FINANCELENS: INVESTIGATION STUDY OF MULTI-DEVICE USE AND CROSS-DEVICE INTERACTIONS IN FINANCIAL COMPUTING

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ABSTRACT

Today most of the work force in corporate workspaces at financial institutions uses and interacts with several digital devices at once and also use specialized systems to manage their tasks. While finance industry have always been at the forefront of using newer technologies, they have not yet been completely explored. The aim of this project is to investigate how employees in financial domain use multiple devices for performing general day-to-day tasks, share information between their teams and colleagues at their workspace and the arrangement of such multiple devices. In particular, this research is focused on how these multiple devices are currently setup, how information flows through these devices in a distributed computing environment and what design considerations can be suggested to mitigate the issues and challenges faced by employees.

In-depth interviews were conducted with 13 different participants with various financial backgrounds, to understand how they interact with multiple devices at their workspace and explore issues, their information flow, configuration spaces and sharing of information across devices as well as with their department. The findings present that the workforce follow simple interaction patterns while performing their tasks on more than two devices i.e. either in parallel, simultaneous or without a logical flow and have one device which is a primary and other device a secondary. Data transfer and sharing is mostly carried out within a dedicated server or on company's own platform. Lastly, information sharing and workflow is heavily focused on interacting with teammates, supervisors, clients or bosses in majority of the scenarios.

Author Keywords
Cross-device interactions, personal information management, multi-device applications.

ACM Classification Keywords
Cross device interaction, computing with multiple devices in financial computing (e.g., HCI): Miscellaneous

MSc Contribution Type
Empirical

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Project report submitted in part fulfilment of the requirements for the degree of Master of Science (Human-Computer Interaction with Ergonomics) in the Faculty of Brain Sciences, University College London, [YEAR].

NOTE BY THE UNIVERSITY
This project report is submitted as an examination paper. No responsibility can be held by London University for the accuracy or completeness of the material therein.

1. INTRODUCTION

The insinuations of science and technology over the decennium, have had a deep effect in the growth of financial systems across the globe. Since then, the finance industry has been able to expand and scale their service. As there has been an exponential increase in the processing power, the role of technology in finance has helped analyze, search and model complex financial data. Today we have huge amount of data in the financial industry for analysis than ever before[9].

The workforce in this sector globally uses several connected technologies like Bloomberg, Reuters, Cloud computing technology and other multi-device computing softwares to complete their tasks. Widely used amongst these is the Bloomberg Terminal software provided by Bloomberg L.P. enabling professionals and other industry users to access Bloomberg Professional services allowing the users to monitor and analyze real-time financial market data and place trades on the electronic trading platform. As employers provide multiple computers and devices to their workers, it's becomes increasingly difficult to interact and carry these devices outside of the workspace [10].

As more and more cross-device applications happen in day-to-day users space, it allows users to distribute their application interfaces and functionality over two or more devices. In order to design better interactions and maximize efficiency in cross-device settings, researchers are motivated to investigate on how to support design for a combined use of several connected devices[11].

A number of studies have been conducted in the use of cross-device interactions and multi-device workflows at workspaces [12]

Jokela et al. study's which focused on different patterns of usage (*Parallel and sequential usage*).[8] Other studies focus on how users operate tasks that are spread across or split between multiple devices than just using single device for a specific task. This indicates that users do not only use one device for a specific activity but the information, data and applications could be distributed via the internet or through physical media. These devices could be connected in parallel, serial or simultaneously worked upon. This study focused on academicians and industry workers, predominantly[3]

Another study discussed how cross-device usage and experiences are generally categorized as Distributed User Interfaces (DUI). An example could be of: *a document that can be edited synchronously on multiple devices at the same time*. Sadly, these experiences are cumbersome across different platforms and sometimes doesn't offer seamless user experiences.[7].

Previous studies primarily focused on general day-to-day multi-device usage and looked across range of industries including technology, business, healthcare and creatives, however the area of cross-device interactions and multi-device use specifically in financial sector has been left largely unexplored. This research aims to explore and investigate the different scenarios about how industry personnel manage information, share data, setup their devices and what does their device ecology look like.

After interviewing 13 different participants from various financial domains across the globe (*UK, India, Russia and Thailand*) and workspaces, this paper seeks to analyze the different devices that are primarily used in this domain, specifically what kinds of softwares and systems are important to their particular roles.

The study showed that an average individual working in the finance sector uses 3-4 devices consisting of multiple desktops, laptops, data providers (for example, the Bloomberg Terminal) and phones. The device setting follows a *primary-secondary* usage pattern. This was explored through the information workflow patterns, which are either *(simultaneous use of all the devices by dividing attention or parallel usage for comparing and finding or without a logical flow)*. Unlike prior studies where mobile phones were heavily used, in this industry mobile phones are not usually used while at work.

These devices are setup based on conveniences of the workforce while on their desks (*some have fixed spaces and some manually set up their devices every day*) and are not moved frequently from their places nonetheless, the information flows in a circular manner. Their interactions are mostly to their bosses, supervisors, clients and/or other teams when performing tasks. Finance sector is very data sensitive and focuses on data protection and expects its workforce to strictly obey the regulations to access and share data securely through the allowed sharing methods only. This includes mostly using their own dedicated centralized server that could be accessed via company's internal network or through remote access with a secure connection and authorization.

This research puts a perception into place and gives a keyhole vision to those who want to design something for the finance industry or want to conduct advanced studies in the future. The top contribution of this research is an insight into a tedious life of financial workers who play with multiple devices entire time.

The rest of the chapters in this report go through a brief background about financial computing, a deep dive into some related work, methods, data collection, analysis, discussion and conclusion.

2. LITERATURE REVIEW

2.1 Financial Computing

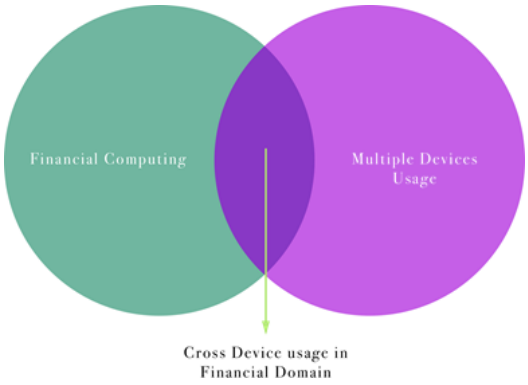


Figure 1: Cross Device

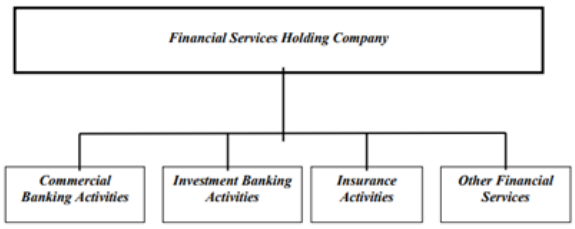


Figure 2: Background financial computing and key activities in this domain

Financial computing is an important domain which is a very vast field that includes complex data processing, visualizations, financial analysis, report generations, policy making, investments evaluation trading, and planning.

There are particular roles associated to these tasks and most of the financial institutions use multiple computers and screens especially Bloomberg Terminal giving data regarding markets, trade, stock markets, investments and banks. The number of such terminals was around 325,000 in October 2016. This domain lists several services such as [15]

- Insurance and related services- Direct insures, Reinsurers, Insurance intermediaries
- Securities Brokerage (Financial Advisory Services)
- Investment Banking
- Securities Trading
- Investment Management
- Financial Management
- Financial Analytics
- Financial Planning

These are most common domains where industry workers like analysts, planners and strategists work and use multiple devices at their workspace in order to calculate, compute and analyze and model financial data.

2.2 Cross-device Interactions and Usage

As mentioned above, more and more number of devices start to accumulate from our day-to-day activities to our work life as there is a constant input and output of multiple devices and cross device interactions all the time. But as a result of growing number of devices, there still exists issues pertaining to interaction, information management, session handling, proxemics and other design challenges that deteriorates cross-device capabilities and diminishes the user experience in general especially when implementing those interactions that cover several devices with a diversity of form factors, computation powers and different software's. [14]

Therefore, the support for multi-device interactions has taken a step behind users' desire to leverage the diverse capabilities of the devices that we own. As multi-device computing environment now plays a significant role in our personal as well as work life, it is important to outlay the issues and identify challenges arising from the use of cross-device interactions [4]

2.3 Studies on Cross- Device Interaction

Device Settings and Information management

This study [5] Various studies are investigated and observations have been made as to how common it is for people to use multiple devices within their reach in a particular or general settings. They observed that many users have lot of devices at home but they also access several devices in different parts of home including the kitchen area, bedroom area and/or the living area. While there are certain fixed devices like televisions in an area, phones, tablets, e-readers are all movable devices and can be moved all around the home as the user moves into a separate space. They also found out that commuters also

carry more than one device when travelling to and from work. In fact these devices give the ability to perform tasks from anywhere while working on trains and planes. They explored that a typical PC worker owns multiple monitors at workspaces and that there are only a few applications that have exploited this opportunity to develop a newer type of interaction for multiple monitor usage at workspace.

They also found that users kept their old devices while upgrading to a newer model or newer device itself however some of those old devices play a very specialized role in a task or used as a permanent device to suit that setting (for example, usage of an old tablet mounted in the kitchen). This shows that multi-device interactions and usage span across not only with devices in use but also through a period of time.

A primary study conducted by Dearman [3] observed that users currently focus on the devices and tasks but not on themselves. The users deploy multiple devices to support tasks and activities and this then becomes complicated if there are newer devices added to the ecosystem. They found out that users perform different tasks and assign various roles to that device within a task without knowing that their actions are part of a bigger task or activity. Their research also showed that industry users kept personal and work related activities separated from each other but still had some issues in separating them while using their devices. They also revealed that users found that information is diffused across them, in spite of tools available to manage and transfer information across those devices. His suggestions included that there has to be a focus on the users first and then his devices which can be done by supporting various activities spanning multiple applications and our current devices shall collaborate with a notion of user-centric activities that can also be run on multiple devices along with multiple applications. Another point that he recommended was to enhance the devices functionality so that it can support segregation of work and private activities. Each device shall keep track of users different versions of information and notify them to return that information to a work device when they have done their tasks on any of their personal devices. Lastly, his study suggests to enhance the file transfer system with improved synchronization that can manage information across devices better and can have a lightweight information transfer system. Talking about synchronization, there must be a better way to synchronize files automatically and one way of doing that is to make sure there is additional visibility to undo an action for same files across multiple devices.

Device usage patterns and cross device interactions

[8] In Everyday Activities and Tasks, diary studies and interviews analyzing 123 real life cases of multi-device use across common devices smartphones, computers, tablets, home media centers, identified the main usage patterns that includes sequential use, resource lending, related and unrelated parallel usage of devices and lastly observed decision making aspects for which devices are used in a given situation that comprises of acquiring, availability and selecting those devices for particular usage. Their motive was to explore real-life practices of multi-device use from pragmatic tasks to leisure activities in different contexts of use.

A study conducted by Daniel Wigdor [7] inspected how users can take advantage of multi device computing in their surroundings. They built a framework prototype conductor that provides a set of interactions through which one can easily share information, splits the tasks and manage sessions across devices. The study firstly was built on past findings of J. Grudin [6], stating that all the participants of this study made use of physical organization of various tablets to track information. Their feature of broadcasting cue messages let people send messages to all the connected devices and then go to the device users wanted to target. They concluded that majority of the users liked the feature and said *"that it's easier to send messages to all the tablets and then catch it on the target device."* And feature of the task manager was an interesting concept for the users of the study as it was demonstrated. Through this study, it was indicated that physical organization of devices along with a system framework which acts as a manager to all the devices makes it worthwhile performing tasks in a easier manner. Also to share and resume work across devices will be more intuitive and this could be applied to multi-monitor interactions.

An alternate study conducted by Daniel Wigdor again, to which this project can be closely related to [13] examined the use of digital and non-digital devices in modern workspaces. The study explored cross-device issues which mainly focused on parallel device usage patterns in adjacent to serial patterns. They observed that there is a need for cross device interactions to support this parallel usage. They suggested that new ways of data transfer mechanisms shall be provided, that can support proximity, orientation and simple interactions for moving open items across devices while using them. Another observation made in this paper was about the different trends and habits that rose during multi-device interactions specifically in understanding a specialized use of various devices in a particular task and how other interactions can be designed to accommodate suitable device which can prevent stoppages in the multi-device experiences. It also explored the various information and data management issues that were showed up during their study such as the more number of devices added in a multi-device interaction, the more data is fragmented. For this issue, suggestions were given to have an automated synchronization that is visible in cloud technology today. Caching was suggested as to access the data even when offline when using services like Dropbox. With a view to get a good data flow across devices, they recommended that applications should support transitioning between to allowing or accept data outputs that can be used

by other applications opened at the same time and applications shall not function like separate boxes as they currently do when opening documents associated with web or mobile applications, every application has to be launched separately to access the appropriate documents.

While previous studies addressed how people use multiple devices in various work settings and focused on general everyday computing, there have not been a specific or targeted research performed in the financial industry domain. Therefore, there is a chance for exploration into understanding how people in the finance industry use multiple devices and how are the cross-device interactions helpful in the modern utilization of multi devices by financial workforces. With a believe in this study to explore the idea of cross-device interactions and multi-device use in a focused group of financial domain, and get qualitative insights from this study it will be further useful in understanding the growing habits of employees computing with multiple devices in a distributed financial workspace and provide suggestions to provide better support for the future developments in this area.

3. RESEARCH QUESTIONS AND STUDY

This research explores the answers to these three questions:

1. How exactly are the current multi-device/display setups used for financial computing/analytics?
2. What strategies exist to arrange devices and information spaces?
3. How is information transferred between devices?

This section aims to give out the certain aspects of the study conducted, information about the participants, the method used to collect data and analyze data.

3.1 Method:

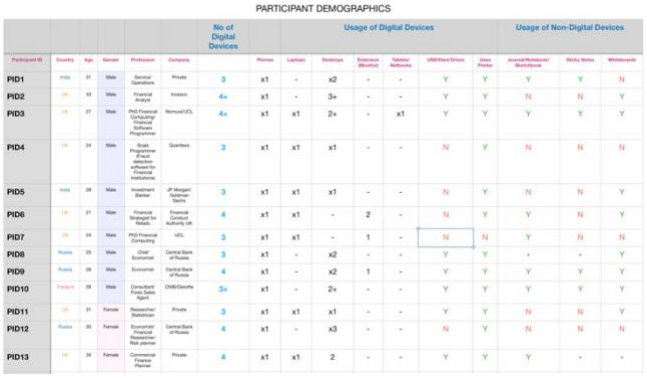


Figure 3: Snapshot of demographics of participants

Please refer to the Appendix for better viewing.

3.1.1 Participants. A total of thirteen (13) participants out of the seventeen (17) people that were contacted personally participated in the study and were extensively interviewed. The participants were contacted and recruited through the researcher's friend's circle, online means -through LinkedIn connections and help was also provided from University College London's Financial Computing Department. (Please Refer appendix to Participants Matrix)

There were a total of ten (10) male and three (3) female participants. The average mean age of the participants is twenty-eight (28) years. The age matrix is shown below in figure 4 and figure 5.

AGE MATRIX

AGE Range	AGE	COUNT AND GENDER
20-25	21x1, 24x2, 25x1	4 (M)
26-30	27x1, 28x2, 30x1	4 (3M, 1F)
31-35	31x2, 33x1, 34x1	4 (2M, 2F)

Figure 4: Age Matrix

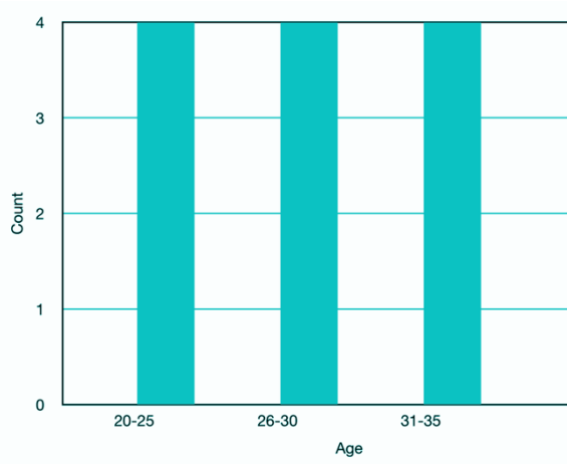


Figure 5 : Age count

It can be seen from the image above that there is an equal split amongst age groups. There are seven (7) participants who gave the interview from the UK, three (3) participants gave the interview from Russia (Moscow), two (2) participants gave the interview from India (Mumbai) and one (1) participant gave the interview from Thailand. With such a diversity, the aim was to further explore if there are differences in working styles, culture and infrastructure in financial institutions across countries. Participants were

given an information sheet that included the study aims and details for them to read as well as a consent form to be filled if they agreed for the interview. They had to also (Refer Appendix) submit an online acknowledge form (Refer Appendix) which consisted of a short questionnaire.

