Master of Education in Educational Technology

Needs Assessment

Needs-based Design of a Management Dashboard at an Academic Technology Services Department at a Higher Education Institution

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Introduction

Academic Technology Services (ATS) is a department or division within a university that is responsible for providing support regarding educational technology to various colleges and departments within a university (Emory University, 2023; University of California Davis, 2019). The primary focus of ATS is on instructional design, which involves the development of educational content and the development of effective teaching strategies to facilitate teaching and learning (Anderson et al., 2019; Ritzhaupt & Kumar, 2015). Instructional designers at ATS often collaborate with faculty members, subject matter experts, and technology specialists to design engaging and effective learning environments, content, and materials.

The nature of instructional design work is highly collaborative, and each project can be unique as faculty members and other clients may have different needs and ideas in mind for ATS staff to design and implement (Richey et al., 2011). Moreover, the duration of each project can be different as well depending on the clients' needs and visions. Due to the project's distinctiveness, it can be quite difficult to quantify and measure the performance and progress of each instructional designer, the technological tools used, and the department as a whole. Yet, it is essential that ATS has a system to collect and analyze data on the progress of instructional design projects. The management team of ATS needs to be able to make informed decisions about the allocation of resources and the development of strategic plans. This needs assessment paper aims to identify the key challenges faced by the management team of a ATS at a university and to develop a product that meets their needs. The paper will draw on the systems approach to instructional design and logic models to inform the development of the dashboard based on the nature of data available at a university's ATS. Finally, the paper will discuss the development and features of the dashboard that can accommodate users with different characteristics.

Theoretical Frameworks

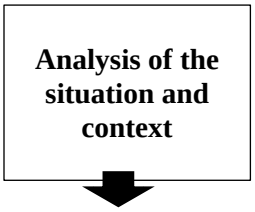
The development of the product in this work drew from the theory of situation awareness (SA), which emphasizes the importance of such awareness in decision-making (Endsley, 1995). Originating in the field of military aviation, SA pertains to an individual's comprehension and understanding of a particular circumstance or context. Having an appropriate level of SA is recognized to have a beneficial impact on subsequent choices and behaviors, which can then lead to modifications in the surrounding environment. As the environment transforms, SA must be changed, which necessitates mental effort on the part of the person involved. As a result of this interplay, establishing and sustaining SA can be challenging. The challenges presented by the ATS in this work are aligned with the challenges of situation awareness as there were a great number of unprocessed data that do not have sufficient descriptive qualities for the management to understand or utilize to make decisions. Therefore, this work aims to develop a dashboard that connects, processes and displays data to help management to understand the status quo of the performance level at the ATS.

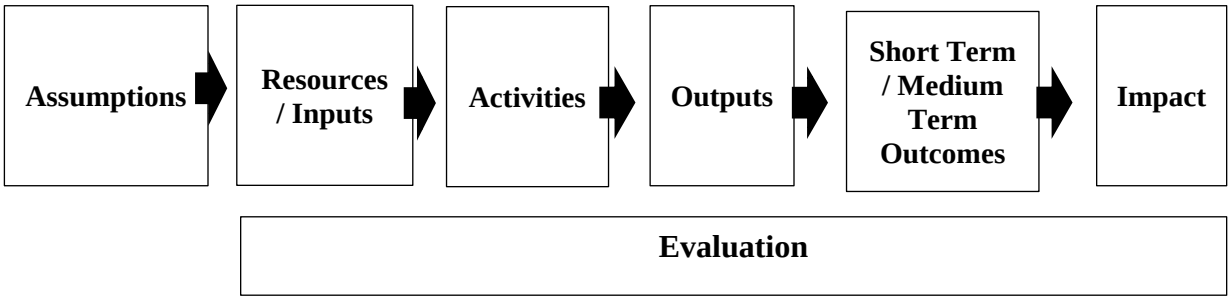
The systems approach to instructional design or ADDIE (Analysis, Design, Development, Implementation, and Evaluation) is a theoretical framework that can inform the development of a dashboard that meets the needs of the management team of the Department of Academic Technology Services (ATS). The ADDIE instructional model was first introduced in 1975 by Branson. The model was later refined by Russell Watson in 1981. It has since been widely recognized as a crucial tool for designing and implementing effective educational and training programs (Hannum, 2005). ADDIE is a framework that provides guidance for navigating complex situations, serving as a process rather than a rigid set of rules. It is designed to be context-sensitive, proactive, and interactive, and can be utilized as a means of effectively

communicating ideas to all stakeholders involved in the instructional design process. However, since this project is particularly designed for ATS management, the approach is adapted and modified to fit the context of the organization. The systems approach in this case centers on the importance of understanding the context in which design occurs, including the needs and characteristics of the users, the purpose of the project, and the constraints and opportunities presented by the environment (Branch, 2009).

