of a system. It concerns specifically the post-implementation and unlike Davis & Venkatesh (1996) it focuses on Information and Collaboration Technologies Acceptance (or ICTA).

4 RESEARCH METHODOLOGY

According to Kumar (2010) a definition of the research type used in a study can be done from three different perspective which are the application perspective, the objective perspective and the process perspective. In order to give a complete perspective of the study type used in this paper, we will explain the research type selected from each perspective.

From the perspective of its application, the research conducted in this paper can be defined as a *pure research*. In fact, in this paper concerns the creation and implementation of a new questionnaire intended for post-implementation user-evaluation of collaboration suites, which has never been done before.

From the perspective of its objective, this research is considered as an *exploratory* one because the goal of this paper is to explore the perceived performance of e-collaboration tools and suites and it's a topic that was never approached before by researchers. Furthermore, according to Kumar, the goal of exploratory studies is to "to develop, refine and/or test measurement tools and procedures" (2010, 10) which our paper exposes with the development and test of a new questionnaire via a case study.

From the perspective of the process adopted to get answers, the present research is categorized as *structured*. In fact, in this paper, the intention is to measure the perception of e-collaboration suites users about the use of their collaboration tools. Indeed, the evaluation of how many users have a particular perception or a particular view of collaboration suites enables a structured approach.

4.1 Research study design

According to Kumar (2010), by choosing a structured approach, the choice to use a quantitative research method is resulting. As explained before, the goal of this research is to quantify the performance perception of e-collaboration suites to have enough data to further analyze and expose some of the odd users' behaviors observed in the results. As a reminder, the research will answer the following question: **How are e-collaboration suites user-perceived performance measured?**

By using a quantitative design, the intention is to create a questionnaire to be used for measuring different e-collaboration suites and to be reused by other companies and/or

researchers to evaluation the user satisfaction of collaboration tools. In addition, as stated earlier, the goal is to test this questionnaire on the support of a case study.

According to Kumar (2010), the quantitative study design selected for this paper can be classified according to three different study design perspectives which are the contacts number perspective, the reference period perspective and the nature perspective.

Following this reasoning, from the number of contacts perspective, the research design used in this paper is considered as a *cross-sectional study* which focus on measuring the overall picture of a situation. It involves only one data collection point and doesn't measure change but the actual state of affairs.

From the reference period perspective, the research designed displayed here is the *prospective design* as our research can only be conducted after the implementation of a e-collaboration tool or suite.

From the nature of the investigation perspective, our research design is an *after-only experimental design* because we know that the population chosen was exposed to the implementation of this e-collaboration suite version and our goal is to study the impact of this on their perception and satisfaction.

4.1.1 Case study

In addition to those research designs considering quantitative data, we also decided to use a **case study** in order to illustrate our quantitative study. Although case studies are more present in qualitative studies (Kumar, 2010), that decision to apply a case study to this research was taken due to the lack of previous studies in our field. Indeed, as stated before, the literature concerning post-implementation evaluation of collaboration technologies in considered here as inexistent. Furthermore, Kumar stated that the use of a case study is very useful "when exploring an area where little is known or where you want to have a holistic understanding of the situation, phenomenon, episode, site, group or community" (2010, 123).

Yin corroborates this idea by citing the definition of research case studies by Schramm (1971): "The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result" (2008, 17). Yin also states that a

"why" or "how" research question was leading to an explanatory research and to the use of case studies and experiments (2008).

Additionally, Runeson et al. consider a case study as "an empirical method aimed at investigating contemporary phenomena in their context" (2012, 12) and states that it exists three other major research strategies that are linked to case studies which are survey, experiment, and action research. It coincides with this study which uses a survey as research strategy and uses the case study to support the theoretical framework (2012).

Indeed, the use of a case study in this research aims to support the creation and the application of the quantitative research. By using a case study, it provides an overview of the application and utilization of collaboration suites in the business world and a reliable sample for the quantitative research of this thesis.

The choice of the case study for this thesis fell on a company called Diadeis which provides collaboration suites tools to its clients. The first factor influencing this choice was the completion of an internship by the author during the writing of the research.

Despite the ease of use to the sample due to the presence inside the company, this choice was secondly motivated by the presence of various collaboration tools as well as their several different uses by the users. Additionally, some of the main collaboration tools available in most of the collaboration suites are existing in this case study.

4.1.1.1   Mediabox Independence (MBI)

The following section explains the commercial product provided by Diadeis to several clients which is called the Mediabox Independence (or MBI). This product is a collaboration suite which will be explained in details later and which constitutes the case study selected by the author of this paper.

In fact, Diadeis is a hybrid company performing in two different fields: design production field and project management. In fact, Diadeis provides artwork and design production for packaging.

In addition to the design agency side, Diadeis is composed of a technical project management side which is coordinating the graphic chain production through a built-in e-collaboration suite called Mediabox Independence (or MBI).

The Mediabox Independence is a suite of collaboration tools designed to support mostly packaging or prepress distributed projects. Indeed, it is a specific suite designed for project management. Following the categorization displayed earlier, MBI is a built-in collaboration suite.

The suite's design provides the features that impact the most distributed project management effectiveness. One of the specificities of this suite is that it is an e-collaboration suite, meaning that users don't need to download a software but only to connect to the suite's webpage with their logins in order to be able to use it.

The tools displayed in the suite are various and also differ depending on the clients' needs. Indeed, the MBI suite is modular; it means that some tools can be displayed in the suite (or not) depending on the clients' demand. For example, the MBI provides a Translation tool which enables translating packaging automatically into one or more languages but is implemented only for a few clients.

As mentioned earlier, the goal of this case study is to provide a sample to test our questionnaire on. Indeed, by submitting it to the users of the MBI, we get to understand the behaviors towards the tools and then, of the suite.

4.1.2   Questionnaire

As stated before, a quantitative method is used in this study through the use of a questionnaire. The questionnaire constructed was named the Perceived Performance of Collaboration Suites Questionnaire (or PPCSQ). It is at the center of this study as it will provide the results needed for further analysis.

The PPCSQ is composed of six different clusters which display different statements and questions built on a pool of items generated from the previous literature. Their selection and composition are furtherly explained.

4.1.2.1   Clusters

In accordance to the Syarnubi et al. (2018) method, we decided to divide our questionnaire into several different parts which can be named categories or clusters according to the previously induced literature (Syarnubi et al., 2018 & Convertino and al., 2006).

However, the decision that the different clusters would be the different collaboration tools was taken by the author. Indeed, instead of measuring the suite of tools in general and in order to evaluate from all angles the perceived performance of a built-in collaboration suite, the decision was taken to adapt these categories in our questionnaire.

That is to say, the questionnaire will comport several parts, corresponding to the different collaboration tools the Mediabox displays. The questionnaire goal is to evaluate the perceived performance by employees of each tool in order to assess the suite' global perceived performance.

In our case study, the Mediabox Independence suite displays different features and enables several functionalities matching with different collaboration tools functionalities formerly seen in this paper. Consequently, with the help of the literature previously induced, we categorized the different tools of the Mediabox Independence suite based on their features into six major tools: **Project Management** (Xu et al., 2008 & McCabe, 2010 & Fichter, 2005)**, Information Sharing** (Xu et al., 2008), **Communication** (Xu et al., 2008 & Fichter, 2005)**, , Planning** (Fichter, 2005 & McCabe, 2010)**, Comparison** (Noy & Musen, 2003)**, KPIs and exportation/importation of documents** (Noy & Musen, 2003 and Bayer, Damianos, Kozierok & Mokwa, 1999). Those tools will be turned into different clusters to measure their perceived performances separately, and then, to measure the overall performance of the suite.

4.1.2.2   The Mediabox Independence tools

The following section explains in details what are the collaboration tools displayed in MBI and their features in order to fully comprehend what the users will evaluate.

