Global Adoption of Unified Communication Technologies as Part of Digital Transformation in Organizations: A Cross-Cultural Perspective

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Abstract. Unified Communication (UC) is increasingly introduced in global enterprises to support the digital interaction of employees. Cultural differences can influence such adoption of corresponding technologies and need to be considered by IT managers. In this study, we show how cultures with specific characteristics (according to Hofstede and Hall) adopt UC differently. This research paper is based on a unique dataset, consisting of communication data from over 6,000 users of a multi-national enterprise. During the period of six months, 4.6 million records were collected with the purpose of analyzing the adoption after the rollout of a UC technology. Eight subsidiaries in Asia, North America and Europe were analyzed. The results show that especially Hofstede's factors Individualism/Collectivism and Long-Term Orientation as well as Hall's factor Monochronic/Polychronic culture helped to explain post-implementation usage activity. The results help IT managers to understand potential cultural influences on introductions of according technologies in global enterprises.

Keywords: Communication Technology, Unified Communication, Digitization, Diffusion, Adoption

1 Introduction

The digital transformation is prospected to have a significant impact on both private and professional life [1]. Taking a closer look at how enterprises deal with it, one can see companies in a permanent struggle, striving to be more digitally mature [2]. On the one hand, this is naturally driven by economic reasons, maintaining the ability to cope with other competitors in terms of new digital products or providing other beneficial processes. On the other hand, and just as important, companies have to transform their working environment, since employees are more attracted by digital leaders [3]. Information Systems need to adjust to different architectures to serve the people's increasing need for efficiency and mobility [4]. As [2] state, the digital transformation is not purely about the technology that is being implemented. It's about how companies integrate it into their global organizations, which is why the adoption process for digital

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oriented technology is crucial for this transformation. The digitalization of a company does also require facilitating communication and "will only succeed with the aid of modern, professional corporate communication" [5]. To do so, enterprises need to adjust their processes and adopt digital novelties. Physical presence is more and more replaced by new communication solutions [3]. It will be of great relevance which channel of communication is going to be used in future to foster knowledge within the organization, whereas solely the choice of channel delivers a certain context of the information itself [4]. It is assumed, that the importance of communication and collaboration across geographical spans increases, emphasizing the need to implement intelligent digital communication concepts such as Unified Communication.

Long before the actual dissemination and implementation of Unified Communication (UC) solutions in companies, various investigations have predicted a high impact of this technology on business. As the everyday work becomes easier to manage, more efficient and the increasing need for communication is easier to handle for office workers [6]. UC is understood as „ […] communication services across geographical boundaries and networks based on rules and policies that provide seamless integration between services" [7]. Companies are increasingly confronted with the change due to globalization and digitization. An international collaboration between employees of different countries becomes more and more important and can be affected by many factors. Two examples are the available type of communication technology and the prevailing culture of that country [8]. For IT-managers, it is therefore valuable to understand the mutual influence of certain *cultural* aspects and the diffusion of communication technologies in this context. It will furthermore help decision makers to cluster and focus respectively, since implementation of new technologies will come in a higher frequency. Employees must cope with this and adopt. This is directly affecting their efficiency, which is why enterprise decision makers should prepare the implementation of new technologies in an optimal way and estimate the adoption speed. For this, it is of importance to know the mutual influence that culture comes along with in different countries. Though we have extensively reviewed the literature in this field, we did not come across a study that is analyzing the correlation between an IS adoption and culture based on a large dataset. Therefore, in this paper we focus on the following two research questions (RQ):

RQ1: How does the usage activity develop over time in different countries after the system's implementation?

RQ2: To which extent can commonly applied cultural factors serve as an explanation for the development of system usage in different countries?

To answer this, our paper is structured as follows. In section 2, we provide an overview of related work on the digital transformation and unified communication. This is followed by an overview of existing research on cultural influences on IS adoption. In section 3, we describe the research design, methodology and underlying data basis in more detail. The results are presented in section 4, followed by a discussion with the study's limitations in section 5. This paper ends with a summary and an outlook to further research in section 6.

