Diffusion of An Online Collaboration Tool: The Case of Google Wave Adoption Failure

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Abstract

The research set to understand reasons for the failure of Google Wave adoption. Based on the Diffusion of Innovation theory, this research employed the content analysis method to analyze secondary data from online forums that discussed the failure of Google Wave. Additionally, primary data were collected from early adopters who had discontinued using Google Wave. The research adds to the literature on adoption of online collaboration tools. It discusses factors accounting for Google Wave failure. Complexity and a lack of relative advantage are found as most-frequently-cited reasons for the failure. The invite-only policy is also cited as one of the main reasons. For academics, this paper highlights the importance of group decision-making as individual adopters with no one to use a tool with will eventually result in rejection of the tool. For collaboration tool developers, the research highlights the conflict between being an all-in-one tool and keeping the tool simple.

1. Introduction

Collaboration has become increasingly important to the success of today's enterprises [2]. Modern organizations have been attempting to capitalize on their ability to collaborate between business units and manufacturing facilities to develop better products and services [15]. To achieve their goals, they rely no longer on internal collaboration only. They also need to work closely and exchange ideas with external partners. The need to collaborate is also seen in everyday's life. A family, which has one or more family members who live abroad, needs to find a way to plan their holiday together. A group of friends who want to organize a party may need a tool to help them obtain common decisions more efficiently. As a result, many collaboration tools have been implemented to facilitate this kind of information sharing as well as decision-making tasks. Nevertheless, little has been reported on adoption success of such tools. In fact, diffusion of collaboration tools still remains as one of the most challenging problems [25, 38].

Challenged by the problems and considering collaboration important activities, Google has launched many online tools to aid collaboration, such as Gmail, Google Docs, and Google Calendar. Google Wave is one of Google's latest products which attempt to facilitate online collaboration. It is defined by Google as "… a live, shared space on the web where people can discuss and work together using richly formatted text, photos, videos, maps, and more" [14]. In short, it is "a personal communication and collaboration tool" [42].

The tool was first introduced at the annual Google I/O conference in May, 2009. It was aimed to be a mixture of email, instant messaging, and online synchronous and asynchronous collaboration, or in other words a social form of Gmail, where a group of people can communicate with each other in a single thread and can share images, files and videos in real time [16]. Also, it allowed users to embed and integrate different kinds of multimedia, such as YouTube and Google Earth, as well as to extend the software capability by installing different extensions, such as PDF support and Mindmap [32].

Google chose to limit the Google Wave users during its beta version by means of invitation-only. This created hype among users so much that soon invite became difficult to find and was posted for a bid or as a prize for answering questions of the month in some websites [9]

Despite many innovative features and the initial hype, Urs Hölzle, the senior vice president of operations and Google Fellow at Google, has announced on August, 4th 2010, around a year after its launch, that Google will cease the Google Wave project.

> "Despite these wins, and numerous loyal fans, Wave has not seen the user adoption we would have liked. We don't plan to continue developing Wave as a standalone product, but we will maintain the site at least through the end of the year and extend the technology for use in other Google projects." [17]

Such decision by Google has become widely criticized, and many websites have written and called

for public discussion on why people think Google Wave failed to get adopted.

The adoption failure of Google Wave is interesting and deserves a better understanding for several reasons. First, the tool provided a variety of helpful features for collaboration tasks. Second, it created a great hype but failed to get adopted. Third, considering benefits and potentials of collaboration tools, an understanding of Google Wave failure could yield both practical and theoretical benefits. For practitioners, lessons learned from failure of Google Wave will help them avoid similar mistakes when introducing other collaboration tools. For academics, such an understanding will add to literature on online collaboration tools, which have become ever more important since collaboration across time and location has become common and critical for firms' success.

According to Rogers [35], adoption is a decision to continue using an innovation. Therefore, this paper sets to understand why many individual users decided to discontinue using Google Wave. It seeks to identify factors accounting for the adoption failure of Google Wave. Clearly speaking, this research attempts to answer the following research question:

"Why Google Wave fail?"

The individual level, rather than the organization level, is of interest, as the individual users are generally the driving force in diffusing the technology across distance [25]. Diffusion of Innovation theory is applied as an initial framework to guide the content analysis of Google Wave users' viewpoints on the failure of the tool.

