DIGITALISATION VS HUMAN FLEXIBILITY

Digitalisation places a heavy burden on designers to understand the context of use of designed technology. But the world of work often requires space for flexibility to adapt to different situations. **Anders Ellerstrand** reflects on the risks of rigidity.

Have you ever checked in to a hotel late in the evening, tired and longing to get up to your room, and go to bed? Then, as part of the check-in procedures, you are given a check-in form to complete. You see all those empty spaces that you should fill with information; personal information, where you are travelling from, your next destination and so on. But then, to your relief, you are told that; "actually, you only need to fill those two that I marked with an 'x' and then sign it down here".

Work-as-imagined, digitalisation, and work-as-done

For me, this is an example of designed 'work-as-imagined' (see *HindSight* 25) in a form that clashes with the needs of hotel guests. The hotel staff has found a 'work-as-done' that manages these competing goals. Probably, all of those fields on the form are not as important in reality as they were in imagination.

In recent years we have seen changes at hotel check in. I once arrived at a very

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modern, low-price hotel close to an airport. To reduce cost, the staff was at a minimum and everything was designed for self-check-in. I went to a screen, telling me to "Start your check-in by clicking here". Here comes digitalisation! No way I could just "fill in here and there and sign". Every page that came up on the screen had to be filled correctly before the next page came up, and only by filling it all according to requirements was the card key printed at the end, allowing me access to my room. In design terms, this is called a 'forcing function' – the user is forced to do certain things to achieve a certain result.

The whole procedure was not only arduous, but also quite difficult. So, there was one of the staff who had to stay behind the guests assisting the whole process, trying to expedite it as much as possible. So much for saving on staff costs…

Finishing the design…in the ops room

So, what has this got to do with digitalisation in ATM and other safety-critical sectors? There is today, in most workplaces, a physical separation between written procedures and actual operations. The procedures in binders or on computers are not always reflected in actual operations. You are supposed to follow procedures, but you are able not to. This means that any poorly designed or insufficient procedures can be fixed by humans adapting and 'finishing the design' in order to get the work done.

For some people this is a big problem, with the often-cited argument that "human error [or non-compliance with procedures] is the cause of 80 % of all incidents and accidents". It is commonly thought that "If only people would follow the procedures, all would be well". If you believe this, digitalisation may seem to offer the perfect solution. When procedures and operations are no longer separated, but integrated in a common system, the possibility to bend rules or take shortcuts can be removed. The design can no longer be 'finished' in operations.

"With digitalisation, certain operational adaptions can be made impossible"

Bending the rules

With digitalisation, certain operational adaptions can be made impossible, which is of course one intention. An everyday example is the car that is not able to start until you have fastened the seatbelt. Sounds like a good idea? The problem is that digitalised systems that are not possible to override also take away the human ability to adapt to many unforeseen situations. I saw a video clip of a woman approaching her car when two armed robbers approached her. In the clip, the woman is extremely fast into the car, gets the engine running, puts it in reverse and quickly gets herself out of the threat. Imagine a car that requires her to fasten the safety belt first, for safety reasons. Different goals can come into conflict and we can't always be sure which is the most important in a given, perhaps unimagined, situation.

I used to work as a Watch Supervisor in an ATC centre. One issue we tried to deal with for a long time was the activation of military restricted airspace. That involved a lot of different tasks, to be performed in a certain sequence, where no task should be omitted. Sometimes we failed and an incident report was written. The cause was always that the procedures were not followed.

This is a case where digitalisation could make it impossible not to follow the procedures. The digitalised version with its forcing functions would require all steps to be performed in the correct sequence – otherwise the restricted area could not be activated.

The digital double-bind

The real problem here is far too easy to miss. The main reason for the problem we were having was that this was usually happening in the early morning when we were very busy and constantly interrupted. Restricted areas were to be activated, but there were also military training areas to be prepared, following a very different procedure. And it was also a time when many controllers came to work, passing the Watch Supervisor to get or provide information. It was often necessary to leave the procedure, to start another one in the same system, to later go back and continue. Would a digitalised system allow that? By introducing a fail-proof digitalised procedure you could probably eliminate the problems with activating restricted airspace. But, in doing so, you could also eliminate all that clever flexibility that got us through those busy mornings, full of competing goals, time constraints, and limited resources.

So, if you did appreciate the person in the hotel who told you to fill only the two boxes with an 'x' and sign 'there', you may find the future not so satisfying. If you believe that a key reason that aviation is efficient and safe is human flexibility and ability to adapt, then you may have reason to be concerned. The burden of getting it right may shift more towards designers, who have to predict and understand all of the possible use cases of software functions.

Assisting human work

I believe, digitalisation and automation could bring many advantages. I even believe the problems I met when activating restricted airspace in the morning could be mitigated through the help of automation and digitalisation, but I prefer to see those improvements as a result of them assisting the human in doing a better job. It is not a given that we will get to a better place by having technology restricting or even eliminating human flexibility.

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