

Est-Agar

Case summary

In 2018, Estonian gelling agent producer Est-Agar introduced two Internet of Things (IoT) based systems for production monitoring (GlobalReader) and employee monitoring (Begin). The overall rationale behind the adoption of IoT technologies was to provide reliable and high-quality data to support decision-making in relation to the production of existing products and the management of factory equipment and human resources. The use of the technologies resulted in greater efficiencies of production processes and contributed to improved relationships and communication with clients about products. The employee monitoring technology led to a mix of positive and negative effects at the employee level. With the deployment of the technology, employee productivity increased which led to a more efficient assignment of shifts, and eventually resulted in the dismissal of one third of shift workers (8 persons in total). The reduction in headcount allowed the company to increase wages for the remaining shift workers. At the same time, the increased monitoring and surveillance of employees in production raised concerns among staff and, at least initially, increased anxiety and stress levels.

About

Case study name: Digitisation in the workplace (/case-study-names/digitisation-in-the-workplace)

Establishment profile

Located in Kärla (Saaremaa island), Est-Agar is an Estonian producer of a gelling agent (an ingredient providing texture to foods and beverages) called furcellaran which is extracted from a red seaweed. The company, which is a single establishment, produces goods related to marine aquaculture under the NACE code A03.21. As well as manufacturing, Est-Agar actively develops a range of new furcellaran-based products, expanding the use of furcellaran from natural origins.

The establishment has 25 employees in total. All employees hold full-time positions with permanent contracts and are organised into two units. Led by the company chief executive officer (CEO), the management team carries out tasks related to sales, quality control, research and development (R&D), bookkeeping, human resources and production management. Employees in production are organised into four teams, with four employees in each team. The division into teams ensures continuity of production (24/7) during a six to seven month period every year. The gelling agent is only produced in winter. In summer, production employees primarily conduct activities related to the repair and maintenance of machines on a full-time basis.

The members of the management team are highly skilled and most of them hold a university master's degree, while employees in production have an upper secondary school education, which in Estonia consists of 12 years of school education.

There is no formal employee representation in this establishment. In Estonia, a working environment council or a commissioner is mandatory only in enterprises with over 50 employees or in enterprises where the Labour Inspectorate requires it due to nature of working conditions. Est-Agar falls in the latter category. The human resource manager acts as an employee representative, voicing the concerns of workers to the CEO. Due to the small size of the establishment, the CEO encourages all employees to approach him directly if issues arise. Typically, meetings with all employees take place once or twice a month. The meetings provide an opportunity for all employees to be informed about relevant business developments, and to discuss individual and collective problems or challenges. The decision-making power is, however, in the hands of the CEO and, to a lesser extent, the management team.

Technologies adopted and embeddedness in the workplace

Est-Agar started to experiment with digital technologies to improve efficiency in 2017. In 2018, the company introduced two IoT-based systems for production monitoring and employee monitoring. Global Reader is a production monitoring system that collects real-time data from IoT sensors installed on production machines and stores them in a central location on the cloud. This system is used for monitoring the water temperature, moisture levels and pressure in production machines and their performance. Global Reader also detects technical errors and monitors the quality of the production processes. Begin is a separate IoT-based employee monitoring system. It monitors employees' working time when they log in and out of the system, thereby assisting accountants in calculating salaries based on hours worked. The system is connected to a biometric time registration terminal, which uses employees' fingerprints to register when they enter and leave work. For the registration of management team working hours, employees can use a non-biometric application on their personal smartphones to log in and out of the system.

Data collected from both IoT systems are displayed on computer monitors during production and on dashboards accessible to management. The data collected is analysed and used by management to make more informed and strategic decisions for optimising production processes and reducing costs. Global Reader and a biometric registration terminal of Begin were installed in the production plant, as most employees in Est-Agar work in the production unit.

Once the IoT technologies were adopted, Est-Agar purchased two supporting non-sensor technologies, which use data from both GlobalReader and Begin. Using data from Begin, one such programme can, for example, identify which employee performed a task or worked with a machine within a specific period. The adoption of GlobalReader and Begin is considered the start of a larger digital and technological transformation in the establishment, as they pave the way for the adoption of other supporting technologies.

Drivers to technology adoption

The adoption of the IoT-based technologies served several purposes. First, to improve efficiency and the effectiveness of business decisions related to the production of existing products, and the management of physical and human resources. Secondly, Est-Agar wanted to monitor the work of the machines/technologies in production, as they affect the quality of materials, laboratory tests and, consequently, the quality of produced goods. Lastly, the management team in the establishment wanted to increase productivity and work effectiveness in both production and management.