The first cluster selected in the PPCSQ corresponds to the **project management** tool available on MBI, also called MediaManager. This tool is composed of different features such as the review of tasks and the lifetime of a project.

As a matter of fact, each order made by the client for a new packaging is treated through Mediabox Independance with the use of approval workflows and lifecycles. Those orders are categorized into different projects which are divided into different "references" or "lines".

Each of these lines has a lifecycle which is a series of steps and phases to go through in order to process the order. For example, a step would be "Artwork" and inside the step

there are several different phases such as "Artwork production" and "Artwork review". Once all the phases are complete, the step moves forward to the next one.

Furthermore, each step can have a different approval workflow which determines the different actors of the step. In general, they approve or reject the document uploaded at the previous step and add comments to specify why they reject it, when they do. The approval workflows specify if the approval is a group approval or not and if it's a permanent approval in case of the production of a second version of the document.

In addition, as seen previously, Xu et al. (2008) & McCabe (2010) state that project management is a type of collaboration tool and, in addition, Fichter (2005) considers the reviewal of tasks as a feature of a project management tool.

In fact, MBI displays a task tool in order for users to review their own tasks faster and gain time in the process.

In addition, MBI allows a specific feature called "view someone else's tasks" which enable different users) to review the tasks of the other users with the same "role" (e.g. different users can belong to the same group such as Marketing or Development for example).

In fact, the notion of collaborative tasks was addressed by Lakhassane Cisse (2018) to define "tasks that can be performed by multiple actors" and is relevant here due to this reviewal and the situation where different users can view and perform the same tasks.

The second cluster is the **information sharing tool** according to Xu et al. (2008) also called MediaBase on the MBI collaboration suite. It regroups all the documents which were validated during the workflow of a packaging project. Those documents concern mainly artwork and production documents which are automatically imported into a correspondent folder in order to put the assets in the right place.

In fact, it is possible to create/deleted different folders as to achieve a good storage and for the user research to be more intuitive. The access to those folders and documents are regulated by rights given to each users in order to ensure confidentiality of some documents. For example, if a client is working with different agencies to create a packaging, agency A shouldn't be authorized to see the documents produced by Agency B.

Mediabase also allows the upload of documents manually. Instead of having an automatic storage, it is also possible to upload documents straight into the good folder. The deletion is also available but the user allowed to do it depends on its rights for safety reasons. Downloading documents is also available for users.

Mediabase offers the possibility to do a mass upload, deletion or download of documents by enabling users to put the desired documents into a "basket" to trigger an action for all of them.

The third cluster chosen was previously seen in the literature and explained by Xu et al. (2008); it is the **communication** tool which concern the exchange of messages or ways to share information such as emails, instant messaging or even chat rooms.

The MBI doesn't propose an instant messaging or chat rooms tool but has a very helpful notification system. It includes automatic emails and a tasks function.

It exists two types of emails sent to the users. The first one is notifications automatically sent when something needs to be done by the receiver. For example, while managing the graphic chain lifecycle, once the approval or the need for review from a specific person or group of people is needed, an email is sent automatically to them to inform about the requested action to perform.

Indeed, this notification tool is tightly linked to the project management one presented earlier.

The second type of email is, in most of the cases, a reminder of tasks to be performed. In fact, MBI allows to schedule some automatic emails such as "TO DO lists" which display the tasks the receiver has left to do.

The fourth cluster selected for the PPCSQ is inspired by Fichter (2005) and McCabe (2010) who reflect on a collaboration tool with a calendaring goal; here we talk about **planning**. In fact, the Planning on MBI is available for all users in order to anticipate and schedule the deadlines.

On MBI, each "line" has its own planning created automatically from the due date or the production date of the order. It is possible to modify the planning, in order to anticipate the different deadlines.

The fifth tool displayed in Mediabox Independance is a very useful collaboration tool cited by Noy & Musen (2003) which is the **comparison** tool. In fact, because MBI is dealing with artworks and designs for new packagings, it is important to be able to compare different documents.

The comparison can take place between documents from different orders or between different versions of one order to check if the changes requested at the previous version(s) was(were) applied.

In fact, during some steps and phases, the users can approve or reject a document and when they reject it they can specify with comments and notes on the document where they spot a problem or a need for change.

Mediabox Independance can host different comparison tools. The ones used actually are called Mediacheck and Greenlight. They have the same features but aren't stocked on the same server and the, don't have the same performance. The goal of MBI is to transfer all the clients using Mediacheck on Greenlight but some are still using the old version.

Then, the few features displayed by both of them are the *measurement* in order to calculate the spaces or the size of some elements, the *layers* to reveal or hide the cutter guide, the colors, the elements... the *addition of notes*, as explained before, with the possibility to circle or indicate where the change needs to be performed.

The sixth, and last cluster, corresponds to two different tools used as one: the **KPIs and the exports of data** (Noy & Musen, 2003; Bayer et al., 1999). They were considered as one by the author due to the number of correspondent features. Indeed, they both enable the extraction of data and the personalization of the data requested.

The KPIs collaboration tool displayed in MBI enables users to understand the actual performance of the tool. Some KPIs are pre-defined in order to facilitate the access and the read of the results and some others can be personalized in order to access only the relevant information. Then, the data selected can be exported in a csv. document.

The export tool available on MBI enables exporting data in order to only generate the information requested through what is called the export feature. It works with pre-created templates displaying different columns and generate the results only due to the selection of filters. The export feature can be used to export user's information, documents from the Mediabase or production data from the lifecycles and approval workflows.

As explained before, the different clusters formerly explained display several statements which were constructed based on a pool of items; they are explained in the next section.

4.1.2.3   Items

The "pool of items" is a term employed by Tziner et al. (1996) to describe all the items used in a questionnaire. The pool of items generated for the PPCSQ was based on: (a) the literature induced in this paper providing conceptualizations, statements and suggestions about the use of collaboration tools (e.g. Riboulet and al., 2005;Ebert, et al., 2010; Kock, 1999; Ebert, et al., 2010) ; (b) the literature previously presented about perceived performance and performance metrics; (c) observations emerging from the author organizational experience of collaboration suites; and (d) the general literature on e-collaboration, e-collaboration tools and suites and perceived performance (e.g. Kock, 2005; Lomas et al., 2008; Xu et al., 2008)

Sixteen (16) items were raised by the author for the initial pool. The complete list of items is displayed in **Table 1** and explained below.

Table 1. Pool of items displayed in the PPCSQ

Category	Items	Sources
Information criteria	Reaching deadlines	
System facilitating criteria	Implication of IT	Patterson et al. (1997) & La et al. (2008)
	Improvement perception	
	Effectiveness perception	
	Satisfaction perception	Convertino and al. (2006)
Information criteria	Quality	Syarnubi et al. (2018) & D'Ambra and Rice (2001)
	Quantity	
	Reliability	
	Intuitiveness	Kozlowska (2018)
System impact criteria	Gain of time	D'Ambra and Rice (2001) & Fichter (2005)
	Review tasks	Fichter (2005)
	Taking decisions	D'Ambra and Rice (2001)
	Total availability	Kaasila (2018)
	Time to first byte	
	Reaction time	
	Time to load	

The decision to categorize the items displayed in the questionnaire following Kumar (1990) method was taken in order to structure the evaluation as displayed in Table 1. In his study, the author divided the items present in his questionnaire into three different categories which are system facilitating criteria, information criteria and system impact criteria.

Here, the first category, System facilitating criteria includes the items related to "important aspects for the continuing operation of the system" but do not have a direct and straight impact on the use of the suite (such as perception and the use of customer-support system) (Kumar, 1990, 207). The second category is called Information criteria and concerns items "related to the information product of the system" (such as the ability to reach deadlines and accuracy indices) (Kumar, 1990, 207). The third and last category is names System Impact criteria and covers the items "evaluating the consequences or impacts of the newly-installed system" (Kumar, 1990, 207).