2 Related Work

2.1 Digitalization and Unified Communication

"Employees want to work for digital leaders." [2]. Enterprises strive to digitally adapt to not only support digital goods and services that secure their economic future, but also provide the environment to ensure the continuance of their human capital. A more digital life comes with more convenience and saves time, and most of all it is more efficient [3]. As [9] postulate, this transformation brings the need of higher connectivity between individuals globally, where people are using a manifold variety of devices. Hence, they strive to be mobile while increasing their own communication activity [9], [10]. More and more people are used to rapid technological changes in society (see e.g. e-business, social media etc.). This is increasingly considered by businesses and as [11] predicts, the frequency of changes in enterprise IS will also increase with the digital transformation process [12], [13]. Thus, many companies have undertaken efforts to start digital initiatives to change their IS portfolio [9]. The software "Skype for Business", which is a UC tool, is an exemplary technology for a modern, cloud enabled architecture. [14] and [15] consider communication technologies as digital technologies, which are the core of digital transformation processes. They argue that the IT strategy needs adjustments to more future-oriented architectures, based on key external digital trends, such as "pervasive connectivity" or "growth of cloud computing". [16] are indicating that this has to be taken a step further and include a digital transformation of cross-company-cooperations. [6] predicted an enormous market potential for the still developing technology of UC for private as well as enterprise usage, crediting it the possibility to change the market. Later, [17] continued this thought and even brought it even further. They concluded that integrated technologies such as UC are one of the most influencing factors on daily work processes. UC represents a combination of different communication services, leading to an improved user experience, since multimedia and communication requirements from users can be covered [17]. Since this technology is becoming of more and more relevance, a vast variety of tools exist, though the enterprise market is dominated by only a few vendors such as Microsoft (Skype for Business), Cisco (Unified Communication Manager) and Mitel [18]. UC focusses on real-time and non-real-time communication, whereas it should be distinguished from enterprise social networks which foster the collective wisdom in organizations.

2.2 Cross-Cultural Adoption of Technology

Regarding the adoption of Information Systems (IS) in different cultural environments, several studies with each a certain focus exist. They all focus on the general acceptance of IS. Especially [8] have reviewed the literature and concluded that several studies base themselves on or mention the cultural dimensions developed by Hofstede. A total of 16 studies existed at the time of their research, focusing on the interaction between culture, technology and adoption. Most of these studies concentrate on the theoretical combination of these aspects, further exploring the model of

Hofstede. However, the literature review brought up just a few studies that support their hypothesis with a dataset of varying size. An example for this is [21]. [22] builds his studies on the cultural dimensions of Hofstede as well and rudimentarily touches the combination of both adoption and technology. Furthermore, an investigation of [23] revealed that also the management of organizational culture is important for an adoption of technologies, because it influences on the one hand the acceptance by individuals and on the other hand the actual use of information technology within an organization. Another affecting factor of the technology diffusion might be the perceived risk and social influence [24]. Particularly social influence can have impact on the decision regarding adoption or rejection of technology, which was indicated by results of [24]. They examine moderating and predictive factors and their impact on trust regarding the adoption of corporate cloud technology. Trust as a basis for cooperation within organizations affects the IT adoption as well, which is suggested by research outcomes of [25]. The combination of all these aspects play an important role in the adoption of a system. However, these influences on adoption are not equally distributed globally but rather varying for each cultural environment. For example, performance oriented cultures tend to compare a new system with the known and try to derive a direct advantage out of this regarding efficiency [26]. In this context, the technology chosen as foundation for this study (UC) may play an important role here, since it does not only support pure content but also provide the possibility to adjust media richness (e.g. chat, audio, video). The argument that the culture could affect the acceptance of technology was confirmed by [27] as well. Therefore [27] conclude(s/d) that such factors impact the technology adoption in dependence of the country and because of their culture. South Korea for example is classified as a culture with a constant fear of not being within the given specification. Another dimension is collectivism and individualism. The United Kingdom can be understood as a strongly individualistic society, where a high complexity is prevailing and the single individuals are in a loose connection with each other. South Korea and China on the contrary are known to be collectivistic and show strong ties among individuals [28], [29]. As previously mentioned, we did not come across research that combined the cultural insights of previous studies (Hofstede, Hall) with the adoption of technology in a digital context. Based on the review of existing literature that we undertook, we contribute with the results of our study towards the closure of this existing gap and provide insights to a large dataset, linking the adoption with culture.

3 Research Design

3.1 Research Model

Based on previous research and the derived knowledge, we chose to underlay Halls' and Hofstede's factors for this study. We gather the input and factors solely based on the studies of [29], [33] and [34] as reference for Hall's research. Out of currently six existing factors based on Hofstede's research, we have chosen five due to the following reasons. Based on his initial research [29], collectivism, uncertainty avoidance, power

