

Globally Distributed Development during COVID-19

Clodagh NicCanna
clodagh.niccanna@ocuco.com
Ocuco Ltd
Dublin, Ireland

John Noll
j.noll@herts.ac.uk
University of Hertfordshire
Hatfield, Herts, UK

Mohammad Abdur Razzak
razzak.abdur@ocuco.com
Ocuco Ltd
Dublin, Ireland

Sarah Beecham
sarah.beecham@lero.ie
Lero, the Irish Software Research Centre
Limerick, Ireland

ABSTRACT

Due to the global pandemic, in March 2020 we in academia and industry were abruptly forced into working from home. Yet teaching never stopped, and neither did developing software, fixing software, and expanding into new markets. Demands for flexible ways of working, responding to new requirements, have never been so high. *How did we manage to continue working, when we had to suddenly switch all communication to online and virtual forms of contact?* In this short paper we describe how Ocuco Ltd., a medium-sized organization headquartered in Ireland, managed our software development teams – distributed throughout Ireland, Europe, Asia and America during the COVID-19 pandemic. We describe how we expanded, kept our customers happy, and our teams motivated. We made changes, some large, such as providing emergency financial support; others small, like implementing regular online social pizza evenings. Technology and process changes were minor, an advantage of working in globally distributed teams since 2016, when development activities were coordinated according to the Scaled Agile Framework (SAFe). The results of implementing the changes were satisfying; productivity went up, we gained new customers, and preliminary results from our wellness survey indicate that everyone feels extremely well-supported by management to achieve their goals. However, the anonymised survey responses did show some developers' anxiety levels were slightly raised, and many are working longer hours. Administering this survey is very beneficial, as now we know, so we can act.

CCS CONCEPTS

• **Software and its engineering** → **Agile software development; Programming teams**; • **Social and professional topics** → **Employment issues**.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

SER&IP, June, 2021,

© 2021 Association for Computing Machinery.
ACM ISBN 978-x-xxxx-xxxx-x/YY/MM...\$15.00
<https://doi.org/10.1145/nnnnnnn.nnnnnnn>

KEYWORDS

Global Software Development, virtual teams, wellness, remote working practices, home-working, working-from-home, WFH, pandemic, Covid-19, change management, Scaled Agile Framework

ACM Reference Format:

Clodagh NicCanna, Mohammad Abdur Razzak, John Noll, and Sarah Beecham. 2021. Globally Distributed Development during COVID-19. In *Proceedings of 8th International Virtual Workshop on Software Engineering Research and Industrial Practice (SER&IP)*. ACM, New York, NY, USA, 8 pages. <https://doi.org/10.1145/nnnnnnn.nnnnnnn>

1 INTRODUCTION

The Coronavirus pandemic global crisis has brought academics, scientists, and practitioners together as we all fight a common cause for our very survival. A key mitigation strategy to stem the viral transmission, while balancing health and economic factors, is to work from home where possible. Software development, especially distributed software development where teams collaborate across multiple sites, would seem particularly suited to this transition. However, even teams familiar with remote forms or work, would traditionally meet other members of their teams, face to face, at key points in the project, in which they would plan for the future, learn together, socialize, and thereby gain trust [9]. Lack of social contact is shown to create many additional problems, associated especially with well-being [10].

As Europe enters a second and arguably more intense wave of COVID-19 transmissions, in this paper we reflect on how software practitioners working-from-home are faring. As a medium-sized enterprise, head-quartered in Ireland, developing software in distributed teams throughout the globe (see Figure 1), we share some of our COVID-19 strategies. We recognized early that changes to our social and technical practices must be made; to ensure the wellness of all our employees, *acting fast is key* [8]. We heeded the warning expressed by a seasoned developer, who, despite having worked remotely for many years, after only one month of quarantine noted “I’m feeling a tinge of burn out for the first time in my life” [10].

While our experience of global software development does help, in that we have both infrastructure and process for remote working in place, this in itself does not guarantee a smooth transition to working-from-home full time. Home working presents a very different rhythm and structure to the working week, and there can be additional pressures of friends and family needing support, dependents becoming ill, and the worry of reduced income. In this paper,

we share our experience with the transition to working-from-home, and address the research question, “what changes does a global software development organization need to make for the wellness of their employees during a pandemic?”

This paper is organized as follows: in the next section we present a brief background into transitioning from the office to working-from-home in a software engineering context. In Section 3, we outline our method to include our company setting, followed by our results in Section 4. We conclude the paper with a discussion and a distilled set of recommendations in Section 5, and final remarks in Section 6.

2 BACKGROUND

To provide a context for this paper, we look to the literature on developing software during the COVID-19 pandemic, and how those working remotely are managing to retain a level of physical and mental health.