4.1.2.4   Items choice

Based on La et al. (2008) study concerning the client-perceived performance and value, the selection of some perceived performance criteria was made. Indeed, although their study doesn't concern the client-perceived performance of a tool or a system but of tangible purchase of B2B services, some of the items they selected to construct their questionnaire can be applied to our study.

In their study, they used as perceived performance items, twenty-two indicators drawn from Patterson, Johnson & Spreng (1997) study *Modeling the determinants of customer satisfaction for business-to-business professional services*. In their paper, Patterson et al. (1997) studied the pre- and post- purchase perception which makes it the only literature found that can be relied concerning the post-implementation collaboration suite perceived performance.

From La et al. (2008) study, the following items can be considered: *the ability to reach deadlines on time, the implication of IT support* (acting here as the after-sale service)**,** *the perception of the performance improvement and effectiveness.*

In addition to those items, other different items will be considered based on the collaboration literature review previously induced. The following items (Convertino and al., 2006) will be taken into consideration: the *quality, quantity and reliability* from Syarnubi et al. (2018) & D'Ambra and Rice (2001) studies of each category (or cluster). In addition to those items, others will be added such as the overall *perceived satisfaction* (Convertino and al., 2006), *the intuitiveness* (Kozlowska, 2018), *the gain of time* **(**D'Ambra and Rice,

2001 & Fichter, 2005) *and the ability to review tasks* (Fichter, 2005) and the *ability to take better decisions* (D'Ambra and Rice, 2001) of each tool.

In order to obtain a wider point of view of the tools and their capability, the metrics (4) introduced by Kaasila's (2018) will also be taken into consideration as items for the questionnaire. Those metrics concern mainly the waiting time or the loading time of the collaborative suite. Several authors such as Burton et al. (2003) emphasize on the importance of the estimated waiting time.

Each tool will be then measured by assessing each item previously mentioned through different statements to deepen the perception of each of them. Because a perceived performance study has not been found in the actual literature, the statement will be formulated by the authors based on this paper's literature as well as the author experience and discussions in the field and the company and the features of each tool.

4.1.2.5 Items validity

In order for the current research to be justified, the items need to be valid. According to Kumar, it exists two different types of validity concerning quantitative researches. The first one is the face validity which concerns the establishment of a link between the items displayed in the questionnaire and clear objectives. The second one is called content validity which concerns the ability of the items to cover completely the attitude being measured, here the perceived performance (2010).

According to that, the selection of items explained previously is considered as being valid as it fulfills both validity criteria set out by Kumar in his book *RESEARCH METHODOLOGY: a step-by-step guide for beginners* (2010).

4.1.2.6 Scale

Due to the use of closed questions, the attitudinal scale (Kumar, 2010) used in this questionnaire is the Likert scale. The Likert scale is a summated rating scale (Kumar, 2010) based on the assumption of some statements displayed in the questionnaire. According to Kumar, the Likert scale doesn't measure the attitude per se but "it shows the strength of

one respondent's view in relation to that of another and not the absolute attitude" (2010, 160).

In this thesis, in order to assess the perceived performance of each tool, each item will be evaluated by the users based on a categorical Likert scale. The possible answers will be from 1 to 5 (from strongly disagree to strongly agree) (Mallick et al., 2008). In addition, the decision to add the possibility to answer N/A if the user answering isn't concerned by one of the tools is made as it is supposed that all the users are not using the totality of the tool as well as are not using them for the same purposes.

4.1.2.7   Calculation

In order to calculate the attitudinal score, we state that the answers from strongly disagree to strongly agree correspond each to a number of points as displayed in **Table 2**.

Table 2. Score calculation of the attitudinal scale

Perceived performance of an e-collaboration tool												
Statement	Results											
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		N/A	
	N	%	N	%	N	%	N	%	N	%	N	%
Statement A	0	0	5	15,2	5	15,2	13	39,4	2	6	8	24,2
Statement B	3	9,1	0	0	8	24,2	12	36,3	5	15,2	5	15,2
Statement C	0	0	7	21,2	3	9,1	20	60,6	3	9,1	0	0

The number of points is given by the number of respondents (N) as displayed in the **Table 2**. For example, by answering "Disagree" to statement A, the answer is worth 5 points and on a basis of 33 respondents, the percentage associated is 15,2%. Another example would be by answering Strongly agree to statement C, the answer is worth 3 points which corresponds to 9,1% of the 33 respondents.

The answer N/A being for respondents not concerned by the cluster. For example, in statement C it is worth 0 points as it does not indicate any attitude towards the item and cluster measured.

With this calculation method, it will be possible to evaluate which statement and therefore which item has the most positive attitude towards and which one has the most negative one.

4.2   Data collection

As stated before, the data will be collected through a questionnaire distributed to the users of the Mediabox Independence e-collaboration suite (cf: case study). A questionnaire is defined by Kumar as a "written list of questions" (2010, 138) answered by the respondents.

Kumar (2010) highlights the importance for the questionnaire to display very clear questions to respondents as it is not possible to explain the questions to them. All the respondents will see the questions presented without any further explanation from the author of the questionnaire. This is why we very carefully created the statements in order to avoid the most misunderstandings.

Additionally, according to Runeson et al., as the questionnaire is the center of this research, the study design is considered as "fixed" because once it is launched, it is impossible to change anymore and it corresponds to a quantitative study design in other terms (2012, 15).

Due to the lack of researches on the perceived performance of collaborative suites, the decision to propose a new evaluation framework was made. To bring this idea to life and evaluate it, a new "instrument" (Tziner et al., 1996) has been developed to address the research agenda called the **Perceived Performance of Collaboration Suites Questionnaire (PPCSQ)**.

4.2.1   Administration

It exists different ways of administering a questionnaire, however, due to the worldwide pandemic crisis happening during the execution of this research, the electronic way was preferred. Indeed, the questionnaire will be sent via email to the prospective respondents. The emails were collected before the beginning of the research in the case study company and in order to prevent the low response rate accompanying this method (Kumar, 2010),

we also addressed private massages via the internal company's chat box to motivate the answers.

The questionnaire was administered via an e-collaboration tool previously seen in the literature and part of the G suite: Google form. As stated before, this collaboration tool enables the creation of questionnaires and surveys by simply registering an email address to access it. It was then possible to send the link to the questionnaire via email to the future respondents. The choice of this tool was made due to its ease of use for the researcher as for the respondents, as well as for its way of displaying the results obtained.

4.2.2   Questions

Based on the previous literature and on the study's outcome wished, providing mainly closed questions in this questionnaire formulated as statements as displayed in Appendix 1 was decided.

However, during the construction of the questionnaire, one item was recognized as needing an open-ended question. Indeed, the item concerning the use of the IT service was identified by the author as a multiple question. More in details, this item was divided into two closed questions and one open-ended question displayed in details in **Table 3**.

This particular case was considered due to the potential importance and useful information it could provide. As a reminder, the IT service is acting here as an "after sales service" which means they are the contact needed in case of problems observed on the collaboration suite.

Table 3. Implication of IT: statements and question

Category	Items	Statements	Sources
System facilitating criteria	Implication of IT	Have you ever had the necessity to contact the IT support? If yes, how many times per month?	Patterson et al. (1997) & La et al. (2008)
		Question	
		For which reason(s) did you contact the IT support?	

4.3   Data analysis

As stated before, the questionnaire goal is to evaluate the perceived performance by employees of each tool in order to assess the suite' global perceived performance.

In order to do so, the data analysis will be divided in four different sections. Part I concerns the analysis of the sociodemographic results of the participants to the questionnaire. Part II is about the overall performance perception of each collaboration tool and part III concerns the overall performance perception of the collaboration suite. The final part considers the results of part III to assess a level of performance of each item.