distance and masculinity are the oldest factors which date back to 1984. According to the findings of [8], these factors play an important role in the context of user adoption. Accordingly, a wide spread collectivism will either result in the quicker acceptance of the technology or a collectivistic restraint from usage [8]. Furthermore, [35] assume(s/d) that cultures that react cautiously to unknown, classify new technologies as unsafe and adapt relatively slow. The power distance is an often-investigated factor in science and may influence a more agile exchange between hierarchical levels, resulting in a different speed of adaptation [8]. Masculinity refers to the orientation of specific masculine or feminine values within a culture. Hence countries with a high value tend to be oriented to masculine values, such as higher focus on competition. The opposite orientation is when cultures foster social components [8], [20], [22], [34], [36]. Long-Term orientation is included in more recent research of Hofstede and catches a culture's handling of past and future with the respective influence on work [37]. Hall mainly describes two factors. The first, low and high context cultures, is capturing a culture's tendency for the need of context to make decisions. High context cultures would gather more information and context before deciding on something than low context cultures. The second factor, monochronic and polychronic cultures, describes another variation of time, more presence-based than Hofstede's long-term orientation. Monochronic cultures are better organized and usually on time, whereas polychronic cultures tend to be organized differently and e.g. tend to start multiple tasks at the same time [34], [38]. For Hall's factors, we were in the need of transcoding them into a suitable format for further analysis. Hence, we made use of the existing research of [34] who already operationalized the classifications of Hall. For this, figure 1 provides an overview of the chosen cultural factors.

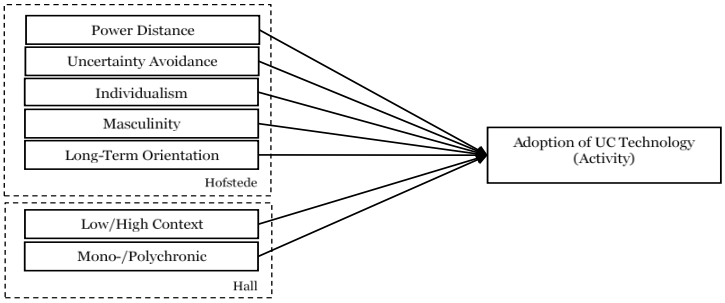

Figure 1. Research Model based on cultural factors

3.2 Methodology and Data Basis

Our foundation is a dataset from a large enterprise headquartered in Germany with approx. 100.000 employees. Being in the manufacturing business, the company decided to switch globally from various communication channels to a unified solution: Skype for Business. Throughout the basic data set, all communication channel activities were considered to conduct comparing analysis. However, since the chat functionality instantly came with the prerequisite of the software installation, we could not make a clear distinction of when the chat feature was used, hence we focused only on the voice

component. The voice feature though could be assigned to a specific implementation date and hence we could mitigate possible interferences. Accordingly, the local management officially pronounced the order to use the solution as soon as possible. In all countries, the internal marketing and advertisement for the new technology has been conducted in the same way - before and after the introduction. We based our analysis on 6,309 users in 8 countries and could draw from 4.6 million records which represented nearly 100% of the employees working in the respective locations. To answer the research questions, we aim to find a pattern in the activity distribution from day 1 to day 180 (six months). The evaluation of this final dataset has been done using SPSS, providing us with all statistical variables. To calculate the necessary correlations, we chose to use the Pearson correlation because all our scales were single-item scales [43].

4 Results

Table 1 provides the output of the Pearson correlation and the linear regression analysis that was done on the dataset. The table indicates the underlying n per country (*Users*) representing the active user count. It is sorted by the Pearson coefficient in an ascending order. The results show that countries with a negative and positive correlation coefficient are balanced. Negative coefficients show, that activity decreases while the time increases (increase of days after go-live). All results show a high significance with $p<0.01$ (indicated with ** in table 1) and mostly a strong correlation (all coefficients >= .279). Categorizing the results by positive and negative correlation coefficients, we observe that countries prevailing with a descending activity (negative correlation) are all located in the Asian region. The opposing pattern - a positive correlation - is reflected by a mix of countries. Three quarter are in the European or American region (Germany, United States and United Kingdom) and the fourth country is Thailand, located in the Asian region.

Table 1. Explorative analysis (activity over Time; significance indicated with ** = p<.01)

Country	*Users*	*Total Voice Conversations*	*Pearson's Corr. Coeff.*	*Gradient*	*Regression Constant*	R^2
China	785	459,971	-.725**	-.012	6.682	.526
South Korea	414	10,100	-.674**	-.011	5.590	.454
Japan	185	163,190	-.422**	-.004	5.093	.178
Singapore	68	43,251	-.279**	-.003	5.510	.078
United States	223	75,269	.485**	.010	3.089	.236
United Kingdom	162	61,931	.569**	.014	4.557	.323
Thailand	65	19,434	.642**	.011	4.662	.117
Germany	4407	3,501,534	.650**	.005	4.874	.422

The results show that countries with a negative Pearson correlation also have a negative gradient, ranging from -.012 (China) to .014 (United Kingdom), due to the similar nature of the analysis. The initial activity on day 1, expressed by the constant of the regression, is showing the highest values for countries with the lowest gradient (or the lowest correlation coefficient respectively). We found R^2 values averaging at .292, with a maximum of .526 (China) and a minimum of .078 (Singapore). We base further analysis mainly on Pearson's coefficient, descriptively supported by the regression gradient and the constant. To visualize the dataset and the undertaken statistical analysis, figure 2 and figure 3 show opposing examples for the activity distribution.

