

**CASSY: An Extensible, Activity-Centered, Ergonomically Designed Task  
Management and Toolkit System for School Professionals**

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By  
Geovani P. Duqueza  
Mark Jude I. Mayores

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## **Chapter I**

### **The Problem and Its Background**

#### **Introduction**

The teaching profession has been called as the noblest of all professions, for indeed, no other profession could exist without it. As such, teachers are expected to possess all the qualities and the skills needed to perform all the duties that a teacher has. This includes class management skills that helps a lot in providing a permissive and stimulating atmosphere that encourages pupils to raise questions and suggest alternative solutions to problems. As such, the teacher always has a lot of things to do: preparing and teaching lessons and teaching devices, marking student output, counseling the students, and a countless other things that are intended to facilitate learning.

However, recent changes in curriculums and national policies have also brought changes to the work of teachers. As the K-12 program under the Revised Basic Education Curriculum became effective a few years ago as of writing, teachers have been required not only to adjust their lessons and teaching styles to the new program but also to do countless paper works for monitoring a lot of things, such as students' proficiency in English, not to mention other mundane things that other government agencies

require such as monitoring the students' BMI (body mass index), among other things. These changes added new burden to the already burdensome work of the teachers. Due to the growing workload of teachers, some have contemplated leaving the teaching profession itself. This is aside from the accompanying issues of teachers being underpaid and the students being overworked too. Being underpaid means that some teachers have to do other things in order to augment their already small take home pay and, unwittingly, pay for their surmounting loans, all the more taking away from what little time they have for their families and themselves.

The issue of teachers being overworked has also been observed in countries other than the Philippines where teachers are also overworked. Some have even avoided promotions, as ascending to higher positions potentially means additional work. Teacher's performance are also affected adversely by too much workload. Because of these impacts, it is, therefore, imperative that this issue is addressed to mitigate its effects on teacher performance and on education itself.

One of the things that can be used to deal with the ever increasing work load not just of teachers but also of everyone else is time management. Some studies have linked proper time management of

teachers to better teacher performance. As such, the numerous tasks of teachers can be dealt with better through time management.

Time management, however, has its drawbacks. For instance, it has been observed that as more tasks get done, even more tasks are left to do, possibly causing more stress and anxiety. On the other hand, task management is posited to not only help in completing tasks but help people in accomplishing their goals as well. If time management aims for efficiency and productivity, task management aims for effectiveness and goal accomplishments. As such, task management is proposed as a complement, if not a better alternative, to time management.

Many tools are already available to assist people with time management and task management. Task organizers can be found being sold in various stores. Likewise, in these days of automation, applications for task and time management have also been available for quite some time as of writing. There are even apps that are designed for use by teachers. Incidentally, many teachers already appear to have mobile phones and, at least, an access to computers, which, all the more, makes the utility of these apps even more appealing. However, some of these only feature task management features, whereas teachers' work have several dimensions. A teacher is not only an instructor: they also are managers, clerks, administrators, counselors, and other things as well. In order to

accommodate such a multifaceted set of roles, a teacher might need to mix and match apps available on app stores just to have the right mix of features. However, maintaining multiple apps just for a single line of work can prove to be grueling and inconvenient. As such, it will be preferable to have a single system to manage all teacher roles in one place. This system should have everything under one application and should be designed with the roles and capabilities of teachers in mind.

It is, therefore, the position of the proponents that a task management and toolkit system that is tailor-fit for teachers and other academic personnel be developed for their ever-evolving needs.

### **Statement of the Problem**

This study aims to develop an extensible task organizer and work support system tailor-fit to the needs of teachers, school administrators, and office personnel involved in the academic sector, hereinafter referred to as the “respondents.” Specifically, the study aims to answer the following inquiries:

- 1) What are the daily roles, functions, and workflow of the respondents that can be supported by the proposed system?
- 2) How do the respondents manage and organize the different kinds of information and resources that they work with?

- 3) How can the following factors about gadget use factor into the design of the proposed system?
  - a) Gadget types
  - b) Experience
  - c) Skill level
  - d) Purpose of use
- 4) What existing management and support systems can be interfaced to, integrated into, or even replaced by the proposed system?
- 5) What are the policies and common practices in the concerned work environments that should be considered in the design of the system?
- 6) What other personal characteristics or habits of the respondents can be taken into consideration in the design of the system?
- 7) What suggestions and preferences can the respondents share to further improve the design of the proposed system?

