

LEARNING FROM A MOUSE -
HOW ADOPTION OF DISNEY METHODS
COULD ASSIST DEVELOPMENT OF CANDU CONTROL CENTRES

by

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ABSTRACT

Many organizations are challenged with the tasks of identifying customer needs and expectations for their products, anticipating future product needs, communicating a future product vision to clients, and designing with today's technology to bring a future vision to successful realization. The design evolution of plant control centres is one aspect of CANDU development that faces such challenges.

The Disney Corporation is an example of an organization that has been successful in consistently meeting these challenges for over fifty years; and some of the design practices proven in moviemaking, theme park and resort layout, and vacation experience organization may be helpful and effective when applied in other domains.

This paper summarizes the findings from an examination of Disney Corporation design practices, and suggests how some practices could be used to simplify and enhance the design of future CANDU control centres.

INTRODUCTION

The expected mission lifetime of the current generation nuclear power plants spans 20 to 30 years. With refurbishment, this original mission lifetime may be extended for an additional 15 years. At the same time, next generation plants are being designed for mission lifetimes of 40 to 60 years. Designing to support such long mission lifetimes creates significant challenge, and demands that designers have effective tools for envisioning how a client may operate a plant in the near-term and the future. The 'future' perspective is needed so that the today's design can incorporate provisions to accommodate product evolution to meet the future vision of how things will be done.

For plant control centres, the need to support operation over such extended times creates specific design and upgrade decision challenges such as:

- Specification - Anticipating and giving definition to future user tools and information needs, and manners of usage,

- Balance - Giving appropriate developmental and implementation emphasis to meeting the needs of users today in comparison to meeting the needs of users in the future,
- Migration - Designing to allow for migration from the information tools and structures of today's needs to meet the tools and information structures of future anticipated usage, and
- Technology - Making equipment selections in a manner to minimize functional dependence on specific technology choices and limit the impacts of future technology obsolescence.

The Disney Corporation has been successful in bringing dreams of the future to practical reality for public audiences in both movies, theme parks, resorts and vacation experiences for many years. This success can be expressed via four properties that customers continually associate with Disney products:

- Uniqueness - Demonstration of new perspectives and ways of doing things that provide practical alternatives to conventional wisdom and practices,
- Friendliness - Pleasing interactive experiences that go beyond the emphasis of conventional ergonomics and usage simplicity,
- Quality - Exceptional attention to long-lasting relevance, attention to detail, and ongoing maintenance and upgrade, and
- Value - Delivery of a broad and immersive experience that exceeds customer expectations and cost value.

This success has also led to the definition of specific design approaches and practices that ensure that the characteristics of new projects are conceived with reference to both the experience of the past and the dreams of the future. These design approaches and practices are 'future' and 'customer experience' oriented and serve as a complement to conventional 'system engineering' practices employed at the implementation stage of a project.

The purpose of this paper is to relate the authors findings from an examination of Disney design practices, and to offer suggestions for how specific Disney practices might be used to advantage in the design of future CANDU control centres.

INVESTIGATIVE APPROACH

The author has enjoyed a longstanding fascination with the skill of Disney staff in envisioning the future needs of clients and bringing examples of the future to reality in both moviemaking and theme parks. For the purpose of identifying potential Disney

design practices that could be applied for improving future control design practices, the following investigative approaches were used:

- Reading - Review of several topical books and assessments of Disney design and business practices to become familiar with the principles, methods and design tools involved [1],[2],[3],[4],
- Observation - Visit to DisneyWorld in Florida to experience firsthand the customer impacts of Disney design practices and obtain clarification from Disney staff concerning specific practices, and
- Reflection - Thought and discussion with industry colleagues on aspects of current control centre design practice that could benefit from application of specific Disney design practices.

DISNEY DESIGN PRACTICES

The Basis - Storytelling

The basis of Disney design is the concept of 'storytelling'. Storytelling is the art of communicating a life experience or lesson through descriptive language, images, and staging. All Disney projects begin with definition of a story as the central theme around which the project features are structured to communicate and reinforce the story message.

This tradition of 'storytelling' evolved from Walt Disney's initial involvement in developing movies. The concept was transferred to become the central tenet of theme-park design, and has more recently been applied to resort, vacation experience, and product design.