In the development of the product, creating a logic model also provides guidance and helps facilitate the planning of the product. A logic model is a structured approach to communicating and showcasing your comprehension of the connections between the resources available to execute your program, the actions you intend to take, and the results or outcomes you aim to attain (W.K. Kellogg Foundation, 2005). In this project, a logic model was used to help structure and identify the resources, activities, outputs, outcomes, and impacts of the project. Therefore, the combination of the systems approach and logic models is illustrated below.

Figure 1. Dashboard Design Process





Analysis of the situation and context: it is essential that the development of the product for the ATS is informed by an analysis of the context and problems identified through data collection to understand the users' needs. The management team at ATS faces the challenge of tracking the progress of instructional design projects across various departments and colleges within the university. The project aims to understand the context and the problems by collecting data from the management which is detailed in the **Data Collection** Section of this paper.

Assumptions: There are some assumptions that help guide us to develop the product to address the problems raised by the management. In order to measure the effectiveness of the design, the assumptions need to be tested.

Resources/Inputs: Key resources and inputs required for the project need to be identified in order to plan the development (e.g., human resources, technological tools, time, etc.).

Activities: refer to how the resources and inputs are used to implement the project.

Outputs: A product is created based on the context and problems, establishing assumptions, and key resources and input available to address the problems and cater to the needs of the users.

Short-term outcomes: refers to an aspect that the project plans to achieve within the first year of the project.

Medium-term outcomes: refers to an aspect that the project plans to achieve within the first few years of the project.

Long-term impacts: refers to the impact that the project plans to make after five years of the project.

Evaluation: refers to the process of analyzing the effectiveness of the development's activities, outputs, outcomes, and long-term impacts.

Related Works

The conventional definition of business intelligence and analytics (BIA) pertains to a data-focused strategy that aims to support strategic and tactical decision-making via predominantly retrospective analysis and is typically intended for a limited audience of BIA experts and managers (Bucher et al., 2009). At the present time, BIA encompasses all approaches, methodologies, techniques, and technologies that are utilized to capture, integrate, analyze, and present data, with the goal of generating actionable insights to facilitate timely decision-making (Chen et al., 2012). Visual elements are utilized in various dashboard types to exhibit data in a graphical form, which helps in reducing the time taken to comprehend and interpret the information. The effectiveness and efficiency of information presented to users are closely linked to these visual elements. Striking an appropriate balance between information usefulness and visual complexity is essential in this regard. Visual complexity, as denoted by (Heaps & Handel, 1999). pertains to the level of complexity involved in verbally describing an image. Yigitbasioglu & Velcu (2012) emphasizes the importance of visual features in facilitating efficient and effective presentation of information. The features that determine the functionality of a dashboard are indirectly linked to its visual components and encompass the various capabilities that it possesses (Yigitbasioglu & Velcu, 2012). Functional features include alerts and notifications (Eckerson, 2010), which can suggest

actions or notify the user of any issues as soon as performance metrics fall below critical thresholds. The various factors that can influence alerts and notifications include the mode of the notifications, and the frequency of the alerts when the alert should be triggered. However, there has been any literature related to the development or use of a dashboard in an ATS or other similar instructional design organization. Therefore, this work incorporated the literature related to the development of dashboards in a general sense.

Data Collection

Semi-structured Interviews An initial interview was conducted with the management team of the ATS in order to learn about the context, nature, and other details of the problems. Two other follow-up interviews were conducted as the product was developed in order to make adjustments to ensure that the product meets the needs of the users.

Instructional Design (ID) Project Data The data were collected from each designer's personal tracking spreadsheets. This includes the data on the number of ongoing projects managed and completed by each instructional designer at the ATS, educational technology tools used by each designer in each project, and the name of the colleges, schools, and departments for which each ID project is.

Data Analysis

Semi-structured Interviews The interviews were transcribed, and the patterns in the data were identified in order to create codes that represent the needs and issues raised by the management. Then, the codes were categorized into different themes (see Table 1).

