DIGITAL SKILL DURING COVID-19: EFFECTS OF DIGITAL LEADERSHIP AND DIGITAL COLLABORATION

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Abstract: The inequality of digital skills is an organizational challenge experienced by public and private organizations to ensure work productivity in work-from-home arrangements during Covid-19. This article aims to elaborate on digital skill development and examine the effects of digital leadership and digital collaboration on digital skill development. This article is based on a cross-sectional study involved 824 office workers from 32 provinces in Indonesia. The combined convenience and snowballing approach were used as the sampling methods. The collected data were structured in the first-order constructs by PLS Structural Equation Modeling. The results revealed that digital skills are significantly influenced directly by digital collaboration and indirectly by digital leadership. For accelerating digital skill development, the superior of office workers should facilitate their team members to collaborate intensively by using digital technology. Further study is recommended to examine the effects of other factors such as work motivation, family support, and availability of digital facility at home, performance management, and perceived organizational support.

Keywords: Digital Skill, Digital Leadership, Digital Collaboration

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Covid-19 has revolutionized the world by accelerating digitalization or digital transformation. It forces us to centralize all activities in many places (e.g., working in the office, studying in school, shopping in the mall, and praying at worship house) into doing all activities at home. The massive growth of virus-infected victims triggers this condition, so that working, studying, shopping, and worshiping must be done from home is one effective way to flatten the curve of Covid-19 infected patients (Iivari et al., 2020).

Digital transformation is not only in private organizations but also at the individual level and public
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organizations. Digitization, digitalization, and digital transformation will leverage consumption of technology products and make work-from-home as best available alternative for working arrangement in organization (Almeida et al., 2020).

However, digital transformation cannot take place as simply as turning on light contact. Thirty-seven percent of jobs can be done entirely from home in the United States alone (Dingel and Neiman, 2020). In addition, the individual productivity of a worker can be very different when working at home rather than from the office as usual (Dingel and Neiman, 2020).

Related to digital inequality, not all office workers today have the same opportunity and convenience to utilize digital technology independently at home. In the UK, the lockdown policy has led to increasing digital inequality. With the closure of public libraries and online learning centers, the citizens without access to digital technology or with low digital skills are hindered from seeking health-related information. In the UK, people experiencing digital imbalance are grouped into three categories: the inability to pay for equipment and connection fees; lack of motivation to utilize digital technology for their lives and businesses, and low digital expertise, inability to use digital technology for information retrieval, and communication (Watt, 2020).

This article tries to discuss digital skill development and how to improve it based on those of views. As an alternative temporary work arrangement, the productivity of work-from-home is still being questioned by many organizations in both the private and public sectors, especially in organizations that suddenly implement intensive virtual work. Digital skill is a determining factor for work-from-home productivity. With adequate digital skills, workers can more flexibly utilize and manage their working time in line with efforts to achieve work-life balance. The development of digital skills can be influenced by the support of superiors or supervisors and interactions with other employees.

This article also attempts to empirically examine the influence of supervisors’ leadership and collaboration with colleagues during the work-from-home process. This article tries to provide recommendations for supervisors and organizations to leverage work productivity during COVID-19 by effectively developing the digital skill of office workers who are especially first-time in work from home arrangement.

LITERATURE REVIEW

Digital Skill

Intensive digital technology impacts productivity in all sectors of the economy (Funes et al., 2018) and contributes to productivity growth in many companies. Therefore, policies to support digital adoption must go hand in hand with increasing digital skills (Gal et al., 2019).

Digital skill includes all technology-related skills ranging from basic skills or literacy, general skills for all workers, and specific skills for information technology professionals (Motyl et al., 2017). This article adopts the concept of digital skill developed by Van Deursen et al. (2016), which measures digital skill in four dimensions: digital technical skill, digital communication, digital analysis, and digital thinking.

Digital Collaboration

Collaboration is a pattern of mutually beneficial and well-defined relationships between two or more entities to achieve common goals. Collaboration is generally used to solve problems or face complex challenges (Green and Johnson, 2015). In a work-from-home context, collaboration takes place over the internet. This article uses digital collaboration as a construct and is operationally defined as collaboration using digital technology between workers and internal and external partners to accomplish joint tasks (Kock, 2009). Digital collaboration is reflected in four dimensions: team characteristics, work type, collaboration quality, and digital technology use (Easley et al., 2003).

