Smarter Smart Lighting

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How smart is (smart) lighting today?

To find an accepted answer to that question we need a reasonable definition of smart lighting. What means smart? What is smart lighting? We somehow use to call a person or an activity smart if it provides expected results in an unexpectedly easy way, or provides unexpected quality of the results without visible difficulty. If we apply that to lighting, the result may read as follows: "smart lighting is "providing well lit spaces whenever needed at low environmental footprint". If we follow that definition, how smart is lighting today? It seems we do not need to worry too much about the "lit spaces", as regulations ask for a minimum quality already today. I have to admit that there is of course some headroom in lighting quality in the built environment, but the knowledge on the "how to" is reasonably established, there are Academies and Universities that teach the art of making spaces lit in reasonable good quality at reasonable cost. And there are well enforced regulations that stop the misuse of commercial arguments to reduce the lighting quality to an improper, hazardous or harmful level. But we should worry! Enforced regulations ensure the minimum, and minimum is by definition far from the "smart" way. But this is not alone the real danger! Most of those smart solutions forget to take the most common light sources into account: The sun and the daylight. The accessible knowledge on how to light spaces well under day-lit conditions is poor, and the existing knowledge is poorly distributed. On top of that the regulations do not really bother about day-lit environments. So we finally do have to bother about "lighting spaces well" when it comes to aspects of daylight and sun. Saying this we should not forget that the final part of our definition "providing well lit spaces whenever needed at low environmental footprint" is not under control at all. There are some notions to take the carbon footprint into account, and some of the environmental labels for buildings created a measurement system that gives some benefits if energy conserving measures have been taken into account in lighting. But overall this is not really a concern, space owners usually do not bother really, they bother on "return on investment", and as long as power is cheap enough there is no real push towards exploring the smart savings potential. Let's have a look to the figures:

Less than 25% of lighting installations react to presence automatically.

Less than 10% of lighting installations are capable of adapting the lighting levels in respect to available daylight, and less than 6% do this automatically.

Less than 50% of the lighting sold uses the energy saving LED technology.

What does this mean? Are we stubborn idiots? Why do we ask for "smart lighting" if the basics do

not perform at all? The answer is "Yes, we are ignorants". But we are two groups of ignorants, perfectly supporting each other: One group ignores that there is a lot of indirectly related downturn of lighting that is not well made, and discards all knowledge about possible positive effects, reducing every possibly positive feature to actual cost only. The other group ignores that the messages are not simple and clear, and not easy to accept, and there are no straight forward methods with clear results that allow to implement reasonable quality with well defined budgets provided. We are researching on and on and never getting it really to the wider market. We tend to solve an obviously very basic problem by researching some distant requests that do more and more of a less and less requested feature. This is NOT very smart, is it? So let us look into the bright future of smart lighting!

Is there more smart functionality already available today?

There is a lot advanced functionality already available today. It ranges from advanced circadian support to shifting colours to match the white of the daylight, and from glare protection to optimized absorption of radiated solar energy. There are different dynamic regimes available that counter-work lighting boredom that leads to fatigue, and there are daylight algorithms that go far beyond a "stable 500 lx" regime, creating highly useable and user friendly environments that run with unexpectedly little amounts of energy.

But you have to travel far to experience all that. Most of these functionalities have a very limited number of installations (often below 10), it seems to be very difficult to convince customers to invest into those features. But why is that? Are the customers unhappy? Are the consultants not aware? Is it prohibitively expensive? Are the benefits not reasonable? Were the prototype installations and showcases flops?

There is a clear "No" to all those questions! Most attempts deliver nice results, some of them were researched thoroughly with confirmed results.

So why is smart lighting features not the success story it should be, and how are we going to change that?

If I could give you the real answer I would not do that lecture, I would rather bathe in my millions.... What I can give you are some spotlights that highlight some areas of deficits, and I will point to aspects of a solution. I am neither claiming to give you a complete picture, nor do I expect you to like it. If you say "this is only guessing": It is true. What I can provide is the "best educated guess you can possibly get", but of course it is still a guess.