Strategy to technology adoption

The technology adoption was driven solely by the CEO, without setting out any explicit digitisation strategy. The establishment did not seek support from external consultants on how to deploy the technology. This approach was taken to reduce costs and to avoid over-reliance on external consultants. The adoption of the monitoring technologies also stimulated the introduction of other digital, non-sensor technologies, that together transformed other processes in the establishment, such as quality control and better reporting to customers.

While management was consulted about the introduction of IoT technologies, employees from the production unit did not have a say in the change process nor were they involved in the piloting of the technologies. Employees were however informed of the technologies prior to deployment to ensure compliance. This required more frequent and direct communication between the CEO, management team and employees. The transition to the new technologies involved the adjustment of data collection processes and significant work for management, as old data in paper reports was manually inserted into new systems.

While the CEO anticipated that the IoT technologies would fully address challenges faced by the establishment, most employees, especially in the production unit, were afraid and reluctant to accept changes, not fully understanding what the technology adoption would involve. In general, employees had two major concerns. These were related to learning to use the technologies and the impact of monitoring on salaries and relations with management.

At the time of technology deployment, training on the employee monitoring technology (Begin) was provided to all employees, while training on the production monitoring technology (GlobalReader) was offered primarily to the management team. However, employees in production also learned to monitor and maintain the work of GlobalReader. Both trainings were offered by external providers, with the support of the CEO. When new employees learn to use GlobalReader, the training is provided internally by an experienced employee. Learning on the job is an important part of ongoing training in this establishment, with employees sharing knowledge and experience.

Impact of the technologies in the workplace

Business model

The IoT technologies help the management to make informed and strategic decisions, increase efficiency in the use of resources and production processes, and reduce costs. Data collected via GlobalReader ensures proper use and maintenance of production machines and equipment, improves the quality of products and provides opportunities for the development of new products and work methods. In addition, real time and better quality of data has been instrumental for the improvement of relationships with clients and for making more informed decisions about suppliers. Est-Agar has intensified communication with clients, as it is possible to offer greater insight on materials, products and production processes. Similarly, data on the quality of materials has given the company more information to look more closely at its choice of suppliers. According to the CEO, the IoT technologies have opened numerous business opportunities. The establishment is however reliant on external provision of digital technologies, as the technologies are not developed in-house.

Begin has led to a mix of positive and negative effects at the employee level. The technology has resulted in an increase in employee productivity and according to the management, changes in attitude to work (i.e. punctuality, higher sense of responsibility at work, greater focus on quality and individual productivity). Due to the automatic collection and storage of various types of data via GlobalReader, the amount of manual work of employees has however decreased. At the same time, the pressure from Begin to work productively reduced the duration of breaks at work and - from a management perspective – resulted in more efficient time allocation.

Work organisation

Internal organisation and decision-making

The deployment of IoT technologies had not significantly altered the establishment's organisational structure. The work of the management and production units did not change in terms of job roles. However, the availability of data via GlobalReader and the adoption of supporting technologies made several business processes more efficient. In the production unit, automation and digitisation of some tasks decreased the amount of manual work. Est-Agar eventually downsized the unit by eight individuals (30%) following the deployment of the IoT technologies.

Information management has undergone a massive transformation, as all data is currently collected, analysed, exchanged and stored on electronic systems, connected to the cloud via the Internet. This has led to greater autonomy of employees in the management unit, enabling them to work from home, if needed, with a more flexible schedule. During COVID-19, management employees benefited from the opportunity to work remotely.

Task definition and content

The adoption of IoT and supporting technologies expanded the task definition for all employees. Employees in the management unit perform more analytical and diverse tasks, due to better data management and new types of data collected. The amount of responsibility at work also increased for them due to the introduction of new tasks. For example, the production manager, who monitors the work of production teams and is responsible for orders and usage of raw materials, has become responsible for planning and monitoring technology maintenance activities. Due to data produced by GlobalReader, it is possible to analyse machine performance and plan technical checks before issues arise.

In the production unit, tasks related to specific product production have not changed. However, due to GlobalReader and other digital technologies, many manual and routine tasks became automated. These included data collection from machines, production output labelling, moisture level or water temperature measurements, and checking machine performance and sending automatic performance indicator reports

to management. Formerly, reports were delivered by a production employee working on a specific shift. New production unit tasks include the monitoring of digital technologies and machines, more frequent repair and maintenance due to predictive maintenance capabilities of GlobalReader, and specific operations that support the work of technologies. Additionally, due to the accessibility of high-quality data and greater employee free time, microbiological laboratory tests are conducted more frequently.

Workflows, quality controls and standards

Both technologies contributed to streamlining of workflows, with a general reduction in execution times and errors, improved efficiency of operations and a greater focus on product quality control.

The adoption of Begin improved the recording of working time, providing a more accurate salary calculation. Previously, paper-based reports were submitted by all employees to the accountant. The planning of working shifts and human capacity has improved, as Begin allows employees to insert information on sick leave, holidays, etc. Overall, the technology contributed to a reduction in bureaucratic processes and the handling of paper-based reports.