The rest of this paper is structured as follows. Section 2 reviews and discusses prior literature on the adoption of collaboration tools and relevant IS adoption theory. Section 3 outlines selected research methods for this paper. Section 4 deliberates research findings, and finally section 5 summarizes the findings and discusses research limitation and potential for future work.

2. Review of relevant literature and theories

2.1 Collaboration tools

A variety of collaboration tools are available. According to Johansen [19], they can be classified by two dimensions: time and location, as shown in Figure 1. Google Wave is one of the hybrid tools which attempt to support activities across the two dimensions.

Benefits of collaboration tools are well recognized. They can help increase efficiency and team's productivity. All project-related work, such as planning documents, budgets, progress reports, and discussions, can be gathered in one place in which all group members can access. As a result, the tools help save teams time by having a common place to look for information on a project. Besides, time spent in unnecessary meetings could be reduced as the tools allow background preparatory work and information to be circulated before meetings [11]. Improved meeting outcome quality and reductions of project calendar days up to 90 percent are also reported [5, 29].
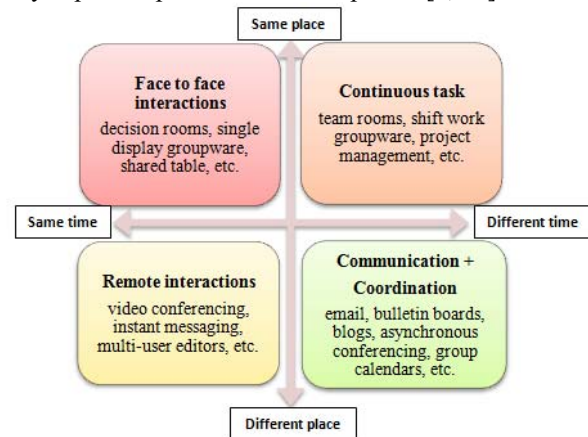

Figure 1: Classifications of collaboration tools
(*adapted from [19]*)

Since collaboration tasks are varied and there is no tool which serves all purposes [1], the use of a variety of tools to collaborate is encouraged [6]. Some recent case studies also support the notion that "a mix of asynchronous and synchronous tools is vital to team success" in collaboration [8]. However, the majority of prior literature on the adoption of collaboration tools focused on a single solution rather than a set of solutions [1].

This study is, therefore, expected to add to the void as Google Wave combined a set of solutions to supports several collaboration tasks (e.g. information sharing, video sharing, group editing, and group decision-making) both synchronously and asynchronously.

2.2 IT/IS adoption and relevant theories

IT/IS adoption issues have long been discussed but still receive continuously attention. This is partly because of mixed findings even among studies which were conducted with organizations of similar size [30]. Also, it is arguably that different technologies may possess different characteristics and have divergent effects on the adoption decision. For example, prior research on Group Support System (GSS) adoption found that the success of GSS is frequently attributed to its specific characteristics, such as the ability to

communicate anonymously and in parallel, and to keep record of the meeting minutes [28].

However, prior literatures on CIT adoption mainly focused on organizational and environmental factors affecting the adoptions. Technological aspect seemed to be disregarded or received little attention. For example, Munkvold and Anson [27] focused on management supports and roles of project champion and found that the two factors played an important role in the adoption of an electronic meeting system in an organization. Bajwa *et al.* [1] were interested in organizational factors, such as organization size, IT function size, and degree of integration and centralization of decision making. They found that these factors significantly influencing CIT adoption both in United States and in Australia. Besides, despite the fact that diffusion is often seeded at the individual level [26], these prior studies were conducted at the organization level. Examples of prior studies which focused on CIT adoption factors are presented in Table 1.

Table 1: Prior studies which focused on CIT adoption in organizations

Authors	Research focus
[27]	Organizational Adoption and Diffusion of Electronic Meeting Systems
[26]	Diffusion of a collaborative technology in a large, complex, distributed organization
[1]	Antecedents of collective adoption and use of CITs in the US, Australia, and Hong Kong organizations
[31]	A study of the adoption and utilization of seven collaboration technologies in large organizations in Australia and New Zealand
[3]	Factors affecting the adoption level of c-commerce in electrical and electronic organizations in Malaysia

Although there are other adoption studies which attempted to explain IT/IS adoption as a complex process going on in various organizational/individual settings, this research attempts to identify factors contributing to the adoption failure of Google Wave. Therefore, those studies were not included here.