Digital Leadership

The disruption of digital technology makes digital capabilities and leadership capabilities equally important and plays a strategic role in company competitiveness (Westerman et al., 2014). Some litera-
ture defines digital leadership as a key skill that managers must have to carry out digital transformation (Zeike et al., 2019). Through digital leadership, business leaders develop a clear and meaningful vision and actualize strategies related to the digitalization process (Zeike et al., 2019). Referring to that definition, this article simplifies the definition by explaining that digital leadership is a capability that superiors or supervisors own to involve and develop all employees in utilizing digital technology for supporting companies to achieve business growth. This article reflects digital leadership in two dimensions: digital attitude and leadership skills (Saputra et al., 2020).

HYPOTHESIS DEVELOPMENT

Previous research has found that collaborative learning approaches have proven effective in developing digital skills for teachers in Thailand (Yooyativong, 2018). Based on these empirical facts, this article hypothesizes that digital collaboration positively and significantly affects digital skills. 

H1: Digital collaboration affects digital expertise significantly

Several previous studies have shown that leadership plays a role in developing skills, competencies, or expertise and influences collaboration development. An empirical study involving 787 teachers from 65 primary schools found a positive and direct influence of distributive leadership on teachers’ collaboration abilities and their motivation to contribute to education actively (Amels et al., 2020). Another empirical study in Korea that involved nurses revealed that self-leadership plays a moderating role in the relationship between work commitment and work competence. Through strong self-leadership, work commitment affects work potential (Kim, 2020). Based on these two empirical facts, this article develops a hypothesis that digital leadership also has a positive and significant effect on digital skills and digital collaboration.

H2: Digital leadership influences digital expertise

H3: Digital leadership affects digital collaboration

METHOD

This article is based on a cross-sectional study about office workers in Indonesia. Data was collected through online questionnaires on social media from the professional and personal networks of the researchers. This research involved 824 office workers as the respondents. Most of the respondents (75%) are permanent workers in an organization (75%) and the rest are professional freelancers. Respondents work for private companies (40%) and government institutions (28%). Respondents are in structural positions at the organization (63%) which 36% work as individual contributors (as staff or officer) and 27% as managers. In contrast, the rest of the respondents (37%) work in functional positions (specialists, expert staff, or advisors). Most of the respondents (70%) were first-timers in working-from-home. Only 18.6% were used to working-from-home before Covid-19.

Demographically, respondents are equally distributed between men (50.36%) and women (49.64%). Most of the respondents were more than 30 years old (64%) with years of service more than five years (72%). The respondents stayed in Jawa (70 %) and Sumatra (21 %). This research involved office workers from 32 out of 34 provinces in Indonesia. This study could not get respondents from Gorontalo and West Papua. A further description of the respondent profile is listed in Table 1.

The structural equation modeling approach based on partial least squares (PLS SEM, variance-based SEM) is used to construct the research model and SmartPLS version 3 is used to compute research data on the model built. The research model developed is a first-order construct format where all variables are reflected on each indicator.

The research model consists of three variables, namely Digital Skill (DSKIL) which is reflected in seven indicators (DIS01, DIS02, DIS03, DIS04, DIS05, DIS06, DIS07); Digital Leadership (DLEAD) is reflected in six indicators (DLE01, DLE02, DLE03, DLE04, DLE05, DLE06), and Digital Collaboration (DCOLA) which is reflected in eight indicators (KOL01, KOL02, KOL03, KOL04, KOL05, KOL06, KOL07, KOL08).
Table 1. Profile of Respondents