The participants recruited for the interview study had an inclusion criterion. Below checkpoints were used as an inclusion criterion. The inclusion criterion:

-must be working in financial domain/financial computing.

*-preferably have a workspace**

-must use and interact with two or more digital devices while at the workspace/workplace.

-must be above 18 year's old

As mentioned in the inclusion criterion, participants were required to own and use at least two devices at their respective workspaces. This included using any type of combination of devices such as (phones, laptops, desktops, additional screens, tablets or other digital devices).

3.1.2 Procedure: Semi-structured informal interviews were conducted with each of the recruited participants, each lasting around 30-45 minutes. About eight (8) of the participants were interviewed over skype/telephone as they were located at in a different country or their workspaces were inaccessible to carry out an interview in-situ. However, three (3) of the total participants agreed to be interviewed at their workspace and two (2) of the total agreed to be interviewed outside their workspace but in person.

For the participants that were interviewed over skype and outside their workspace, they were asked to submit pictures of their workspace or to describe their settings of different devices that they use. The were also asked to share their background information prior to the start of their interviews. This was helpful especially in understanding their level of know-how and experiences with handling a specific device, software or hardware for their roles. For example, *Bloomberg Terminal, Murex: a trading software.*

3.2 Data Collection

Primary data was collected from the recorded semi-structured interviews with all the participants. Pictures and sketches were requested from the participants. The landscape of various types of configurations and settings of devices at their workspace, assisted in generation of workflows, device matrix and device configuration diagrams.

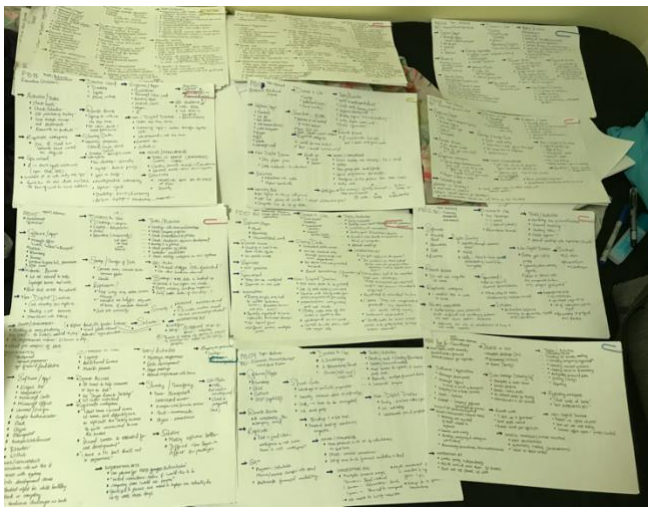
Semi-structured interviews: One of the ways to get helpful insights is by doing a semi-structured interview. Because it was not possible to do an observation study for most of the participants, it was more accessible and convenient for them to give an interview. This required planning and fixing particular dates beforehand and also having enough time to analyze the data coherently after the interviews were done to extract meaningful information using thematic coding. Semi structured interview provided more detailed overview about the participants work habits, their intentions and motivations behind why they did things in a particular manner [1]. This helped the researcher to collect a good amount of sample data from all the participants which later formed a knowledge basket or raw data. The interviews were mostly kept flexible and followed almost similar pattern of questions to be asked to all participants.

Questionnaire

An online questionnaire was sent to the participants prior to their interviews along with consent forms and information sheets. The purpose of this questionnaire was to understand how many devices are being used by the participants at their workspace. Later the same was used to probe deep in the interview related to a specific device or technology.

3.3 Data Analysis

Based on all the data collected in the form of recorded audio, each of the interviews were manually transcribed by the researcher. Each of the interviews were scripted and then printed to further analysis. The researcher then started analyzing each transcript individually to gather meaningful information using thematic coding.



Thematic Analysis

Based on the research questions to answer through this research, the analysis technique used was a mix of top-bottom approach and bottom-top approach. Key categories

like Data transfer and sharing, Device Settings/Ecologies, Information flows were the main focuses here and the others came from the analysis of interesting facts and insights from the interviews. Thematic coding was used because this is one of the most widely used Grounded theory approaches. This approach let the researcher form *"thematizing meanings"* from the data gathered. Because this method is flexible and gives a freedom to concentrate on key elements and analyze that specific area of interview data, it also takes enormous period of time coding longer interviews. The researcher followed the following stages to complete the thematic analysis. Reading through the data and made notes. After the first stage of note taking was completed, the researcher moved to the generating general codes for the analysis. Codes and themes which were related data or experiences were gathered in the this stage. Further categorizing these codes into more relatable themes was the next step and finally defining names and creating relationships between these themes was the final step. These were the three-layer analysis that was carried out with the qualitative data from all the interviews. [2]

Device Configurations (Device Ecologies)

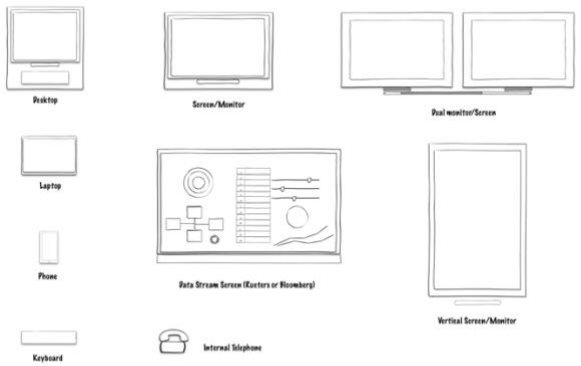


Figure 6: Different device types

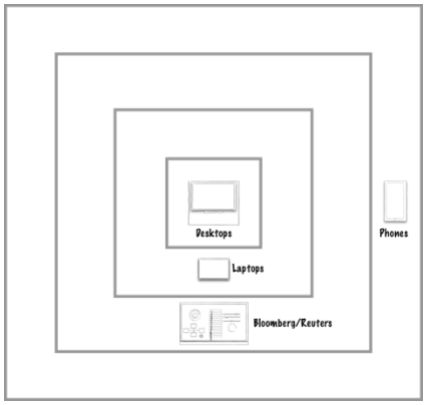


Figure 7: Frequently used devices

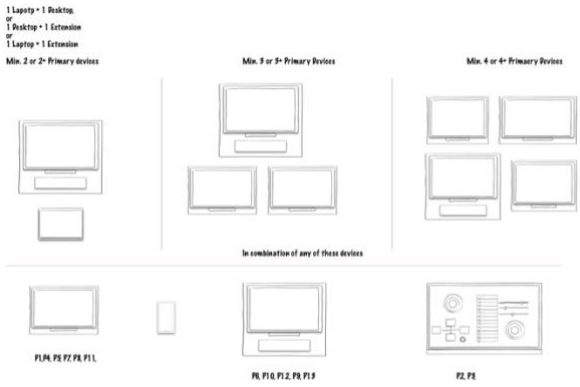


Figure 8: Minimum number of devices per participant

Digital devices

Laptop and Desktops

On an average, each participant actively uses 3-4 information devices at their workspace. Twelve (12) participants run Windows operating system and one (1) participant runs Mac OS. All the devices that are used at workspace are provided by their employers. The most common devices currently being used by the participants include desktops, laptops and Bloomberg Terminals.

All the participants carry their personal mobile phones at work. But only four (4) use their phones during a typical work day either to share media items which included scanning documents, capturing pictures, accessing passcodes sent on the phone to log into a system or to check emails. Rest nine (9) of the participants said that they avoid using phones at work. This is contrasting to previous study [13] where every participant had a phone and phones were used in lot of activities.

All the thirteen (13) participants owned at least two devices at their workspace with desktops being the most common device used by eleven (11) participants. Laptops were used by seven (7) participants. While five (5) participants used dual screen monitor desktops, Bloomberg Terminal were being used by six (6) of the participant. Please refer **Figure 6 ,7 and 8.**

As per the data collected, all participants worked independently and each one of them had their own separate desks. They were not sharing their own devices like desktops or laptops. P10 mentioned *"some teams or departments only have one Bloomberg Terminal, some multiple. It depends on the service needed and if a department can afford it or not"*

Printer

PID	Often (Everyday)	Occasionally (Weekly)	Rarely (once or more in Month)

1	-	Yes	
2	Yes		
3	-	-	Yes
4	-	-	Yes
5	Yes		
6	Yes		
7			Yes
8	Yes		
9	Yes		
10	-	-	Yes
11	-	Yes	
12	Yes		
13	Yes		

Table 1: Printer usage

It was noted from the data that, all the participants have access to a printer, which is either in their own room where they sit, or in a common room outside their main place of work. Seven (7) participants use lot of printing, specially for reviewing, highlighting, sharing financial documents, and presentations with their team. P7 stated that he prefers to stay *"Paper free for the most of the times."* This indicates that papers are still being preferred and offices are yet not completely paperless [13]

Internal Desk Phone:

All participants mentioned that they also have an internal phone on their desk. P10 stated that his role required to communicate a lot with his clients over the phone. His phone could record phone calls and could keep up to ten callers on hold at the same time. Participants (P8, P9) both mentioned that they have a radio device similar to that of walkie-talkie through which their supervisors contact them in case they are not present in the office.

Non-Digital Devices

Note taking

Six (6) participants expressed that they took hand notes using either sticky notes or a diary. Participant P1 stated "*I prefer taking handwritten notes as it's much faster and handy*".

Participant P10 mentioned that he does not use much printing and takes lot of notes and uses journal, sticky notes to remember his priorities and lists of things related to his clients.

Whiteboards:

Eight (8) participants stated that they had whiteboards in their workspaces, although five (5) participants (P11, P10, P9, P8, P6) expressed that they use whiteboards during the time of meetings, to jot down ideas, brainstorm and to explain things to clients or team while giving presentations.

Some Workflow Diagrams stating the flow of information:

(Please refer to the task matrix in the appendix)

Below here are some examples of different device settings and different workflow diagrams that highlight the various aspects of participants data flow.

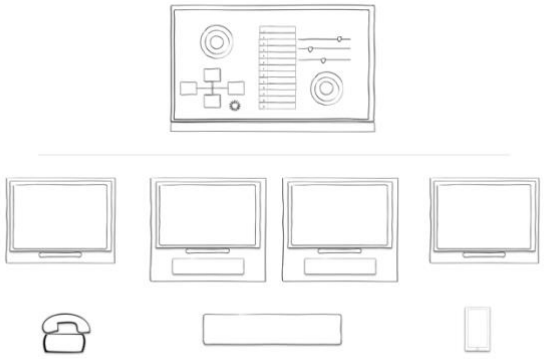


Figure 9 A Participant 3 - Workspace devices

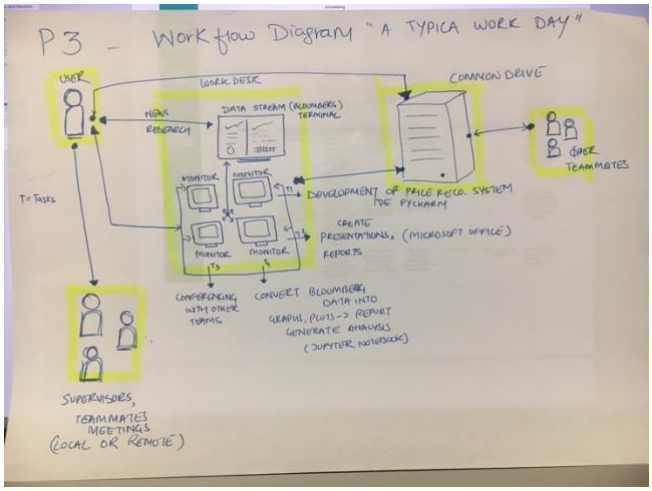


Figure 9B Participant 3 - Workflow

Example 1: (More than 4 devices) As per the figures 9A and 9B, it can be seen that P3 has more than two desktops and one Bloomberg terminal. Most of the interactions with the desktops are in parallel. He stated that his work was mostly serially performed like, first meeting with the stakeholders and then performing tasks over the devices. After performing tasks the participant would eventually share the results or outcomes with the other team through the server. He mentioned that most of the times, his

attention has to be on Bloomberg as he gets most of the news from there.

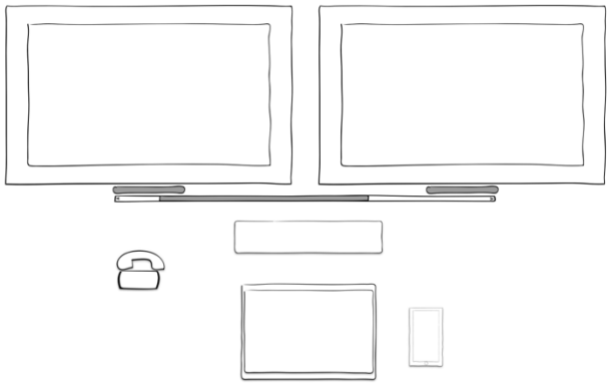


Figure 10 A Participant 6 Workspace devices

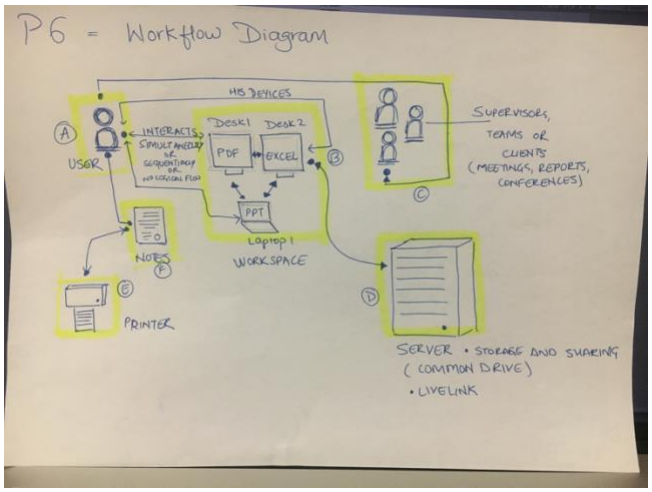


Figure 10 B Participant 6 Workflow

Example 2: (More than 2 devices): This setting is of participant P5 who uses dual screen monitor along with a laptop on this workspace. His workflow consists mainly getting inputs from the Bloomberg terminal into Excel on one computer, then creating notes on it on the other computer and further creating a presentation. While performing his tasks, he mentioned that how he literally has to look across all the screens and split attention equally.

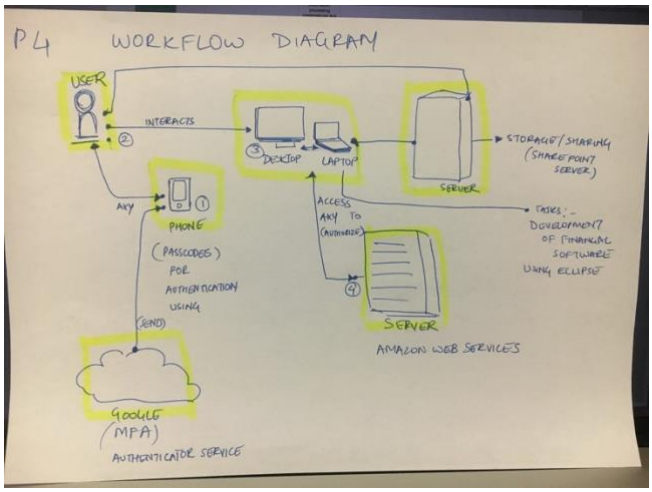


Figure 11 A Participant P4 Workflow

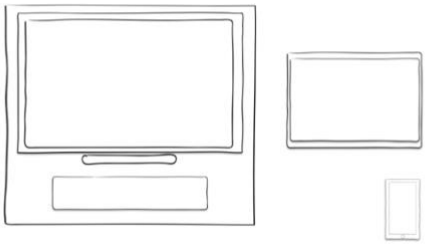


Figure 11 B Participant P4 Workspace devices

Example 3: (More than two devices (Desktop + laptop + phone) In this scenario, participant P4 uses his phone to get access codes to log in into amazon web services. He starts with login into the application on the desktop and then waits for the access code to be sent on his phone. Once he gets his access code, he then inputs it into the desktop and continues his work on the desktop and laptop. Predominantly, his desktop is his primary device here.