In terms of theory applied in IT/IS adoption factors research, Technology Acceptance Model [4] (TAM) and Diffusion of Innovation theory (DOI) are well cited. This is partly because at the individual level, IT/IS adoption can be measured in terms of the users' perception of utility and satisfaction [13], and both theories directly address the two perspectives. Nevertheless, TAM has been commented on its parsimony, and many studies which adopted the model

expanded it in order to better explain user's acceptance and use. Tang and Chiang [40], for example, extended TAM with perceived self-efficacy and perceived convenience in their research on an understanding of the behavioral intention to use mobile knowledge management.

While TAM focuses users' perception towards technology, DoI includes other factors influencing the rate of an innovation adoption, such as type of adoption-decision, communication channels, nature of the social system, and change agents. Based on DoI, diverse findings were found. For example, while Soroka and Jacovi [38] found that compatibility, complexity, observability, and trialability were influential factors determining an adoption of collaboration technologies, Chong *et al.* [3] found relative advantage, complexity, and compatibility insignificantly affecting the adoption of collaboration commerce.

In summary, although a large number of technology adoption studies have been conducted, Google Wave possessed a different set of characteristics and therefore requires specific research. Besides, since Google targeted the tool for a wider audience, including users outside work organizations, attributes of the technology are a main focus of the study rather than other organizational and environmental factors. Therefore, DoI is considered an appropriate framework to start with.

3. Methodology

The objective of this paper was to understand why Google Wave failed. The mixed method research design was applied. The researcher combined content analysis, *a quantitative research technique*, with interview, *a qualitative research technique*. The latter was used in order to triangulate and complement the former, and therefore the research was divided into two parts.

3.1 Content analysis

In the first part, the researcher attempted to i) identify factors by which Google Wave users considered accounting for the adoption failure of the tool, and ii) rank them in an order of most-cited factors to least-cited factors.

Content analysis was chosen to make inferences from the data. According to Krisppendorff [20], Content analysis is a research technique for making replicable and valid inferences from data to their context (p.21). It can be used to examine any piece of writing or occurrence of recorded communication [23].

Therefore, the method is considered appropriate and helpful.

As mentioned earlier that a number of websites have written and called for discussion on Google Wave failure. The researcher considered those written opinions an interesting and appropriate source to learn about Google Wave failure for three reasons. First, online forums were places which usually gathered a number of early adopters who were keen on sharing their opinions about certain tools. Therefore online forums which discussed Google Wave failure seemed to be a good source of opinions from early Google Wave adopters. Second, it reduced hugely the limitation on data collection as there was no need to search for Google Wave users. Besides, the written form is considered appropriate and helpful in avoiding transcribing mistakes [23]. Third, individuals usually expressed their views freely and naturally on online forums; hence it seemed to be neutral and free from pressure. Therefore, instead of surveying a number of users who have used and decided to discontinue their use of Google Wave, the researcher chose to understand the underlying reasons of such decision from existing sources of data.

To obtain the secondary data, the researcher first checked out the official Google Wave Blog (http://googlewave.blogspot.com/) and also Google

Blog (http://googleblog.blogspot.com) to see if there is any discussion on the termination of Google Wave or Google Wave failure. The two blogs, however, contained no comments pertaining to why Google Wave failed to get adopted. Consequently, the researcher turned to other blogs and forums which usually discussed new technologies through Google search engine, using search keywords pertaining to Google Wave adoption failure. Although Google is an owner of Google Wave, the company is not related by any means to those blogs and forums. Therefore, the researcher believed that using Google search engine as a tool to locate data did not affect the reliability or validity of the data.

Since Google search result normally ranks by relevancy and quality of result pages, the researcher sampled the top ten search results of a certain keyword and selected only the websites which contained comments from readers. However, the researcher acknowledged that the top ten is not a good representative of the huge amount of web data. Therefore, more searches were conducted using different keywords until no new results were found in the top ten search results of each keyword. This was expected to help increase the quality of data sampling. Table 2 captures sources of secondary data and numbers of comments posted in the selected forums.