### **Objectives of the Study**

The main objective of the study is to create an extensible digital task management software for the respondents with consideration for the nature of their work as professionals in the academic sector. Toward this end, the following secondary aims need to be accomplished:

- 1) Create a profile for the respondents according to the following categories:
  - a) Work roles
  - b) Usage of gadgets/electronic devices
  - c) Management and support systems used at work
  - d) Information and resources managed, if any
  - e) Personal characteristics and habits related to tasks performed at work
- 2) Create a profile for the existing management and support systems in terms of the following attributes:
  - a) Functions and features
  - b) Frequency of use
  - c) Ability to interface with other systems
  - d) Authorization level
- 3) Identify the tasks, processes, situations, and management roles where the proposed system can be designed for use.
- 4) Identify policies and common workplace practices that can affect the system design.
- 5) Attempt to accommodate suggestions and preferences of respondents in the software design.

## **Significance of the Study**

This study will benefit the respondents by developing a system that can assist in the management of their workflow and provide other tools to fulfill or even automate other work-related functions as well. Likewise, the resultant system will also provide a platform which can be targeted by institutionally-backed software development endeavors to produce other custom-designed tools that further increase efficiency in work. As mobile devices are more commonplace than ever, the product system will extend the functionalities of these devices to provide not just communicative and entertainment functions, but task, information, and organization management functions as well.

This study will also benefit software developers who have the needs of teachers in mind by providing a platform that can host subsystems to cater to the needs of teachers and other academic professionals.

This study will also benefit the students in such a way that, if their teachers are always able to more efficiently manage their time and work, they will receive more effectively prepared instruction and, ultimately, a better quality of education.

This study also intends to provide education sector administrators and policy makers another choice by which workflow in both classrooms and offices can better be managed.



## Theoretical Framework

To create a system that caters to the needs and preferences of its intended users, it is imperative that it is designed with the users in mind. This is dealt with in the field of human factors and ergonomics.

Human factors and ergonomics, or simply ergonomics, is defined as the study of people at work. The field got its name in 1949 when a group of interested individuals assembled in Oxford, England to discuss the topic of human performance and eventually establish the Ergonomics Research Society. Some time later, the term *human factors* was coined in the U.S. for a society of similar purpose. Ergonomics can also be described as the study of human-machine systems, with an emphasis on the human aspect. Ergonomists study people and how they operate equipment in the home, in commerce, in factories, and in governmental activities.<sup>1</sup>

The field of ergonomics is also divided in three broad domains of specialization: *physical ergonomics*, which emphasizes physiological and anatomical characteristics of humans related to physical activity; *cognitive ergonomics*, which emphasizes mental processes that affect interactions of humans and systems; and *organizational ergonomics*, which emphasizes

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<sup>1</sup> Mark R. Lehto and James R. Buck, *Introduction to Human Factors and Ergonomics for Engineers* (New York: Taylor & Francis Group, LLC, 2008), 2-3.

sociotechnical systems and organizations.<sup>2</sup> Teachers' work can be viewed in the respective perspectives of each domain, however, as these relate more to complex tasks and organizational interactions and policies, it will be simpler enough to deal with the cognitive and organizational domains in the design of the proposed system.

Many of the principles and suggestions learned from ergonomics can be used in designing the software intended for teachers' use. Among them are the following:

1. Eliminate unnecessary elements.
2. Simplify elements
3. Keep things natural.
4. Combine compatible elements where possible.
5. Group elements in their sequence of use.
6. Locate those elements with the most frequent use in the most favorable locations.<sup>3</sup>

Aside from these suggestions, five usability attributes can both be targeted in the design and used in software requirements validation:<sup>4</sup>

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<sup>2</sup> "Definition and Domains of Ergonomics," *International Ergonomics Association* [«https://www.iea.cc/whats/index.html»](https://www.iea.cc/whats/index.html) (Accessed on April 26, 2018).

<sup>3</sup> Lehto and Buck, *Introduction to Human Factors*, 97-99.

<sup>4</sup> Jakob Nielsen, *Usability Engineering* (San Diego, CA: Academic Press, 1993), 20.