| Description            | Men          | Women          | Total          |
|------------------------|--------------|----------------|----------------|
| Gender                 | 415          | 49,36%         | 409            | 50,64%         |
| Age                    |              |                |                |                |
| Until 20 years old     | 12           | 1,46%          | 12             | 1,46%          |
| 21 – 30 years old      | 283          | 34,34%         | 31,43%         |
| 31 - 40 years old      | 259          | 31,43%         | 67,23%         |
| 41 - 50 years old      | 169          | 20,51%         | 87,74%         |
| 51 – 60 years old      | 91           | 11,04%         | 98,79%         |
| More than 60 years old | 10           | 1,21%          | 100,00%        |
| Education              |              |                |                |                |
| Diploma                | 67           | 8,13%          | 8,13%          |
| Sarjana                | 249          | 30,22%         | 38,35%         |
| Master                 | 330          | 40,05%         | 78,40%         |
| Doktor                 | 79           | 9,59%          | 87,99%         |
| Lainnya                | 99           | 12,01%         | 100,00%        |
| Years of service       |              |                |                |                |
| 0 - 2 years            | 94           | 11,41%         | 11,41%         |
| 3 - 5 years            | 135          | 16,38%         | 27,79%         |
| 6 - 10 years           | 174          | 21,12%         | 48,91%         |
| 11 - 20 years          | 231          | 28,03%         | 76,94%         |
| 21 - 30 years          | 135          | 16,38%         | 93,33%         |
| More than 30 year      | 55           | 6,67%          | 100,00%        |
| WFH Experience         |              |                |                |                |
| Pertama kali           | 572          | 69,42%         | 69,42%         |
| Pernah lakukan         | 53           | 6,43%          | 75,85%         |
| Sudah biasa            | 153          | 18,57%         | 94,42%         |
| Lainnya                | 46           | 5,58%          | 100,00%        |

| Description            | Government  | 230 | 27,91% | 27,91% |
| State-Owned            | 38          | 4,61%| 32,52% |
| Private                | 327         | 39,68%| 72,21% |
| Multi-National         | 22          | 2,67%| 74,88% |
| Others                 | 207         | 25,12%| 100,00%|
| Position in Office     | Staff or officer | 295 | 35,80% | 35,80% |
| Supervisor             | 84          | 10,19%| 46,00% |
| Manager                | 53          | 6,43% | 52,43% |
| Senior Manager         | 25          | 3,03% | 55,46% |
| Director               | 40          | 4,85% | 60,32% |
| Business Owner         | 24          | 2,91% | 63,23% |
| Functional Position    | 303         | 36,77%| 100,00%|
| Location               | Jawa Timur  | 284 | 34,47% | 34,47% |
| Jawa Tengah            | 113         | 13,71%| 48,18% |
| Sumatera Barat         | 110         | 13,35%| 61,53% |
| Jawa Barat             | 56          | 6,80% | 68,33% |
| DKI Jakarta            | 54          | 6,55% | 74,88% |
| DI Yogyakarta          | 48          | 5,83% | 80,70% |
RESULTS

Table 2 explains that all indicators of the three variables are valid from the results of validity and reliability analysis because they have an Outer Loading (OL) score of more than 0.60. Likewise, all variables are also valid because they have an Average Variance Extracted (AVE) score of more than 0.50. Table 3 shows the analysis of discriminant validity, where all variables are discriminant valid because they have a square root score of AVE (score on diagonal stripes and in bold) greater than 0.7 and is the highest score in the column.

Table 2. Validity and Reliability Analysis

| VARIABLES, DIMENSIONS, AND INDICATORS                      | OL  | AVE | CA  | CR  |
|-----------------------------------------------------------|-----|-----|-----|-----|
| Digital Skill (DSKIL)                                     |     |     |     |     |
| Saya menguasai dengan baik bagaimana mengoperasikan aplikasi digital untuk bekerja | DIS01 | 0,78 |
| Orang lain bertanya kepada saya bila hadapi masalah teknis terkait teknologi digital | DIS02 | 0,67 |
| Saya menggunakan teknologi digital untuk berkoordinasi menyelesaikan pekerjaan | DIS03 | 0,66 |
| Saya menggunakan teknologi digital untuk melakukan investigasi atas suatu masalah | DIS04 | 0,79 | 0,57 | 0,87 | 0,90 |
| Teknologi digital memudahkan saya untuk membuat keputusan penting | DIS05 | 0,81 |
| Dengan teknologi digital, saya lebih akurat dalam melakukan prediksi | DIS06 | 0,80 |
| Kerjasama atau kolaborasi saya dengan pihak lain jadi lebih efektif lewat teknologi digital | DIS07 | 0,76 |
| Digital Leadership (DLEAD)                                |     |     |     |     |
| Atasan saya mengikuti perkembangan terbaru dari teknologi digital | DLE01 | 0,76 |
| Atasan saya merekomendasikan tim untuk kuasai aplikasi digital baru yang memudahkan pekerjaan | DLE02 | 0,81 |
| Atasan saya bersedia untuk mengajar timnya untuk kuasai teknologi digital | DLE03 | 0,85 | 0,65 | 0,89 | 0,92 |
| Dalam memimpin tim kerja, atasan saya punya tujuan atau obyektif yang jelas | DLE04 | 0,85 |
| Atasan saya peduli terhadap kesejahteraan saya sebagai bawahan saya | DLE05 | 0,78 |
| Atasan saya membimbing saya agar memiliki karir yang lebih baik di masa depan | DLE06 | 0,79 |
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Saya berkolaborasi dengan orang-orang yang ahli dalam pekerjaannya. Dengan teknologi digital, saya lebih mudah berkolaborasi dengan tim lebih dari delapan orang. Saya berkolaborasi untuk pekerjaan yang sudah rutin dilakukan. Saya berkolaborasi untuk pekerjaan yang baru sama sekali saya kerjakan. Saya mudah untuk berkomunikasi dan berkoordinasi ketika berkolaborasi. Dalam berkolaborasi, saya mendapatkan teman yang saling memotivasi dan mendukung. Dalam berkolaborasi, saya menggunakan teknologi digital secara intensif. Teknologi digital yang dibutuhkan untuk saya berkolaborasi itu beragam macam.