Table 2: Secondary data collected from online forums in which Google Wave failure has been discussed

Keyword: Google Wave Failure		
Results	**Published Date**	**No. of comments**
Lessons Google Can Learn From Wave's Failure	August 6, 2010	88
Terminal Wave: The Google Wave Failure | The Milwaukee SEO	December 14, 2009	58
Reasons why Google Wave Failed | Blog Godown	February 11, 2010	18
Lessons from Google Wave failure | ZDNet	August 5, 2010	55
Google Wave failure may help Google Me succeed – Computerworld	August 5, 2010	19
Shouldn't We Be Celebrating Google's Failures?: Tech News and ...	August 5, 2010	29
Wave Goodbye To Google Wave	August 4, 2010	228
Keyword: Google Wave Failed		
Results	**Published Date**	**No. of Comments**
On Google Wave and "Failed" Experiments	August 5, 2010	51
Why Google Wave Failed And What It Means - Slate Magazine	August 24, 2010	60
Why Google Wave Failed - 5 Reasons Why Wave Tanked: TP Tells It ...	August 5, 2010	7
R.I.P. Google Wave | TechHaze.com	August 5, 2010	44
Why Google Wave failed? | YugaTech | Philippines, Technology News	August 5, 2010	23
Keyword: Google Wave Adoption Failure		
Result	**Published Date**	**No. of Comments**
Why did Google Wave fail to get significant user adoption? – Quora	August 4, 2010	22

Google Wave Gone, But Not Quite A Failure | Javalobby	August 4, 2010	7
	Total Comments	709

Four out of five characteristics of innovation from the Diffusion of Innovation theory [35] are applied to providing the coding scheme. Trialability is omitted because Google Wave was free, and therefore everyone was able to use the software without any trial limitation. Although the invite-only policy was applied during an early launch of the tool, invites were free, and once a person received an invitation he/she could try any features with no limitation. In other words, the invite-only policy is considered relevant to a matter of when a person gets to use the tool, but it does not make the tool not "triable". Table 3 presents the four characteristics and their definitions which provide a boundary for interpretation.

Table 3: Diffusion of Innovation Theory as the coding scheme for content analysis

Characteristics	Definition
Relative advantage	The degree to which an innovation is superior to ideas it supersedes
Compatibility	The degree to which an innovation is consistent with existing values and past experiences of the adopters
Complexity	The degree to which an innovation is relatively difficult to understand and use
Observability	The degree to which the results of an innovation are clear or may be diffused to others

The research reliability was enhanced by following the prior coding steps, namely establishing categories based upon the DoI prior to an analysis, having two analysts (the author a part-time research assistant) agreed on the categories, applying the coding to the data, and revising as necessary to increase mutual exclusivity and exhaustiveness of the categories. This process is recommend by [41] who notes that "reliability problems usually grow out of the ambiguity of word meanings, category definitions, or other coding rules" (p. 15). Therefore, the researcher paid careful attention to the development of coding scheme and that the two analysts have established shared and hidden meanings of the coding.

As a result, during the coding process, the two analysts agreed to revise the coding scheme by adding three more categories, namely type of adoption-decision [36], system quality [7], and communication/marketing.

3.2 Interviews

The second part of the research was conducted to increase research validity. The researcher conducted face-to-face interviews to obtain qualitative data in order to help explain the adoption failure of Google Wave. Three early adopters who later on discontinued using the tool were chosen and contacted.

Background and other contextual characteristics of the interviewees were not taken into consideration when selecting them. This was because limited background and contextual characteristics of those which made up the secondary data for this research were also limited. The researcher only knew that they were adopters who were keen on using the tool and the failure of Google Wave enough to share their view on the Internet.

Notes were taken during each interview and used for later analysis. The same interpretation guideline as used in the first part of the research was also used in this part of the research. Importantly, it allowed the researcher to link the research findings from the two parts together.

4. Research findings and discussions

4.1 Research findings

Of total 709 comments, 373 comments were discarded because they were irrelevant (e.g. they were advertising or discussion on Google Strategy rather than the failure of Google Wave), duplicated, or not able to obtain common code from the two analysts. This accounts for approximately 50 percent of the total comments. Interestingly, almost 20 percent (61 comments) of the rest 336 comments actually liked and mentioned that they benefited from the tool. The other 275 comments were further analyzed. They mentioned various factors perceived as reasons for Google Wave failure, making 431 occurrences of relevant factors. Note that the total occurrences of all factors are greater than the total number of comments, because one user usually mentioned more than one factor accounting for the adoption failure. Table 4 presents number of occurrences which are grouped into the same characteristic taxonomy.