One of the reasons why smart lighting is not what we expected it to be lies in the nature of light. Not in the physical conditions of the light itself, it is rather the way we use light, what we expect and what our biology tells us about our lit environment. We have had millions of years of evolution that optimized our eyes to adapt to any lighting. The eye is a fantastic instrument, it just works, and it does not complain. It provides precise optical information to the brain no matter what kind of

lighting environment it encounters. There is no real difference in the quality of the optical signal the eye provides with surrounding lux levels of 100, 1000 or 10.000 lx. We just cover it all. This means: without education, training, and instruments any reasonable lighting system seems to deliver. I've seen a presentation of a room, lit with 89 lx average (daylight) that looked bright, and had no visible lighting issue. There have been multiple millions of office lights invested with a substantial 100Hz flicker, years after it has been proven scientifically that avoiding such flicker reduces headaches and eyestrain substantially. The reason: It does not smell, it does not tell, it is not detectible. And we are ignorants as long as we are not well educated, and some even after that moment in time. Or, in other words: We do not see the benefits if we can't physically see or feel them.

And that is not all of it! It is even worse: On the edge of some belief and willing to try some of the advanced features, we are exposed to all together wrong signals: Lighting systems that promise to perform better are difficult to specify, difficult to order, difficult to implement and difficult to operate, not mentioning the money they take. Vendors claim to have divers best solutions, and are heavily contradicting what their competitors claim. After all there seems to be no basic consensus, no common reasoning, no way out! What a nightmare!

What are the key issues for tomorrows smart functionality?

Looking back to what I said the key issues are: Gain width, gain relevance, gain market resonance. It is not the next generation of scientific studies, not the more advanced features that we lack. We need to get the existing knowledge to the earth -and to the market! Why don't we invest in smooth workflows that ease the deployment of the existing "smart" features, and make sure that smart lighting is easily specified, easily implemented, can be ordered straight forward, and why don't we create a basic common sense across all vendors that tell what is necessary to enjoy smart lighting?

I am sorry: we cannot! There seem to be no way to achieve that. One can not just create that, not even the lighting industry as a whole. No, this is not a pessimistic statement, it is just the reality. Investments in "make it easy and moving smooth" are huge, and the today market is relatively small. Heavy money to invest in easier access to a relatively small market is simply not available, and the hope that the smart lighting market grows rapidly is not shared by most of them. Investors put their money where they see a good chance for huge returns.

Simple market mechanics are against huge returns in smart lighting: let us draw an optimistic scenario: We can make smart lighting market rise by 20% per annum (wow!), if we invest 30 M EUR in technology, training, nice software and workflow support for sales, consultants, contractors, services and facilities persons. (The 30 M EUR are relatively small money to achieve "real smooth and simple" of today's advanced smart features). If we are lucky we could even achieve 30% increase per annum: sounds like a breakthrough, a real story. But: I am sorry, it is not going to happen! If we calculate the 30% rise and put all additional volume as additional revenue (both will be questioned heavily as "far too optimistic"), we will not pay off the 30 Mio in a few years. For this simple reason it is not going to happen.

So why is smart lighting happening at all? If it does not pay off the investment it should not exist at all, but we know it exists! The reason it does exist is relatively complex: Lighting is an emotional theme, and the way it interacts with the human is scientifically very exciting. The larger companies seek for a competence and trust for their public profile, and some of the marketing efforts are always based on "achievements". So there is interest of some companies to show their competence in lighting, there is scientific interest, there is public money to support the science, and there is the positive image one can get in doing such things. This gives a good reason for the existence, and also for the actual status of smart lighting: We do not look at it as a real business, we use it to support some other "real" business.