Table 3. Discriminant Validity Analysis

|   | [1]   | [2]   | [3]   |
|---|-------|-------|-------|
| [1] Digital Collaboration (DCOLA) | 0.730  |       |       |
| [2] Digital Leadership (DLEAD)   | 0.535  | 0.808 |       |
| [3] Digital Skill (DSKIL)         | 0.645  | 0.367 | 0.755 |

Meanwhile, for reliability analysis, Cronbach Alpha (CA) and Composite Reliability (CR) are used as parameters. The three variables (DSKIL, DLEAD, DCOLA) are reliable because they have a CA or CR score of more than 0.70. Based on the analysis of validity and reliability, the research model is composed of valid indicators and variables that are valid and reliable.

Table 4 demonstrates the results of the hypothesis testing. From the three hypotheses which are developed in this article, only one hypothesis is rejected. H1 and H2 are accepted because path coefficients have scored in t-Statistics more than 1.96 or in p-values smaller than 0.05. Meanwhile, H2 is rejected because the path coefficient has a t-Statistics score less than 1.96 or p-values more than 0.05.

Figure 1 presents the results of the PLS Algorithm analysis in the research model. The figure shows that digital expertise is influenced by digital leadership and digital collaboration by 41.6%. Other factors account for 58.4%, which have not been examined in this study. Meanwhile, Figure 2 presents the results of the bootstrapping analysis on the research model. Digital skill is not influenced by digital leadership but is influenced positively and sig-

Table 4. Hypotheses Testing

| HIPOTESIS                              | Koef. Jalur | t-Statistics | p-Values | Kesimpulan |
|----------------------------------------|-------------|--------------|----------|------------|
| H1: Digital Collaboration ==> Digital Skill | 0.630       | 18.658       | 0.000    | Accepted   |
| H2: Digital Leadership ==> Digital Skill | 0.029       | 0.939        | 0.348    | Rejected   |
| H3: Digital Leadership ==> Digital Collaboration | 0.535       | 16.671       | 0.000    | Accepted   |
Digital skill development is a strategic issue during COVID-19 driven digital transformation because it will determine the productivity of office workers both in private companies and in the public sector. Digital skill is the ability of office workers to utilize digital technology, including digital thinking, digital technologies, digital communication, and digital analytical skills.

Theoretically, digital skill development can be driven from two directions: vertical and horizontal directions. Vertical direction development comes from the influence of the supervisor’s leadership. Horizontal direction development comes from the influence of collaboration with colleagues.

The analytical results suggest that digital skill development should be initiated from the horizontal rather than vertical direction. In a work-from-home
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context, where a supervisor cannot interact face-to-face directly with the team members every day, the influence from the vertical direction is not significant enough to support digital skills development. The development of digital skills is more influenced by collaboration with colleagues, both from inside and outside the business unit, even from external institutions.

Thao and Kang (2018) studied a previous study, which involved 148 employees of local engineering firm in Vietnam showed that servant leadership influence follower competence and perceived organizational support played a moderating role in the relationship between servant leadership and follower competence. Although this finding affirms that leadership influence directly and significantly on competence or skill development and does not support the analytical result, it inspires the authors about a new research idea to add perceived organizational support as a moderator in the relationship between digital leadership and digital skill. By including perceived organizational support as a moderator in the research model, it opens a possibility that digital leadership may impact digital skill significantly if the organization supports the employees with digital resources at home for doing WFH.