4.3.1   Items perception

Part IV will be performed based on the results obtained from the PPCSQ. The results will be displayed in tables and in percentages in order to identify which item is the best perceived and which one is the worst perceived by the MBI users.

The best perceived item will be judged based on the indicators of performance and level of performance displayed in Table 4.

Table 4. Level of performance of the PPCSQ items

Results (%)	Level of performance depending on the answer			
	Strongly disagree	Disagree	Agree	Strongly agree
Between 0 and 5%	Low		Low	
Between 5% and 10%	Medium	Low	Low	
Between 10% and 15%	High	Medium	Low	Medium
Between 15% and 20%	High		Low	Medium
Between 20% and 30%	High		Low	High
Between 30% and 40%	High		Medium	High
Between 40% and 50%	Very high		High	Very high
Above 50%	Very high		Very high	Very high

To measure the level of perceived performance of each of the items, we consider that the results present in the two columns "Agree and Strongly Agree" corresponds to the level of performance perceived while the results present in the columns "Strongly disagree and Disagree" constitute the level of issues and encountered problems by the respondents.

We consider the following scale presented in Table 4. which explains depending on the results displayed in each column, what is the level of performance associated. It exists

four different levels for the performance and for the issues which are low, medium, high and very high.

For example, if the results of an item are 45% for "Agree", then, the item is considered as Medium and if it reaches 60% it is considered as performant. Additionally, if the "Disagree" answers equal 12%, the level of issues is considered as Medium.

The answers neutral and N/A are not taken into consideration as they do not bring any valid information concerning the user perceived-performance.

4.3.2   Collaboration tool perception

In their study, Patterson et al. (1997) calculated the performance from an average of the items displayed in their questionnaire. In our study, we will calculate the average of all the items in each cluster in order to measure the perceived performance of each cluster and, then, we will measure the overall perceived performance of the e-collaboration suite by evaluating the average of the different clusters.

To calculate the average perceived performance of a cluster, we will use the following equation:

$$\text{Items average } (a_1) = \frac{\text{Total sum of the items}}{\text{Number of the items}}$$

4.3.3   Collaboration suite perception

The same process that the overall perceived performance of each collaborative tool is used to calculate the general perceived performance of the collaborative suite.

Indeed, the equation below takes into account the different perceptions of the tools in order to determine the one of the suites.

$$\text{Clusters average } (a_2) = \frac{\text{Total sum of the clusters}}{\text{Number of the clusters}}$$

4.4   Data sample

According to Kumar (2010), the accuracy of the research results will depend on how the sample was selected. Here, we decided to select our sample depending on the judgmental or purposive sampling method (Kumar, 2010).

This method is based mainly on the author's judgment about which respondents will "provide the best information in order to achieve the objectives of the study" (Kumar, 2010, 189). When there is only little to no information already harvested in your field of study, this is a good sampling method.

Therefore, in this research, the choice to select a number of, at least, 30 people was made by the author, judging the sample would be sufficient in order to obtain meaningful and impactful results.

The respondents are geographically dispersed in more than 2 different locations and include two different types of users. On one hand, internal users stand for people on Diadeis side. Internal users are composed of Project Managers, Graphic Chain Managers (GCM), coordinators, 3D coordinators, operators and 3D operators.

On the other hand, the external users are considered in this study as the client side, the purchaser of the Mediabox suite. External users are composed of different services at the client's company such as Central Marketing, Local Marketing, Local Regulatory and Development; but also, external providers such as Printers and External profiles solicited; it also includes "onsite" which are part of Diadeis but work at the client's office.

The participants were contacted individually through the company's email address or via the company's chat box. They were informed about the goal of the study, that the participation to the study was voluntary and that the answers will remain anonymous. For those who requested it, they will be informed about the results of this study.

The Mediabox users answered the questionnaire individually, during their work hours and at home, due to the quarantine policy in effect in the countries they live in.

5   RESULTS AND ANALYSIS

The following sections concern the explanation of the results as well as their analysis by the author. The results displayed were previously calculated in order to appear as percentages.

In the following analysis, the answers Agree and Strongly Agree are considered as positive answers and attitude towards the tool whereas the answers Disagree and Strongly Disagree are negative answers and attitude.

5.1   Sociodemographic results

We observe that the parity of respondents is almost fair with 51,5% of male and 48,5% of female. Additionally, none of the 33 participants are older than 56 years old and the majority is around 25-35 years old. The percentage of young participant is well visible with three third of the respondents below 35 years old.

Furthermore, the results about the seniority in the company seems well dispersed with a short majority between one and two years.

Table 5. Sociodemographic results

Users	N	%
Internal	30	90,9
External	3	9,1

Gender	N	%
Male	17	51,5
Female	16	48,5

Age	N	%
Less than 25 years old	9	27,3
25-35 years old	19	67,6
36-45 years old	2	6
46-55 years old	3	9,1
more than 56 years old	0	0

History in the company	N	%
Less than a year	10	30,3
Between 1 and 2 years	14	42,4
More than 3 years	9	27,3

Those results are important to understand the characteristics of the population interrogated.

According to Dobronte (2016), sociodemographic data enables to determine if the targeted audience was reached. Here, we can see that the audience reached was overwhelmingly the internal users of the Mediabox Independance e-collaboration suite.

As displayed in Table 5, the questionnaire was answered by 33 persons including 91% of internal users and 9% of external users.

We can therefore immediately determine that one of the limits of this research is its population. To be able to have a better understanding of the perceived performance of the MBI, a second research including external users to complete this first research is necessary.

5.2   Clusters results

The following sections expose the results obtained from the 33 respondents of the questionnaire for each cluster. They display the statement the participants answered to as well as the percentage of answers obtained for each "measure" of the scale.

As a reminder the Likert scale was used in order for the user of MBI to assess his/her thoughts about the performance of the suite. The scale goes from one to five, from strongly disagree to strongly agree, and includes the possibility to answer N/A for Non-Applicable.

In fact, as seen earlier, the respondents are part of different groups and have different roles, thereby they have dissimilar tasks. It is considered by the author that due to the several uses made of the MBI, each user is not using the totality of the different tools displayed in MBI but only one or several.

In conclusion, the percentage of answers corresponding to N/A are the respondents of the questionnaire not using the tool in question.

5.2.1 Project management

The project management tool available on Mediabox Independence was explained to the respondents as the lifecycles and approval workflows used for the life process of a project.

On this basis, we can clearly see on **Table 6** that none of the 33 respondents answered "strongly disagree" to any of the perception items. Furthermore, none of the 30% who contacted the IT service had to do it more than twice a month. We can assume that this tool wasn't presenting many difficulties or issues to its users.

Concerning the reasons the IT service was contacted, the users mainly answered that some approvers were not solicited when they should've and that some errors were occurring when connecting the MBI to an external server used for production purposes. One answer differed as it explained that the user thought the previous version of MBI (Mediabox Legacy or MBL), which commonly called Mediabox V1, was more performant and more efficient in displaying all the different steps of the lifecycles of all the references in one project.

We can also observe a very high concentration of "Agree" answers as none of the items is perceived as performant by less than 36,4% of the users questioned. Therefore, the results displayed on **Table 6** show very distinctly that a very high percentage of respondents agree with a high number of items.

Additionally, all the respondents felt concerned about the statement "*I think the delay in displaying the first results is reasonable/decent/acceptable*" as none of them answered "N/A" which shows that 60,6% of the totality of the 33 users composing the sample agrees with it.

The items *Taking decisions* and *Review of tasks* have the lowest rate of users agreeing with their performance while *Taking decisions* also has the lowest disagreeing rate.

Out of all the different items, *Time to load* and *Reaction time* are the ones with the highest percentage of users disagreeing with their performance. Additionally, *Reaction Time* is also the item with the lowest rate of non-concerned users. We can therefore assume that the loading metrics are not well perceived.