Several surveys have been conducted to assess the impact of COVID-19 pandemic on software developers, ranging from measuring practitioner wellness [10], productivity [1], and job satisfaction and work-life balance [2]. Some shift the focus from problem to solution, proposing mitigation strategies [8]; others [3], recognize the dichotomy where developers prefer, and at the same time dislike, some aspects of working from home.

Ralph et al’s [10] timely and large global study on the impact of COVID-19 on the wellness of developers (with over 2,200 responses across 53 countries), identified that poor disaster preparedness, fear relating to the pandemic, and not having the right set up at home (home office ergonomics), all adversely affect well-being. They were also, through statistical tests, able to show a close relationship between wellness and productivity. Other areas of concern are indications that “women, parents and people with disabilities may be disproportionately affected.” They conclude that support needs to be tailored to the needs of individuals.

Ford et al [3] noted the dichotomy of the same factors having both a negative and positive effect. For example, people missed social interactions, found it hard to create a clear boundary between home life and work, suffered from poor ergonomics, had less visibility and awareness of how other people are working, and exercised less. Communication was also an issue, and some parent employees suffered from a lack of childcare.

On the other hand, the same participants see benefits to working from home, such as, no commute and associated reduction in expense, flexible hours, being close to family, comfort at home, health, and more time. This dichotomy was also observed by Boa et al [1], “Many . . . agreed that [working-from-home] can have both positive and negative impacts on developer productivity.”

A big question that will guide the future of working-from-home post pandemic is whether productivity is impacted. Boa et al’s [1] study on the productivity before and during COVID-19 found very little difference (using a selection of productivity measures on the output of 139 developers). The literature presents mixed messages here, as these neutral findings contrast with those of Ralph et al [10] who suggest that conditions imposed by the pandemic and working-from-home had a negative impact on productivity. The other extreme comes from pre-pandemic studies on teleworking, and home

working, where several studies revealed productivity improvements when working-from-home [1].

Moving to the open-source community, a special report published by the GitHub Data Science team [4] highlights trends and insights into developer activity on GitHub at the start of COVID-19. The research team investigated how a sudden shift to working from home affected developers according to three themes: productivity and activity, work cadence, and collaboration. Their findings suggest that developers have continued to contribute and show resilience in the face of uncertainty. Developers are working longer, by up to an hour a day. “The cadence of work has changed. [4, *Key Findings*]” The researchers suggest that these longer workdays (when working from home) may be due to non-work interruptions such as childcare, that cannot be ignored when working from home. The team warn that “patterns of developer activity have implications for burnout” [4].

Transitioning to new work routines can lead to developers spending more time online, and completing tasks on time might be taking away from “personal time and breaks to replenish, ponder, and maintain healthy separation. [4, *Key Findings*]” They query whether this is sustainable. On a positive side, developers are collaborating more, with many open-source projects seeing a spike in activity.

Key cross cutting themes from the research on development during the COVID-19 pandemic are: maintaining a work-life balance with boundaries to avoid burnout, setting up home office environment, childcare, women being disadvantaged due to care responsibilities, productivity changes, lack of awareness of others’ work, communication, and exercise.

The next section looks at how we in Ocuco Ltd. responded and implemented changes to support our employees during the pandemic.

3 METHOD

To answer our question, “what changes does a global software development organization need to make for the wellness of their employees during a pandemic?” we looked at wellness according to three key concepts: *People*, *Technology*, and *Process*. Fig. 1 shows the timeline of Ocuco Ltd. interventions in response to the emergence of COVID-19 in Ireland.

3.1 Ocuco Ltd. Setting

Our company, Ocuco Ltd., is a medium-sized Irish software company that develops practice and laboratory management software for the optical industry. We employ more than 300 staff members in our software development organization (including support and management personnel). Of these, a growing team of 75 developers and 40 operations engineers work from Ocuco Ltd.’s Dublin Headquarters, working on software development projects across twelve countries. Fig. 2 shows the distribution of countries and roles.

3.2 Problem identification, data collection and analysis

We conducted a series of one-to-one meetings in March 2020. The first set of meetings focused on checking staff welfare and needs in transitioning to working-from-home; the second set of meetings were held straight after the announcement of pay cuts, in which financial assistance was offered where necessary. A “work location” survey was administered to 88 employees in July 2020 (to