- Learnability
- Efficiency
- Memorability
- Errors
- Satisfaction

So far, human-centered design focuses on human needs, capabilities, and behavior.<sup>5</sup> However, sometimes it is not enough to focus on the user as the tasks that a certain user performs and the way these tasks are done using a piece of technology is often also dictated by the technology. By also looking at the actual tasks that the users do, the products of design will not only fit the user but should also fit the user's tasks, as well. This is the focus of activity-centered design.<sup>6</sup>

To complete the user experience, human behavior should also be taken into consideration, especially as human emotions have a crucial role in the human ability to understand the world and how they learn new things. People can more easily relate to a product, a service, a system, or an

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<sup>5</sup> Donald A. Norman, *The Design of Everyday Things* revised and expanded edition (NY: Basic Books, 2013), 8.

<sup>6</sup> "Activity-centered design," in Wikipedia [«https://en.wikipedia.org/wiki/Activity-centered\\_design»](https://en.wikipedia.org/wiki/Activity-centered_design) (April 22, 2018).

experience when they are able to connect with it at a personal level.<sup>7</sup> As such the following levels of design should also be taken into consideration:<sup>8</sup>

- The *visceral level* is concerned with immediate emotional impact, where the appearance, shape, form, size, texture, and feel of products matter.
- The *behavioral level* is concerned with performance and usability.
- The *reflective level* is concerned with message, culture, and the meaning of a product or its use.

Questionnaires are an economical way to gather information regarding target users. In some cases these are used after experiments to collect subjective opinions of the experimental subjects during or subsequent to the experiment.<sup>9</sup>

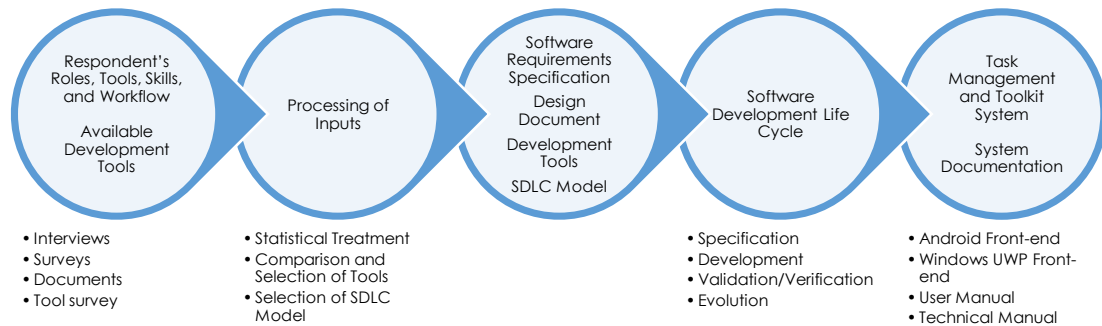
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<sup>7</sup> "Emotional design," in Wikipedia [«https://en.wikipedia.org/wiki/Emotional\\_Design»](https://en.wikipedia.org/wiki/Emotional_Design) (April 15, 2018).

<sup>8</sup> Donald A. Norman, *Emotional Design: Why We Love (or Hate) Everyday Things* (NY: Basic Books, 2004), 65-89.

<sup>9</sup> Lehto and Buck, *Introduction to Human Factors*, 414.

## Conceptual Framework



**Figure I-1 Conceptual Framework**

The paradigm in Figure I-1 represents the logical proceeding of this study. Inputs, which comprise of respondent information and information about available development tools, are to be rigorously gathered through interviews, surveys, documentary analysis, and tool surveys. Once the data are gathered, the responses will be summarized through the use of statistical treatment and rating scales. The summarized data will then be interpreted to be considered in the formulation of the user requirements. Furthermore, the development tools surveyed will also be compared and tested, from which an appropriate tool set will be selected. An appropriate SDLC model will also be selected depending on contingent constraints. The software development life cycle will then commence, starting with requirements specifications, until the desired system meets the requirements.

## **Scope and Delimitation**

This study shall focus on the roles and workflow of respondents that can be supported by different types of management systems. The respondents of the study shall include teachers, school administrators, and office personnel in the academic sector. As such, the study will also deal with administrative and clerical issues as well as instructional issues. The respondents shall also come from selected schools and offices that would agree to participate in the study.

This study will also look at existing management and support software systems that are already in place in the school and academic settings and how these can be replaced or adapted to interface with the proposed system. Restricted management systems may also be studied, but the degree of liberty in doing so will depend on the authorization level that the respondents' respective parties are willing to grant to the proponents for this study.

Software development tools selection will also be dealt with in this study. The study will not look at these tools in depth. However, these tools shall be considered according to utility and practicality to the proponents.