Table 1. Coding Scheme

Themes	Codes	Descriptions
Performance Tracking	ID Project Tracking	Tracking project completion and the number of projects managed by each designer
	Presentation Tracking	Tracking the number of presentations given by each designer and the topics
	Special Project Tracking	Tracking the completion of nonroutine projects (e.g., media production) and the number of projects managed by each designer
Educational Technology Tools Utilization	Frequency by designers	Tracking the frequency of the tools being used by each designer
	Frequency by Project	Tracking the frequency of the tools being used by each project
University Coverage	Distribution within the university	Tracking the number of projects within each college or department

	Measurement for effective coverage	Creating a means to measure the effectiveness of the coverage (e.g., creating a ratio)
Overall Feature	User Friendly Interface Visualization	Using a familiar platform that allows users to make future changes easily
	Trends	Calculating changes to each tracked variable

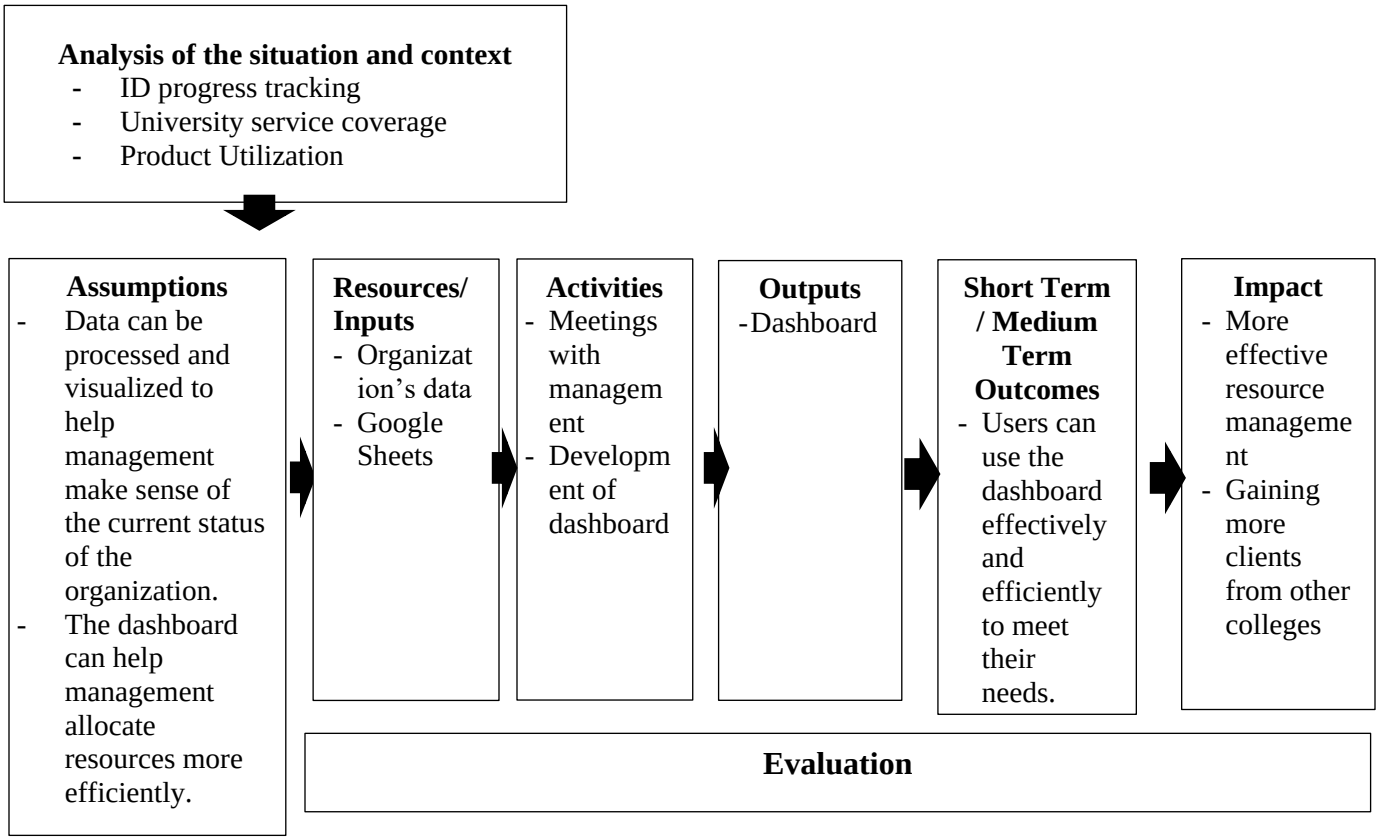
Instructional Design (ID) Project Data The nature of the data was evaluated in order to match with the coding schemes to identify the suitability of each type of data for the needs of the management.