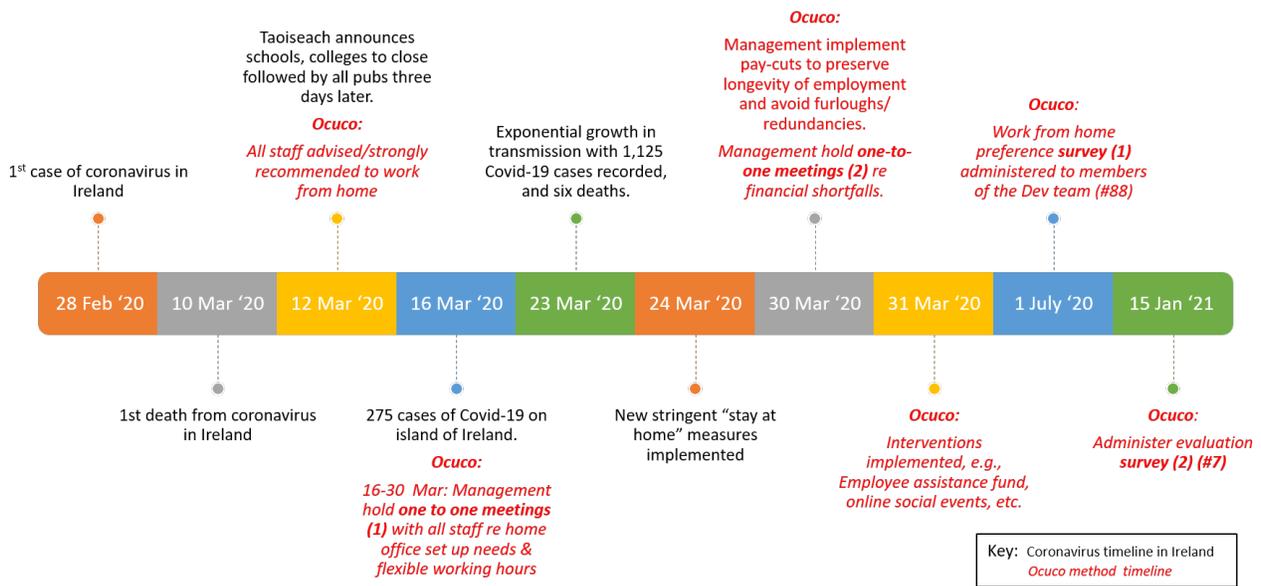


Figure 1: Coronavirus Timeline in Ireland and Ocuco Ltd.'s response



Figure 2: Ocuco Ltd..

include developer, product owner, QA and project manager roles) based across all geographic locations. With many members of Ocuco Ltd. already working remotely, we wanted a picture of changes imposed by the working-from-home regime, and future wishes. The survey asked participants to select from one of seven options relating to working-from-home and/or working from the office. The data analysis involved identifying individual needs (from the one to one meetings), and aggregating the responses from future work location

survey. Interventions based on this analysis were implemented with immediate effect in March, 2020 as described in Section 4.

3.3 Evaluation of impact of changes made during the pandemic

In order to check management perception directly as to how well the interventions were working, we administered an evaluation survey on 15th January 2021 to a stratified sample, to assess People, Technology, Process, and Wellness factors (see Appendix A). The

Table 1: Work location preference (#88) - Home/Office/Abroad?

Work location (pre COVID-19 and future)	Count	
No change, worked from abroad before:	18	20%
No change, working-from-home (WFH) full time before:	2	2%
Need to be in office full time (once conditions allow):	4	5%
Change: Would like flexibility (50 WFH/50 office):	32	36%
Change: Would like flexibility - mainly WFH:	14	16%
Change: Would like flexibility - mainly office:	13	15%
Change: Would like flexibility - other country/city:	5	6%

online survey was administered using Microsoft Forms¹ in which all responses were anonymous and voluntary.

The sample comprised ten team members having one of seven roles: Senior Software Engineer (x 2), Software Engineer (x 3), QA Manager, QA Engineer, Automated Test Architect, Project Manager, Development & PMO Director; we received seven responses. Because some of these roles have only one team member in the sample, to preserve anonymity the survey does not ask respondents to identify their roles; nevertheless, we can deduce that at least four of the seven roles are represented in our results (Section 4).

4 RESULTS

This section presents results derived from our data collection, problem identification and interventions according to the timeline given in Fig. 1. First we present results from our ‘work location preference’ survey in Table 1, followed by a list of problems and interventions to support employees working-from-home (WFH) in Tables 2 to 5. Finally, Table 7 presents preliminary results from our working-from-home evaluation survey that we administered in January 2021 (see Appendix A for questions). Table 6 provides the demographic breakdown of the seven practitioners who responded to our survey. Note, we cannot specify roles of respondents as we did not include this identifying feature in our preliminary survey, to preserve anonymity. However, we can be confident that we have at least four roles included in the responses (see breakdown of roles in Section 3).

Although all Irish based staff were asked to work from home to keep safe and comply with Ireland’s COVID-19 guidance, results from our world-wide work location survey (Table 1) shows 88 practitioners (comprising developers, product owners, QAs and project managers) had a mix of preferences. 20% already work from home (prior to COVID-19). 59% (32 +14+13) of office-based workers would like flexibility to work from home or office. 8% of office-based workers would like to work from home or another country full-time (with willingness to go to office/Dublin whenever required, e.g. for PI planning meetings). A small number (5%) feel the need to work in office full time in the future. The majority wanted the flexibility to work from both the office and home.