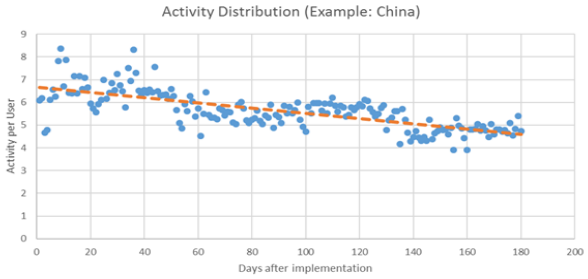

Figure 2. Negative correlation coefficient with decrease of activity (example China)

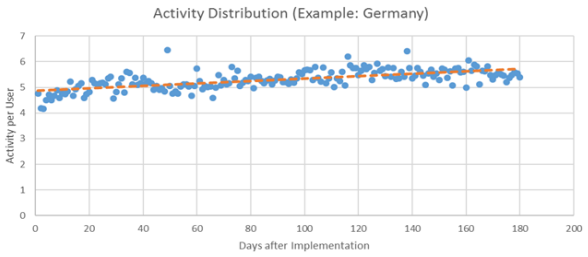

Figure 3. Positive correlation coefficient with increase of activity (example Germany)

The regression function is visualized in orange. The blue dots each represent the averaged activity data (per user) gathered for one day as introduced earlier. As the analyzed features were fully available to all users right from day one, a comparable situation is given. However, we observed that in each country the number of users increased with a different speed. Further statistical tests have shown a significant positive correlation between the increasing user count and the user activity. Countries with a positive correlation of *activity* and *time* (table 1) show a reluctant initial adoption (as in actively using the technology) which is strongly increasing over time. Countries with a negative correlation tend to adopt quickly with a higher initial user count and continue with a steady (slow) linear increase of additional active users over time.

As figure 1 indicates, we aim to exploratively analyze the association between Halls' and Hofstedes' factors and the results of our previous analysis. To do so, we collected the factors (table 2) Power Distance (PDI), Individualism/Collectivism (IDV), Masculinity (MAS), Uncertainty Avoidance (UAI) and Long-term Orientation (LTO)

from Hofstede, as well as Low-/High Context (LHC) and Mono-/Polychronic (MPC) from Hall [29], [33], [34], [39]. A limitation is that the most recent index of Hofstede, the *Indulgence vs. Restrain* index was not included, because it was just established in year 2010, a sufficient amount of data could not be collected and it has not been verified by as many studies as the other indexes to be representative [40]. It must be noted that there was no MPC value for Thailand derivable from [34].

Table 2. Cultural factors for regression analysis

Country	*PDI*	*IDV*	*MAS*	*UAI*	*LTO*	*LHC*	*MPC*
China	80	20	66	30	87	15	12
South Korea	60	18	39	85	100	10	10
Japan	54	46	95	92	88	16	6
Singapore	74	20	48	8	72	10	10
United States	40	91	62	46	26	3	2
United Kingdom	35	89	66	35	51	5	4
Thailand	64	20	34	64	32	10	-
Germany	35	67	66	65	83	1	1

Especially for Hall's indexes we observe, that a negative correlation reflects a high LHC and MPC value. Hofstede's indexes MAS and UAI show mixed values and no pattern towards a correlation with the first analysis. IDV and LTO on the other hand show possibilities for a pattern. IDV is low for countries with a negative correlation of activity and time and LTO is high for those countries. PDI shows a weak pattern, where high power distance reflects in a negative activity correlation.

5 Discussion and Limitations

With the first part of the analysis we could show that for different countries the adoption process looks different. Our explorative analysis returned attributes for each country that indicate a decrease or an increase of activity after the introduction of a new technology. Hence, we can cluster the countries accordingly, which represents the focus of this study. The goal was to analyze the activity over time and find patterns directly after the go-live. With the explorative approach, we applied a correlation analysis and found a tendency for four Asian countries to start with a high activity and then decrease. Additionally, we observed that the stronger the correlation was between *time* and *activity*, the higher (for negative correlation) or lower (for positive correlation) an initial activity level on day 1 was. With the mentioned results, we can answer research question RQ1, since 2 patterns have been found: (1) countries with low activity at the beginning and an increase over time and (2) countries with a high start-activity and a decrease.