Through 'storytelling', project and product design is anchored with a purposeful customer oriented activity basis. Projects and products are developed not just to provide available features, all aspects of the project and project design are focussed on contributing to the customer experience and communicating a specific story.

The Process - Imagineering

'Imagineering' is the term used to describe the Disney design practice. The term is used interchangeably as a both a verb and noun:

- As a verb - What Disney designers do - Engineering with imagination, and
- As a noun - Who Disney designers are - Engineers with imagination.

'Imagineering' involves a strong blend of three fundamental human behaviours, that are seasoned with a positive outlook and aligned to a project goal. The human behaviours are:

- Curiosity - The desire to explore and examine beyond current knowledge,
- Creativity - The practice of imagining new ideas and dreams for accomplishing things, and
- Constructing - The process of giving practical realization to an idea or dream through technical know-how.

An 'Imagineering' project is staffed with a multi-disciplinary team comprising artists, engineers, communicators, and personnel from other disciplines as dictated by project needs. The initial team may comprise less than ten people, but will grow to several tens or hundreds of contributors as the project proceeds. Throughout, the project, the principle of people from different disciplines working in an integrated fashion together, as opposed to individual discipline silos, is promoted.

The process of 'Imagineering' is based on four project stages that are characterized by the names of Dream, Believe, Dare, Do. The characteristics of each stage are as follows:

- Stage 1 - Dream

The Dream stage involves initial idea creation with reference to a project story theme. During idea creation, all ideas are accepted without judgment as to practicality, and are sorted by relevance to the project story theme and goals. Out of this creative process, the most relevant ideas and dreams are selected as the basis for further project definition.

- Stage 2 - Believe

The Believe stage involves using creative imagination to provide further definition and depth to promising ideas through the mediums of sketches, scripts, storyboarding, models, and prototypes. The objective of this stage is to develop team confidence in the value of the idea or dream and characterize their full potential. During this stage of definition and assessment, potential obstacles to success are ignored, and set aside as challenges to be overcome at a later stage of the project.

- Stage 3 - Dare

The Dare stage involves establishing how to bring a selected idea or dream to life. The objective of this stage is to figure out ways to economically achieve ideas and dreams while achieving their full value. This objective is achieved through interactive sessions of trial and error leading to trial and success.

- Stage 4 - Do

The Do stage corresponds to the conventional implementation stage of a project. The objective of this stage is to bring the idea and dreams to realization through design and engineering implementation. During this stage Disney adheres to conventional 'system engineering' practices involving such elements as requirements specification, standards compliance, design verification, and operational assessments to deliver sound, quality project deliverables that remain true to the original story theme, and idea vision and values.

Supplementary Principles

In applying the 'Imagineering' process in project and product design, Disney staff are additionally guided by a number of supplementary principles. Examples of these principles include:

- Customer Orientation - Design and build with respect to what the customer wants and needs,
- Embrace Change - In order for new ideas and dreams to be realized, change must be welcomed. There is nothing to fear in embracing change; as long as project vision remains fixed upon the goal, any path dictated by change will lead to project success.
- Ongoing Improvement - Projects are never complete, there are always opportunities for ongoing refinement and improvement.
- Measuring Success - User perceptions of the customer experience and product value are the means for measuring project and product success.

OBSERVATIONS ON CANDU CONTROL CENTRE DESIGN PRACTICE

The current industry control centre design practice is grounded in the 'system engineering' tradition and augmented with a regulatory based set of human factors activities. In practice, the execution of activities for a project proceeds from analysis to specification, to design, to implementation to assessment in a linear fashion. In general, definition, assessment and refinement of new ideas are undertaken outside of and as a precursor to project adoption.

The following observations concerning current industry control centre design tradition are offered in the spirit of promoting constructive discussion. The intent is not to criticize specific aspects of current practice but to identify aspects that may benefit from adoption of augmented or alternative methods to achieve more effective and complete control centre designs.