4.1 Problem identification

The recurrent one-to-one online meetings identified anxieties, needs and preferences, as follows:

4.1.1 People concerns.

- (1) How to share work with childcare?

¹forms.office.com.

- (2) How to relieve financial demands such as mortgage payments, due to reduction in salary or partner’s loss of job?

- (3) How to facilitate move from office to working-from-home, and compensate for reduced level of social and informal interaction with colleagues.

- (4) How to welcome new staff remotely?

- (5) How to support (new) staff moving to Ireland from abroad?

4.1.2 Technology concerns.

- (1) Is our current technology adequate for us to adapt to working from home, and does it scale?

- (2) Does everyone have the right set up at home?

- (3) Does need for fast broadband connection from home result in any additional cost to our staff?

4.1.3 Process concerns.

- (1) How can we adapt processes to keep people socially connected (beyond having the right technology)? For example, pre-pandemic, we held regular face-to-face program increment (PI) planning meetings that take place over two weeks at the Dublin headquarters. Attendees from 10 different countries in five time zones all travel to be physically in the same space. During the pandemic we held a virtual version of the PI planning meeting, and in the retrospective attendees reported that they “miss social contact and cross team collaboration enabled by on-site meetings.”

- (2) How can we replicate (in a virtual setting) the informal gatherings and interactions enjoyed by our staff? While “daily stand-ups” and other Scaled Agile Framework® (SAFe) virtual ceremonies offer opportunities for staff to meet, many employees noted that this did not satisfy the need for informal gatherings, and getting to know new members in a relaxed social setting.

4.2 Interventions

We introduced new initiatives in recognition of the needs expressed by employees in our one-to-one interviews.

Tables 2 to 4 list our interventions to address the above problems. All interventions were implemented immediately, and where appropriate, repeated regularly.

4.3 Evaluation Survey

On 15 January, 2021, we administered an online “Work from home evaluation” survey (see Appendix A for questions). We received seven completed responses (out of 10); Table 6 shows the sample distribution. Information has been aggregated to ensure anonymity in this small sample.

A selected set of Evaluation Survey results are shown in Table 7, Fig. 3 and Fig. 4. Even with our small sample, we can draw some conclusions from these results with a degree of confidence³ Looking at the level of support from Ocuco (Q2.1, Table 7), there was near consensus that the support was excellent. Given the range of responses for other questions, we describe further in Fig. 3 and Fig. 4.

Fig. 3 suggests that Ocuco Ltd. employees are working at least as long when working-from-home as when they were in the office.

³According to the “rule of five [participants]” [7] there is nearly a 95% likelihood that the median response of a population is within the highest and lowest responses of a random sample of only five members of the population. So with a sample of seven we have high confidence that the median response represents the company as a whole.

Table 2: New strategies–People

Problem	Solution
Sharing work with child-care.	Allowed flexibility to staff with kids who are working-from-home–could adjust their day to share childcare.
Unsuitable home environment for remote working (e.g. no space, too many people in house).	Offered a Taxi service to office (adapted to be COVID-19 compliant) to those unable to working-from-home comfortably.
Concerns about family who are living in a different country.	Facilitated staff living abroad to go home for extended periods to see their families allowing for COVID-19 restrictions.
Concerns about living arrangements for those committed to moving countries.	Provided accommodation to staff moving to Ireland to start new roles within Ocuco Ltd..
Loss of contact.	Line Managers check in with teams at least once a month. (Teams meet regularly with their daily stand-ups).

Table 3: New strategies – Process

Problem	Solution
Feeling isolated.	Established ‘Remote working Initiatives’ Team to keep people connected. Simulated team lunches/nights out, coffee dock/water cooler chats, etc. Required everyone in teleconferences to share their cameras.
Financial difficulties.	Introduced Employee Assistance fund for those struggling during temporary pay cut period.
Lack of job security.	Offered free and independent advice to staff with financial commitments, e.g. whether to avail of mortgage extensions offered by their banks.
Anxiety over status of Ocuco Ltd. business.	CEO gave key updates at least once a month in company wide meetings.

Fig. 3 also shows that Ocuco Ltd. developers perceive they are at least as productive during the pandemic as they were before the pandemic. There was a more mixed response when considering the impact of working-from-home on personal responsibilities.

Regarding productivity, we wanted to know whether there was a change in productivity at the beginning of the pandemic, when working-from-home was novel, and little was known about short- or long-term effects of the pandemic. The responses suggest increased productivity immediately after shifting to working-from-home. This increase in productivity seems to have been maintained, with a majority of respondents continuing to report higher productivity compared

Table 4: New strategies – Technology

Problem	Solution
Home office and ergonomics.	Reached out to ensure all staff had a suitable working-from-home environment; budget provided for chairs, desks, and extra screens.
How to scale existing video conferencing applications.	Switched to Microsoft Teams®.
Retain privacy and security of code and data.	Provided access to virtual build machines via virtual private network (VPN).
Connection costs.	Paid broadband subsidies and upgrade costs where needed.