The development cycle will also focus on creating an extensible system that can accommodate changes and additional features in the future, particularly in cases where there are changes in policies and

workflows. As a corollary, an attempt to design a developer kit to address the related issue of independent plugin development shall be undertaken.

Finally, this study will initiate a cross-platform development but efforts shall be exerted for the Android and Windows UWP versions only due to hardware and software constraints on the proponents' part.

## Definition of Terms

Some terms used in the study have already been defined in-text or through notes. However, this list of recurring terms with their accompanying definitions are included for further reference. The following terms are defined either nominally or operationally, whichever the case may be:

- **Android** – refers to the Android OS, a mobile operating system developed by Google.<sup>10</sup>
- **Counseling and guidance** – the activity of a guidance counselor, a professional who counsels people, especially on personal problems and difficulties.<sup>11</sup> A teacher performs this role to assist students in their many and varied problems.<sup>12</sup>
- **DepEd** – refers to the Department of Education.

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<sup>10</sup> "Android (operating system)," in Wikipedia [«https://en.wikipedia.org/wiki/Android\\_\(operating\\_system\)»](https://en.wikipedia.org/wiki/Android_(operating_system)) (May 7, 2018).

<sup>11</sup> "List of counseling topics," in Wikipedia [«https://en.wikipedia.org/wiki/List\\_of\\_counseling\\_topics»](https://en.wikipedia.org/wiki/List_of_counseling_topics) (March 4, 2018).

<sup>12</sup> Amparo S. Lardizabal, et al., *Principles and Methods of Teaching* (Quezon City: Phoenix Publishing House, Inc., 1995), 8.

- **Emotional Design** – a design perspective by Donald Norman.
- **Extensibility** – refers to a system feature wherein other features can be added on demand.
- **Human Factor** – refers to human characteristics, abilities, and limitations.
- **Human Factors and Ergonomics** – refers to the field of human factors and ergonomics.
- **iOS** – refers to a mobile operating system created and developed by Apple Inc. exclusively for its hardware.
- **Platform** – depending on context, this could either refer to the different operating systems that can host current system or to the system itself which can host other subsystems. When taken to refer to operating systems, this includes Android and Windows UWP.
- **UWP** – refers to the Universal Windows Platform, a platform-homogeneous application architecture created by Microsoft and first introduced in Windows 10. UWP apps are also known as Windows Store apps. UWP apps are formerly called Metro-style apps, Modern UI-style apps, and Windows 8-style apps.
- **Windows** – refers to Microsoft Windows, a graphical operating system developed, marketed, and sold by Microsoft.



## Chapter II

### Review of Related Studies and Literature

In order to design a task management system tailor-fit to the needs of the respondents, it is imperative to have a fuller grasp of the issues that they deal with. As such, various materials are reviewed, ranging from various local and foreign articles to reference works. Likewise, related studies and special problems that can provide better design insight are also consulted.

### The Teacher's Work

Lardizabal, et al. (1995) provides a detailed and very informative reference regarding the work and functions of a teacher, such as classroom management, planning of lessons, and evaluation of learning. According to this reference text, teachers are expected to have not only teaching, guidance, and evaluation skills, but management skills as well. Furthermore, the teacher's job is summed up in the following tasks:<sup>13</sup>

7. **Guiding the learning process.** The teacher should promote learning by planning and organizing meaningful learning experiences, among others.

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<sup>13</sup> Amparo S. Lardizabal, et al., *Principles and Methods of Teaching* (Quezon City: Phoenix Publishing House, Inc., 1995), 8-9 (adapted).

8. **Counseling and guidance.** In performing the guidance function, the teacher uses various sources and procedures to know the pupils and their needs, works closely with the guidance counselor, and learns the techniques of individual as well as group guidance. This responsibility is especially important when there is no guidance program in the school.
9. **Sponsoring extra class activities.** Extra class activities are considered part of any school program as they are important in contributing to the development of children. Some of these activities may include student organizations, publications, athletics, speech, drama, music, and others depending on school. In assigning a teacher to any extra class activity, an administrator usually considers the teacher's interest and ability.
10. **Working with parents and the community.** As the teacher's important responsibility is the establishment of harmonious relationships between the school and the community, the teacher interprets his/her work and that of the school to parents by conferring with them about their children at school or at home, cooperates actively in community organizations, and participates

in various PTA<sup>14</sup> activities and in community activities for social, economic, and political improvement.

**11. Professional responsibilities.** As a member of the teaching profession, it is the teacher's responsibility to improve one's self by maintaining high standards of personal and professional conduct and by continuing to grow professionally.