Solutions to the Needs

Product Planning

With consideration of the different needs of the management, I decided to develop a dashboard to show them to see the performance of the ATS. The dashboard was developed on Google Sheets, which is a platform that the clients were accustomed to and allows complex data analyses and connections for this development. In order to plan for the development, the framework adapted from Systems Approaches and Logic Models was developed and described below.

Figure 2. Design Process of Dashboard for ATS Management



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Assumptions: There are some assumptions that help guide us to develop the product to address the problems raised by the management. The first assumption is that data can be processed and visualized to help management make sense of the current status of the organization. These assumptions underpin the development of the dashboard as a tool for supporting decision-making

and resource allocation. The second assumption is that using visualization dashboards can help management understand the status quo of the organization better and allocate resources more efficiently.

Activities: Multiple meetings with the management are important as the dashboard is being developed to make sure that it meets the needs of the management, and some showcases are needed so that the users can fully understand the functions and how to use the dashboard efficiently.

Resources/Inputs: The development of the dashboard relies on several key resources and inputs, including the current data on instructional design progress, time, and the selected tool. Google Sheets was chosen as the tool for developing the dashboard due to its user-friendly interface and versatility. By leveraging existing data and using a readily available tool, the development team aims to minimize the time and resources required for implementation.

Output: The primary output of the development process is the Google Sheets Dashboard that connects all the data and processes them to provide visualization. The dashboard serves as a centralized platform for tracking and monitoring instructional design progress, providing insights into the workload and availability of instructional designers across various departments and colleges within the university. By presenting data in an accessible and visually engaging way, the dashboard helps management make informed decisions about resource allocation and management.

Short-term outcomes: The short-term outcomes of the development of the dashboard are focused on the management team's ability to read and make use of the dashboard efficiently and effectively. By providing clear and accessible data visualizations, the dashboard aims to improve the team's understanding of instructional design progress and workload.

Medium-term outcomes: The medium-term outcomes of the dashboard development focused on the management team's ability to allocate resources and make effective informed decisions based on the dashboard. By providing a centralized platform for tracking instructional design progress, the dashboard aims to improve resource allocation and management, leading to greater efficiency and effectiveness in program delivery.

Long-term impacts: The long-term impacts of the dashboard development are focused on ATS's ability to effectively manage resources and reach out to clients from other colleges and departments within the university. By improving visibility into instructional design progress and workload, the dashboard aims to support ATS in expanding its reach and impact, ultimately contributing to the university's broader mission of providing high-quality educational programs.

Evaluation:

- *Evaluation of resources and inputs*: they can be reviewed based on their effectiveness in minimizing the time and resources required for implementation. This can involve reviewing the documentation of the development process to identify any areas where time and resources were saved, conducting a cost-benefit analysis to identify the cost-effectiveness of the resources and inputs used, and gathering feedback from the development team on the effectiveness of the resources and inputs.
- *Evaluation of outputs*: It is important to review the dashboard and its ability to provide useful visualizations. This can involve reviewing the dashboard to ensure it effectively connects all the data and provides useful visualizations, conducting user testing sessions with the management team to gather feedback on the usefulness of the dashboard, and reviewing the feedback received to identify any necessary adjustments to the dashboard.

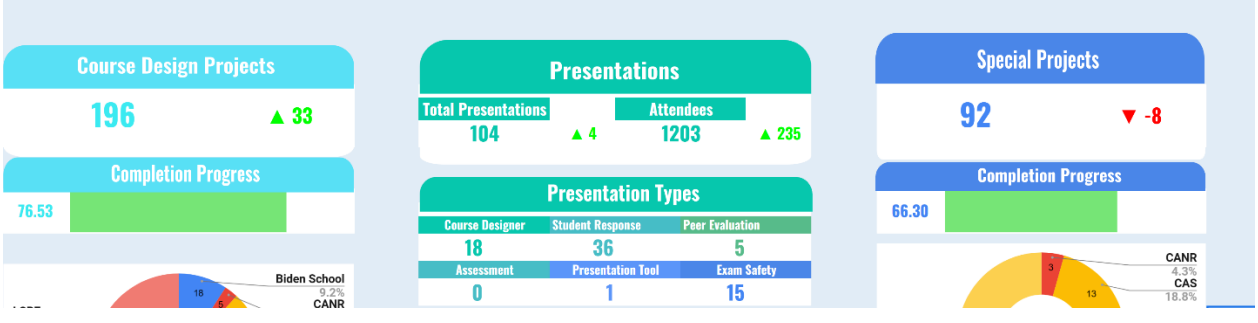
- *Evaluation of short-term outcomes*: They can be evaluated by gathering feedback from the management team on their ability to read and use the dashboard efficiently and effectively. This can involve conducting interviews with the management team to gather feedback on their ability to use the dashboard, conducting surveys to gather feedback on the usefulness of the dashboard, and reviewing the feedback received to identify any necessary adjustments to the dashboard.
- *Evaluation of medium- and long-term outcomes*: The dashboard itself can evaluate the effectiveness and success of the outcomes as it includes metrics and generate information about the organization.