Table 5: New strategies – Wellness

Problem	Solution
Anxiety and fear of burn-out.	Check for burn-out, and encourage setting work/home boundaries. Meet staff one-to-one meetings, or administer anonymous surveys in work routines and levels of anxiety can be reported anonymously or directly with line manager.
New employee feelings of uncertainty.	Set-up remote staff induction programs to ensure new staff are onboarded efficiently and quickly to the Ocuco Ltd. team. Provide accommodation to staff committed to moving to Ireland to start new roles.
All work and no play.	We maintain social connections globally by hosting: Pizza Fridays (with synchronized expensed lunches), knowledge and music quizzes (Fig. 5). Coffee mornings where groups of four from different countries and offices meet via video conference for casual chat. “Coffee Dock ² ” meet ups where anyone can open up a ‘meet’ an invite colleagues.
Feeling lost and isolated.	The management team has a monthly informal one-to-one chat with each staff member.

to the “pre-pandemic” (Fig. 4). Finally, looking at the evolution from when we first moved to working-from-home to now, we see a further upward shift in productivity. This could be due to taking time to acclimatize to the early move to working-from-home. But we don’t know whether this productivity increase is the result of longer working hours, or other factors related to working-from-home specifically. Also, these observations are based on participant’s self-reported

Table 6: Survey (Appendix A) respondent demographics (#7)
 ('DNS' = "did not specify").

Category	Number			
	Female	Male	Other	DNS
Gender:	3	4	-	-
Age:	20-29 1	30-39 2	40-49 3	DNS 1
Location:	GB 1	Ireland 5	DNS 1	
Time at Ocuco Ltd. (years):	1-2 1	3-5 1	5-10 1	10+ 4

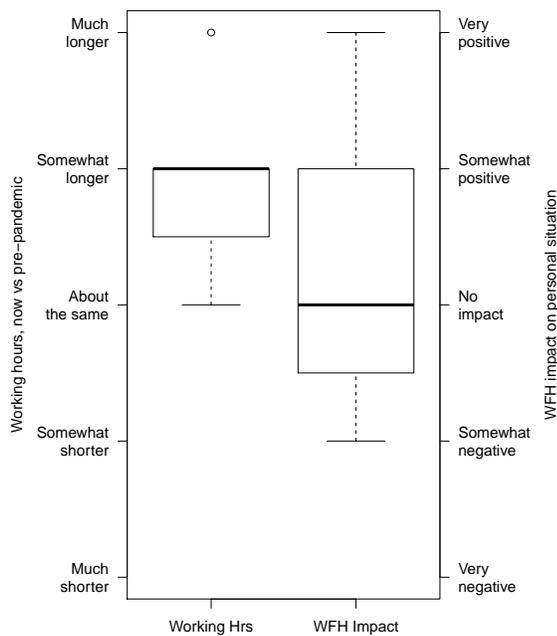


Figure 3: Plot of survey results re working hours (Q1.7, Appendix A) and impact on personal life (Q2.7) (#7).

perceptions; it remains to be seen whether actual productivity has increased.

5 DISCUSSION

Politicians, organizations, economists and individuals are all consumed with the pressing economic question of the long-term cost arising from the COVID-19 pandemic [6]. Organizations need to balance keeping afloat and surviving during the pandemic, maintaining an experienced and trained workforce, and, being prepared for growth in the near future. Agile takes on a whole new meaning in the pandemic, moving way beyond the development team. SAFE paves the way for the whole company to be involved, so that decisions can be made quickly, communication channels are open with regular contact across roles and divisions, and management are flexible in terms of changing processes to meet the new needs of employees. As

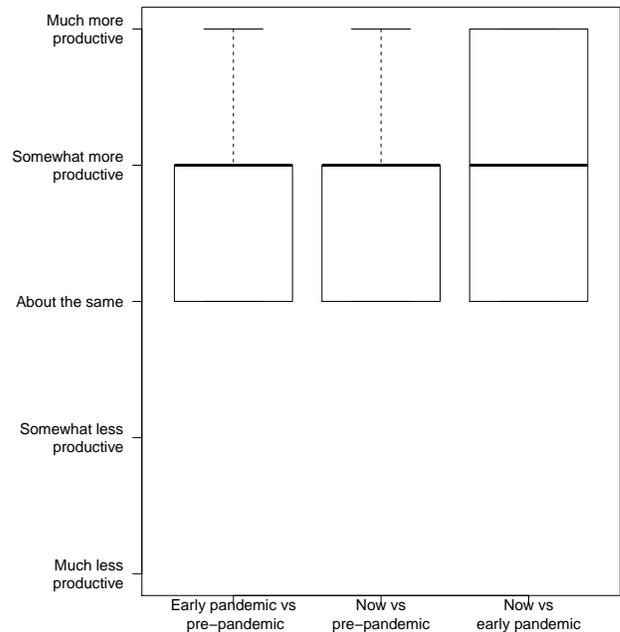


Figure 4: Plot of survey results related to productivity (Q4.5-7, Appendix A) (#7).

a people-intensive field, software engineering relies heavily on the wellness of a skilled workforce. A particular challenge is to reverse the negative impact working-from-home can have on work-life balance [2]. From our initial survey feedback, we need to be particularly aware of raised anxiety in our employees and longer working hours.