Examples of current control centre design aspects that could benefit from augmented or alternative design practices, in the opinion of the author, include:

- Specification Basis - Past and current operational experience used as the primary basis for design specification, with less examination and emphasis given to characterization of future needs as a product specification input,
- Operational Emphasis - An under-weighting of definition to production related aspects of the design in comparison to those concerned with safety,
- Facility Design Approach - Design of workplace architecture and tools from an availability basis with the understanding that the definition of how these facilities will be used to support plant operation will follow and be structured to accommodate the physical layout and design, and
- Activity Specification - Limited characterization of user activities through task analysis as a requirement and design input.

CANDU APPLICATION SUGGESTIONS

The design of CANDU control centres already shares use of a number of design practices common to the Disney design experience. Examples of design practices employed in both domains include:

- Task Immersive Environments - CANDU practice provides an information rich workplace environment to assist operators in supervising and remaining aware of multiple aspects of plant operation. Disney employs image, motion and sound rich environments to temporarily displace guests from normal reality in order to heighten the entertainment experience.
- Use of Themes and Landmarks - CANDU practice uses system affiliations and visual demarcations to partition the workplace and information resources into meaningful organizational units to assist operators in workplace navigation. Disney employs architectural styles, colour consistency, and spatial layout to partition a complex entertainment experience into customer absorbable units.
- Multiple Levels of Information - CANDU practice employs a hierarchical organization of information resources to simplify operator understanding of and access to plant information. Disney employs multiple levels of entertainment detail to maintain a consistent delivery of customer experience from a span of possible customer viewpoint perspectives.
- Separation of Users from Mechanics - CANDU practice uses a centralized control centre to provide a centralized focus to plant monitoring and supervision separate from the distraction of multiple systems operation. Disney uses separation to

ensure that the magic of customer experience is not disrupted by entertainment delivery mechanics.

- Use of Meaningful Engagement - CANDU practice uses data driven interface cues to promote operator maintenance of plant status awareness. Disney uses assignment of story related action roles to guests along with environmental cues to involve guests in entertainment sequences as a means to enrich the entertainment experience.

The following suggestions outline how application of Disney design practices might be used to further improve CANDU control centre design practice. The suggestions offered are listed in two groups:

- Augmentations or refinement of current design practices, and
- Substantial changes to current design practices.

Suggestions that represent an augmentation or refinement of current design practices include:

- Adoption of a Future Needs Characterization Activity - Addition of a specific requirements specification activity that focuses on future needs characterization would broaden requirements input, provide balance to the current past and current needs focussed requirements emphasis, and may lead to product designs with increased obsolescence resistance.
- Use of Sketches, Photos and Storyboarding as a form of Task Analysis - The current text based methods of task description are time and labour intensive, and thus are only selectively applied. As consequence, large aspects of user tasks do not benefit from detailed definition. Visual approaches such as sketches, photos and storyboarding offer the potential of information rich, and less time and labour intensive means of documenting task detail.
- Emphasis on Context Presentation as a Complement to Information Detail - Past control centre workplaces, tools and information resources limit task support to detail. Operators are left to assimilate volumes of information detail in order to mentally construct overview contexts within which plant overall and specific task performance is assessed. Providing contextual information continuously within the operator's interface will simplify plant supervision, and task decision-making and performance.
- Use of Exaggeration of Change in Information Presentation - Recognizing changes in plant conditions is important to enable operators to maintain a current awareness of plant status and to be able to respond promptly to process and equipment disturbances before they develop to system or plant upsets. The use of proven change highlighting cues from animation experience such as shape distortion or

movement anticipation may prove effective in improving operator recognition of parameter changes in interface displays.

A suggestion that represents a substantial change to current design practice is:

- Using Activity Specification as a Basis for Design Orientation - Adopting activity specification as the first step in design specification would establish a strong user needs orientation to control centre design practice. Such an approach would be similar to the Disney practice of employing a story theme as the basis for project and product design. With such an approach, the specification of control centre workplaces, tools, and information resources would be driven from a task satisfaction needs perspective, rather than anchored to the more limited options of past and current experience.

CONCLUSIONS

In today's information rich environment, there are multiple opportunities available to learn from the experience of other work domains. The investigation of the use of Disney design practices to enhance the design of future CANDU control centres described in this paper represents just one possible application example.

Continual refinement of local design practices through evaluation and incorporation of successful design practices from other domains offers a low-cost and risk pathway to design process and product improvement in comparison to alternative methods.

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