Even though all countries from (2) are Asian countries, we draw from a limited dataset and for a conclusion overall Asian region, further validation is necessary. Furthermore, the shortcomings of a regression analysis with *time* as an independent variable were known and accepted, because the focus was to generate as many descriptive parameters as possible. Since the results of the linear regression were not used for prediction but rather for description, we believe the parameters contribute to understanding the various activity pattern. As limitation it is to say, that the values we found for Singapore did not show a very strong correlation (-.279), although being highly significant. This is also reflected in the regression that was applied, where Singapore and Thailand had a noteworthy lower R^2 and lower number of users, forming the base for our data. Results for those two countries are therefore not as representative as the others.

As stated earlier, digital transformation is heavily depending on a global collaboration of individuals and hence a globally synchronous usage of such is desirable. Given this, our study contributes in a unique way, since it is significant to IT decision makers, that they need to assume different usage adoptions in different regions. Additionally, with the digital transformation, all enterprises will have to struggle with new technologies that are emerging [41]. Hence the frequency of technology adoption that a user is going to face will increase. As new technologies are to be piloted first [42], our results suggest that this should be done in Asian countries preferably. Since a quick initial adoption was noticed and the activity was at first relatively high, we conclude that this carries the benefit of immediate pilot feedback regarding the technology. As initially stated, RQ1 aimed to provide descriptive insights into the adoption phase after go-live, whereas RQ2 provides an approach to identify reasons for the analyzed patterns. However, it was not possible to answer RQ2 with significant reliability, since the dataset we drew from did not contain enough countries to run representative statistical tests. But we could see a strong tendency which helps to understand the results of our first analysis. For our research, we derived and compared especially Hofstede's factors from various sources, as well as his website. Interestingly, the newest factor long-term orientation also reflects the highest correlation and r^2 in our results.

Nevertheless, like every research, our analysis also comes with limitations, such as a seasonal or project based bias. We could not ensure that the observed regions do not have seasonal variability or activity peaks due to projects. We filtered those to the best of our knowledge and made sure with each local responsible, that no unusual dynamic prevails. Furthermore, we were only able to collect a limited amount of time and hence focused on the first six months after go-live. Therefore, we were not able to make further reliable long-term prognosis and further strengthen our results. The underlying data which was used to derive assumptions, is based on a large multi-national enterprise with a European headquarter. Therefore, the results might differ with a dataset from various smaller companies or different technologies for example. As mentioned earlier, to generate further descriptive parameters we applied a linear regression analysis which is feasible for the limited dataset we drew from. However, the results and common sense indicate that a logarithmic model will fit better for longer time frames as the activity will not reach a negative level, but will get close to a threshold. Also, our

findings are derived from one case company only. Therefore, even though based on a large data set, the results cannot automatically be transferred to all organizations (or regions as mentioned earlier) without considering the individual contexts.

6 Conclusion and Further Research

In this study, we focused on the adoption pattern of a digital technology in a global, cross-cultural context. Analyzing eight different countries across the globe, we found that employees react differently, depending on the region they come from. Our results indicate that Asian countries adopt the technology initially quickly, which is reflected in a high initial activity among users. It then decreased steadily over time and settled at a certain level. European and American countries (together with Thailand which is not fitting the pattern) show an opposing behavioral pattern. Due to limited data availability, we were not able not extent our research to the level at which the activity finally settles. We encourage other researchers to pick up on this research area and investigate the long-term usage of communication technology with regards to user activity.

Furthermore, we found that within a digital transformation, an isolated look at individual countries does not make sense anymore, which is in line with [42]. Global actions need to keep local cultures in mind. The contribution of this study indicates that not all cultural factors are equally vital in the adoption process and its different characteristics. We propose that several cultural factors do correlate with the findings of our first research question. Attributes like mono-/polychronic [38] seem to predict the user adoption well. We could provide descriptive insights on the adoption pattern after go-live which we believe is a novel contribution to the community and an important first step for further studies in this direction. Due to this, our study is relevant to scholars for further research, as well as for practitioners in enterprises of global scale. Even though we were not able to reliably answer the second research question – examining the correlation between cultural indexes and the adoption patterns – we encourage for further studies while picking up these results.

The contribution for decision makers indicates that particularly the change management process within their digital transformation should not look the same globally. Our results suggest adjusting the marketing actions regionally, depending on the region.

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