Furthermore, the item the less used by the users of the sample is *Taking decisions* with the highest rate of users answering N/A. *Reach of deadlines* and *Total availability,*

on their side, have the highest percentages of users strongly agreeing with their statements.

To conclude, more than the majority of the participants agrees with most of the items except *Reaching the deadlines, Review of tasks* and *Taking decisions* which are all under 50% but above 35%. We can therefore consider the project management tool of Mediabox Independence as performant.

Table 6. Results of the first cluster - Project management tool

Statements	Results (%)					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	N/A
I can reach my deadlines on time thank to Lifecycles and Approval Workflows	0	9,1	6	45,5	21,2	18,2
I think that my work capacity has improved by using Lifecycles and Approval Workflows	0	6,05	6,05	63,6	9,1	15,2
I think Lifecycles and Approval Workflows are efficient and useful	0	6,05	6,05	60,6	18,2	9,1
I am overall satisfied with Lifecycles and Approval Workflows	0	9,1	6,05	63,6	6,05	15,2
The quality of my work has been improved using Lifecycles and Approval Workflows	0	9,1	9,1	54,5	6,1	21,2
I can treat a large amount of data through Lifecycles and Approval Workflows	0	9,1	9,1	66,6	0	15,2
Lifecycles and Approval Workflows are reliable (stable, trustworthy, solid…)	0	6,05	27,3	51,5	6,05	9,1
Lifecycles and Approval Workflows provide a good intuitiveness	0	15,2	15,2	57,6	6	6
I can accomplish some tasks faster thanks to Lifecycles and Approval Workflows	0	9,1	6,1	54,54	9,1	21,2
Lifecycles and Approval Workflows help me reviewing my tasks	0	9	30,3	36,4	9,1	15,2
The information available on Lifecycles and Approval Workflows help me taking better decisions	0	6	18,2	36,4	15,2	24,2
I think it is easy to access the Lifecycles and Approval Workflows	0	6,05	15,2	51,5	21,2	6,05
I think the loading time from the login page to Lifecycles and Approval Workflows is reasonable/decent/acceptable	0	9,1	15,2	57,6	12,1	6
I think the delay in displaying the first results is reasonable/decent/acceptable	0	21,2	9,1	60,6	9,1	0
I think the time elapse when opening Lifecycles and Approval Workflows is reasonable/decent/acceptable	0	21,2	9,1	54,5	9,1	6,1

	Yes	No	N/A
Have you ever had the necessity to contact the IT support?	30%	55%	15%

	Once	Twice	Three times	More than for times
If yes, how many times per month?	50%	50%	0%	0%

5.2.2 Information sharing

Table 7 displays the results in percentages of the second cluster results. As a reminder, this cluster deals with Mediabase which is the information sharing tool and acts like and automated cloud.

Here, we can clearly observe that the percentage of "Strongly Disagree" respondents is very low, on average 3,4% of the users questioned.

Furthermore, almost half of the respondents ever had to contact the IT support team for debugging or other service. For the rest, the reasons evoked were bugs, indexation of documents, loading troubles and research by keyword and unique number rarely working.

The item *Taking decisions* has the highest rate of users strongly disagreeing with its use; 9,1% of the respondents strongly disagree the information available on Mediabase help taking better decisions. However, 15,2% strongly agree that this is the case; it is interesting to observe two completely different opinions on one item.

Total availability has by far the best rate with almost 50% of the users solicited who strongly agree that Mediabase is easy to access.

The highest percentage of N/A concern the *Review tasks* item. It is considered that 33,3% of the users solicited don't use Mediabase for this particular use. Same ascertainment for *Reach of deadlines* which counts 24,2% of non-users.

Concerning the item *Reaction time*, like for the precedent tool, it contains the highest rate of disagreeing participants closely followed by the *Reliability*.

However, almost 50% of the respondents think that Mediabase is efficient and useful. Which leads to think they will continue to use it and help improving the actual troubles and issues. Additionally, almost half of the respondents also consider that Mediabase provides a good intuitiveness.

To conclude, the results of the second cluster are more dispersed than the first one as the rate of strongly disagreeing users is more important as well as the lower rate of agreeing participants. Additionally, the need to contact the IT support is higher for the Mediabase which can make us wonder why and if the issues spotted here are more important and bothering than the ones for Lifecycles and Approval workflows.

The author considers then that this collaboration tool available on MBI is low performant which means this tool fulfill its purpose but needs some fixes to gain a strong performance.

Table 7. Results of the second cluster - Information sharing tool

Statements	Results (%)					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	N/A
I can reach my deadlines on time thank to Mediabase	0	15,2	15,2	39,4	6	24,2
I think that my work capacity has improved by using Mediabase	0	6	33,4	45,5	6	9,1
I think Mediabase is efficient and useful	0	9,1	9,1	57,6	18,2	6
I am overall satisfied with Mediabase	0	14,2	21,2	39,4	9,1	6,1
The quality of my work has been improved using Mediabase	0	9,1	45,5	24,2	6	15,2
I can treat a large amount of data through Mediabase	6,1	9,1	21,2	30,3	24,2	9,1
Mediabase is reliable (stable, trustworthy, solid…)	6,1	24,2	30,3	24,2	9,1	6,1
Mediabase provides a good intuitiveness	0	9,1	15,2	48,5	21,2	6
I can accomplish some tasks faster thanks to Mediabase	6	6,1	30,3	33,3	15,2	9,1
Mediabase helps me reviewing my tasks	6,1	15,2	24,2	0	21,2	33,3
The information available on Mediabase helps me taking better decisions	9,1	0	24,2	36,3	15,2	15,2
I think it is easy to access the Mediabase	0	6	6,1	36,4	45,5	6
I think the loading time from the login page to Mediabase is reasonable/decent/acceptable	6	15,2	24,2	42,4	6,1	6,1
I think the delay in displaying the first results is reasonable/decent/acceptable	6	30,3	30,3	21,2	6,1	6,1
I think the time elapse when opening the Mediabase is reasonable/decent/acceptable	6,1	24,2	24,2	33,3	6,1	6,1

	Yes	No	N/A
Have you ever had the necessity to contact the IT support?	45%	30%	25%

	Once	Twice	Three times	More than for times
If yes, how many times per month?	60%	20%	0%	20%

5.2.3 Communication

The number of users contacting the IT service is low comparing to the previous clusters results as it doesn't exceed 30%. And amongst them, a great majority contact the team for support only once per month. Furthermore, the main reasons evoked for the emails are the "crash" of the server allowing the shipment of the emails, the non-conformity of the email content and an error due to the moment the email is sent.

Concerning the reasons for the tasks, the presence of tasks that are finished still appear on the task list and nothing was brought up concerning the TO DO list.

Additionally, the amount of "Strongly disagree" answers appears as very low compared to the "Agree" ones.

We can clearly see that two items have a higher strongly disagreeing rate for the communication tool. Indeed, *Quantity* and *Total availability* both totalize 9,1%. However, *Total Availability* is supported by almost 40% of agreeing users. Additionally, *Perceived satisfaction* is the only item which has no "Strongly agree" answers nor "Strongly disagree" but has the highest rate concerning for the "Agree" one.

A curious behavior is the high percentage of N/A concerning the use of Emails/Notifications to reach deadlines. It can be interpreted as users don't use the tool for this purpose as well as emails and notifications are not clear enough to use it for this purpose.

A great majority, over 60%, of participants are satisfied with this tool and think it is reliable and useful.

To conclude, the results of the communication tool are still very dispersed but it is clear that the overall perceived performance tends to the level "performant" as despite several negative answers, the great majority of participants considers it as performant.