Product Development

Performance Tracking

The dashboard was developed to include different tabs due to the nature of the organization, including (1) course design projects, (2) presentations, and (3) special projects. All tabs are equipped with the function of auto-highlighting cells and alerts to grab the attention of the users as they are important functions for users to make informed and timely decisions (Eckerson, 2010). For course design projects and special projects, each tab contains a real-time updated number of projects and changes compared to the previous academic year. There are also progress bars, indicating the progress of completion of all the projects. The presentation tab contains a real-time updated number of presentations and the number of attendees. The breakdown of different categories of presentations is added below the tab (See Figure 1).

Figure 1. Project Tracking Dashboard



For each tab, there is also a breakdown of the number of projects managed by different instructional designers (ID) and the progress of the projects. The purpose of this design is to help management understand the workload of each ID and assign work accordingly.

Educational Technology Tools Utilization

In order to keep track of the use of educational technology (EdTech) tools, each ID has its own Google Sheets workbook to keep track of its projects and the tools that they use for each project. The information related to the tools includes the name of the tools and the nature of the tools (e.g., assessment, exam safety, etc.). The data are processed to create an EdTech tool tab that includes information related to how often the tools are used or needed overall and based on colleges or schools within the university. This information is crucial for the management team to understand how often the tools are being used and how they are being used across different colleges or schools. By having a clear view of the usage of the EdTech tools, the management team can identify areas where additional support or resources may be needed to ensure that the tools are being used effectively. Moreover, the information also helps the management team to make informed decisions about whether to continue subscribing to them or to explore other approaches. For example, the management team may decide to provide additional training or support for the instructional designers to use the tools more effectively. Alternatively, the

management team may decide to stop subscribing to the tools and explore other options that better meet the needs of the instructional designers.

University Coverage

There are two main tabs for university coverage data that provide valuable information for the management team at ATS to effectively track the progress of instructional design projects across various departments and colleges within the university.

Tab 1 provides a distribution of the projects among schools and colleges within the university. This information is crucial for the management team to understand the workload of instructional designers across different departments and colleges. By having a clear view of how the projects are distributed, the management team can allocate resources and manpower more efficiently. This can help to avoid the overburdening of ID working with certain departments or colleges while also ensuring that all instructional design projects are completed in a timely manner.

Tab 2, on the other hand, includes information related to the project-faculty ratio, which indicates the extent that the number of projects is proportional to the number of faculty within a college. This ratio is a crucial metric for the management team to evaluate the workload of faculty members within a college. By analyzing the project-faculty ratio for each college or department, the management team can identify areas where the workload is not proportional to the number of faculty members. This may indicate that some colleges or departments are not receiving sufficient attention or resources, which can lead to delays in project completion or a lower quality of work. By identifying these areas, the management team can take steps to address

any issues and ensure that all colleges and departments receive the necessary support and resources. This can include providing additional training or hiring additional instructional designers to balance the workload or working with the college or department leaders to determine areas where resources can be allocated more effectively. By addressing any imbalances in workload, the management team can ensure that all instructional design projects are completed on time and to a high standard. This can help to build strong relationships with colleges or departments that may have been overlooked in the past and to further ATS's mission of providing high-quality educational programs to clients from all areas of the university.

Conclusion

A dashboard has been developed to meet the needs of the management of an ATS and is considered to be an effective tool for tracking the progress of instructional design projects and ensuring the efficient use of resources. The dashboard provides valuable insights into the distribution of projects among schools and colleges within the university, the workload of faculty members, and the use of EdTech tools to support the delivery of educational programs. By having a clear view of this data, the management team can make informed decisions about resource allocation and management, ensuring that all instructional design projects are completed on time and to a high standard.

Furthermore, the dashboard was future-proofed by linking with other pre-created sheets for the next five years. This ensures that the dashboard remains relevant and effective in tracking the progress of instructional design projects in the coming years. The linking of pre-created sheets provides seamless integration of data for the management team, saving time and effort in tracking the progress of projects.

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