Table 4: Findings from the web and the students

Characteristics	Examples	Occurrences (from online forums)
Complexity	Difficult to understand and use, User interface is not intuitive	88
Relative advantage	Not better than msn, email, Google Docs	81
Type of adoption-decision	No one to work with because of invitation	79
Compatibility	No integration with email, More thing to check	63
Communication/ marketing	Google didn't promote it, Overhyped	48
Observability	Not sure what it (Google Wave) was, cannot explain to others in short what it is	39
System quality	Synchronization bugs, Slow, Not quite finished, Prone to excessive spamming	33
	Total	431

From the web data, complexity is most frequently identified as a factor accounting for Google Wave failure. It can be seen from Table 4 that complexity was mentioned 88 times. This made up 32 percent of the comments. Almost half of the 88 comments concerning complexity indicated that Wave includes a number of features and makes it difficult to understand what it actually was. As mentioned by one of the users:

"A service that requires 20 tutorial videos to even explain the concept is doomed from the beginning." (Chris)

"Wave, in some significant ways, seemed like an elegant grown-up version of Lotus Notes, but, like Lotus Notes, it tried to do too much and was brought down by its own weight." (John)

One of the interviewees also raised this issue:
"It was quite a complex tool as I understand that Google tried to make it skillful, but then it turned out to be complex and difficult to use compared to other tools. And, I guess that's one of the reason my colleagues didn't respond well to my invitation to use the tool." (Interviewee A)

Although it is not surprising that complexity accounts partly for the failure of the tool, the finding adds to the diffusion of innovation theory by supplementing user interface perspective to the original

meaning of complexity (difficult to understand and use). It is found that from 88 occurrences relevant to complexity, more than half (49 occurrences) of them mentioned the complexity of user interface as an underlying reason that they did not want to continue using Google Wave. The following quote provides a good example of such occurrences.

"One of the challenges for Wave was that the interface was not immediately intuitive, even for people used to technology." (Kevin William David)

Ranked second is a lack of relative advantage. From 275 usable comments, a lack of relative advantage was mentioned 81 times. Many users commented that they found no superior advantages than existing tools they were already using, while some users found no relevant advantage at all. Below are some examples of those who found Google Wave offered no relative advantage.

"Wave failed to specialize or exhibit a strong use case:
- In terms of real-time collaboration, Google Docs and Spreadsheets are an established product with nearly the same capabilities and functionality
- In terms of communication, email and Gmail/Chat are well established and, again provide similar functionality
- The clever Wave features, like widgets and playback are cute, but not valuable enough or sufficiently differentiating to encourage user adoption and stickiness" (Anon User)

"Simply put, everything that you can do with Wave you can also perform using another service that's far easier to use." (Anonymous)

This is also supported by data from one of the interviewees who mentioned:
"Well, Wave is interesting. But, after trying to use it I don't think it is superior to Google docs and gmail which I and my colleagues have been using when we needed to work together." (Interviewee B)

Type of adoption decision is ranked third. This factor was not included in the original construct for this research but appears almost as frequent as a lack of relative advantage with 79 occurrences from 275 comments. Although the factor was not considered one of the innovation characteristics, Rogers [35] explained it in terms of elements of diffusion. Since social system is one of the elements of diffusion, types of adoption decision ranging from individual choice to group decision can therefore affect the adoption of an innovation. Simply speaking, for some innovations, "an individual may wish to adopt, but he cannot do so until others join him" (p.15). This appears to be

particularly true in the context of Google Wave, as many users pointed out:

"I was excited that I got an invite, but after 2 weeks I forgot about it, since nobody I knew had gotten an invite. Google should have had just a big world wide release." (Anonymous)

"Reason is simple; none of my friends are using it." (Gaivnzy)

All three interviewees also agreed with the limitation from the invite-only policy. Examples are:

"Why made it invite-only? It just impeded new users who wanted to just try first but can't be bothered requesting for an access and waiting for a reply. Too bad, Wave would have gained more users without this invite thing." (Interviewee A)

"I ranked the invite-only policy the first barrier, and I think it truly was. It made it more difficult for people who wanted to use the tool." (Interviewee C)

Following type of adoption decision is compatibility. 63 occurrences concerning compatibility were found from the total 275 comments. It was usually mentioned in terms of integration in this context. Users believed that Google Wave should be integrated to email, which is an existing tool that they are already using in everyday life. The importance of degree of integration was also recognized by Bajwa *et al.* [1] who also studied an adoption of collaborative information technology in organizations in United States and Australia. Below are some examples of users who perceived a lack of integration or compatibility with existing tools as a factor explaining for failure of Google Wave.

"Imagine if they actually built wave *to integrate with services that everyone already uses*. A way to combine all of these into a single interface.