Table 8. Results of the third cluster - Communication

Statements	Results (%)					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	N/A
I can reach my deadlines on time thank to the use of Emails and Notifications	0	0	18,2	30,3	30,3	21,2
I think that my work capacity has improved by using Emails and Notifications	6,05	6,05	15,2	51,5	12,1	9,1
I think Emails and Notifications are efficient and useful	0	0	15,2	54,5	24,2	6,1
I am overall satisfied with Emails and Notifications	0	9,1	21,2	60,6	0	9,1
The quality of my work has been improved using Emails and Notifications	3	6,05	30,3	39,4	6,05	15,2
I can treat a large amount of data through Emails and Notifications	9,1	9,1	24,2	30,3	18,2	9,1
I think that Emails and Notifications are reliable (stable, trustworthy, solid…)	0	9,1	15,2	60,6	9,1	6
Emails and Notifications provide a good intuitiveness	0	6,05	6,05	51,5	30,3	6,1
I can accomplish some tasks faster thanks to Emails and Notifications	0	6,1	9,1	54,5	21,2	9,1
Emails and Notifications help me reviewing my tasks	0	0	0	51,5	33,3	15,2
The information available on Emails and Notifications help me taking better decisions	0	6,05	30,3	48,5	6,05	9,1
I think it is easy to access the Emails and Notifications	9,1	0	9,1	33,3	39,4	9,1
I think the loading time from the login page to Emails and Notifications is reasonable/decent/acceptable	0	6	15,2	51,5	15,2	12,1
I think the time elapse when opening Emails and Notifications is reasonable/decent/acceptable	0	0	21,2	51,5	15,2	12,1

	Yes	No	N/A
Have you ever had the necessity to contact the IT support?	30%	45%	25%

	Once	Twice	Three times	More than for times
If yes, how many times per month?	83,3%	16,7%	0%	0%

5.2.4 Planning

The planning tool results show a behavior completely different from the previous clusters results. Indeed, we can observe a greater amount of the answers "Strongly disagree". In fact, only three items are not concerned which are *the Time to load, Reaction time* and *Time to First Byte*.

Additionally, we observe an extra amount of N/A answers which means that a great part of our sample isn't concerned about this tool. The author doesn't consider the difference explanation of the different use the users are having as an average 38,2% isn't concerned by the tool.

Table 9. Results of the fourth cluster - Planning

Statements	Results (%)					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	N/A
I can reach my deadlines on time thank to the use of the Planning	6,05	6,05	9,1	30,3	6,1	42,4
I think that my work capacity has improved by using the Planning	6,05	15,2	6,05	24,2	0	48,5
I think the Planning is efficient and useful	6,1	24,2	0	33,3	6,1	30,3
I am overall satisfied with the Planning	6,1	24,2	0	36,4	0	33,3
The quality of my work has been improved using the Planning	9,1	9,1	15,2	21,2	0	45,4
I can treat a large amount of data through the Planning	6,1	21,2	9,1	24,2	6,1	33,3
I think that the Planning is reliable (stable, trustworthy, solid…)	9,1	15,2	21,2	21,2	0	33,3
I think the Planning provides a good intuitiveness	6	15,2	15,2	30,3	0	33,3
I can accomplish some tasks faster thanks to the Planning	6,1	9,1	21,2	21,2	0	42,4
the Planning helps me reviewing my tasks	9,1	9,1	6,05	21,2	6,05	48,5
The information available on the Planning help me taking better decisions	6	15,2	9,1	21,2	9,1	39,4
I think it is easy to access the Planning	6,05	6,05	6	30,3	15,2	36,4
I think the loading time from the login page to the Planning is reasonable/decent/acceptable	0	6,05	15,2	39,4	6,05	33,3
I think the delay in displaying the first results is reasonable/decent/acceptable	0	9,1	9,1	39,4	6	36,4
I think the time elapse when opening the Planning is reasonable/decent/acceptable	0	9,1	9	36,4	9,1	36,4

	Yes	No	N/A
Have you ever had the necessity to contact the IT support?	15%	50%	35%

	Once	Twice	Three times	More than for times
If yes, how many times per month?	100%	0%	0%	0%

Amongst the actual users of this tool, never less than 21% agrees with all the different statements and a very small quantity used the answer "neutral" compared to the previous clusters.

In comparison with the other tools, the number of users who had needed the support of the IT team is only 15% and all of them only contacted them once a month approximately.

The reasons expressed were some general bugs as well as, like the project management tool in the first cluster, the general use compared to the previous version of the collaboration suite which was considered by those users as "more useful" and "better to manage the projects".

In conclusion, this tool isn't considered as performant by the author due to the number of participants not using it. The author decided to explain this absence of use due to the several issues discussed in the open questions concerning the IT support.

5.2.5   Comparison

As stated earlier, different comparison tools are displayed on MBI mainly due to their creation date. The first comparison tool which was displayed at the creation of the collaboration suite is Mediacheck and is used by 63,2% of the questionnaire respondents. The second comparison tool available is Greenlight which is being implemented in more and more MBIs over the time and which is used by 36,8% of the questionnaire respondents.

The behavior of users who answered "Strongly Disagree" is intriguing because either no user responds or at least 12% does strongly disagree. We can wonder deeply about the items involved which are reliability, total availability, time to first byte, reaction time and time to load.

We can observe that the *Gain of time* is the item which has the highest rate in the "agree" column with more than 60% of users thinking that the comparison tool enables to accomplish some tasks faster. However, 21,2% are not overly satisfied with this tool and the time metrics has high rates of very dissatisfied users.

Additionally, almost half of the 33 participants had the need to contact the IT support and more than half of them had to do it more than four times a month. It clearly shows how issues are present on this tool. The reasons expressed in the questionnaire were a bug occurring very often with a blank page not charging and necessitating a restart of the server from the IT team and comments disappearing which cannot be recovered.

In conclusion, due to the answers listed and explained above, this comparison tool is considered as low performance due to the need for the IT support and the great amount of positive answers.

Table 10. Results of the fifth cluster - Comparison tool

Statements	Results (%)					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	N/A
I can reach my deadlines on time thank to the use of Mediacheck/Greenlight	0	6,1	24,2	39,4	9,1	21,2
I think that my work capacity has improved by using Mediacheck/Greenlight	0	15,2	15	39,4	15,2	15,2
I think Mediacheck/Greenlight is efficient and useful	0	12,1	9,1	54,5	15,2	9,1
I am overall satisfied with Mediacheck/Greenlight	0	21,2	9,1	45,4	15,2	9,1
The quality of my work has been improved using Mediacheck/Greenlight	0	0	30,3	45,5	12,1	12,1
I can treat a large amount of data through Mediacheck/Greenlight	0	15,2	27,3	33,3	9	15,2
I think that Mediacheck/Greenlight is reliable (stable, trustworthy, solid…)	15,2	12,1	15,2	33,3	15,2	9
I think Mediacheck/Greenlight provides a good intuitiveness	0	9,1	9,1	51,5	21,2	9,1
I can accomplish some tasks faster thanks to Mediacheck/Greenlight	6	0	9,1	60,6	9,1	15,2
Mediacheck/Greenlight helps me reviewing my tasks	0	9,1	33,4	24,2	9,1	24,2
The information available on Mediacheck/Greenlight help me taking better decisions	0	12,1	21,2	39,4	12,1	15,2
I think it is easy to access Mediacheck/Greenlight	12,1	0	24,2	39,4	15,2	9,1
I think the loading time from the login page to Mediacheck/Greenlight is reasonable/decent/acceptable	15,2	12,1	21,2	42,4	0	9,1
I think the delay in displaying the first results is reasonable/decent/acceptable	18,2	9,1	9	39,4	9,1	15,2
I think the time elapse when opening Mediacheck/Greenlight is reasonable/decent/acceptable	15,2	12,1	30,3	33,3	0	9,1

	Yes	No	N/A
Have you ever had the necessity to contact the IT support?	45%	40%	15%

	Once	Twice	Three times	More than for times
If yes, how many times per month?	11,1%	33,3%	0%	55,6%

5.2.6   KPIs and exportation of data

The most common reasons the IT support is contacted is for concern the missing values present in some exports and not due to the non-conformity of the value previously filled, wrong data appearing in some, several general bugs as well as run time errors.