5.1 Recommendations

Returning to our original research question, “what changes does a global software development organization need to make for the wellness of their employees during a pandemic?” we distill the results from the previous section into five recommendations:

Recommendation 1: Be flexible. Example: allow flexible working hours, and flexibility of work location. Allow employees who have relocated from abroad to return to their home country, when travel restrictions allow.

Recommendation 2: Be proactive and supportive. Example: reach out to all staff to ensure they have a suitable work from home set up. Provide financial support for acquiring same. Facilitate staff living away from their families to either find a place to live (for new members), or travel home when COVID-19 restrictions allow.

Recommendation 3: Keep connected. Example: Remove technical barriers to communication. Initiate and maintain communication. Keep lines of communication open, bi-directional, and active. Balance number of work meetings with regular and varied social events to on-board new members of staff and keep existing people connected. Have fun!

Due to the wide distribution of sites, Ocuco Ltd. had already invested in strong tools to collaborate and host meetings across

Table 7: Selected results from Ocuco Ltd.’s COVID-19 working-from-home evaluation survey (#7) (see Appendix A).

Working hours now vs pre-pandemic (Q1.7)	Much longer	Somewhat longer	About the same	Somewhat shorter	Much shorter
	1	4	2	0	0
Level of support from Ocuco (Q2.1)	Excellent	Adequate	Neither helped nor hindered	Inadequate	Very inadequate
	6	1	0	0	0
Working-from-home impact on personal responsibilities (Q2.7)	Very positive	Somewhat positive	No impact	Somewhat negative	Very negative
	2	0	3	2	0
Productivity	Much more productive	Somewhat more productive	About the same	Somewhat less productive	Much less productive
Early- vs pre-pandemic (Q4.5)	1	3	3	0	0
Now vs pre-pandemic (Q4.6)	1	3	3	0	0
Now vs early-pandemic (Q4.7)	3	1	3	0	0

distance. As such, technology interventions during COVID-19 were more about scaling, upgrading personal connections, and ensuring privacy, than introducing new applications.

We are planning more remote events during 2021 to replace the larger “all hands” workshops that normally take place in person. In addition, we are coordinating the safe return to office day events when local government guidelines permit.

Recommendation 4: Give financial support where needed. Allocate funds to support staff experiencing financial shortfalls as a result of temporary pay cuts. Offer impartial, professional independent advice on financial affairs, such as bank loans and mortgages.

Recommendation 5: Show strong leadership. Have the CEO and Management team provide regular updates on the current and future direction of the company, and provide an open door policy for staff to come and ask questions or raise concerns.

Ocuco Ltd. is a medium-size company, and so can implement recommendations such as these rapidly, on a company-wide basis. Nevertheless, we feel that larger organizations can still benefit from these recommendations, which can be adapted to the department or division level. Not doing so, on the other hand, risks depletion of the social capital created from face-to-face working [5].

6 CONCLUSION

In this paper we presented our experience of managing remote development teams during the COVID-19 pandemic. Ocuco Ltd. has taken very naturally to remote working, having already had a strong ethos, based on agile practices, for working with colleagues in any of the 14 different Ocuco Ltd. locations around the world. But we recognized early that our previous processes and infrastructure do not guarantee a smooth transition to working-from-home full time. As a result, we implemented several new interventions, in three key areas: People, Process and Technology. Our key message when it comes to *People* is that management need to be quick to recognize and react to the crisis, show strong leadership, listen to employees’ needs, and be informative. *Technology*, on the other hand, as the route to remaining connected, must be ubiquitous throughout the



Figure 5: Virtual music quiz hosted by Ocuco Ltd.’s BeNeLux team.

company, regardless of location; equipment and infrastructure costs must be met by the employer. Finally, *Process* changes need to be fast, flexible, and inclusive.

Our results are encouraging, as during the pandemic crisis, we have kept all our current staff on the payroll, employed new people, and won new contracts. Early feedback on productivity is also positive.

We still have a lot of hard work to do to prevent losing the social fabric of the company and the culture we have worked so hard to build over 25 years of trading. So, although we’ve been successful in working remotely in the past, we recognize there is more to do, and we do all miss the office for the human interactions.

Our future plans involve administering the Ocuco Ltd. COVID-19 Working from Home Evaluation Survey to all Ocuco Ltd. employees.