The World Book Encyclopedia describes a teacher's job as follows:<sup>15</sup>

A teacher's job involves four main duties. (1) Teachers must prepare for their classes. (2) They must guide, or assist, the learning of students. (3) They must check student progress. (4) Teachers must set a good example for their students. In carrying out these duties, teachers try to identify and respond to the needs of individual students.

Kelly (2017), a web article, also includes a list of teacher tasks organized into basic categories covering everything from planning lessons to classroom management:<sup>16</sup>

1. Planning, Developing, and Organizing Instruction
2. Housekeeping and Recordkeeping
3. Managing Student Conduct

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<sup>14</sup> Parent and teacher associations.

<sup>15</sup> Willard Abraham, "Teaching," in *World Book Encyclopedia* (Chicago, Illinois: World Book, Inc., 1990), 65-70.

<sup>16</sup> Melissa Kelly, "Six Daily Tasks All Teachers Should Do," *ThoughtCo.com is World's Largest Education Resource* [«https://www.thoughtco.com/top-teacher-tasks-8422»](https://www.thoughtco.com/top-teacher-tasks-8422) (August 17, 2017) (adapted).

4. Presenting Subject Material
5. Assessing Student Learning
6. Meeting Professional Obligations

Considering all the tasks in store for every teacher, new teachers experience some struggles at work. Llego (2017), from the TeacherPH website, lists some of them: (1) lesson plan making; (2) some administrators are making it hard for the new teacher; (3) students; (4) "I am overworked."; (5) overexpecting co-teachers; and (6) "May be teaching is not for me."<sup>17</sup> As such, it is very clear that, even from the very beginning of a teacher's career, the teacher is always busy and even struggling with work. A teacher's work does not stop at teaching in the classroom and managing student learning: a teacher also needs to deal with co-teachers, school administrators, parents, and the community itself. Likewise, a teacher should also take care never to neglect professional obligations and continuous personal and professional development. This still does not mention all the paperwork and recordkeeping that teachers have to deal with in their work.

Teachers cover such a wide variety of tasks that related issues arise due the number of tasks they need to fulfill. For instance, in a web article,

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<sup>17</sup> Mark Anthony Llego, 'New Teachers: "The Struggle is Real."', *TeacherPH* [«https://www.teacherph.com/new-teachers-struggle-real/»](https://www.teacherph.com/new-teachers-struggle-real/) (January 28, 2017) (adapted).

de Dios (2012) describes the predicament of underpaid and overworked teachers, who try their best to augment their income to support their family and pay their loans. The article also raises the issue's impacts on both the pupils and the educational system, as a whole:

Public school teachers in the Philippines do not have the time, energy and money to spare. x x x

... Teachers who have to resort to additional ways to augment their income are not able to give their undivided attention to the education of the pupils in their classrooms. Both their time and attention are now compromised. On top of this, there is very little reason to be motivated, much less participate in renewing and reforming education.<sup>18</sup>

Another article from a news site (Clerigo 2016) also reports about a certain incident involving an overworked teacher from the Philippine DepEd of Region XI who collapsed and was hospitalized. The article reports that she finished 30 lesson plans, prepared activities until 12:00 midnight, and skipped meals. Although the news article mentioned that the teacher allegedly skipped meals, it is still clear that she is indeed overworked and possibly sleep deprived, as well. The article also reported that a lack of teachers is also to blame for the incident.<sup>19</sup>

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<sup>18</sup> Angel C. de Dios, "When Teachers Are Underpaid ....," *Philippine Basic Education* [«http://www.philippinesbasiceducation.us/2012/07/when-teachers-are-underpaid.html»](http://www.philippinesbasiceducation.us/2012/07/when-teachers-are-underpaid.html) (July 5, 2012).

<sup>19</sup> Evan Michael S. Clerigo, "DepEd XI warns teachers of overwork," *Davao Today* [«http://davaotoday.com/main/economy/education/dep-ed-xi-warns-teachers-of-overwork/»](http://davaotoday.com/main/economy/education/dep-ed-xi-warns-teachers-of-overwork/) (July 13, 2016).