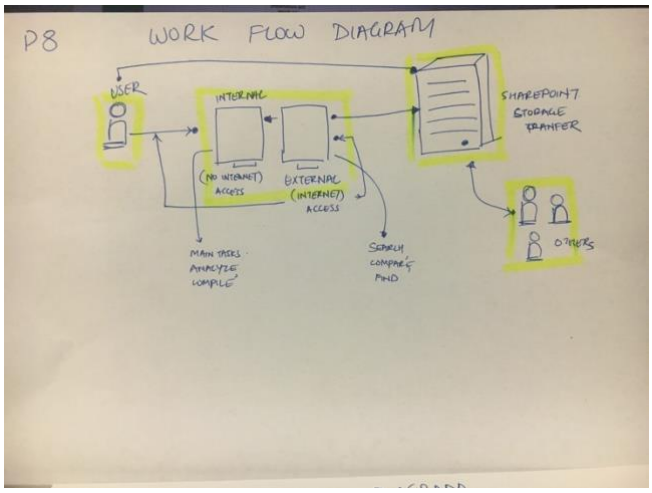


Figure 12 A Participant P8 Workflow

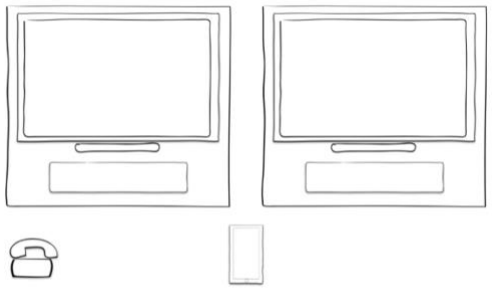


Figure 12 B Participant P8 Devices

Example 4: Participant P8 has two devices at his workspace, one which is the internal and the second which is external PC. He's role is to analyze financial data and also perform financial modelling. He stated that his primary device is the internal one as most of the work of compiling and modelling is performed on this data. External computer is generally used to perform searches and comparisons alongside the internal computer.

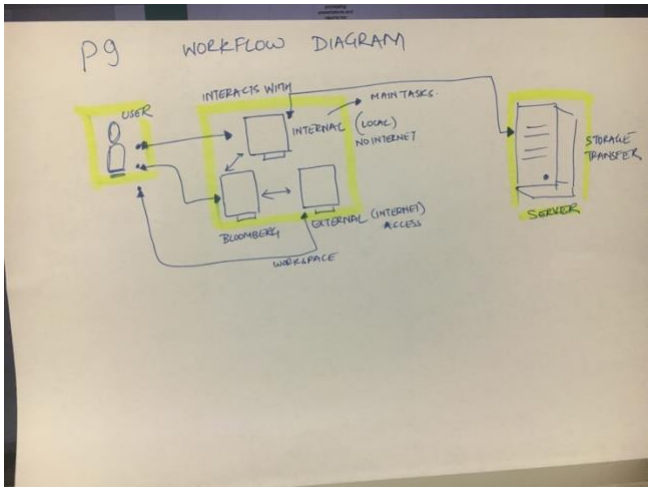


Figure 13 A Participant P9 Workflow

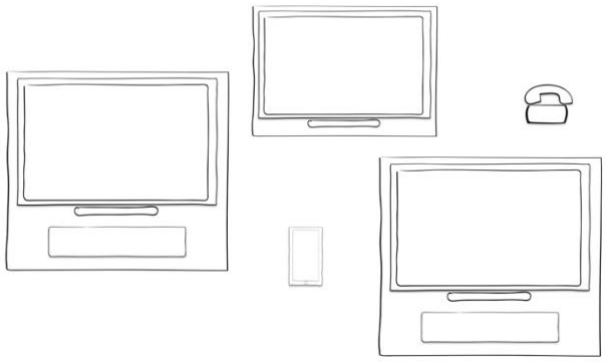


Figure 13 B Participant P9 Devices

Example 5: Looking at this setting, Participant 9 along with an internal and external computer uses a Bloomberg terminal. He usually takes in the data from Bloomberg to his internal computer and researches on the external computer to check with news and financial data. His interactions are mainly with Bloomberg and internal computer and sometimes with the external one.

Tasks/Activities

TASKS AND DEVICES MATRIX

USER ID AND ROLE	USER TYPE	DEVICES	FREQUENCY/ ORDER	TYPICAL TASKS IN A DAY	APPLICATIONS/ SOFTWARES USED	SHARING DATA	PLATFORM	USAGE	COMMENTS
PID 01- OPERATIONS	Advance	Laptop, desktop, personal phone, USBs,	Majority of the times desktop and phone at work, laptop at home.	-Observing and operating trading software ALGO, Ninjatrader, - coordinating with different clients, -Bill generation, - preparing and checking payment sheets, profit and loss sheets	Computers ,ALGO, Ninjatrader, Interactive Broker, E-Signal, Microsoft office- Excel and Word extensively, Teamviewer, PDF reader and converter, Whatsapp and Camera application on Phone	Heavy use of WhatsApp to share scanned documents, sometimes USBs across team, Emails with clients and phone to communicate.	Windows	Usually throughout the day. There is not much of communication at the market hours.	There are lot of desktops at his workspace
PID 02- FINANCIAL ANALYST	Intermediate	Desktops, additional monitors, Bloomberg Terminal, personal phone,	Simultaneously uses all the systems,	Looks at bond trading, companies information, checking on market activities, information flows about specific financial data	Sharepoint, Everest Software ,Microsoft office, Excel, word, Bloomberg, Powerpoint, Microsoft photos, sniping tool, Emails	Usually use emails for files. Microsoft Sharepoint is commonly used in the department to share other data.	Windows	Throughout the day, mainly.	USBs are restricted in the company as a policy.
PID 03- FINANCIAL SOFTWARE PROGRAMMER/ PHD IN FINANCIAL COMPUTING	Advance	Multiple desktops, laptop, Data stream providers (Bloomberg/ Reuters), personal phone	Mostly uses multiple desktops at the same time, distributes work across.	Conferencing calls, meetings with supervisors and other teams across continents and countries, development of price recommendation system, create visualisations, analytics, information processing presentations and reports too	Microsoft office- (Excel, Word, Powerpoint, ,Bloomberg, PyCharm IDE, Jupyter Notebook, Symphony (Slack for Banks), RSA for passcode	Usually share things across emails if they are plots, graphs or other data from Bloomberg. But on a common platform made by Nomura.	Windows	Mostly work over desktops, use phone middle of the day, check mails and to access pass codes or authorization code, remotely to work on pycharm	USBs are prohibited and is very strictly monitored.
PID 04- FINANCIAL FRAUD DETECTION SOFTWARE PROGRAMMER	Advance	A desktop, laptop and a phone.	Uses all three devices in co-ordination. Usually the desktop > laptop > phone	Write and development of code, conferences, Skype meetings, Scala development,	Eclipse IDE, notepad++, Microsoft code, chrome, Firefox, Skype, Google authenticator, Amazon Web Services, Slack, Sharepoint	Sharepoint for files, Slack for communication/ Skype at times,	Windows/Linux	Majority of the work is done on the desktop and laptop is used as a secondary screen	Phone is used to get authorization logging on into the Amazon Web Services to work on the products
PID05- INVESTMENT BANKER	Advance	Desktop, laptop, phone	Laptop > desktop, phone rarely at work	Create profiles for companies to invest, meetings with directors and other teams, create pitches, presentations and reports, interview candidates, training	Microsoft office pack, Excel, Word, Powerpoint, Outlook mail, Bloomberg, PDF viewer, Chrome, windows snipping tool	Through a common drive as a centralized server by the company.	Windows	Through out the day- mostly uses desktops and Microsoft office software.	Phones are not allowed to be used while working, cant take pictures or record anything, there are cctv cameras everywhere inside the room. USBs are disabled and cant use third party softwares.
PID06- FINANCIAL STRATEGIST/ REGULATOR	Advance	Desktops, laptop, phone	Simultaneously use desktops and laptops.	Setup workspace, check emails, have meetings with supervisor for a short time, analysis of financial statements, strategy, collect data from Bloomberg and convert into excel, making reports, presentations,	Microsoft office > Excel, powerpoint, word, PDF reader, Bloomberg, LiveLink, R, Outlook,	Through emails and dedicated server called LiveLink (Oralce) centralized server	Windows	Work throughout the day on desktops	USBs are not allowed, cant access personal emails from workspace laptop, cant connect to any personal devices. Security is a big concern.

Figure 13 A Tasks/Activities Matrix

For a full list of activities performed by participants please refer to [Appendix]

Exploring exactly what types of activities each of our participants do in their roles, gives a perception of what tasks are being done on which of their devices.

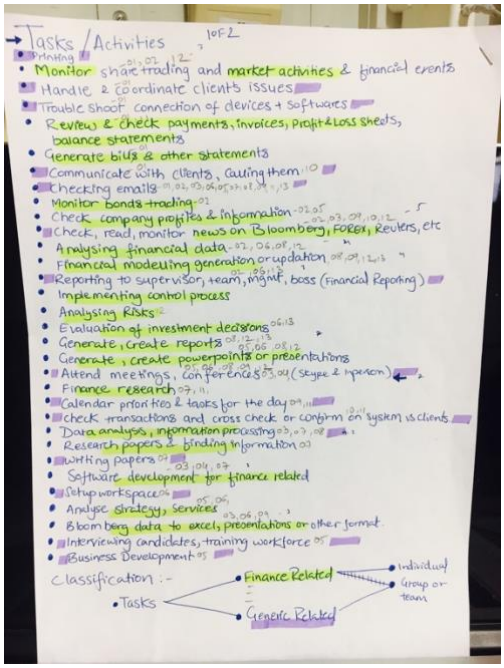


Figure 13 B List of all the tasks performed

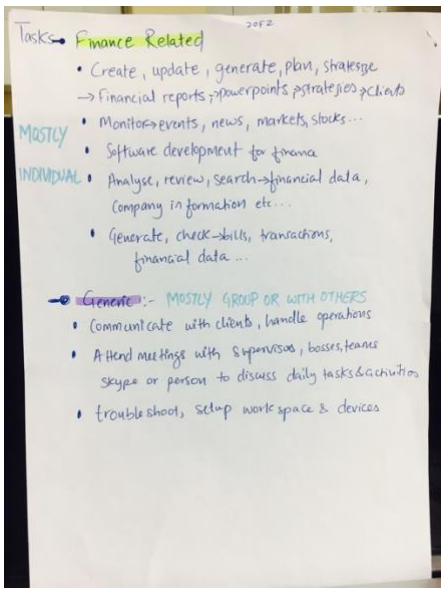


Figure 13 C Classification of tasks

All the participants mentioned that one of the most common activity they perform is checking emails. As per the research, all the tasks and activities that were analysed related to a participant's role can be categorised into two main sections

A) Individual Activities; and

B) Group Related Activities.

Finance Activities (Individual)

Seven (7) participants mentioned that they have to create reports and powerpoint presentations as a significant part of their roles.

Creating, updating, generating and analysing financial reports and financial data are mainly activities of the participants (P2, P6 P8, P12) and modelling of financial data are performed by participants (P8, P9, P12, P 13) respectively. Other key activities include monitoring of news, markets, stocks, shares and trades by participants (P1, P2, P03, P09, P10, P12).

General Activities (Group Related)

These activities generally are performed with a group of people with the department, teams, supervisors and clients. The activities does not relate to performing tasks on the computer or any digital devices but instead interacting with people who are relevant to their roles.

Seven (7) participants reported that they attend meetings and skype conferences with their clients, the teams located abroad nationally and internationally both and with higher management people, regularly ranging from everyday short meetings before beginning their work to once a week long meetings. Meetings typically discussed the agenda and priorities for that particular day, the tasks and feedbacks of pending work cases and briefing about the next steps for the coming days.

Participant P1 usually setups his work desk and computers manually everyday when he comes to work in the morning.

Participant P3 particularly stated that *" It's very important for all of the team members to be on the same page in order to proceed ahead."*

Another participant P6 stated that generally "*we have a catch up meetings everyday for about 5-10 minutes with my supervisors to discuss strategy."*

Softwares

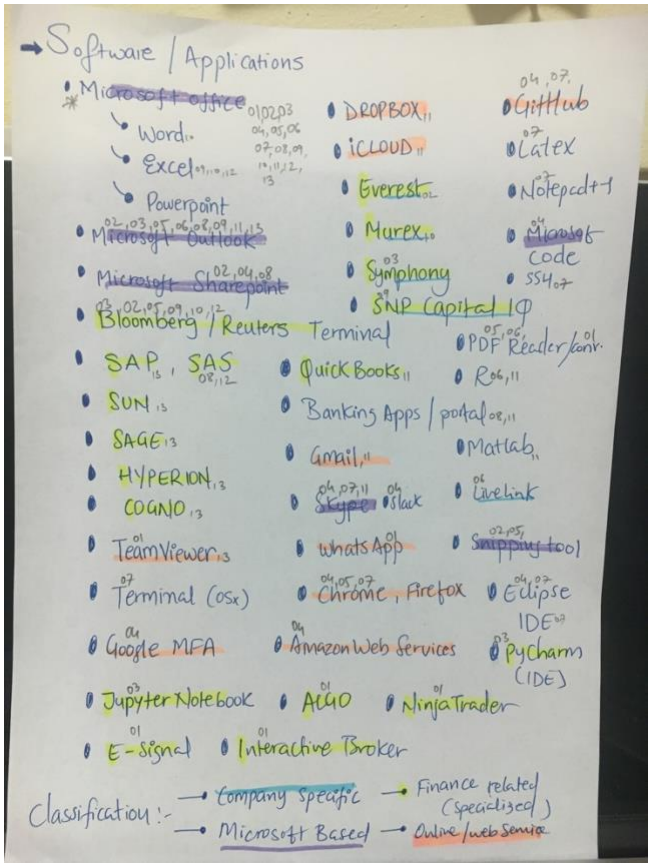


Figure 14 Softwares used by participants

Computers and devices run on certain softwares that are important to specific industry, task or activity. This study reveals that majority of the people in finance domain use lot of the standard everyday tools that most of the people in everyday life use. For example, All participants used Microsoft Office, Patterns included using Excel, Word and Powerpoint almost everyday. Whereas eight (8) participants also used Microsoft Outlook as an email client on their devices. This category further looks at what specific softwares are used according to the particular roles of the participants. There are in total three (3) categories that all the softwares fall into. A) Specialized financial softwares B) Microsoft Based, C) Online/Web service softwares.

Specialized Software: A very strong mix of various softwares were seen by participants in this study. Most of the participants used at least one software that specializes in their one particular task that their roles demand.

Bloomberg/Reuters Terminal are used by 6 participants (P3, P02, P05, P09, P10, P12) in total as their roles demanded specific financial activities like creating graphs, plots, getting news regarding specific markets across the world, monitoring news, share prices and so on. [Refer to task matrix]

General software: Based on their roles like creating reports, and generating excel sheets (Payment sheets, profit and loss sheets and more) these are the basic softwares used.

Software from Microsoft: Microsoft Excel, Word, Powerpoint, Code, Snipping tool, Outlook. Adobe PDF was also mentioned by half of the participants for either converting data from PDF to Excel or Excel to PDF.