To achieve a real step forward we need to understand how smart lighting possibly becomes a business. No, I am not pointing back to my example above. If I would close the circle now I could easily demonstrate that smart lighting is never going to happen, will always stay a niche, exciting for science, but poor in revenues. But I will not do this, I am sure smart lighting can happen! What was demonstrated is that the path we follow will not lead to our goal! We need to take a different path. We need to get other persons involved. We need to create a nourishing environment that feeds smart lighting until it is grown enough to really push through. And I know this is possible, and I do see movements already happen, but they happen behind the scenes, it is not what the smart lighting conferences talk about, it happens for other purposes.

How do we get smart?

Let me iterate the main obstacles: One major obstacle is: Cannot smell, feel or see "smart lighting". The other major obstacle is: It is complicated to get it and it eats a lot of upfront investment.

So let us tackle these two issues first:

How can we possible create involvement? How do we get "better lighting" easily detectable, how do we get it a "must"? I don't think we can, but what we can is shift the focus to the haptic interface: Make the users feel and see it, and experience it as "the smart lighting". Hand over control to users, create the requested smart "look and feel" at the haptic interface! Make sure the users have options available they really like, and such that they really like to show their friends, and that they will ask for wherever they go.

The way to overcome the second obstacle is less obvious, but on a wider screen we do see a major helping force that pushes the borders to help finally also smart lighting to happen! Most of the obstacles named on the way are not genuine "smart lighting", the main obstacles are part of the technical systems that are used as supporting structure to allow smart lighting to happen. If you want smart lighting today, you better deal with DALI, KNX and BACNET (and alike), and it is exactly those acronyms that make it technically so difficult to deploy and use smart lighting without obstacles.

"Drop them" sounds easy, but is impossible, there is a need of a supporting communication system

to enable smart lighting. "Replace them" is not that easy, as this will eat lots of money upfront, with no guarantee that it really gets better (see my example above). So what else is going to change things really? We need a need a kind of disruption to get out of this technical jail.

It is already on the move! It is also presented on this conference! And it already changed the world visibly. It is "the Internet", that will change the lighting infrastructure hopefully in a way that smart lighting will be able to use for moving on.

Internet in Lighting? Is this really happening? Will it help? Why, How and When?

Let us have a short look to the cardinal questions:

Why is the Internet "changing everything"??? It seems as if "internet" is not answering the questions: It will be difficult to use, it will be expensive to invest! That is true, but only on the first glance, and only partially: The basic internet technology is complex, that is true. But lighting will profit from massive investments into internet tools, from existing knowledge in the field, and from the large numbers of (general purpose) internet nodes that carry the investments. This way it will get cheaper and easier as we ever could expect to achieve through isolated lighting industry efforts.

How is the Internet replacing DALI, BACNET, KNX and alike? The main force of the internet is its "neutrality". It is a transport system, that can be used for a high variety of informations. This way there is no longer any exclusivity. Any investment into "internet transport" has a proven sustainability, there is no lock-into a specific vendor or association and his system any more. Internet may transport KNX data, technically no problem. But it will end different: as the internet communication allows a variety of contextual protocols, and may have them in parallel in a given system, the investment into making it more easy to use gets relatively small, and may be achieved in smaller steps compared to the example above. The risk comes down, and the investment for any of these steps comes into a useful range: Competition on better solutions are possible again, progress will happen on the basics, smart lighting is able to get a wider market.

If a vendor of a device allows the update of the firmware or the use of plug-ins or supports app-like structures, the protocol used on the smart lighting node may be adapted later. And this is really a major change: The investment into the lighting node is sustained, the smart lighting investment no longer needed upfront: The first invest is creating the infrastructure, and the "smart features" may be invested i.e. when the tenant comes in or changes. The deployment of smart lighting will be possible without physical access to the devices, without any change in hardware. And this should be very good news, as this way smart lighting is finally able to get smart.

Conclusion:

"Internet to the node" with some plug-in or app-type features will open the path to achieve smart lighting as a business.

"Use the haptic interface to make smart lighting tangible": This will help to get the users involved,

and to get the smartness of smart lighting more visible.