Chat: Google Talk, AIM, Yahoo, Etc.
Email: ...
Social: Twitter, Buzz, Facebook, etc
Documents: Google Docs, Microsoft Office Online, etc.
I believe this would have raised the adoption rate of wave much higher as anyone could use it to communicate with current contacts. It failed because it was designed for collaboration/ communication, but does not integrate with what people use to communicate." (AG)

"100% agree- wave should have always been part of gmail. Maybe a choice to switch interface between wave or gmail, or turn email threads into waves. Nobody wanted to maintain a separate communication account for working with the few

people from your other address book that wanted to try wave." (JG)

Again, all three interviewees pointed this out unanimously. They eventually discontinued their use of the tool simply because few of their colleagues used it with them, and that made the tool become of little use.

Communication is ranked fifth. From 275 comments, various issues related to communication problem of Google Wave were mentioned for 48 times. In other words, there are 48 from 275 users who perceived that Google have unsuccessfully introduced (including promote) Google Wave to its audiences (potential users). This is interesting as there were several users who thought that the tool was actually useful but Google did not market it appropriately. From a practical point of view, this is actually important in order to obtain a large number of users, as the bigger the group of early adopters is, the more likely the users will exponentially increase. Examples of comments are as follows:

"This is very sad. I thought it was a great product but suffered from a lack of good marketing AND positioning (as in it wasn't good enough to do what Google wanted it to, and it was never marketed adequately to fill a niche) ..." (Robert Mark Bram)

"The idea behind Wave is great, "real-time collaboration and chat". However, ... The marketing and branding was poor, … In marketing, the target audience wasn't explicatively defined, the branding didn't coincide with the purpose. …" (Rick Canfield)

Interestingly, none of the interviewees raised any issue concerning the way Google Wave market itself or communicate with potential users. It may well be that the interviewees were academics whose research was related to the IS/IT field and, thus, had no problem keeping themselves updated with IT news.

Ranked sixth is observability. According to Rogers [35] observability is important because if the ideas and results of an innovation cannot be easily diffused to others, it will affect the adoption rate. 39 from 275 web comments recognized observability as one of the factors accounting for Google Wave failure. Problems concerning observability can be seen from many comments, which contradicted with each other in terms of what Google Wave was and what it did. Although this sounds similar to what regarded as complexity, observability in this research is more of the ability of users to explain and diffuse their ideas about Google Wave to others rather than the ability of users to understand and use the tool. As one of the users pointed out:

"Another reason they [Google] failed, was because they didn't know the true purpose of Wave ... Was it a next generation email system? Was it a collaboration tool? Was it a social network? If it wasn't very clear for them, how could it be for people that would try to promote it to their friends?" (Lucian Armasu)

This issue was also mentioned by one of the interviewees:

"I don't know. I just can't understand it. And, different people that I asked seemed to understand it differently. Anyway, I don't mean it is not useful..umm..just thought it is difficult to digest and explain to others. To me, this is quite important. If you can't explain it simply, it won't diffuse easily." (Interviewee C)

The least mentioned factor is system quality. 33 occurrences of system quality were found. Although it is not included in the diffusion of innovation theory, system quality is well researched and cited as one of the factors influencing adoption decision or user acceptance [37, 22, 43]. It is also encompassed in the IS success model by [18]. From both data sources, system quality concerns two main points: loading time and bugs of the software. Below are some examples of comments in which system quality was mentioned.

"The most failure for me is the loading time. It is killing me while access it with my current internet bandwith."(Dana)

"There were synchronization bugs that were never worked out. It's incredibly frustrating when you work on something and then just flat-out lose it because 15 other people are working on it at the same time and the server has no idea what to do with all the changes." (Jae Won Joh)

System quality was also found problematic by two of the interviewees. They pointed out that:

"Besides, in comparison with other tools I have used, I think Wave was quite unreliable. Still there were problems with synchronization, and sometimes just crashed down with no reasons." (Interviewee A)

"You need to take also the quality issue into consideration. I think Wave had some quality problems like tiny bugs here and there." (Interviewee B)

4.2 Discussions of the research findings

Although there appeared no single major characteristic, which accounts for Google Wave failure, influences of the top two most-mentioned characteristics, *relative advantage and complexity*, on adoption and use decision are well supported in a number of prior studies (e.g. [33, 48]). In terms of relative advantage, it shows that only benefits are not enough to change early users to be long-term users. Rather, the tool has to be able to offer clear benefits enough that the users consider it worthwhile leaving an existing tool and turning to adopt a new tool. The passion to provide such superior benefits, however, might have led Google Wave to incorporate so many features, which turned out to be a complexity trouble. Therefore, this lesson implies that it would be better to really excel in one thing rather than doing fairly average in many things. Although this is not a brand new lesson, it is worth mentioning, as the balance between complexity and relative advantage will be problematic issue for the future development of the group support system and collaborative tools, which need to be able to support various tasks.