Those issues are really concerning about an export tool and we could expect the results to show it unreliable and to be negative concerning the loading time metrics.

However, 48,5% of the sample agree with the fact that KPIs/Exports are reliable when 21,2% disagree. Concerning the loading time metrics, the results are considered coherent by the author as the users who needed the support of the IT team is represented in the results.

In this tool, we can observe that a great part of the sample is simply not using the tool. On average, only 76,6% of the respondents are using this KPIs/Exports.

We can observe a rate of nearly 50% of agree answers for the items *Effectiveness perception* and *Reliability*.

In conclusion, this tool is considered as performant due to the great amount of positive answers and despite the loading time metrics results.

Table 11. Results of the sixth cluster - KPIs/Exports tool

Statements	Results (%)					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	N/A
I can reach my deadlines on time thank to the use of KPIs/Exports	0	6	39,4	15,2	9,1	30,3
I think that my work capacity has improved by using KPIs/Exports	0	0	30,3	18,2	21,2	30,3
I think KPIs/Exports are efficient and useful	0	0	6,1	48,5	24,2	21,2
I am overall satisfied with KPIs/Exports	0	12,1	21,2	39,4	6,1	21,2
The quality of my work has been improved using KPIs/Exports	0	9,1	24,2	33,4	9,1	24,2
I can treat a large amount of data through KPIs/Exports	0	0	0	33,4	45,4	21,2
I think that KPIs/Exports are reliable (stable, trustworthy, solid…)	0	21,2	9,1	48,5	0	21,2
I think KPIs/Exports provide a good intuitiveness	9,1	21,2	9,1	39,4	0	21,2
I can accomplish some tasks faster thanks to KPIs/Exports	0	9,1	39,4	21,2	9,1	21,2
KPIs/Exports helps me reviewing my tasks	0	6,05	24,2	30,3	6,05	33,4
The information available on KPIs/Exports help me taking better decisions	0	0	33,4	21,2	21,2	24,2
I think it is easy to access KPIs/Exports	0	15,2	6	42,4	15,2	21,2
I think the loading time from the login page to KPIs/Exports is reasonable/decent/acceptable	6,1	9,1	24,2	30,3	9,1	21,2
I think the delay in displaying the first results is reasonable/decent/acceptable	15,2	9,1	30,3	24,2	0	21,2
I think the time elapse when opening KPIs/Exports is reasonable/decent/acceptable	15,2	9,1	24,2	0	30,3	21,2

	Yes	No	N/A
Have you ever had the necessity to contact the IT support?	20%	50%	30%

	Once	Twice	Three times	More than for times
If yes, how many times per month?	50%	25%	0%	25%

5.3   Suite results

Table 12 displays the overall user-perceived performance of the Mediabox Independence based on the results obtained in the different clusters which compose the suite. Based on it, we can analyze and determine the level of satisfaction of each item of the suite.

Surprisingly, the item *Total Availability* is the item with the highest percentage of "strongly agree" responses followed closely by *Taking decisions*. On the other hand, the item with the highest rate of "strongly disagree" answers concern the *Reaction time*. We can then assume that it is a strong point to take into consideration for further investigation and developments.

As stated earlier, a very important item concerns the implication of IT which is not very important applied to the set of tools as only 31% of the users solicited had the need to call the after-sales service which manages problems related to the platform and almost 60% percent of them did it only once per month. We can assume that due to the low rate of solicitation MBI is not providing issues for the 69% of the remaining users. *Implication of IT* could be rated as performant due to the great number of participants not having the need to reach more than once to fix the problems.

Reviewing tasks displays a very specific behavior as only 72,7% users are concerned about it and still 8,1% strongly disagree with the role of Mediabox for reviewing tasks when 12,1 strongly agree. The results here are very dispersed as we can clearly observe two different user behaviors.

One of the most important result concerns the overall effectiveness perception of the Mediabox Independence. Here, we can observe that almost 70% of the participants to the study were positive concerning the efficacy and usefulness of MBI followed closely by the *Intuitiveness* of the software. Additionally, *Effectiveness perception* is one of the two items with the lowest "strongly disagree" with *Reaching deadlines*.

Table 12. Perceived performance of the Mediabox Independence suite

Items	Statements	Results (%)					
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	N/A
Reaching deadlines	I can reach my deadlines on time thank to Mediabox Independance	1	7,1	18,7	33,3	13,6	26,3
Improvement perception	I think that my work capacity has improved by using Mediabox Independance	2	8,1	17,7	40,4	10,6	21,2
Effectiveness perception	I think Mediabox Independance is efficient and useful	1	8,6	7,6	51,5	17,7	13,6
Satisfaction perception	I am overall satisfied with Mediabox Independance	2,1	15,2	13,1	47,6	6,3	15,7
Quality	The quality of my work has been improved using Mediabox Independance	2	7,1	25,7	36,4	6,6	22,2
Quantity	I can treat a large amount of data through Mediabox Independance	3,6	10,6	15,2	36,4	17,2	17,2
Reliability	Mediabox Independance is reliable (stable, trustworthy, solid…)	5,1	14,7	19,6	39,9	6,7	14,1
Intuitiveness	Mediabox Independance provides a good intuitiveness	2,5	12,6	11,6	46,5	13,1	13,6
Gain of time	I can accomplish some tasks faster thanks to Mediabox Independance	3	6,6	18,7	40,4	12,1	19,2
Review tasks	Mediabox Independance helps me reviewing my tasks	3,5	8,1	21,2	27,8	12,1	27,3
Taking decisions	The information available on Mediabox Independance helps me taking better decisions	2,5	5,6	17,7	34,3	17,7	22,2
Total availability	I think it is easy to access the Mediabox Independance	3	6,7	14,6	41,4	19,7	14,6
Time to first byte	I think the loading time from the login page to Mediabox Independance is reasonable/decent/acceptable	6,1	8,6	18,2	40,9	12,1	14,1
Reaction time	I think the delay in displaying the first results is reasonable/decent/acceptable	6,6	14,1	17,2	39,4	7,6	15,1
Time to load	I think the time elapse when opening the Mediabox Independance is reasonable/decent/acceptable	6,2	12,6	19,6	34,8	11,6	15,2

		Yes	No	N/A
	Have you ever had the necessity to contact the IT support?	31%	45%	24%

		Once	Twice	Three times	More than for times
Implication of IT	If yes, how many times per month?	59%	24%	0%	17%

6   DISCUSSION

This research permitted to enlighten the lack of researches concerning the post-evaluation of collaboration tools. Due to this, a theoretical framework was created and tested.

The performance results of the different tools can be summarized as follow on Table 13.

Table 13. Perceived performance of the Mediabox Independence tools

Mediabox Independence collaboration tools	Project management	Information sharing	Communication	Planning	Comparison	KPIs and Exports
Performance of the tool	Performant	Low performant	Performant	Not performant	Low performant	Performant

In addition, the perceived performance of MBI was considered as performant due to the results obtained in Table 12 and 13.

The goal of this study was to find a way to measure the perceived performance of an e-collaboration suite. However, no previous researches in this field would have provided us with results expectations. However, the results of this thesis relate to Mainkar thoughts about collaboration suite which are measuring the ability of the suite to achieve the tasks it is employed for and if they are completed within a tolerated and admissible amount of time (1997) and Grigoroudis et al. who stated that it is possible to identify the users' attitude and preferences (2008) through the results.

Indeed, the results presented here enable the researcher and the reader to underlie some user's attitudes and preferences as explained in the results sections. The percentage of users answering positively or negatively to an item expressed more than just their thoughts but also their behaviors toward the tools.