Remote access and Replication of Workspace

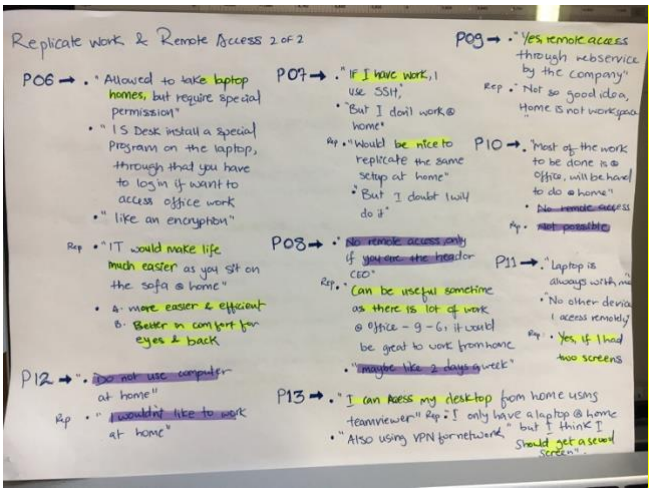


Figure 15 A Remote

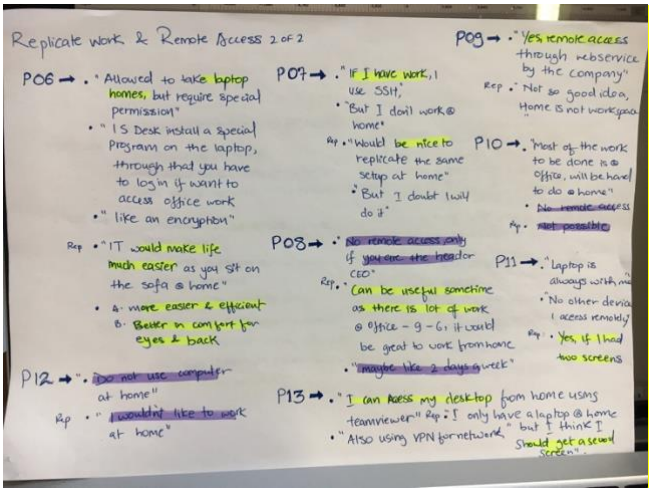


Figure 15 B

Six (6) participants (P1, P2, P5, P7, P10, P12) mentioned that they don't use any kind of remote software to access their workspace computers. Although five (5) participants (P3, P4, P6, P9, P13) stated they have remote access available at their homes.

P13 uses *TeamViewer* and Virtual Private Network to access her workspace computers. Participants (P7, P11, P13) showed an interest in replicating their settings. (P3, P4) are the two participants who work at a similar setting to their workspace at home.

P12 mentioned *"I don't use computer at home and I would not like to work at home",* Similarly, P10 stated *"Most of the work is done at office because it is hard to work from home as we can't have remote access because the main work is carried out on the internal PC which does not have internet".* P5 stated that "there is no way that I can access the company network from home and hence"

(P8, P1) both stated *"remote access is only available if you are the CEO or the head "* and *"only the boss and the partner has those rights for remote usage"* respectively.

Five (5) Participants (P3, P4, P6, P7, P13) mentioned that they are interested in replicating the setting of their workspace at home if they had similar resources. P4 enthusiastically stated *"I would have definitely replicated the workspace setting had I a second screen, it's essential for core development"* and P3 similarly stated "*I like the multi screen approach, I find it convenient, I used to access PyCharm IDE editor".*

P6 stated *"It would make life much easier, as you sit on sofa at home, you can work more easier and more efficient manner with the same settings if provided. It will be better for eyes and back.."*

Participant P8 mentioned that *"replicating can be useful sometime as there is lot of work in the office and I have to sit for long hours in front of the computer usually 9-6, would be great to work from home maybe like 2 days a week!"*

Sharing Data and Information

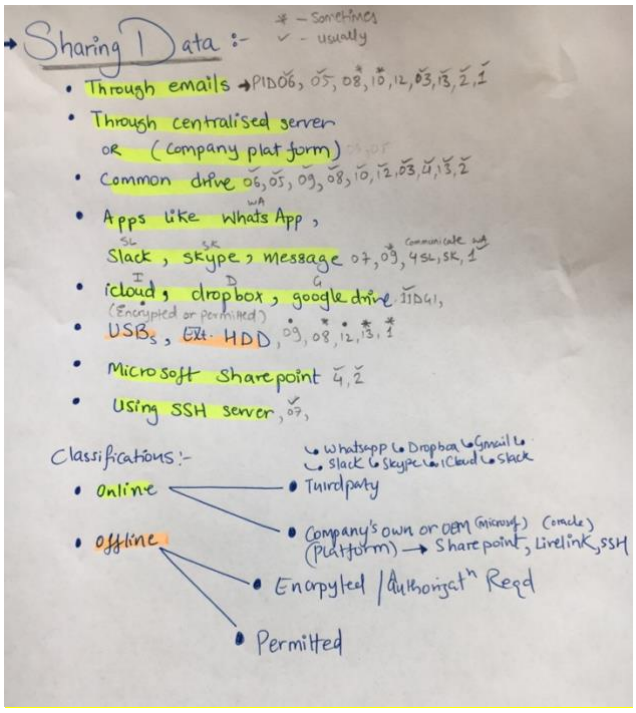


Figure 16 Sharing data via different channels

All participants at their workspaces shared data with their colleagues, team members, various departments, bosses and supervisors. Apart from sharing, they also stated that most of the data is stored on the common network. The files contained mostly financial documents, analysis documents, financial reports, presentations, Bloomberg graphs, plots, news media, articles, trends, market activities reports and other financial related data. The information included mixture or general, public and private or confidential data and information. The workspaces also had different access level and requires special authorization to gain access to a particular data or information on the network. There were mainly two (2) ways of sharing information. The first one is online where participants used a combination of different online channels to send and receive data from within their workforce. And other through offline media which includes USBs.

A) Online

Company Platform/Centralized Server: Ten (10) participants reported that they use a common centralized server that included a common shared drive or folder on their workspace network to send and receive common files. Two (2 -P4, P2)) of them also use *Microsoft SharePoint* as a common folder or platform and one (1, P6) participant uses a software called *Live Link* which is a product of Oracle. One participant (1, P7) also used SSH (Secure Shell) to access data.

Participant P13 stated that *"Server access levels are defined when sharing specific files".*

Participant P10 mentioned that *"some of the folders and files on the network can only be accessed by a team and not even other departments".* He also stated an issue which was not found with other twelve (12) participants which was *"when I joined the company, the centralized server space was full and my team mates had to delete certain data in order to make new space"*

Email: Nine (9) participants expressed that they share data and information using email as well. Specifically Outlook was the email client they were using. Participant P10 stated that *"Emails are used usually for smaller file sizes*".

"I hate outlook, for students it's alright, but for professionals but it's bizarre" quoted participant P3 suggesting he does not believe that Outlook is a good mail client for business.

Third Party Applications: Six (6) participants said that they also use applications like *WhatsApp, Slack, Skype, Messages (Apple), iCloud, Dropbox, Google drive-(P11)* to either communicate or share data with their colleagues and team. (P1) mentioned ". *I use WhatsApp to scan documents and take pictures as it's much faster and easier...* ".

Another participant (P11) mentioned that "*Usually we prefer to use iCloud and Dropbox because of the Apple ecosystem and it is very much easy to access in our team as we have Apple devices mostly also Dropbox allows us to give specific access to specific people".*

B) Offline

Five (5) participants stated that they use external media such as pen drives or USBs to share and transfer data. Although, they stated that the USBs have to be either encrypted or you require special permission/authorization to use it across the office with the team. Their workspace does not allow them to connect any kind of personal media connected to their desk computers.

-Encrypted: Two (2- P9, P12) of the participants mentioned that they use encrypted USBs if they really need. P12 stated *"you can use USB but then you have to get a special permission to use it or it has to be encrypted".* P3 mentioned that "*my workspace had too much concern regarding protection against external devices, hence USBs or Hard drives were strictly not allowed*"

Permitted/Authorized(Non-Encrypted): Participants (P1, P08, P13) mentioned that they use normal USBs without encryption but provided they have been authorized with their supervisor or the boss.

Backup: All the participants have at least one or the other way of storing their data and backing them up. Backup can be categorized in two categories: A) Online and B) Offline and then further divided into frequency, every day, once a week and once a month.

Participants P1 stated *"There is one computer in the office that stores all the backup and is also used for general purposes."*

Participant P9 and P12 mentioned that the do not know about the workspace backup but individually they store it on their desktops regularly.

P10 stated "*most of the backup is done spontaneously, also most of the backup is on the internal desktops*", P5 stated "Backup"

Issues and challenges at work

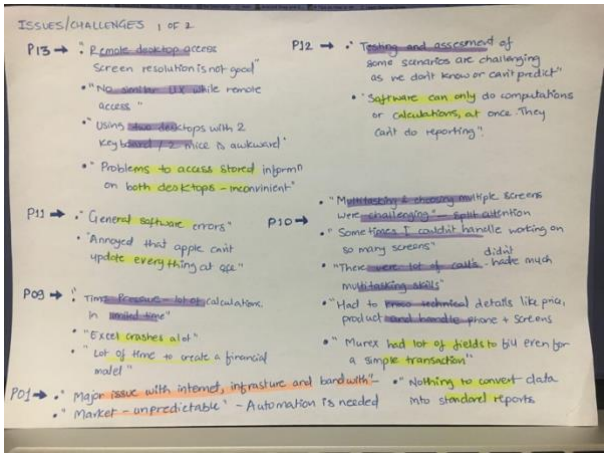


Figure 19 A Issues and Challenges 1

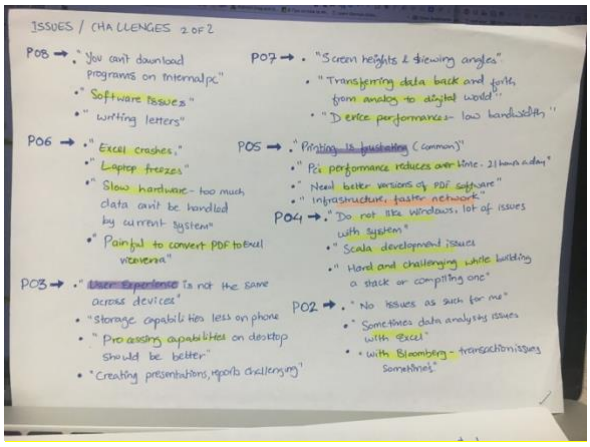


Figure 19 B Issues and Challenges 2

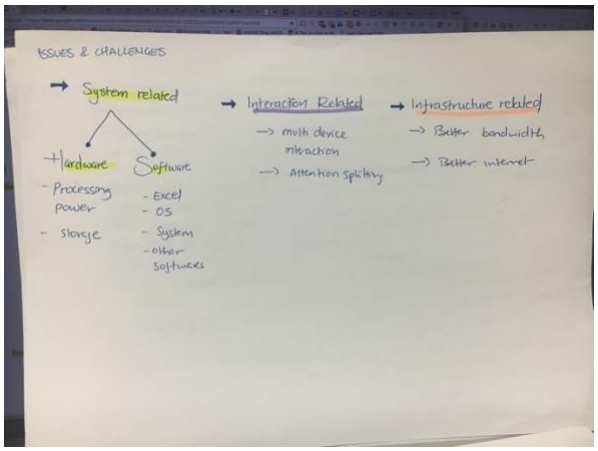


Figure 19 C Issues and Challenges Consolidated

All participants had some issues related to their workspace explicitly. For some, it was very much a minor issue and for some it created huge problems of data loss in their activity. Please refer to figures 19 A, 19 B and 19 C while reading through this section.

Majority of the issues and challenges can be divided into three categories: A) System related which consists of hardware and software B) Interaction Related and C) Infrastructure Related.

A) System related: Participant P13 stated that *"its problematic and inconvenient to access stored information on both desktops"* and *"using two desktops with 2 keyboards and 2 mice is awkward".*

P2, P6 and P9 mentioned that *"excel had issues handling large data and models, it crashes and freezes while using large data set"*

Some participants like P6, P8, P3, P5, P7 commented on the "*overall performances of the systems deteriorate over time, slow hardware, processing capabilities on the desktop shall be improved, low bandwidth and device performances are low"*

Participant P10 specifically mentioned that "*multitasking and choosing multiple screens were challenging to split attention in between. I couldn't handle working on so many screens, there were lot of ongoing calls as well as screens to watch out for, and at the same time keep track of all the prices of the products.*"

Participants P1, P05, mentioned *"issues with the infrastructure and electricity was main challenges. They believe it's because of the socio-economic condition of india, also they said that it is not like western countries where electricity is 24 hours and internet is as speedy as it should be!"*

Other issues included problems with general software like P6 found it difficult to convert PDF to Excel and vice versa. P5 also mentioned that there is a need for a better version of PDF software.

P7 mentioned that *"transferring data back and forth is a difficult issue"*

Solutions desired

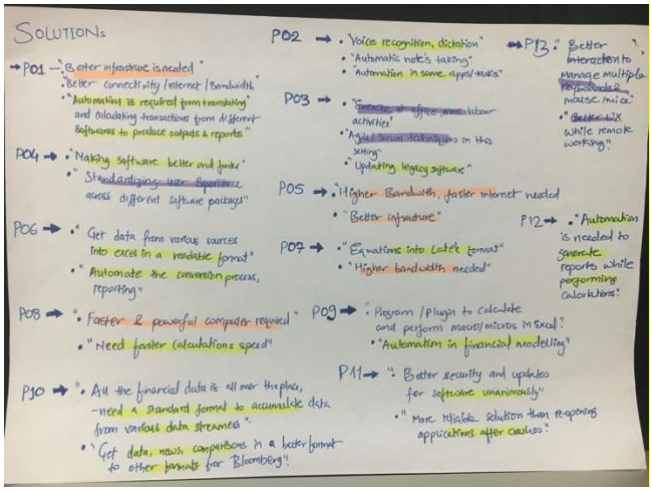


Figure 20 A Solutions desired by participants

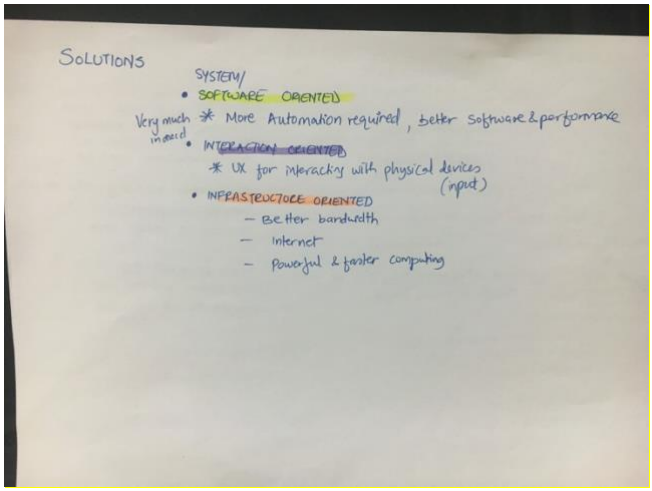


Figure 20 B Solutions list consolidated

All participants were asked about one desired solution which could maximize their efficiency and minimize their pain. Solutions can be categorized into three categories: A) Software/System related, B) Interaction related and C) Hardware related based on the data collected.

Participants P1, P2, P4, P6, P9 and P12 strongly desired for an automation solution in their softwares. Specifically, to

generate user defined reports and generating typical models where one needs to change the macros and micros.

Participants P1, P5, P7, P8 quoted that they would want much better bandwidth and faster computation and internet speed.

Participant P10 stated that *"all the financial data is all over the place, there is a need for a standard format to accumulate data from various data streamers (Bloomberg/Reuters)"*

Participant P13 stated that "*While working and managing multiple keyboards and mice, the UX needs to be much better*".

4. DISCUSSION

One of the findings showed that, there is a *primary-secondary device pattern usage* and settings from the data flow diagrams and task-activity matrix that is prepared. Most of the participants use one computer as their primary go to device and the other as helping device.