The other two interesting factors are type of adoption decision and communication/marketing. In the case of collaboration tool like Google Wave, type of innovation decision is shown to be important and extensively pointed out by several users. It is not just about influences of opinion leaders or other social factors. On the other hand, such a tool becomes useless when there is no one to use with (supported by several quotes presented above). Therefore, the invitation-only policy can be regarded as a big mistake that makes Google Wave fail to get significant adoption rate that Google expected. Although Google decided to open Google Wave for anyone on its first birthday anniversary [12], it seemed to be too late that in the next few months later Google announced to discontinue the development of Google Wave.

The communication/marketing issues are twofold. On one hand, there were users who mentioned that they would have not known Google Wave, if it had not been directly introduced to them. This group of users found the tool was quite useful and thought that if it was promoted or advertised more, it could receive much more attention. On the other hand, there were users who heard a lot about Google Wave and what it promised to offer from several media. However, it had been more than half a year later that Google Wave was actually launched and those users got to use it. This group of users claimed that during the waiting period the tool was overhyped and that it failed to offer what had been promised. Interestingly, marketing is rarely mentioned or studied in IT adoption literature. This is probably because other studies focused on technology or system which was implemented or used in organizations, but Google wave is somewhat different. It is a tool, which has a wide range of target audiences, and marketing could therefore be helpful in obtaining a

significant adoption rate. The author encourages other researchers, who are interested in studying an adoption of any particular tool or technology, to include marketing factor into their model to test our finding further. Expectation management is also revealed by users, and thus has implication for practitioners.

Despite being least-mentioned factors, it does not mean that observability and system quality are not important nor less important than other aforementioned factors. Observability is important in helping early adopters spread the words about the tool, while system quality is important in sustaining early adopters and turning them to real users. Future work can therefore study further in these aspects.

5. Conclusion

Seven factors, including complexity, a lack of relative advantage, type of adoption decision, compatibility, communication, observability, and system quality are found in this research as factors contributing to the adoption failure of Google Wave. Between the two data sources, no conflict findings were found except that none of the interviewees raised any issues concerning communication/marketing factor. Apart from that both secondary and primary data revealed similar results. Therefore, it reconfirms each other and increases validity of the findings.

This research supplements existing literature with factors accounting specifically for the adoption failure of online collaboration tools. It also adds insights into potential areas where collaboration tools differ from individual-user tools. In particular, type of adoption decision is of great importance to the adoption of online collaboration tools. This is because for any collaboration tools many individual users with no one to work with resulted in adoption failure as shown in this case. In other words, a lack of critical mass is important for diffusion of other collaboration tools similar to Google Wave, whose target users are free to choose and not influenced by organizational factors but by their group members.

Insights are also added into complexity and observability factors. They are revealed as problematic and perhaps relevant issues. Since collaboration tasks are varied, and to support the tasks the tool needs to provide several functionalities. Therefore, it is likely that the tool is complex and as a result difficult to diffuse the product to others. Practitioners who are to develop and promote an online collaboration tool have to balance the effects of the two factors.

However, it is important to note that the ranking of occurrences is not related to the degree of influence that each factor has on the adoption decision. In other words, this research does not find any evidence on which factor significantly influences the decision and which does not, nor there is support on which factor has higher influences than the others. Also, an uneven proportion between primary and secondary data causes limited comparison. Limited knowledge on contexts of the secondary data, such as locations of those users, their computer background, and their work, impede a more in-depth interpretation.

Future research could pay more attention on the context of users and their characteristics. This issue is also noted in several adoption studies [4, 21]. Additionally, in-depth interviews or focus groups with users could add insights into users' experiences and help identify what make some users perceive the tool as useful, whilst the other users do not find any particular use for their work. Processual theories as noted in the literature review could be used to further explain how users accepted and used or tried and rejected the tool. This could benefit the research area by adding further on how to plan for successful diffusion of collaboration tools.

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