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1. You've got a vast experience in managing a drawing office. Please tell us about the challenges you faced when you had to evaluate, approve, and assist in drawings creation, perform drawing control?

My work experience in a team lead position since 2011 was in the project execution environment with mining companies being the clients. These projects included both green and brown fields projects and ranged from designing complete mineral processing plants (gold and chrome extraction) to sub-processes like iron ore beneficiation, crushing and screening, cobalt extraction, and gold refining.

The challenges we faced impacting the drawing or design offices specifically could be listed as:

- Scope of Work for the project not correctly defined. The cause for this could range from the client not understanding what they require or holding back on some information (several reasons for this) to the business development team not defining the offer in a definitive way or "giving" away portions without considering the effect it will have on the final design and cost.

- Being project driven our work force tended to be fluid, i.e., we used contractors mainly and matched our human resource numbers to our workload. This meant that there sometimes was a lag between the time when the requirement for extra resources were defined and the actual start date of said resources. This also meant that sometimes one had to accept a resource with a lower skill level just so the work could continue, placing additional stress on the other team members.

- The kind of projects I mention were driven by extremely tight schedules with timelines that did not allow much availability of extra time. This meant that when a workflow was based on for example a three-day turnaround, those three days were critical. Unfortunately, submitting drawings or specifications to a client or external design entity meant that we had to accept that our critical timelines were not regarded in the same way by those that had to review and/or approve these documents.

- There is also a misconception of the importance of document (including drawing) control within a project. I have experienced a case where a project manager insisted, he could manage the document control himself based on an Excel spreadsheet….until I showed him the register of only the drawings we expected to create for his small project. The role of a document controller on a project is often not understood correctly by the business development team that costs the tender for the client nor by project management, but also sometimes by the design team. Most of the times it was difficult to convey the importance of this position.

2. In your article on Inventor structural modelling, you said that "we tend to repeat the mistakes and the successes (typically linked to a specific individual or two) are closely guarded secrets which tend to stagnate the industry as no new ideas are introduced." Can you elaborate a bit on it?

Again, based on my experience in the mining project environment, the projects were anything from 6 to 18 months in duration. Based on this, the companies involved with these tended to have a high staff (contractor based mainly) turnover, as there might not be another project ready to absorb these resources as they are demobilised from the completed project. However, in this group there always tended to be a nucleus of designers which were kept on longer or open-ended term contracts.

These designers were the ones that formed the core knowledge and experience and they "drove" the way projects were executed from a designer (3D modeller/draughtsperson) point of view. To maintain their value, we found that there tended to be a resistance to skills transfer to other persons who were seen as temporary and therefor not part of the core. This attitude sometimes leaked through to disciplines around the drawing office, like engineering for instance, who strengthened this situation.

Therefor, the knowledge and processes that were developed tended to stay within an extremely specific group and very rarely spread out through the industry. It can be argued that it is a form of IP protection, but the downside is that very few new innovative processes or knowledge streams entered the industry. You still found situations like no PLM being used, or if it was then it was used as a file storage system only, or there is only a partial transition from 2D to 3D modelling with truly little attention to the use of advanced parametrics.

I also experienced that the boundaries in the use of parametric design software, are challenged by the smaller companies or even the free-lancing users. As these users tend to be more sensitive to working clever, they are the ones finding the more time and cost-effective ways to achieve the same or even better results. That do not imply that the larger companies do not follow this, but there tends to be more resistance to exploring new work processes from an organisational point of view.

3. What, in your opinion, precludes professionals from shifting from 2D to 3D modelling, other than having needed skills?

Resistance to change, inability to appreciate the value, lack of vision or nobody driving the transition are some of the ones I encountered.

Resistance to change – especially amongst those that have been doing their work the same way for a long time. Unless there is a compelling reason to change, it is just easier to keep on doing it the same way.

The inability to realise the value of 3D modelling is also a factor as the arguments against it can be quite compelling sometimes. Cost of change or even the lack of data on the possible increase in efficiency, are some of the arguments used. Unfortunately, it can be difficult to quantify the expected increase in efficiency and savings of the change, as you need real data specific to that design team's work processes and you can only have that once the change is implemented. Kind of a chicken and egg thing.

If the transition from 2D to 3D has a strong advocate or champion, it can be done successfully. But it takes somebody with a strong leadership ability, that has empathy for those most affected by the change but cans till drive the deliverables in a way that ensures buy-in from everyone as much as possible. It helps if this person has done it before or has access to a mentor that has the experience.

Of all these I think resistance to change is the most dangerous and the most difficult to manage. It indicates an inability from the team members to entertain any challenge to their comfort zones. It also shows a single-minded belief in their own way without considering the possibility that anything better can exist outside their bubble.

4. You also were part of a global project team where you had to streamline and clean the company's data on home databases. As we understand, you dealt with large data volumes, which apparently sometimes might be quite chaotic. How would you change the approach to this kind of task?

Assuming you have the time and resources to do it properly, the way we did it was to analyse each of the various databases and map the corresponding metadata fields used. We then decided as a group how the new database should use metadata, specifically what fields to be used, the specifics like naming the fields, number of characters used, formats, etc.

It sounds simple but we had seven databases worldwide, in different languages, different formats for names and dates and a whole lot of other obstacles to map into a common set. Just the different first name and family name formats were enough to give us sleepless nights. And we had to ensure that the users could relate after the changes, so we set up a small dummy system and assessed it in the different offices. This also involved training for the various administrators for these offices to ensure we had a localised help system in place before the big clean-up and merging.

This gave us clean local databases which were then easier to manage and applying the new formats became easier to do. In hindsight, the crucial factors were:

- A strong project leader with knowledge on data management. We were lucky in that such a person was available, and that he could work within a multi-national team setup.

- A diverse team that had a powerful desire to have a success story. The team members were chosen from different departments, from all the international offices and were not just restricted to management but included the day-to-day users of the systems as well.

- The fact that the company allowed us time to do it properly, with no unrealistic deliverables.

5. Is intellectual property protection a pain point in the CAD field, these days? Why?

It most definitely is a point of concern or pain as you call it. With the increase in technology and the staggering amounts of data flowing through a design office, it is extremely difficult to control it.

You cannot take away access to a mailing system or the internet, it will be counterproductive. You can on a company network, restrict access to file sharing sites like Drobox, but can you stop somebody with a USB stick?

Pre CAD it was difficult to walk out of the front door with a full set of drawings for a product or project. But now you can fit a project or even multiple projects onto a memory stick or even portable hard drive and walk out of the office with it. So there goes thousands of hours of effort out your front door and into the public domain.

Non-disclosure agreements have a place, but you as a company must know about the use of your IP by another person or company to take any action. You might have developed a specific way to design and model a conveyor to transport bulk ore or rock from point A to B. The value is in the process and the 3D model and how it is assembled during design, but you might not see the effect visually once the conveyor is built. How do you protect against that?

It causes a lot of headaches in the industrial design disciplines, so much so that most design offices accepts that their work in producing new ways or processes will only be an advantage for a brief period, and this negatively affects return on the investment. Or they stop developing processes which they cannot control, which is also a negative way to fix the issue.

Lastly, the use of social media can also be a conduit for IP loss. Example, a designer is working on a project where the company is developing a product that will have a significant financial benefit. Being a 3D modeller he or she generates a render of the 3D model and enormously proud of their work, posts it on LinkedIn. They do it on a Friday afternoon and by Monday morning before anyone can do some damage control, the idea or concept was seen by many users. This can have a tremendous impact on the profitability of that product. They can fire the designers, but it does not put the genie back in the lamp.