The other finding states about how workforce in the finance domain usually use online method to share and transfer data within their colleagues and departments. They use a dedicated server which is either company owned or a separate platform like Microsoft SharePoint or Live Link. Often participants still use emails to share smaller size files and USBs and external media inside financial institutions are strictly monitored if not prohibited. They do not want any kind of breach which can lead to a loss. The third finding is that the workforces' information space revolves around interacting with lot of their human resources in their team and departments. In general, these findings give a brief picture about the finance industry through a keyhole.

This research validates the *serial and parallel patterns of usage from the prior studies conducted* [3][12][5] The contribution of this project is that it shades light on how financial domain workforce use their devices and share information in a secure manner.

Limitations of the study

Because the primary data was only collected through interviews, there is much more that could have been discovered and explored had all of the participants agreed to give an interview at their workspaces. Technically it would not have been possible due to the geographical restrictions.

Although, shadowing and observing people at their work desks in financial institutions would have added to gaining more insights.

Sample size and quality of samples: The sample size could be increased to about 20-25 ranging from more particular financial domain or particular sector like *banking or only trading.*

Challenges of this project:

Lack of Time > This project has been one of the most challenging projects personally to me. As other student projects received approximately 12-14 weeks to finish their work and study, this project was introduced to me on July 15th 2017. The research started by July 21st as there were permissions and other administrative things that had to be fixed before I could begin. That gave me a time period of exactly less than 6 weeks to plan this study, recruit participants, conduct interviews, collect data, analyze them critically and write up the report. For an unknown reason, I was told that I would not be able to get an extension for this project to which I could not have argued upon, as the decision was final by the programe director and I had to start this project first.

Lack of resources > I had to look for participants single handedly, although some people in my department helped me, most of the participants that I could contact did not respond or show any interest. As my program is ICT Innovation, I was not allocated funds to pay to my study participants that was something that I thought should have been sorted out but it didn't.

Personal Health > Unfortunately, my health was not optimal while all of this was happening, I have sinus issues that stopped me working on my project couple of days in a week or two.

Overall, I believe I have tried my best to compile a report that can be considered to be of a Thesis level, given the extreme short time scale to finish a big qualitative study.

5. CONCLUSION

Using several multiple devices in modern workspaces is a norm. There is a need to better understand people in the finance industry to design better user experience that helps them in their future working styles. This research conducted 13 in depth semi structured interviews specifically from the financial domain to explore and investigate insights about this industry.

There were three research questions to answer about how people in the finance industry set up their devices? how is the information space and information flow carried out? and how do they share information across multiple devices. The research to quite an extent tried to investigate and explore the answers to the research questions. For the first question, yes there is a strong behavior of using devices in serial and parallel patterns coming out from the primary data. The

devices are also setup on the basis of one's roles and activities but follow *primary-secondary* pattern when choosing the go to device. For the second question to answer, Information space is generally split across interacting with people from the office majority of the time. And to answer the third question about how data sharing works in these environment is mostly through a dedicated centralized server or emails. Occasionally, USBs are used but needs to be encrypted.

The future work would be to conduct a bigger study for a longer period which can look at specific details of the industry like how do people use Bloomberg Terminal across different roles and positions.

While this project has explained short insights regarding the finance industry, it can be seen as a stepping stone towards further studies that can be built up on this and advance the domains knowledge.

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7 Appendix

PARTICIPANT DEMOGRAPHICS

						No of Digital Devices		Usage of Digital Devices						Usage of Non-Digital Devices		
Participant ID	Country	Age	Gender	Profession	Company		Phones	Laptops	Desktops	Extension (Monitor)	Tablets/ Netbooks	USB/Hard Drives	Uses Printer	Journal/Notebook/ Sketchbook	Sticky Notes	Whiteboards
PID1	India	31	Male	Service/ Operations	Private	3	x1	-	x2	-	-	Y	Y	Y	Y	N
PID2	UK	33	Male	Financial Analyst	Invesco	4+	x1	-	3+	-	-	Y	Y	N	N	Y
PID3	UK	27	Male	PhD Financial Computing/ Financial Software Programmer	Nomura/UCL	4+	x1	x1	2+	-	x1	Y	Y	Y	Y	Y
PID4	UK	24	Male	Scala Programmer (Fraud detection software for Financial Institutions)	Quantexa	3	x1	x1	x1	-	-	N	Y	N	N	N
PID5	India	28	Male	Investment Banker	JP Morgan/ Goldman Sachs	3	x1	x1	x1	-	-	N	Y	N	N	Y
PID6	UK	21	Male	Financial Strategist for Retails	Financial Conduct Authority UK	4	x1	x1	-	2	-	N	Y	Y	N	Y
PID7	UK	24	Male	PhD Financial Computing	UCL	3	x1	x1	-	1	-	N	N	Y	N	N
PID8	Russia	25	Male	Chief Economist	Central Bank of Russia	3	x1	-	x2	-	-	Y	Y	-	-	Y
PID9	Russia	28	Male	Economist	Central Bank of Russia	4	x1	-	x2	1	-	Y	Y	Y	Y	Y
PID10	Thailand	28	Male	Consultant/ Forex Sales Agent	CNIB/Deloitte	3+	x1	-	2+	-	-	Y	Y	Y	Y	Y
PID11	UK	31	Female	Researcher/ Statistician	Private	3	x1	x1	x1	-	-	Y	Y	N	N	Y
PID12	Russia	30	Female	Economist/ Financial Researcher/ Risk planner	Central Bank of Russia	4	x1	-	x3	-	-	N	Y	N	N	N
PID13	UK	34	Female	Commercial Finance Planner	Private	4	x1	x1	2	-	-	Y	Y	Y	-	-

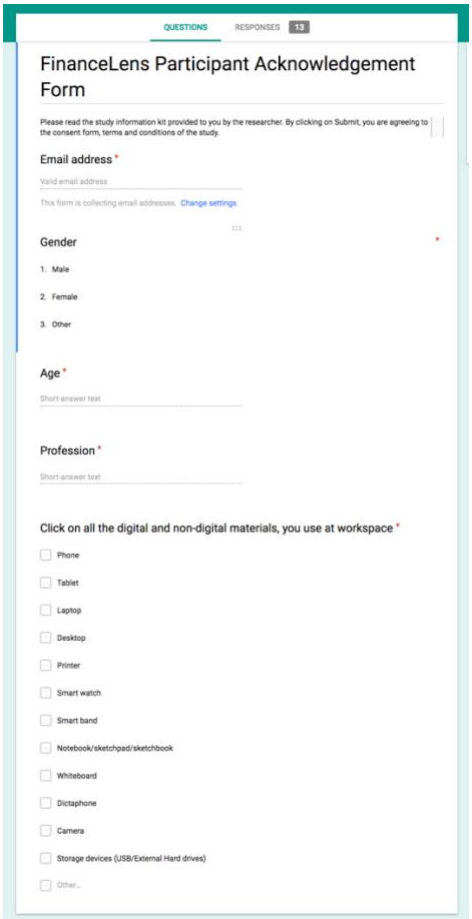
TASKS AND DEVICES MATRIX

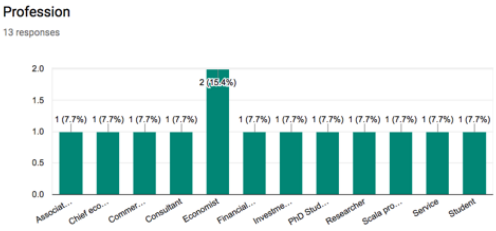
USER ID AND ROLE	USER TYPE	DEVICES	FREQUENCY/ ORDER	TYPICAL TASKS IN A DAY	APPLICATIONS/ SOFTWARES USED	SHARING DATA	PLATFORM	USAGE	COMMENTS
PID 01- OPERATIONS	Advance	Laptop, desktop, personal phone, USBs,	Majority of the times desktop and phone at work, laptop at home.	-Observing and operating trading software ALGO, Ninjatrader, -coordinating with different clients, -Bill generation, -preparing and checking payment sheets, profit and loss sheets	Computers :ALGO, Ninjatrader, Interactive Broker, E-Signal, Microsoft office- Excel and Word extensively, Teamviewer, PDF reader and converter, Whatsapp and Camera application on Phone	Heavy use of WhatsApp to share scanned documents, sometimes USBs across team, Emails with clients and phone to communicate.	Windows	Usually throughout the day. There is not much of communication at the market hours.	There are lot of desktops at his workspace
PID 02- FINANCIAL ANALYST	Intermediate	Desktops, additional monitors, Bloomberg Terminal, personal phone,	Simulataneously uses all the systems,	Looks at bond trading, companies information, checking on market activities, information flows about specific financial data	Sharepoint, Everest Software :Microsoft office, Excel, word, Bloomberg, Powerpoint, Microsoft photos, snipping tool, Emails	Usually use emails for files. Microsoft Sharepoint is commonly used in the department to share other data.	Windows	Throughout the day, mainly.	USBs are restricted in the company as a policy.
PID 03- FINANCIAL SOFTWARE PROGRAMMER/ PhD IN FINANCIAL COMPUTING	Advance	Multiple desktops, laptop, Data stream providers (Bloomberg/ Reuters), personal phone	Mostly uses multiple desktops at the same time, distributes work across.	Conferencing calls, meetings with supervisors and other teams across continents and countries, development of price recommendation system, create visualizations, analytics, information processing presentations and reports too	Microsoft office- (Excel, Word, Powerpoint,)Bloomberg, PyCharm IDE, Jupyter Notebook, Symphony (Slack for Banks), RSA for passcode	Usually share things across emails if they are plots, graphs or other data from Bloomberg. But on a common platform made by Nomura.	Windows	Mostly work over desktops, use phone middle of the day, check mails and to access pass codes or authorization code, remotely to work on pycharm	USBs are prohibited and is very strictly monitored.
PID 04- FINANCIAL FRAUD DETECTION SOFTWARE PROGRAMMER	Advance	A desktop, laptop and a phone.	Uses all three devices in co-ordination. Usually the desktop > laptop > phone	Write and development of code, conferences, Skype meetings, Scala development,	Eclipse IDE, notepad++, Microsoft code, chrome, Firefox, Skype, Google authenticator, Amazon Web Services, Slack, Sharepoint	Sharepoint for files, Slack for communication/ Skype at times,	Windows/Linux	Majority of the work is done on the desktop and laptop is used as a secondary screen	Phone is used to get authorization logging on into the Amazon Web Services to work on the products
PID05- INVESTMENT BANKER	Advance	Desktop, laptop, phone	Laptop > desktop, phone rarely at work	Create profiles for companies to invest, meetings with directors and other teams, create pitches, presentations and reports. interview candidates, training	Microsoft office pack, Excel, Word, Powerpoint, Outlook mail, Bloomberg, PDF viewer, Chrome, windows snipping tool	Through a common drive as a centralized server by the company.	Windows	Through out the day- mostly uses desktops and Microsoft office software.	Phones are not allowed to be used while working, cant take pictures or record anything, there are cctv cameras everywhere inside the room. USBs are disabled and cant use third party softwares.
PID06- FINANCIAL STRATEGIST/ REGULATOR	Advance	Desktops, laptop, phone	Simultaneously use desktops and laptops.	Setup workspace, check emails, have meetings with supervisor for a short time, analysis of financial statements, strategy, collect data from Bloomberg and convert into excel, making reports, presentations,	Microsoft office > Excel, powerpoint, word, PDF reader, Bloomberg, LiveLink, R, Outlook,	Through emails and dedicated server called LiveLink (Oralce) centralized server	Windows	Work throughout the day on desktops	USBs are not allowed, cant access personal emails from workspace laptop, cant connect to any personal devices. Security is a big concern.

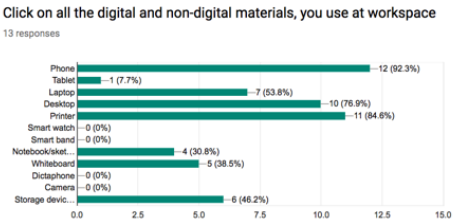
PID07-PhD FINANCIAL COMPUTING	Advance	Additional screen, laptop and phone	Screen is the primary device, writing code and writing paper, use laptop to sometimes reading, comparing.	Researching, checking emails, reading papers, writing code/ development, write reports and technical paper, finding information, writing editing documents and reports	Terminal, IDEs, Chrome, Firefox, Latex Interpreter, Skype, GitHub and Microsoft word.	Usually on a remote server from the university using SSH (secure shell)	Windows	Mostly work on the laptop.	Prefer to have an additional keyboard and a mouse, would use phone while on the go to check the emails.
PID08-CHIEF ECONOMIST	Advance	Two desktops, phone	Internal(Bank portal) and external computer(internet access)	Data mart, warehouse and big data analysis, produce analytical reports, powerpoint presentation	SAS, Microsoft office pack- some internal banking software. SQL, Sharepoint, Outlook	Use generally Microsoft Sharepoint and Outlook, dedicated central server	Windows	eight hours in day on desktops	No third party softwares for cloud storage, USB sometimes.
PID09-ECONOMIST	Advance	two desktop, one Bloomberg terminal, phone	Simultaneously all three majority of the time, (One internal-for bank), One external to access internet, one is the Bloomberg software	Checking mails, checking Bloomberg News, generating graphs, lots, financial modeling, risk analysis, meetings with supervisors and bosses	Bloomberg, Excel, Windows mail or outlook, SNP Capital IQ,	There is a common drive that is used to share data, this drive is allowed to be accessed only by the internal computer	Windows	Usually use the desktops though out the day, have to juggle between internal and external computers.	Internal PC or portal is secured, you are not allowed to go to any hiring websites
PID10-FOREX SALES CONSULTANT	Beginner to Intermediate	Dual screen desktop, data stream monitor on the top, internal phone	Most of them are equally important and had to split attention across the screens especially to know a price of a product while selling to a customer or a client	Attend briefs and meetings, calling customers, reading news about trading, bonds, forex, securities, derivative products, coordinating with transactions across the day, reading from Bloomberg/ Reuters data stream, record and cross check transactions on phone and computer	Murex, Bloomberg, Microsoft Excel	Centralized server where we can put anything	Windows	Mainly use the internal phone to record transactions	The central space provided was only with teammates not even with other departments, cant use personal devices, USBs were prohibited.
PID11-RESEARCHER/ STATISTICIAN	Advance	Desktop, laptop and phone	Laptop > Desktop	Check my emails, check calendar, list priorities for the day, look at invoice and statements and deal, research based	QuickBooks, Banking application, Outlook, Gmail, Skype, R, Microsoft Word, Excel	Usually use Dropbox as a common platform, also, iCloud and Gmail.	Mac Os	More active on Laptop, uses desktop as a secondary screen, phone is used to check emails throughout the day	everything is backed online, some important things are backed up over the hard drives,
PID12-ECONOMIST, FINANCIAL RESEARCHER, RISK ANALYST	Advance	Two desktops(One Internal, One external(internet)) and Bloomberg	Have to focus on all three things, Bloomberg > Internet computer > Internal computer	Monitoring key financial markets, financial modeling, monitoring of reports, preparing financial reports, attending meetings small or big once a week	Microsoft Excel, Bloomberg, Matlab, SAS,	Mainly centralized server, its a secured server	Windows	The internal commuter is mainly used to calculate along side the Bloomberg Terminal,	Do not use phone, or emails to share stuff, USBs have to be encrypted and need special permission to use or else they are not allowed
PID13-FINANCIAL PLANNER	Advance	Two desktops, one laptop and phone	Mainly use the two desktops for all the tasks	Checking emails, financial modelling, implementing control process, evaluating investment decisions, reporting to the group	Outlook, Microsoft Office pack, SAP, SUN, SAGE, and reporting tools like Hyperion and COGNO and subscribed to business news	Use emails and a shared drive. Access levels are defined, centralized server	Windows	Does not use phone a lot, also laptop mainly at home.	USBs are used sometimes, usually share items through drive

Interview Questionnaire

Google Form: Participant Information







Questions to ask:

1) What type of user you identify yourself as when it comes to using these devices?

A) Beginner B) Intermediate C) Advanced

Briefly describe a typical work day and key activities and tasks you work on.

Can you tell me more about the digital devices you are using in a typical work day?

Explain how do you use these devices in your current workplace.

What tasks do you use these devices for?

Briefly explain about the devices provided by your employer. Is there any reason behind why they provide it?

What types of applications or programmes you use to perform your tasks?