7 ACKNOWLEDGMENTS

We are indebted to the many members of Ocuco Ltd. who responded to our survey and volunteered their insights about working during the COVID-19 pandemic. This work was supported, in part, by Science

Foundation Ireland grant 13/RC/2094 to Lero – The SFI Software Research Centre.

REFERENCES

- [1] Lingfeng Bao, Tao Li, Xin Xia, Kaiyu Zhu, Hui Li, and Xiaohu Yang. 2020. How does Working from Home Affect Developer Productivity?—A Case Study of Baidu During COVID-19 Pandemic. *arXiv preprint arXiv:2005.13167* (2020).
- [2] Lutz Bellmann and Olaf Hübler. 2020. Working from home, job satisfaction and work–life balance—robust or heterogeneous links? *International Journal of Manpower* (2020).
- [3] Dena Ford, Margaret-Anne Storey, Thomas Zimmermann, Christian Bird, Sonia Jaffe, Chandra Maddila, Jenna L Butler, Brian Houck, and Nachiappan Nagappan. 2020. A tale of two cities: Software developers working from home during the covid-19 pandemic. *arXiv preprint arXiv:2008.11147* (2020).
- [4] N. Forsgren. 2020. Octoverse spotlight: An analysis of developer productivity, work cadence, and collaboration in the early days of covid-19. WWW page, accessed 10 January 2021. <https://github.blog/2020-05-06-octoverse-spotlight-an-analysis-of-developer-productivity-work-cadence-and-collaboration-in-the-early-days-of-covid-19/>
- [5] Neil Franklin. 2020. Remote working productivity will slump as firms burn up their social capital. *insight* online magazine, accessed 6 March 2021. workplaceinsight.net/remote-working-productivity-will-slump-as-firms-burn-up-their-social-capital
- [6] Charles Gottlieb, Jan Grobovšek, and Markus Poschke. 2020. Working from home across countries. *Covid Economics* 1, 8 (2020), 71–91.
- [7] Douglas W. Hubbard. 2014. *How to Measure Anything: Finding the Value of Intangibles in Business* (3 ed.). Wiley.
- [8] Callum J Jones, Thomas Philippon, and Venky Venkateswaran. 2020. *Optimal mitigation policies in a pandemic: Social distancing and working from home*. Technical Report. National Bureau of Economic Research.
- [9] John Noll, Sarah Beecham, and Ita Richardson. 2010. Global Software Development and Collaboration: Barriers and Solutions. *ACM Inroads* 1, 3 (September 2010).
- [10] Ralph Paul, Sebastian Baltes, Adisaputri Gianisa, Richard Torkar, Vladimir Kovalenko, Kalinowski Marcos, Novielli Nicole, Shin Yoo, Devroey Xavier, Xin Tan, et al. 2020. Pandemic programming. *Empirical Software Engineering* 25, 6 (2020), 4927–4961.

A OCUCO LTD. COVID-19 WORKING FROM HOME EVALUATION SURVEY

This survey was administered online to employees after 11 months of lockdown. Respondents were informed that participation is voluntary, completely anonymous, that results would be disseminated in aggregate form only, and they had the option of not answering any particular question.

(1) Demographics

- 1.1. What is your age? under 20 20-29 30-39 40-49 50-59 60+
- 1.2. What is your gender? Male Female Other Prefer not to disclose
- 1.3. Where are you located? Ireland & Great Britain Nordic region Continental Europe North America South Asia East Asia Africa Australia, New Zealand, Pacific Islands
- 1.4. How long have you worked for Ocuco Ltd.? Less than one year 1-2 years 3-5 years 5-10 years more than 10 years
- 1.5. On average, how many days in a working week (Mon to Friday) did you work from home *pre-pandemic*? 1 2 3 4 5
- 1.6. On average, how many days a week in a working week (Mon to Friday) do you work from home *now*? 1 2 3 4 5
- 1.7. How have your working *hours* (average per day/week) changed compared to pre-pandemic? Much longer Somewhat longer About the same Somewhat shorter Much shorter

(2) People

- 2.1. How adequate was the support your received from Ocuco Ltd. to achieve your goal while working from home? Very adequate (Excellent) Adequate Neither helped nor hindered Inadequate Very inadequate
- 2.2. What support (if any) did you find particularly helpful?
- 2.3. What support (if any) did you find lacking, that you wish you had?
- 2.4. How adequately do your work from home facilities (desk, chair, monitor, broadband, etc.) support your work? Very well Adequate Neither help nor hinder Inadequate Very inadequate
- 2.5. What facilities (if any) did you find particularly helpful?
- 2.6. What facilities (if any) did you find lacking, that you wish you had?
- 2.7. Has working from home impacted your personal situation (for example, childcare or taking care of an elderly family member)? Very positive impact. Example: I can now do important things I wasn't able to do before. Somewhat positive impact. Example: I can now do pleasant things, like spending more time with my children. No impact. Somewhat negative impact. Example: my children want to play with me rather than do their schoolwork. Very negative impact. Example: I have to compete with my partner and/or children for private space/internet bandwidth for meetings.
- 2.8. Please add any additional comment about your working from home situation you would like to make.