Although the technologies did not significantly change quality control procedures and standards, the management team devotes more attention to quality control issues, drawing from the data collected through the employee and production monitoring systems. For example, Begin allows management to see what tasks employees have conducted and to trace mistakes. Similarly, the use of GlobalReader allows the specialist in hazard analysis and critical control points to conduct more laboratory tests and analyse data at more granular level.

Employee monitoring and control

Employment relationships in Estonia are regulated by the Employment Contracts Act, which does not provide detailed instructions with respect to employer's monitoring rights. Employers must comply with the GDPR principles, but the Act provides scope for internal regulations and practices in establishments. Only the production manager and the CEO monitor work in production through surveillance systems and most employees assume that the recorded data is being used appropriately. According to the management, safeguards were put in place to ensure proper collection and handling of data, in compliance with data protection regulations.

Begin monitors productivity, documenting working hours, breaks, tasks, work quality and speed. With the deployment of the monitoring technology, the management team gained greater control over business processes. The system not only enables the close monitoring of employees in production but also of the management team, as work in the new electronic systems is visible to other colleagues who work on them and can easily be traced. One key challenge that Begin, coupled with the existing surveillance system, has helped to solve is the control of work in the production unit during night shifts. Prior to the adoption of the technology, this work could not be viewed and supervised by management.

The increased monitoring and surveillance of employees particularly in production raised some initial concerns among staff; most employees felt uncomfortable with the fact that digital technologies would increase the level of monitoring of their activities at work. This led to increased anxiety and stress levels among staff, particularly before the technology adoption and in the initial phase of deployment. To mitigate the concerns of employees, the management held individual and collective meetings with employees to explain the benefits of the two adopted technologies and the positive impact on work processes. At the time of writing, the discomfort from monitoring decreased, but several employees in production felt that personal security and privacy decreased significantly. Nevertheless, all employees have become used to Begin and some admitted that it had a positive impact on their work performance. Reportedly, acceptance of change (and monitoring) is affected by cultural norms, inherited from the Soviet period, when employees did not openly dispute or oppose decisions taken by a superior.

Job quality

Physical environment

The introduction of the IoT-based technologies did not bring significant changes to the physical work environment. The new production monitoring system (GlobalReader) required the installation of an additional computer in the production plant, which was done by the external technology provider. GlobalReader replaced a few old machines and led to fewer interactions between humans and machines, as most data is collected automatically, thus contributing to a safer work environment.

The physical environment of the management unit has not been affected, as employees access data on their computers. Despite that, several employees from the management team expressed concerns about their health due to long working hours sitting at the computer, which affects eyesight, levels of physical activity and posture.

Social environment

Following the adoption of the production monitoring system (GlobalReader) and other supporting technologies, the amount of face-to-face communication within the management team decreased. Employees believe that this did not affect negatively personal and professional relations. The introduction of the technology involved a shift in work practices, with greater emphasis on online rather than physical meetings, and more frequent email exchanges rather than phone calls. Management employees also reported that the use of IoT technologies changed general attitudes among staff to digital technologies and contributed to a greater openness to change.

Overall communication levels between employees in production unit has not been affected, as they continue working in teams. However, the use of the employee monitoring technology resulted in fewer rest breaks and social interactions. Additionally, collaboration between the production and management units has also somehow decreased, due to the automatic collection of data and the diminished need for face-to-face contact.

Working time quality and work intensity

Est-Agar did not impose longer working hours or set high targets for employees following the adoption of GlobalReader and Begin. The workload remained at a similar level, as freed time was filled with new tasks.

According to the management, the increase in productivity is related to the use of digital technologies rather than to greater pressure from monitoring or increased workload. Despite an increasing diversity of tasks, new responsibilities and monitoring, the level of work intensity did not increase.

Overall, employees at Est-Agar are positive about the change that IoT and other digital technologies have brought. The management unit report higher job satisfaction, as their productivity and effectiveness at work has increased, and they are remunerated with higher wages. Employees appreciate that manual work and repetitive tasks have decreased. The IoT technologies and the resulting digital transformation has facilitated many work processes, making daily work more interesting and satisfactory. Thus, positive changes in their working life made up for the initial discomfort from the employee monitoring.

Skills and discretion

The aim in Est-Agar is not to reskill employees or to create unrealistic and new skills demands. The recruitment and training strategy has remained unaltered since 2018. The CEO had been looking for technological solutions that are easy to learn and use by existing employees. To manage the current IoT and supporting technologies, employees do not need to possess advanced IT skills. Even for most complex technical tasks, it is sufficient to have basic IT skills and some degree of understanding of how the technologies work. However, due to the training provided by the IT provider on how to use GlobalReader and other supporting technologies, several employees in the production unit improved their IT skills. Additionally, increased data analysis improved the analytical and data management skills of employees in the management unit.