Is there any specific application you use to perform financial activities?

Elaborate on how you share information or data between these devices.

****If offline, please explain the flow. If online, elaborate which service is used and how**

9) What type of information is shared or transferred across these devices?

10) With which of the devices you interact and access them remotely? If yes, do you use any platform or service?

How have different devices become specialized for different aspects of a workflow?

Please tell me about the non-digital devices you interact with? Eg: Printing, notes etc.

Where are devices? E.g., where are monitors, notebooks, maybe tablets anywhere, phone, etc?

Do you replicate your workspace at home, do you remotely access any of the devices?

Kindly talk about the backup if you know?

What do they primarily use? Email, drobox, other sync services, web services, etc.? Maybe USB sticks to transfer information

Describe major issues while using these devices for your work

> applications > devices > interactions > functionalities

Which tasks would you pick as the most challenging one while interacting with?

What other problems in general do you have around using digital devices for financial applications

What options, technology or functionality would make your everyday life and tasks more efficient or easier?

Consent Form and Information Sheet

Informed Consent Form for Participants in Research Studies

Title of Project: FinanceLens: Studying multi-device use and cross-device interactions in Financial Computing

This study has been approved by the UCL Interaction Centre Research Department's Ethics Chair Project ID No: **UCLIC/1617/011/Staff Marquardt/Brudy**

Participant's Statement

I ..... agree that I have

- read the information sheet;
- had the opportunity to ask questions and discuss the study;
- received satisfactory answers to all my questions or have been advised of an individual to contact for answers to pertinent questions about the research and my rights as a participant and whom to contact in the event of a research-related injury.
- I understand that my participation will be audio taped or might be video recorded, and I am aware of, and consent to, any use you intend to make of the recordings after the end of the study.
- I understand that the information I have submitted will be published as a report and I will be sent a copy. Confidentiality and anonymity will be maintained, and it will not be possible to identify me from any publications.
- I understand that if I am being paid for my assistance in this research and that some of my personal details will be passed to UCL Finance for administration purposes.

For the following, please circle "Yes" or "No" and initial each point.

- I agree for photos being taken of my workspace. Note: you have the opportunity to review photos and ask for deletion.
  YES / NO initial: _____
- I agree for the audio recording, video recording or photos to be used by the researchers in further research studies
  YES / NO initial: _____
- I understand that I will have the opportunity to confirm these decisions after I have seen my audio recording, video recording and/or photos.
  YES / NO initial: _____
- I agree to be contacted in the future by UCL researchers who would like to invite me to participate in follow-up studies
  YES / NO initial: _____

I understand that I am free to withdraw from the study without penalty if I so wish. I understand that I consent to the processing of my personal information for the purposes of this study only. I understand that any such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Signed (participant): **Date:**

Investigator's Statement

I, Yashwant Todar, confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonably foreseeable risks or benefits (where applicable).

Signed (researcher): **Date:**

Information Sheet for Participants in Research Studies

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Project ID No: **UCLIC/1617/011/Staff Marquardt/Brudy**

Principal Investigator	Name	Address	Contact
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Other Investigator	**Name**	**Address**	**Contact**
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We would like to invite you to participate in this research project directed by researchers at UCL. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

Details of the research project:

This study aims to investigate how people in the financial domain interact with multiple digital devices (e.g., their laptop, tablets, phones, etc.) to do everyday tasks or specific financial activities. This study includes interviewing people from the financial computing domain using a semi-structured interview and a questionnaire. We will ask you to provide some basic demographic information about yourself, your work practices, and the devices that you use at your workspace. If you agree, we would like to take photos or some short video recordings of your workspace setup. You will be able to review the photos and the videos after we take them. No financial data will be collected in this study.

The information that we collect will not be associated to you personally. However, we will publish the results of our analysis of the data in anonymized form, e.g. in academic journals and conference papers. Confidentiality and anonymity will be maintained, and it will not be possible to identify you from any publications. Given explicit consent (see the consent form) we might use certain parts of video/audio recordings or photos (blurred faces in both videos and photos) in presentations or publications.

This interview is expected to last about 45-60 minutes.

All data will be handled according to the Data Protection Act 1998 and will be kept anonymous. Only UCL researchers working with Dr. Marquardt will analyze these data.

It is up to you to decide whether or not to take part. If you decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time and without giving a reason.

Interview data

Interview Xu
Financial Analyst - 33 Invesco

Background: Worked in Finance, asset management, fixed-income credit research for corporates.

Type of User: Intermediate (neither beginner or advanced)
Comments on devices: uses multiple computers > 3 +

What type of work activities?
Mostly looks at bond trading, company information, difficult to say > generally, morning tend to be checking on Markets trading activities > news flows, information flows, company specific researches. Pretty independently, there are not any team projects.

How many times do you interact with those devices and for what?
Through entire day, most of my activities are computer based.

Softwares or activities majorly on computer.
Does not use phone,

Microsoft Office Photos, snaps
Financial softwares>
(1. Excel, 3.Word, Bloomberg software, 2.Bloomberg Terminal, 4.Powerpoint)

Employer provides:
Employer provides all the devices. Company policy, security is obvious. Most importantly.

Backup >
No idea.

Sharing information across devices
Company provides platform, can email, files.
Personally does not connect using remote. But some people do use remote control.

Use any external devices: normally it's not allowed. Kind of a company policy.

For workplace sharing: Microsoft Sharepoint: Common file

Any access from home: Didn't need it.

3rd party services: No idea

Spec. for a task: Multiple things on one device.
Bloomberg is on same computer. No specification of different devices.

Non-Digital Devices

Printer > often > Computer based > Common office space - No idea why its placed there.
Note taking > No

Identical workspace at home :
I dont work at home!

Individuals have own cabin and their devices.

Services: No third party services.

Issues:
No issues what.

Challenges in task : Bloomberg could be one.

Interaction with multiple devices: Now a days, generally. I never pay attention on problems o devices, generally does not do much of tasks, mostly reading and analysing.

Pretty straightforward

Company specific software: Everest- a company designed for research based interface put in information and standardised format.

General comment: I can read and type, (dictation software or automatic typing, voice recognition).

Tasks : No tedious tasks.

Interview Adriano

Check back for the description of cabin layout,
PhD CS- Financial Computing

Background: Bachelors in Economics, research assistant- power sector, data science for retails and r and d in Brazil. One year in Investment bank in Nomura- strategy

Type of User: Advanced

Describe your everyday tasks
Wednesday
8 am video calls, with all the offices around the world, sinapore mumbai, tokyo, hongkong,
Sit one hour, to discuss, potential client, strategy, etc so that we can be on the same page.

9 am go back to the desk- in my case particular
My time- working 2-3 hpurs working on pySham- IDE- recommendation fpr finance,
Later for lunch, have lunch on the desk, future, start to work again after finishing the lunch.
Usually afternoon- catch iwth my Boss- runs throuh progress and get feedback on what i did and whats to be done later on

Catch up with traders and sales to show current status and what needs to be done and so far and also get feedback.

Work more on the recommendation system.

Close to about 6-7- 5 days a week. Not working on weekends.

How important is this? Very important- very easy for you to not get on te same page-

Similar to people who do in tech sector- agile and scrum sprints,

Digital devices used on the given day-

Hardware: screens, desktops, bloomberg desktop- 4 screen terminal, pySham, Jupiter Notebook, ubiquitous > bloomberg Jupiter Notebook> suitable manner to write python codes- reports and data visualisations, quick method for reporting, same time you can write code-it's a browser no problem as you can use the other tabs to search.

Use phone in the middle- check mails when something needs to be done on the bloomberg app. For passcodes accessing the computer from home.

What are the tasks that you use the devices for
Desktop > bloomberg, pysham, jupiter,excel, office, Information processing, analytics, reporting, conversions,

Devices provided by employer, want to make sure- no leakage of information
Privacy and they are very strongly regulated. Probably leak some information, you want to make sure you use their software - so that you are under their environment so you don't leak data.

Comfortable using their software
Outlook not so comfortable- old environment, email to send from personal space- compliance etc its bizarre, painful, for students its fine.

How is the information being shared.

Between the devices, very tricky - maybe - kind of data- mobile and desktop is more presentations, because its really difficult to open sheets, codes on phone.

Bloomberg- share plots across. Emails

Team > via emails used to do it, data is bigger- shared space- companies centralised network- backup every hour, rigorous, you can't delete files, now they have introduced a new software across most banks Symphony- consortium of banks- slack for banks- bots. Goldman,nomura, jp morgan, share data seemless and protected manner.

Allows all of the data, plots, graphs, impressive, bloomberg

Backup= offline,

Not for public fine- Pricing models- nomura- every pricing models have parameters-- Hedge fund, they know how Nomura pricing- damage for a day- CEO has more power.

Access from home: Desktop > using pysham> using software specific company one windows, RSA software > passcodes to access desktop terminal.

Do you think devices have become more specialised?
They have their purpose- brilliantly, people will not change or stop using it. If they try to do everything, people will not buy it, charged more and for what is more- we just want to get news, data and that is it. Depends on the context- segregation of tasks, it's much better to have a specialised devices
Serial patterns.

Non Digital devices.

Print outs > Very few occasions. Create reports, presentations, not something to do job.
Books yes, papers, magazines yes, still prefer- physical book

Replicating workspace: find it convenient to work-
Multi screen approach- especially for programmers- once screen email- music, one screen code and other screen google.

Common device accessed by everyone?
Bloomberg Terminal is accessed by everyone.

Web services:
Company = none . internal

USB/Hard Drives:
Not at all- very strict.

Decision of sharing of information and access: (should be aware or not)

Recipient of the information > does he need to know

2nd question: what is the worst case in the disclosure of data

3rd q: disclosure of data is right or wrong? (implicit)

Tedious, become like a robot- give you so much training- every two weeks, client systems- some kind of regulatory compliance

Breaking the legal;= breach of data? The boss texts you,

Too bad- they sack you directly- blacklist- on the city- serious track down corruption.
If not serious- sent some spreadsheets - got a call from the lawyer- compliance team- my boss- attach an email- saying somehow address the questions why did you use the spreadsheet- explain find it on bloomberg- UCL-

Everyone is watching everything.

Top issues:

Possibility to have the same experience across device- desktop vs smartphone-
Smart phone no coding, in future- could be,

User experience can be a problem.

Storage capabilities >
Processing capabilities - desktops

Challenging task- most common thing- preparing presentations- clients-

Not as similar background- easier to them to understand - speed their languages
More technical on wednesdays

Apart from this, software is piece of cake.

Flow of software- is pretty good.
Platforms- pipeline- prepare presentation-get data- jupiter notebook- function communicating with bloomberg, getting spreadsheet- function which communicates- get data directly from bloomberg- create plots- graphs- models - tables- translate into microsoft office- windows.

General problems or issues
Not really

Financial sw- just bloomberg- improved substantially- seems like a dinosaur- the standards are so old- search for what you want- instead of pressing buttons- still pain in the **s

More efficient?

More labour excuses- get off the chair do some excercises-

- update softwares- legacy software- people don't update because they don't want to pay for new license they feel insecure to update whats working,
Improve in agile- test- not something similar to tech space-=
Miss this space-
Someone responsible for doing this-

Hurdle, challenge me to get better and opportunity to do well. Try to show that i am able to overcome.
Stress > get rid of the stress is do something you like- when you feel like that.

Interview Ivan

Background Bsc Msc Corporate finance > Central bank federation- risk of corporate sector,

Type of user: Advanced

What is your typical work day?
Day begins with checking mails, bloomberg news, magazines about corporate sector and risks, update on financial models, meet bosses to clear tests, know updates on the days or weeks on what they say. If I don't have specific task, then I do financial modelling, research on news etc.

The task also depends on the supervisor's and bosses tasks.

What activities you do on the devices?

Tool > main > Excel and Windows and Mail. Calculations, modelling, generating graphs, plots and tables.

Explain the picture.

What types of softwares do you use?

Bloomberg terminal, SNP - provides financial information about public companies, financial statements, balance sheets, cash flows etc. It's a specialized financial program, financial analysis- SNP CapitalQ.

What employers provide?
Internal computer - Bloomberg and External computer (Internet)

Can’t have pc with internal access together with internet.

The desktop with the internet access except hiring websites.
The internal desktop used for data transfer, only between office and employees.
Other services > external mail- to send information out of company. Regular outlook with other mail.

Corporate uses internal desktop is common disk drive.

Backup - i don't know, most likely IT department they know. My backup is always stored on my computer (My desktops)

Do you think workspaces have become specialised in workflow?
Multiple softwares and programs can run on one device.
Screens x 3
Excel > internal
Searching > external
Bloomberg > Terminal to compare
Much convenient to see on two monitors and input number on the third monitor.
Yes, its because of the workplace.

Most of the

How do you interact with the non digital devices,?

Printing > 3,4 times per day, one in the room. How the cabins? Some of them are huge room, with cabins. 20 quad meters, 7people sit there.

Do you use notebook to take notes, whiteboards, projectors,

I dont think its going to be a good idea, homeplace is not my workplace.

Access from home?

Website which provide access from,

I know the services- but we don't use. Maximum - whatsapp - to send information or mails to boss and supervisors.

Data transfers- have to be encrypted, some external pcs, encrypt it first and then put it on my external pc, common for all the people in the office.

Issues you face while working on these devices.

Main issues > more powerful pc, computing power. Bandwidth and calculation speed is slow?

Software issues : no crashes- excel.

Challenging or difficult task in a day > doing lot of calculations in small time.
If my supervisor asks me to do calculations in 30 minutes, but if I know it takes more than that, it's difficult.

No problem with bloomberg- awesome machine, awesome software- works like a robot-
Specific problem with SnP Capital IQ.

solution> financial modelling by providing some macro or micro changes about companies.
Put all the numbers by my self. The program shall calculate all the sheets. (Automation)

Data in excel > some kind of software. It takes lot of hours to do financial modelling, lot of numbers.

Phone for work> whatsapp or mail to receive from supervisor > sometimes specific, we have internal phone > micro mobile phone- not having to use my mobile phone, it works everywhere, in office to half kilometer outside, my supervisor can call me anytime.

Interview Prithiv

Intro
A laptop > splits two big screens and a keyboard- 90% of the work,
Phone, printers, Bloomberg terminals, pretty much it.

Questions

Type of user: Advanced

Background: Internship in investment banking in India, PWC - Cardif, Summer associate retail banking strategy FCA

Typical work day and activities:

Come into office and setup my workspace- open workspace culture anyone can sit anywhere, you can setup your own workspace, check emails, generally have a catch up with supervisor for about 5-10 mins, most of the work i do is analysing financial stmnts, strategy, big movement, collect data from bloomberg- online and take it on excel- calculations and ratios over there- once I have all the calculations and analysis in place- see my supervisor (remotely makes sens)make notes on word- go back to supervisor- use powerpoint in a way to present to people who are not in finance background

Our team create analysis- passes to daily supervisor who acts with the banks and see all the regulatory action that needs to be taken. I have meetings -
Interesting- we have an office in london and edinburgh, some person of our team sitting there and join us through video conferencing.

How do you use these devices in your workspace (Software and tasks)

Excel, word, powerpoint, outlook, Bloomberg- current role no heavy or statistical work- not much dedicated financial softwares used.

All the devices are provided by employer because we need it for everyday work- security and privacy > Unpublished data- not available to public or anyone but only to C level. Confidentiality is a big thing, for

eg; we are not allowed to connect our phone or any external device to any of our workspace laptop, must be in the office, must not be connected to any of our personal devices, can't access personal emails from workspace laptop, we cant go to sites where we can share data. Big big concern!

Share information

Most of the data is strongly kept in the workspace laptop. We can email them through email, we have a dedicated server called LiveLink > Oracle software- idea is that we can give them access depending on the levels. Centralised server.

What type of information is shared across?

Unpublished Financial documents, r analysis, strategies, planning documents, microsoft office pack, pdfs,

Accessing devices:

From home, in special situations we can take the laptop need special clearance from the manager, the IS desk, they upload a program on the laptop and go home open the program, sort of encryption, need to log in the app and connect to external wifi, access outside office.

Separate platform > generally we dont use, we have our own platform.

Specialised for single purpose?