6.1   Study limitations

However, we can underlie some limitations to this research concerning the pool of items, the sample of the study, the scale used and the theoretical framework.

We based our pool of items on the literature and observations made by the author. However, in preparation to get a more appropriate pool of items, a qualitative research can be added with interviews in order to extract the main themes and confront them to the literature (Frédouet and Le Mestre, 2005 & La et al., 2008). Indeed, a mixed research method would allow a more precise selection of items and permit the equation of each item to each cluster.

Here the selection of the same items for each cluster was made due to the lack of previous researches on the subject and in order to compare each cluster on the same items as well as calculating the final perception of the suite.

Another limitation of this study, as mentioned earlier, would be the selection of a wider population which would include more external users of the suite. Indeed, the results obtained in this study resulted from an online questionnaire submitted to a big population of approximately sixty users. However, as stated by Kumar, 2010, an online questionnaire is a research method obtaining a very low rate of answers. Do to this, the population obtained for this paper didn't provide a good representation of the users of Mediabox Independence bur only of the internal users.

Concerning the Likert scale, giving the possibility to respondents to answer N/A was based on the fact that different users means different roles and then different tasks which leads to divergent uses of the tools. However, the answer "Neutral" considered as neither agreeing or disagreeing with the statement didn't provide much insight in this study. Without this possible answer, the perceived performant results might have been more relevant and performant.

Furthermore, this study provides a theoretical framework supported by the use of a questionnaire but the results provided at the end only exposes the percentages of users agreeing with the statements; It quantifies the number of users satisfied with some perceived performance metrics. However, the use of some indicators of performance such as low, medium and high previously induced might give a more general idea of the overall performance.

6.2   Future research directions

The present study analyses the user-perceived performance of one collaboration suite at one point in the time. Due to the weekly changes put in place by the development team

on the demand of internal teams or clients, the perceived performance is very likely to evolve.

In addition to that, the perceived performance is based on human implication, it means that the results presented depend on the respondents "cognitions, affective responses, and behaviors" (Fry et al., 1993, 180).

Future refinement of the PPCSQ might be selecting different items for different clusters instead of applying the same ones everywhere even if they might not be relevant. In fact, the selection of the items in this study was done mainly through the literature review and the goal of this study was to provide a general model for post-implementation user-perceived performance evaluation for e-collaboration suites. In order to refine the PPCSQ, several items can be added or changed depending on the research method and the items relevance for each cluster.

Additionally, future researches can treat about the comparison between different collaboration suites performance evaluation in order to pick the most appropriate or to refine them in order to create the one which will fit the best.

Another comparison of perceived performance can be done between the different versions of one suite. For example, the Mediabox Independance was the second version of the collaboration suite and a comparison could've been done between the perceived performance of the fist and the second version.

Furthermore, as seen in the theoretical framework, it exists different post-implementation evaluations which can be perceived or actual. They can concern performance, ease of use, usefulness, quality… As explained in the model created by the author, perceived performance is important, useful and directly linked to customer satisfaction. A future research direction would be investigating the link between post-implementation customer satisfaction evaluation and the way it was implemented.

7 CONCLUSION

This paper introduced the following main research question: *How are e-collaboration suites user-perceived performance measured?* This thesis goal is to provide a simple and generic answer because it was discovered that it has never been done before. To remedy this, the author constructed a theoretical framework supported by a questionnaire and its application to test it via a case study.

In order to measure the user-perceived performance of e-collaboration suites, a literature review combined with a literature background is performed. Then, the selection of different items measuring perceived performance is conducted while the division of the collaboration suite in different clusters is done. The items are then associated to each cluster and the questionnaire thus constructed, is submitted to the sample of users.

This research had one main goal which is to propose a theoretical framework to evaluate the user performance perception of an e-collaboration suite. The analysis must be carried out once the e-collaboration suite has been reviewed in details in order to separate the different tools into different well-defined clusters. The way of working of each tool, its features and functionalities must be known by the researcher and by the users.

The first step of this theoretical framework is to create a questionnaire which emphasizes on the perception and not the actual performance. To do so, a literature and background review were necessary in order to select the items which compose the questionnaire.

The second step was to submit it to different users of the collaboration suite in question, in order to collect their judgements for each tool.

The third step consisted in finding a way to calculate those results and display them for a clear understanding and future analysis. It includes the cluster results which are very detailed and the suite results which is more global.

The fourth and last step is to understand what is not considered as performant for each tool and what is. From this last step, future implementations can be done based on further investigation to understand in detail and depth what the problems are and to what it is due. Only the results representing a surprising or an odd behavior from the sample of users is brought up in order to further investigate to understand them.

The sub-questions formulated at the beginning of this paper were answered throughout the literature review and the results obtained from the questionnaire. Here, a summary of the answers is provided.

The first question: *Why is user-perceived performance evaluation useful?* can now be answered through the statement that user-perceived performance is tightly linked to the user satisfaction and Mediabox Independence being used by internal profiles and clients, being able to evaluate their satisfaction is a big step towards future improvements and refinements of the suite.

To the question *How to select items for a questionnaire?* It was discovered that the low number of previous researches in this field could only be answered by the literature from other fields. The items were therefore selected based on various researches from disparate fields. However, the selection of items can also be performed based on or with the help of a qualitative research conducted previously.

The question *From which item is there more knowledge from?* can be answered differently in all the clusters. Depending on the answers of the participants the items can have an interesting behavior as shown previously in the results part.

To conclude this thesis, it was demonstrated that the user-perceived performance is important for companies as well as for clients especially because it is related to user and customer satisfaction and because potential future developments to enhance the suite are depending on it. This research present one way to measure perceived performance of collaborative tools but can be enhanced and improved by future researches. Additionally, this thesis fills the lack of literature previously mentioned concerning the post-implementation evaluation of collaboration technologies and will provide Diadeis with significant insights about Mediabox Independence.

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APPENDICES

Appendix 1. Perceived Performance of Collaboration Suites Questionnaire (PPCSQ) architecture

Category	Items	Statements	Sources
Information criteria	Reaching deadlines	I can reach my deadlines on time thank to [*insert collaboration tool name*]	
System facilitating criteria	Implication of IT	Closed question: Have you ever had the necessity to contact the IT support? Closed question: If yes, how many times per month? Open question: For what subjects?	Patterson et al. (1997) & La et al. (2008)
	Improvement perception	I think that my work capacity has improved by using [*insert collaboration tool name*]	
	Effectiveness perception	I think [*insert collaboration tool name*] is efficient. I can use it well	
	Satisfaction perception	I am overall satisfied with [*insert collaboration tool name*]	Convertino and al. (2006)
Information criteria	Quality	The quality of my work has been improved using the [*insert collaboration tool name*]	Syarnubi et al. (2018) & D'Ambra and Rice (2001)
	Quantity	I can treat a large amount of data through [insert collaboration tool name]	
	Reliability	I think [*insert collaboration tool name*] is reliable (stable, trustworthy, solid…)	
	Intuitiveness	I think [insert collaboration tool name] provides a good intuitiveness	Kozlowska (2018)
System impact criteria	Gain of time	I can accomplish some tasks faster thanks to [*insert collaboration tool name*]	D'Ambra and Rice (2001) & Fichter (2005)
	Review tasks	[*insert collaboration tool name*] helps me reviewing my tasks	Fichter (2005)
	Taking decisions	The information available on [*insert collaboration tool name*] helps me taking better decisions	D'Ambra and Rice (2001)
	Total availability	I think it is easy to access the [*insert collaboration tool name*]	Kaasila (2018)
	Time to first byte	I think the loading time from the login page to the [*insert collaboration tool name*] is reasonable/decent/acceptable	
	Reaction time	I think the delay in displaying the first results is reasonable/decent/acceptable	
	Time to load	I think the time elapse when opening the [*insert collaboration tool name*] is reasonable/decent/acceptable	