The uptake of IoT technologies did not create new skill requirements for production workers, apart from learning how to use Begin. Nevertheless, the gradual digital transformation in Est-Agar resulted in opportunities for employees in production to use computers, basic applications and communication software. For some employees this was a significant achievement. Increasing task diversity also resulted in more opportunities for learning on the job. For most employees, this has increased job satisfaction, and only a few consider it a challenge.

As the technology enables remote access to data, employees in the management unit have greater autonomy. However, for employees in the production team the degree of autonomy has not changed, as they are still greatly dependent on each other's work and instructions from the management team.

Prospects and earnings

The dismissal of eight employees from the production unit, due to more efficient shift assignment, led to an increase in the salaries of other production employees. This increased the willingness of employees to work more productively and, according to the management, led to a greater acceptance of surveillance.

The salaries of employees in the management unit were also increased to compensate for learning and doing new tasks.

Workers at Est-Agar believe that Begin guarantees a fair calculation of salaries, based on their working hours. Although it is possible to calculate individual productivity of employees and, based on that, develop a formula for remuneration, the CEO decided not to do it, as it would put extra pressure on employees.

Despite the downsizing, interviewed employees do not consider digital technologies as a threat to their job. Many believe that a successful digital transformation in Est-Agar is a promise of stable future income, as the establishment has higher turnover and profit by being innovative. Greater confidence stems from the fact that employees, especially in the management unit, have acquired new transferable skills.

Employee involvement

Est-Agar has an employee representative, who primarily acts as a working environment commissioner. Their role is to monitor and inform the management team about issues related to occupational safety and health, rather than represent the collective interests of employees. The employee representative was not involved in the decision-making process on the adoption of digital technologies or in the impact assessment.

While employees from the management unit were consulted about how to improve business processes prior to the technology deployment, the opinion of the employees from the production unit was not sought. In Est-Agar, the practice for the CEO is to discuss strategic decisions with the management staff; employees from the production unit are rarely involved in decision-making processes. Once the decision was made to deploy technologies, the CEO announced it in a collective meeting to all employees. In addition to collective meetings, the management team held individual meetings with employees and explained why new technologies are needed and how they will affect work and tasks. Hence, all employees had a chance to ask questions and had direct dialogue with the CEO and the management team.

Commentary

- IoT technologies can optimise and improve several business processes. However, according to the CEO of Est-Agar, business owners/managers generally lack information about available digital technologies, their implementation in the workplace and the impact of their adoption. Such information is key for a smooth and cost-effective process of technology adoption. The public sector could fill this gap by offering or facilitating access to consultative services on digital technologies to innovators.
- Adoption of digital technologies always leads to a change, which is typically opposed by those who must adjust to it. The process of adjustment depends on a degree of involvement of employees in the decision-making process, cultural norms and on implementation process. To reduce the levels of stress prior and during the period of technology adoption, open and clear communication with the management is needed. Affected employees should understand implications of technological change, have an ability to voice their concerns and should be assured that their rights will be preserved. In the Est-Agar case, the CEO informed employees prior to the technology adoption and sought to address their concerns. Active employee involvement is advisable to ensure that employee rights and interests are taken into consideration. This would increase acceptance of a technological change, reduce concerns of employees around data protection and privacy, and dispel feelings of job insecurity. Additionally, the lack of social dialogue structures reinforces the power imbalance between the employer and employees, which could affect the openness of employees about experienced issues.
- When a digital technology monitors employee performance at work, workers should feel confident that the collected data will be used for appropriate and legitimate purposes. Management should indicate their commitment to compliance with the GDPR, explain the consequences of monitoring and how they have weighed the workers' interests in their

decision. It is also essential to establish a clear governance around the data collection, usage and storage and to put in place adequate mechanisms to preserve and prevent any misuse of workers' data.

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Technologies that digitise and automate tasks can lead to job losses as in the case of Est-Agar. Manual tasks and skills are more likely to be replaced by technologies, while the demand for analytical tasks is growing. The downsizing in Est-Agar triggered feelings of job insecurity among the remaining staff. The risk of losing a job is particularly high among employees who perform manual tasks and do not receive training for upskilling or reskilling. Policymakers should consider how to support employees whose work is predominantly manual and how to support companies ready to invest in upskilling.

Information sources

Interviews conducted between June and September 2020 with the CEO, human resource manager, production manager, specialist in hazard analysis and critical control points, and a shift maintenance specialist, who in the absence of formal employee representation acts in the capacity of an employee representative.

Company web site: <http://estagar.ee/> (<http://estagar.ee/>)

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Revision log summary