Most of the devices have general purpose- not specialist, but there are specialist for their roles,

Simultaneously > literally say all 3 screens, excel on one, pdf on another and powerpoint on the third.

Which of these three screens you would use for primarily doing the work
One of tthe bigger screen, because laptop screen is smaller,

One would be for input, searching and comparison.

How do you manage to get the keyboard?

Have to use the mouse, click and type, eg: internet explorer, powerpoint, pdf,
Continuously clicking and opening tabs.

Non digital devices:

2-3 common printers on our floor, send wirelessly, lot of printing, create information packs- send them around,
Using whiteboards or note taking- definitely, notebooks while meetings take down, whiteboards- ideas to put and go around,

Option to replicate?

Workspace while at home- yes definitely, if I have to do work at home, it would make life much easier, you pretty much sit ont the sofa with the laptop,

1. Much more on that configuration, more efficient,
2. For the eyes and back more comfortable,

Web services?

We use services like databases for analyses,= thomson database, gfk reports > data on different banks, customer satisfactions, complaints, trends.

External media to share/data?

We use usbs but that is encrypted usbs, can't use personal ones.

Back up >

Livelink, once uploaded it can be recovered and backed up > online backup > often > am not sure about that > another database we have we don't use but bottle between us and the banks, not sure what's is called, banks can access it as a website and they can download any confidential information and its securely transferred in our system, if any information request from banks they can send from that.

Issues?

Laptops > freezes everyday for no dam reason, excel > put in too much of data > crashes, email > outlook > not so efficient, that crashes quite a bit,

Interaction? Not sure

Top 3 most challenging tasks >

Most difficult in terms of taxing > the financial analysis > looking at companies financials, strategy go together > 2> certain frameworks > not applying to document,
3 > painful to do taking data from pdf to excel >

Slow, hardware problems?
Secondly > not very portable with that desktop, if you go to the meetings you can't really take along, you have to take the notebook and get transferred back the data,

We are changing in the next 6 months, into hybrid/portable and fast?

Excel not able to handle lot of data,

One technology, to get data from different sources into excel > way to automate it. Pretty much thats it.

Interview sam

Background: I am a PhD student financial computing, banks and asset managers.

Type of user: Advanced:

Typical work day and key activities:

My work is mostly research based, come in procrastinate, check my emails look at new interesting papers that have been published yet, i will then write code or work on writing on results and writing papers.

Its all on my laptop > on the move > phone most of the time> laptop, code > most of the time laptop>

Other dgitial devices:

I have a telephone > i dont think I have ever used > jsut a laptop and desktop monitor > extension of the laptop > cellphone > i try to keep it away > so it doesnt distract me.

What all software do you use while at work,>

I use, terminal, > various text editors, IDE, web browsers, chrome and firefox, and I will use some kind of latex interpreter and word usually,

Nothing specific financial software,

How do you use your desktop monitor? I usually have is if I am writing code, one of my two screens will have the code up - terminal or text editor > generally have a web browser on another screen to figure out what i am doing .

One is used for coding and other googling > exactly writing up and searching, alternative,

Writing up a report> document i am working on, looking at other documents and researchers,, some time for comparison or find references and supporting arguments,

Share data between?

I back my data up= remote server = most work is done remotely, i use SSH,

Type of information ? dgiv

Data, code, the final documents on my machine,

Do you access from home?
If I need to work, i use SSH , but i dont usually work from home.

Do you think these days……

My computer can do all of the tasks and the phone can do as well.

Given scenario . I prefer having a mechanical keyboard and mouse, perfectly happy with the feedback, plug into my laptop at workplace.

Non digital >

Stay paper free , little notebook that i carry around, burps of inspirations or ideas,

How do you share between your colleagues

Data > server access permissions.

Information > journal articles, generally over email, or (slack)

No printing, any external drives> no need to get it, back up all on ssh,

Web Services: github, which I use for some projects, lots of it depends upon how the strict are if it has to be open or not,

Skype sometimes,

Issues and challenges :

One issue that i faced > i didn't like it when it was the screens were at a different height, allows me to seamlessly integrate at the same level, move my mouse, that is just kind of easier,

Cables get in a way a bit, wireless mouse and wireless keyboard,

Replicate workspace: nice ot have it if I could.

What would be challenging task >

Transferring data back and forth > big data > tricky > net capacity and bandwidth than the devices themselves

Analog devices: something digital > take a picture and but if you have to turn

Equations and transcripts into latex,
Higher bandwidth

Interview Daniel

Type of User : Advanced

Background: studied physics - warwick, data oriented - quantexa - network analytics and anti-financial fraud startup which develops sw/ financial analysts help fight fraud
What key activities on a typical work day>

Arrive at the office 10-9, daily stand up= 15 mins, what i did last day- today we use skype with 6-7 other people r and d which i am part of, i start my basic apps for development I do, party connection to our servers using MfA using Google authenticator- definitely need my phone to log in to these servers, & i then just work on my laptop connected to a separate screen and that is it for the most part.

What all softwares you use on the devices:

On laptop > IDE eclipse > development, notepad++, google chrome, app is controlled by web interface dev tools, some random text editors > microsoft code,

Microsoft office > sparingly, type some documents.

Platforms
Laptops > windows 10, phone > android.

Laptop and the screen are provided by the employer >

WHy?

I suppose laptop is great for remote work or any place, and second screen is essential for core development.

Yes, security, bitlocker is installed on the laptop and we have other security measures employed antivirus, file software, free avg, other than that, bitlocker- when it gets stolen no one can access data.

workflow >

Start the application to the party > type password > receive the prompt to enter the secondary password from google app > changes every 30 seconds, until you use the connection and then if needed I reconnect, when I need to login to amazon web services, rent a server or access our code commit, also need to use MFA to login into that, secondary authentication as well other wise I just code with a separate keyboard connected to the laptop.

Switching between screens?

External screen is the main screen and the laptop is the secondary screen.
Compares to the text files,

Information transfer between your devices?

Nothing as such specific or important > sharing files with other people mainly use skype, group chats and slack as a communication tool,

Access devices remotely?

I take the laptop home when i need, I suppose I only remotely access the service from Amazon, and sometimes when I someone asks me help them out, skype remote desktop feature.

Centralised server? > We use sharepoint, for some inter company documents and as for, our software products and specific stuff is mainly servers from amazon,

R and D team and other technical team.

Specialised for purpose?

I think its mixed, laptops these days can do so much of work, I guess if I really need to get some massive computing power I need to get cluster of servers- in our case it will be amazon server.

Non-digital devices,

I havent taken any traditional notes for a while now, didnt really had the needs,
I open a tab on notepad, I dont use printer maybe once a month.

Replicate:

I dont have a secrond screen at home, but if I did I would definitely use it, I have a tv but rarely use both of the time because it does not feel ergonomic

Any other devices ? company >

Nothing springs to mind really.

What other files are being transfered into the server,

Git repositories and code comments, some of our data sets that we have accessed to, like customer information, banking information, tests of our software,

USB and hard- drives are used rarely, mostly we have everything in the cloud.

Issues:

Other than windows being an a**H*** > windows 10 regarded as pinncale of windows platform > can cause issues not presented in Linux,

Sometimes I cant delete a directory that I cant delete them directly > linux emulated terminal to delete in their. Stupid errors like that. Nothing major,

Other sw? >

Challenging tasks >

Quite difficult to answer > some days i might be doing completely different things, recently i have started working on a project which will last several weeks, if I only focus on that, there are certain things I do everyday, hardest might be system related issues- when trying to compile or build our stack,

Scala development >

Other issues >

Life or task easier what that could be better version of windows, it isn't stable- fully fledged bullet proof feature > making software better, no hardware issues,

User experience or interaction between the softwares?
Nothing in general. Number of different s/w packages in our stack, maybe a bit of complications.

Development fraud detection > quantexa explorer main software, alternative to the software, not major competition, depending on the work the clients need, we tailor the software to them because micro services are set of main different interaction of microservices, deploy this set of features.

Interview Tanete

Type of User: Lot of devices > but I would consider

I graduated in Thailand overseas- finance in the us and then came back
Sales in treasury dept. 3 years > Financial consulting area in Deloitte. Banks and securities.

3 screens, desktop which was dual screen (L and R) and on TOP > reuters screen, treasury products. Behind my workspace there is whiteboard- which has some products, main communication was over the phone- its quite different from normal phones- it records every phone- handle and hold up to 10 calls.Be multitasking person in sales.

Describe typical day with key activities:

A) early morning into the bank, read the brief how is everything going, start calling customers, bonds securities, fx and derivatives products, call and hold and look at the screen on reuters and see bloomberg terminals- keep working all day long. At the end i have to check my transaction

8 30- 6 30 pm. Current role > go to client's office in morning 8 30-9, ask and collect information from clients using intvs, through hard/soft copies and work on excel.
Some day meetings with clients, i finish my work at 7, basically as a consultant, might meet clients and clarify until it finishes, sometimes its 3 months. Working individually, not much interaction with clients.

What sort of softwares you used?

Previously couple of softwares> treasury software - Murex.main software thats used in dept. Bloomberg terminal, Reuters screen - selling and buying with clients, microsoft > excel recording transactions.

CINB Thai

Provided
EMployers provide cause it's needed and because of sales, some had 3 screens and some had 4, specific had bloomberg, mine was embeded in the dual screen, murex and excel and everything else,

Yes, my bank was very conscious, cant use my personal device- to download any data from the desktop, if i want to send any data to other dept, email has limitation, with the file size,

How did you share information

We had a centralised server where I can put anything there, and they can access that space- it can be only between the teammates- not other departments. The server might not be provided by the Bank, maybe some outside people. Not sure how the protection and privacy is concerned.

Daily transactions, every evening transferred, sometimes its presentations as well for the products just in case they want to explain to new clients, also documents, only available to the team. Financial institutions clients, other would have corporate teams which I can't access their space.

The problem of the central space is that as time passes, it gets filled. When I got into the team the central space was not empty and other teammates deleted the older files. The team had asked for extra space to the IT dept.

Accessed remotely?

It was mainly in the office and has to be in the office as every transaction i have to do is over the phone and that have to be recorded- murex- many times I call and talk over whatsapp, weekdays have to be confirmed about the transactions to be recorded through the phone and confirm it.

WHy is it necessary to record?

Law regulated by central bank of thailand in treasury dept has to be recorded on both phone and computer, for reuters and bloomberg there is a chat as well- record have to be kept for 5 years, many transactions that had happened many years ago- i can ask IT for it, derivatives is very price sensitive, the price is 5 million usd, any deviation can cause lot of money, we went to the records and ask for the records, we hear what I said and what the customer said, it happened like once a year, but I sent the file for them to hear- also customers know the rules and sent the record to resolve the situation.

Bloomberg and Reuters and Data providers- lot of data there is too general but it can be modified as I want it. I set up in the bloomberg that send me the news on this keywords if there is then send me email- send me the news to my bank's mail, if i put fx in an fx, also questions about derivatives, I can setup screens from easy to access, calculations about derivatives,

How did you use them?

No logical flow , look at different screens, multiple times buy usd-packet price- target price and make a transaction, if that happens so I have to always look at Reuters screen, there is always a need for multitasking.
Primary device: equally important, as clients are financial institutions, life insurances, buying products like bonds and fx and derivatives- everyday it would be buy and sell, for Fx- reuters and for Bonds- not much, maybe from Bloomberg, for Derivatives- mainly in the bloomberg and then into the Murex. All of these were equally important.

Non digital devices

Not so much of data is needed to be printed. Presentations were the most of the things that would be printed, but they did not happen frequently. Lot of note taking was used, for some clients they can only buy some products as rules of financial institutions are very complicated, and the clients don't know what they can actually buy, I need to know what can they buy, eg: insurance companies cannot buy prohibited and I can violate the law and rules.

I have sticky notes on the side of the notes, main of the eye contact would be around these three screens, it's easier to see and whiteboard > my team also used whiteboard > the main idea about sticky note is what customer can buy what products. I had journal to write down during the day but it did not play a much role, take price and calculations.

How the data is backed up?

Spontaneous backup > sometimes my screen is blanked out, they recover the most recent files are recovered. Its backed up daily. For my team there was no central workspace, but for other teams > they have 4 people and they had one Bloomberg terminal and one Reuters screen. Its mainly because how much one team can afford it, service fees are quite high, some teams only have one and some two.

Webservices:

Used dropbox for personal file, but at work never really used at work. External media?

External media?

Everything was prohibited to use as an external media,
but now as a consultant I have a usb which is encrypted. As a consultant we have a central space, as our USB is already a lot of space there and is much easier to transfer the file via usb. On the sides of customer currently and if I want to get to the server, I have to get access. I use USB to send things to my supervisor.

Challenges and issues when you worked there?

Everyone would be multiasking and challenging as it was a new area. There were many screens, many times I couldnt handle the work, there were lot of calls that had to be taken and also gone out, at first I didnt have the multitaksing skills, most people took about two months, I had to also see the prices, process and other things with the banks, I had to be fast, have to calculate and call the client fast, problem of being fast is that people made mistakes and have the call and move frmo one screen to another and some products need more data from various sources- some from Murex, bloomberg and ruetures, mos tof the epople made mistakes at first, main problem of working in the treasury dept. Multiple devices, screens, phone and applications.

For software, at first my skills about Ruetures and Bloomberg was very limited, learnt how to use it, i had some problems in learning them, also the Murex system is used in the treasury dept. If people are not working in the treasury dept. They wouldnt know about it nor knew about it. They havent seen it every in their life, the system has lot of fields to fill out for one basic transaction, for bonds it had 20-30 inputs, being fast if people put wrong data into the fields.

For excel, not so much of the problems not so much inot the calculations, for Bloomberg and the rueters had problem- if in bloomberg , I had to find news, new codes to put in to get the news, needed help from my seniors.

Challenging Task

Handling many things at one time and not knowing how Bloomberg and Rueters worked at that time.

Bloomberg > news, transactions, data etc.

Solution?

All of the financial data is all over the place, bloomberg and reuters to get US govt quotes and reuters quotes are different, service providers dominating in the market, if there was a way to compare information, news and data.

Interview Ajinkya

Background: MBA in FInance - two years - JP Morgan, Singapore based investment bank, restructuring and mergers and acquisitions, industrial sector last one year.

Type of user: Advanced

Workspace:
Team of around 15 people, 8 juniors and 7 seniors - operations team, we have a room where all the edges are the seniors, 7 cabins at the corners, one of the cabins have been removed for the entry and rest is for meetings,

Two rows of cubicle- 8 of us sits, associates and analysts in the meeting, seating arrangements,

Corner of each square we have our desktops, a separate extra screen, input devices, mouse, touchpad for the laptop > connected to those extra screen.

The one square adjoining the wall has the Bloomberg computer is kept there.
Another space for the accounts dept or external guests.

Typical work day

Work starts around 9 am, we have a short 20 mins interaction with our director > we provide the workflow, which deals we are working on and mandates, business dev deals which is pitching to clients, on an average 3-4 pitches, deals which goes through, creating a presentation what is the industry, economy, company and what opportunities can be involved in m and a and we have debts we can restructure, we give them options on structured finance, hybrid capital, hybrid equity etc.

Task involves: create profiles for companies, we need to buyout a company in the range of xxcr go to bloomberg- select the clients for that window, learn about the companies, during the day we interact 3-4 times with the director, updates on what we are working whcih clients are perfect fits, if we are on the right track we then create the full pitch deck. Mandates- we talk to clients on day to day basis, talk to them about requirements, what details we need to creat the ptich, eg: products, company structures, growth stratgies etc. General intvs candidates, permanent roles, training exisiting workspace for new programs and databases

How do you use your devices:

Laptop is used for daily purposes > presentations and excel - extra screen- copying data from the annual reports- easy if we have excel on one and the report on the other, we have an extra keyboard and mouse, its quite handy to have, we are more habituated with the ext keyboard as touch typing is faster, bloomberg is the most expensive devices in our team.
The devices > extra screen, bloomberg terminal, android devices for accessing mails, chargers etc.

Applications or programs,

Microsoft applications > Opening annual reports, pdfs, microsoft snipping tool, bloomberg application > google chrome, windows products>

Specific one > not in the current form,

Information shared?