(3) Technology

- 3.1. What technology do you use frequently to meet synchronously with the global or local team (select all that apply)? Microsoft Teams chat Zoom chat Microsoft chat Slack video calling Skype Facetime WhatsApp video calling Plain old telephone system Other (please specify)
- 3.2. Do these tools help you to communicate and collaborate (e.g share knowledge, resolve issues quicker etc.) more efficiently while working from home compared to in an office environment? Much more efficient Somewhat more efficient About the same Somewhat less efficient. Much less efficient
- 3.3. What technology do you use frequently to communicate asynchronously with the global or local team (select all that apply)? Microsoft Teams chat Zoom chat Microsoft chat SMS Slack Skype chat WhatsApp Git Confluence Jira Email Other (please specify)
- 3.4. Do these tools help you to communicate and collaborate (e.g share knowledge, resolve issues quicker etc.) more efficiently while working from home compared to in an office environment? Much more efficient Somewhat more efficient About the same Somewhat less efficient A lot less efficient
- 3.5. How has the number of meetings you attend changed compared to pre-pandemic? Many more meetings Somewhat more meetings About the same Somewhat fewer meetings A lot fewer meetings
- 3.6. How has the length of meetings you attend changed compared to pre-pandemic? Much longer meetings Somewhat longer meetings About the same Somewhat shorter meetings Much shorter meetings
- 3.7. Have you changed your work from home technology to meet changing needs in the pandemic? Reconfigure/make space for home office Increase broadband speed Obtain larger/multiple monitors Upgrade home computer speed, memory, or storage Better camera/microphone Other (please specify):

(4) Process

- 4.1. How has working from home impacted your interaction with the distributed team? Much more interaction Somewhat more interaction About the same Somewhat less interaction Much less interaction
- 4.2. Do any of the following software development practices help you collaborate with others remotely? Daily standup Backlog refinement Sprint retrospective Sprint review & demo PI (program increment) planning. Communities of practice
- 4.3. Looking back to the beginning of the pandemic (March-April 2020), how did your productivity at the beginning of the pandemic compare to pre-pandemic? Much more productive at beginning of pandemic than pre-pandemic Somewhat more productive at beginning of pandemic than pre-pandemic About the same Somewhat less productive at beginning of pandemic than pre-pandemic Much less productive at beginning of pandemic than pre-pandemic Don't know – joined Ocuco Ltd. during the pandemic
- 4.4. How is your productivity *now* compared to pre-pandemic? Much more productive now than pre-pandemic Somewhat more productive now than pre-pandemic About the same Somewhat less productive now than pre-pandemic Much less productive now than pre-pandemic Don't know – joined Ocuco Ltd. during the pandemic
- 4.5. How is your productivity *now* compared to the beginning of the pandemic (March-April 2020)? Much more productive now than at the beginning of the pandemic Somewhat more productive now than at the beginning of the pandemic About the same now than at the beginning of the pandemic Somewhat less productive now than at the beginning of the pandemic Much less productive now than at the beginning of the pandemic Don't know – joined Ocuco Ltd. recently
- 4.6. How effective are Ocuco Ltd.'s pre-pandemic distributed development processes and practices for working from home? Very effective Somewhat effective Neither effective nor ineffective Somewhat ineffective Very ineffective Don't know – joined Ocuco Ltd. during the pandemic
- 4.7. Is there any practice introduced for working from home that you would like to see implemented in the office environment post-pandemic (flexibility of working hours, better communication, helpful attitude, etc.)? Please elaborate:

(5) Wellness

- 5.1. During the pandemic, have you found it is more or less difficult to concentrate as compared to pre-pandemic? Much more difficult Somewhat more difficult About the same Somewhat less difficult Much less difficult
- 5.2. During the pandemic, have you felt more or less anxiety as compared to pre-pandemic? Much more anxious Somewhat more anxious About the same Somewhat less anxious Much less anxious
- 5.3. During the pandemic, how often do you engage in vigorous activities (like running or HIIT) compared to pre-pandemic? Much more often Somewhat more often About the same Somewhat less often Much less often
- 5.4. During the pandemic, how often do you engage in moderate activities (other than walking) compared to pre-pandemic? Much more often Somewhat more often About the same Somewhat less often Much less often
- 5.5. During the pandemic, how often do you engage in walking compared to pre-pandemic? Much more often Somewhat more often About the same Somewhat less often Much less often
- 5.6. Overall, how do you feel your wellbeing has been impacted during the pandemic? Very positive impact Somewhat positive impact No impact Somewhat negative impact Very negative impact
- 5.7. Any other comment?