The leadership of supervisors during work-from-home arrangements is more optimally geared for encouraging and supporting digital collaboration. The supervisor’s support for digital collaboration can be strengthened by paying attention to team characteristics, type of work, collaboration quality, and availability of digital technology in the homes. Through the digital attitude and leadership skills of these supervisors or superiors, collaboration is expected to develop the digital skills of office workers who conduct work-from-home as alternative work arrangements during COVID-19.

A previous empirical study (Evertson, 2020), which used data sample of 1,926 teachers from 122 schools in the USA that participated in the TALIS 2013 survey, found that the principal’s instructional leadership significantly influenced teacher collaboration indirectly and was fully mediated by teacher-learning based professional development. It means that the instructional leadership of the principal did not directly make teachers collaborate frequently. Still, when the principal’s leadership supported professional development on teacher learning, collaboration was increasing as the effect.

Although the empirical study of Evertson (2020) does not support the result of this article, other previous studies are supporting. An empirical study in Penang Malaysia (Soon and Salamzadeh, 2021) was conducted among 150 employees with virtual team experience from multi-national companies. It found that digital leadership influenced the effectiveness of virtual teams significantly but partially. Digital leadership or e-leadership in the study was defined into the six e-Competencies models, which consist of six aspects: e-tech savvy, e-change, e-social, e-team, e-trust, and e-communication. From six aspects of digital leadership, only two aspects (e-trust and e-communication) having a significant and positive relationship with the effectiveness of the virtual team. It indicates that digital leadership influenced virtual team effectiveness as a form of digital collaboration.

Another empirical study by Mora-Ruano et al. (2021) used a data sample from PISA 2015 survey and selected 185 schools with 3,569 non-science teachers as respondents. They showed that the principal’s instructional leadership could positively and significantly influence the collaboration frequency of the teachers. The study of Mora-Ruano et al. (2021) fully supports the result of this study. The leadership of the supervisor during work-from-home arrangements is more optimally directed for encouraging and supporting digital collaboration. By supporting the digital collaboration of the employees with the other team members internally or with other parties externally, it will improve and accelerate digital skill development.

Collaboration and skill - or competence or ability are two variables or factors that mutually influence each other. On the one hand, competence affects collaboration. But on the other hand, collaboration affects skills. The previous study (Ting et al., 2019), which involved 121 researchers from five universities in Malaysia, has empirically identified that researcher competence is the significant drive to the university-industry collaboration formation.
The study affirms that skill, competence, or ability affects collaboration. On the other previous study in Dutch university (de Hei et al., 2020), which involved 252 students, a higher perceived quality of the collaboration relates to increasing development of intercultural competence. The study affirms that collaboration affects skill or competence development. Another empirical study in Japan (Okato et al., 2020) also affirms that collaboration affects ability or skill. The study has involved 277 individuals from various agencies and found a successful inter-agency collaboration that affects multi-disciplinary workers’ abilities to identify child maltreatment. Collaboration affects ability. By encouraging and supporting office workers to collaborate digitally by providing needed digital resources at home positively impacts digital skills development. Development of digital skills for office workers during COVID-19 is recommended to be stimulated and accelerated by digital collaboration as the horizontal direction rather than digital leadership as the vertical direction.

CONCLUSIONS

Digital skill development of office workers during the COVID-19 pandemic is influenced directly by digital collaboration rather than digital leadership. Digital leadership impacts digital collaboration, and then digital collaboration impacts digital skill. Digital skill indirectly affects digital skill.

IMPLICATIONS

The ability of supervisors to utilize digital technology for leading their team is not sufficient for developing team members’ digital skills. Supervisor’s digital leadership indirectly influences and should be directed to make their team member collaborate intensively to accelerate digital skill development.

LIMITATIONS

The limitation of this study is the sampling method. The sampling method is non-probabilistic. Further study may collaborate with governmental institutions that handle Indonesia’s office workers to have the sample frame and conduct a probabilistic approach in the sampling method.

RECOMMENDATIONS

Further study is recommended to examine other influential factors of digital skill development from the individual, group, or organizational scope. Further study could examine personality, working motivation, learning capability, or growth mindset from an individual scope. Further study could elaborate the influence of group cohesiveness, group size, role in group, or collective decision style from group scope. From an organizational perspective, further study may examine the impact of performance management, perceived organizational support, learning culture, or the digital mindset of senior leaders.

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