Two ways > common server > between devices > common server room, common folder accessible via network to all. The other person can pick up data.

Types of data > Reports downloaded from Bloomberg, one person who has created the file, downloaded by other person,

Share via, investment banking MNPI , usbs are disabled and you can't use third party softwares as there might be invasion of privacy.

Remote access:

As we are allowed to take the laptop home, we can't access the network drive but we can transfer it to our laptop and take home.

Non-digital devices:

Call recorder, printing- native printing- adobe print setup, no third party apps.
Printing is done a lot. We have a common printer connected to the network, everyone has an ID and PAss its used to track who's printing how much.

About cubicle = square 1 feat wall about the table, four corners have 4 chairs, laptop and beside it,

Replicate?

Not using extra screen, woudln ot be helpful, we only work overnight on the mandate, if its copying data or something, most of the work is done at the office, cant see the necessity of having to work at home.

Storage data: Outlook service,

Backup: all the data is backed up on the server has two copies, have redundancy for data recovery, every morning we start working, we update it on the network drive before going home, in case the laptop or network is down we only will have a loss of one days work.

Issues: Printer > 15-20 people using the same printer, there are three or four printings, printing takes a long time, converts to around 20-30 minutes, where there is in emergency and he gives you a last minute order to print and you will have to interrupt > sometimes it's taken well by others and sometimes not.

There are times when we come home and want to access network drive, that is not allowed to access from home.

Apart from that, the computer is given that 21 hours a day, the cache and ram and more than 50 windows opened, it becomes quite slow and performance is reduced. There is a need to replace computers

Software: Needed the pro version of the pdf, which are confidential and who you have signed NDA with, you can't send all the pages, need to cut it down- if you don't have the pdf, print pages, scan it back and pdf does not remain OCR so can't select and paste data.

The most challenging in your day to day office space:

Not really sharing of data: post home its a challenge, can't share data using google or yahoo, outlook has limitations, larger than a particular size.

No problems much, its not much of trading but mostly presentations and talking to clients.
Use terminal sometimes when required.

Solution?

Data transfer and network works on the same speed, the bandwidth is quite low- transfer file or folder in GBs, in such cases there was a faster network (Optic fibre) would have helped. Help in taking data from the net, 15 people, two routers, data download is a problem - india- internet speeds are not at all high, diving network between 15-16 people is challenge, faster network

Data workflow>

We get resumes > int via mail, 6 -7 goes through the resumes, hr via emails, can we call the person for the inter, we ask him very specific options- via outlooks, HR collects answers and responses and then they are forwarded for the 2nd round, modelling tests, check the models created, we have an answer key in Excel then we send the results to the HR and the last 3 4 5 rounds are taken by the senior management.

Security > third party - putting antivirus, firewalls, usb restricted, bios inaccessible, keeping all the s/w pass protected, they come in every 2-3 weeks to check the desktops, no one has taken access etc.
Interview Swapnil

Background:

Type of user: Advanced user.

Hindi translated into English:

Typical work activity:

Workspace - around 8 am it starts, whatever system we have based on the sharemarket, based on Algorithmic base software- We can have one desk to three desks, we connect it in the morning.

Algo runs on 35-40 stocks which changes in every quarter. Based on top dealers.
9 am we connect the machines, then market starts at 9 15= ALGO runs, i have to manually check if this software runs properly or not. IN case there is any kind of issues like internet or electricity, i then have to take a backup. In that too we have some clients who see the ALGO on their screen, and I have to coordinate if they receive the display signal properly or not. I handle the entire operations. After 3 30, ALGO is stopped, I have to get the data of 3 weeks stocks, also cross check the payment sheets. Bills generated will be confirmed with the clients. Morning 8 to 5 30.

Devices: Local internet providers, companies like airtel/reliance. MTNL service provider.
We don't use tablets, we use Laptops have been reserved, for an intern. All the people use their desktop- 3 people team, founder and cofounder are the partners and I handle operations.

5 Desktops, 1 Laptop > 3 people.

Tasks and activities on these desktops:

We use teamviewer to share, we use one desktop where we use day-to-day task, one desktop we use the Internet Broker and excels, another desktop there are several displays of remote based information.

Sometimes we use phone to scan and share documents or information, whatsapp is preferred.

Devices are provided by the company.
Normally people are provided by the company as a policy. Till the time you are working for the company, I have got a phone from them, but the company takes the cost.

Softwares;
ALGO, data providers Interactive Broker is a broker software (US) software and terminal. We use IB to run into ALGO. Trading related, most used. Others are Ninjatrader (Back testing and market time testing), e-signal (Delayed signals, but good data)

Information sharing:

Mostly we use phones, there is not much communication during market hours. If there is any kind of problems then, most of them use pendrive to transfer and share data. The data are confidential and some general. Whatever is normally available, that is shared but also like strategy and test results are shared.

Remote Access:

I don't personally use remote access, but my boss does it using teamviewer.

Setup of the space: One place to another place where ever the display is, we would be able to move easily. Wherever I sit, there is a PC on which ALGO runs, the display on which the clients can see- it's on my left, other desktops are used by the partners.

Non-Digital :

Notepad mostly, I use lot of note taking, depends on the expiry of the contracts will have to be cross checked if there are rollovers or not.

Printing is important in the office, mostly we do have printouts but its occasionally, based on the clients, if they want strategy or performances. But I prefer handwritten notes.

Issues : Mostly internet and infrastructure, there are issues in the week like once or twice, or many times in a month. I had to restart the system, big internet issue. Rest there are no issues. Back up we have inverters to allow us 1-2 hours of on time.
Excel sheet, Profit and Loss sheet gets corrupt, we do not face this problem a lot.

Software : Have to check if there is an issue in the data provider, sometimes we don't have the proper signals. E-Signals, I have to check the positions on IB. Ransomware issue affected IB server-

Platform: Windows 7 is used. Algo has been developed by Ex Infosys. Microsoft office pack, e signal, ninjatradrader, pdf converter.

Problem:

Backup: We have one computer that stores all the backups. Sometimes is used for general purposes too.

Challenging : Market plays an important role, market had fallen down, ALGO fell, I used to get the signals but manually I had to deal with it, that was challenging.

Solution: Internet bandwidth, real time data updates, automation is required.

Interview Jennifer.

Type of user: Intermediate

Background: Senior financial planning controller for retail group, similar roles and prior to that i was in Audit and advisory,

Typical work day: Main job Financial modelling, I participate in other projects in the firm, implementing control process, evaluating investment decisions, and do reporting to the group.

Devices: Usually laptop and desktop to check emails, use excel, powerpoint presentations and sometimes do word document, shared drive storage and thats about it. No bloomberg.
Most data is internal data.

The office desktop and laptop is provided by the employer, what I use is microsoft which is already installed and then you go to the server to access internal information and access to data.

I don't think so there are firms which do not give the employees. Part of business fixed costs.

Softwares and tasks on your laptops and desktops: Outlook, microsoft office for most of the softwares, also financial accounting system, SAP, SUN, SAGE, reporting tools like Hyperion, COGNO. We have some subscription to business news.

Sharing information : we mostly use email to share files and shared drive. It's a centralised server, access levels are defined.

Type of information: Information, data, analysis that are carried out, documents.

Devices accessed remotely: I can access my desktop through remote control > use teamviewer, access the company network through vpn.

Specialised: I do lot of things on one computer, sometimes it can't handle everything like models, that's why I use other desktop.

Replicated workspace: At home only laptop, don't have a screen personally but I should get one, so I work on the desktop. If I have an extra screen, typically use it to more information for analysis and comparison and give example, you can use one month's report and other month's report- compare, analysis and compiling, have access to more information in that view.

Non-digital devices: Often, we print, but we also use paper, highlights, all sort of purposes, reviews the reports and all. The printer is located- in the canteen area. Probably 5 yards away, depends where you sit as well.

Any particular reason how the layout is setup, you need to have both the screens, on both sides, I want to have the mouse in a position where i can maneuver, sometimes it's inconvenient to use two mouses, its awkward to use two desktops.

External media: Yes, sometimes we use USBs, but not much. We usually use the shared drive, not much of these media.

Issues: Screen resolution is not good while accessing the desktop remotely, does not give same user experience.
Using two desktops, sometimes it's awkward to switch between two mouses and two keyboards.

Same software, not many issues. Stored information in desktop, you can access it from other dekstop, trying to switch between the desktops is pain point.
Windows.

In work, I dont use my phone too much, its an apple device. I did use it very often last role.
I try to get everything get done in the office and then go home, but you can view and access email client on the phone sometimes. It's not a typical case.

Solution
A) Better remote access (Desktop),
B) A better set up of for example: user requirements I need two desktops, better setup which allows me to switch between desktops easily would be helpful.

Not sure how many people would use two desktops, as my financial model is quite big, it helps to have two desktops so that I can use both of them to open two different models.
Although my desktop does not have much capacity to process one model completely.

Interview Dima

Type of user: Advanced

Background: Moscow university: mathematics etc. Currently chief economist, central bank of russia, preparing analytical reports, work with data mart, warehouses, prepare reports from big data, moscow exchange and national repository etc.

Typical work and activities: We start at 9 am, everyday we work on computers- we also have meetings most of the time, for eg: 8 hours in a day, five hours in front of the computer.

Devices: Two desktops > two separate networks in the bank. One computer is internal network where we use internal banking and information and the other desktop is for the internet and google. No phone during the working hours.

Tasks and softwares: Work with digital mart, warehouse- big data, SAS, use microsoft office pack, and some of the internal programs from the internal banking portal. Data analytics, for example, sql requests, to do analytical reports, how to use datamart, about research- not so much. Ex: Helpful two screens : analytical + powerpoint data.

Sharing: Use a server and usb sometimes, no google drive or no dropbox, earlier we had two computers, internet is different, we can't use dropbox in the internal. We share all types of information. But the internal computer is the confidential one.

Remote access: No remote access to working desktop. Only if you are the head or ceo then you have the access.

Non-Digital devices: We have printers and multifunction device: We print reports in all tasks, it's easy to read than desktop. We have also, different printers for internet printer and internal printers.

No note taking so much, when we have the meeting with external competitors like auditors, we use laptop and slides on the whiteboards.

Replicate at home: It can be useful sometimes because some time we have such models that we have to spend a lot of time working on it, like 9 to 6, if we had temporary programs, we can then take the work at home and work in our home, eg: two days a week.

Provide by employer: Bank gives the desktops, personal computers are not allowed.

Web services: Outlook and microsoft sharepoint.

Tasks on desktop 1 vs desktop 2: Working desktop all the tasks (Internet computer - google, commit to meeting) we can't post from the internal to external. Banking service, other programs but they are licensed one and it has the local network. Internet computers can be hacked and less secured. Windows platform.
Issues and challenges > You can't use downloaded programs from the internet into internal computer. It is difficult to transfer information from internal to external. We don't use all of the products from SAS. Usually if we have any kind of software issue, we call or write an email to the helpdesk.

Backup: once a day maybe.

Most difficult challenge: Writing letter.

General difficulty? Nothing major.

Solution: More powerful computer.

Interview Malika

Type of user: Advanced

Background: Russian federation, system risk analysis, analysis of current situations of russian financial markets, making models, assessing risks, stress testing and other issues. Moscow state of international relations, faculty of international economic affairs.

Typical work day and activities: We have some regular work which we do on day to day basis: monitoring key financial markets, key events, we use different sources for these purposes, computing and calculations, different monitoring reports, weekly ones we prepare them, we also have different objectives and issues which we have to do in our management, top management- financial reporting

and analysis of financial reporting data. We have meetings and small meetings with our departments as well as on a higher level, once a week.

Devices: Three computers and a telephone: One for internet, one for local internal purposes, one for internal purposes- bloomberg terminal (One screen). Reuters datastream as well.

Softwares and tasks: Mostly excel, bloomberg, Matlab, SAS, on windows platform.

Interaction with the devices: For calculating, we use the local and internal purposes, bloomberg is also quite often used to get data. Internet if you have to do some special tasks,

Data sharing: Mainly on the server. Company's platform> **type of information:** public and confidential information. We mostly use the server and not use email.

Remote: Do not use computers at home. If you have some tasks you can work at home, but you can't do using internet. Most of the job I try to do at work.

Provided by employer: Security and privacy and own asset.

Specialised: Not an issue to use several devices- quite comfortable for me.
Internal - computer is the main go to. Internet and bloomberg is equal.
Searching and comparison is used as well.

Step by step focus or simultaneously :

Sometimes every minute on bloomberg > internet > internal computer, usually you use one computer doing a task and helping yourself.

It helps if there are three different screens.

Non-Digital devices: We have several printers for the room, not just for individual. Printing is often a lot when making our reports as we have to discuss them without management, there is a lot of process when we make conclusions or remarks and then we get the final product.

Replicate at home: I don't know, I wouldn't like to work at home.

External media/devices: USB - need to have special allowance and it's quite difficult to use them in the office- encryption or authorised devices only can be used.

No webservices, skype, etc

Backup: I don't know unfortunately. Personally, it is always on my computer.

Issues and challenges faced: not major problems : there are people who can solve the problems. Bloomberg is more comfortable to use, better than Reuters. I don't think any issues with Bloomberg.

Challenging task?

The work associated with stress testing and some assessment that we make are quite difficult and challenging because sometimes you don't know which scenarios are there, calculations have to be quite responsibly share and hence you have to be very careful, they should reflect reality.

Solution: At one time not only make calculations but write reports. They could be more automated reports- from the calculations, many graphs and write descriptions, report is made by lot of people, a program can be built to make this automated and help us to make it easier for us.

Interview Valmira

Type of user : some intermediate and some advanced (depends on the certain softwares)

Background: UG degree in finance and auditing, masters in statistics and PhD in statistics, I worked as junior auditor in Kosovo, accounting bits - in her business, financial projections, accounting - administrative work as well.

Sketch: Printer, laptop, telephone, usbs, hard drives, and additional screen, my phone.
Big desk, Laptop and behind is a desktop, side of the right I have a printer and on top is the lamp, i have a telephone, hard drives and other equipments.

Typical work day key activities: I start my day- first thing I do is to check the email. Check the calendars, listing priorities for the day in terms for the business side, making sure invoices and statements are dealt in the given time, rest of the day is research, we are research and development company, we do a lot.

Devices and applications: Quickbooks, Bank applications, email (Outlook, gmail, skype- contact with our customers**)** personal statistical softwares, word, excel is the most I used. *Quickbooks *Excel

Everything is owned by me.

Sharing between the devices: We use dropbox as a common platform, as apple users we have iCloud and gmail. Bank apps

Remote access: I take the laptop with me most of the time. I don't access any other device from home.

Specialized: R > multi application use, it's a benefit, I wouldn't go with a specialisation of a software, but being specialised as R - it enables you and help you to do data analysis, while it focuses on one domain, having extra addons makes it beneficial.

Data across: Big data more sort of secondary screen on desktop, on laptop am more active, latex or word, excel . I can split them in halves or with panels and check multifaceted interaction.

Primary device: Laptop for inputting data and desktop searching and comparing. I rely lot on laptop. I think it's because of the convenience, having two jobs, easier to navigate, desktop is a backup for everything.

Replicate: Yes, definitely wherever I work I would like to have two screens!

Non-Digital devices: well, I use a lot of whiteboard, for main deadlines, notes I tend to take notes when meeting and interacting with people and then transfer all the notes onto laptop. I have a scanning app after taking the notes > it transfers into the laptop (OCR and note scanning app). Using the phone at work? I do use phone for checking emails, outlook, I have deactivated other emails.

USB Drives/hard drives: I don't leave everything on the computer, I keep them at different places. While sharing we usually have dropbox to share data with restricted access on specific projects.

Backups: Basically I do all my backups > apple iCloud and hard drive- regularly- sensitive I back up it immediately on the hard drive.

Issues: Used to use dell, it used to crash, apple is more reliable,
Having split things make things easier and clearer, definitely helps in accuracy.

Most challenging task: Checking emails throughout.

Others: Generally, some applications have errors, I change the application, it's not reliable.
Platform: Mac Os on Laptop, iPhone, Desktop is Windows.

Solution? Security, having to download all the time, it's irritating to update them rather all at once.