The issue of teachers having too much work not only exists in the Philippines. Various web articles from foreign sources report about this issue as well. For instance, Adams (2017) cites a report saying that young teachers are being driven out of the profession after only a few years in the job because of the demanding workload, many of them saying the job has affected their mental health.<sup>20</sup> A survey (Toplikar 2007) highlights the issues of teachers having less time to do their jobs, with paperwork and record keeping adding much to their workload and stress leading some teachers to “burn out” and leave the profession.<sup>21</sup> Similarly, a teacher union’s general secretary (Cockroft 2015) has released a statement about increased workload and bureaucracy making teaching an unappealing profession, thereby pushing some teachers to leave the profession or inhibiting prospective teachers from entering.<sup>22</sup> Furthermore, a survey of 4382 teachers (Lover 2016) points out the following results:<sup>23</sup>

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<sup>20</sup> Richard Adams, “Demanding workload driving young teachers out of profession,” *The Guardian* [«https://www.theguardian.com/education/2017/apr/15/demanding-workload-driving-young-teachers-out-of-profession»](https://www.theguardian.com/education/2017/apr/15/demanding-workload-driving-young-teachers-out-of-profession) (April 15, 2017).

<sup>21</sup> Dave Toplikar, “Survey: Teachers overworked, lack sufficient time to plan,” *LJWorld.com* [«http://www2.ljworld.com/news/2007/mar/12/survey\\_teachers\\_overworked\\_lack\\_sufficient\\_time\\_pl/»](http://www2.ljworld.com/news/2007/mar/12/survey_teachers_overworked_lack_sufficient_time_pl/) (March 12, 2007).

<sup>22</sup> Steph Cockcroft, “40% new teachers don’t last a YEAR due to stress and exhaustion ATL warns,” *Daily Mail Online* [«http://www.dailymail.co.uk/news/article-3020255/Four-10-new-teachers-don-t-YEAR-classroom-exhausted-stressed-colleagues-says-union-boss.html»](http://www.dailymail.co.uk/news/article-3020255/Four-10-new-teachers-don-t-YEAR-classroom-exhausted-stressed-colleagues-says-union-boss.html) (March 31, 2015).

<sup>23</sup> Rachel Banning-Lover, “60-hour weeks and unrealistic targets: teachers’ working lives uncovered,” *The Guardian* [«https://www.theguardian.com/teacher-network/datablog/2016/mar/22/60-hour-weeks-and-unrealistic-targets-teachers-working-lives-uncovered»](https://www.theguardian.com/teacher-network/datablog/2016/mar/22/60-hour-weeks-and-unrealistic-targets-teachers-working-lives-uncovered) (March 22, 2016) (adapted).

1. Almost a third of teachers work more than 60 hours a week, 82% stated that their workload was unmanageable, 73% said that their workload was affecting their physical health, and 76% their mental health.
2. One in five teachers intends to leave due to workload concerns.
3. One in four teachers wants to be a deputy head, but only 5% want to be a headteacher, for fear of increased workload and poorer work-life balance.
4. It's tough to fill teaching vacancies due to a lack of good candidates.
5. The teacher shortage is already affecting children.

More than enough has been said about the plight of the overworked teachers. However, when the students are factored in, things look somewhat worse. For instance, Benn (2014) reacts to a report released by the UK's Association of Teachers and Lecturers (ATL) and posits that overworked teachers are also teaching overworked schoolchildren, further saying, "Overtired children don't learn." In this light, teachers' stress is not

really the culprit but the entire system itself that requires people to do more.<sup>24</sup>

There are, however, some proposals that aim to alleviate the issue of overworked teachers. Local education officials, for example, suggest that every school must regulate their programs and employ schemes that will not burden the teachers.<sup>25</sup> Likewise, in the United Kingdom, a four-point plan is suggested (Harris 2017) to address issues in four key areas that school administrators need to look at so as to reduce the longer and longer hours of work faced by teachers:<sup>26</sup>

1. Every school needs to know the direction it is going in, and this needs to be understood by every member of staff.
2. Planning and assessment needs to be radically reduced.
3. Marking should never be for the benefit of the senior staff or the parents. It's to move children's work.

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<sup>24</sup> Melissa Benn, "Education's culture of overwork is turning children and teachers into ghosts," *The Guardian* [«https://www.theguardian.com/commentisfree/2014/apr/16/culture-overwork-teachers-children-ghosts-schools»](https://www.theguardian.com/commentisfree/2014/apr/16/culture-overwork-teachers-children-ghosts-schools) (April 16, 2014).

<sup>25</sup> Evan Michael S. Clerigo, "DepEd XI warns teachers of overwork," *Davao Today* [«http://davaotoday.com/main/economy/education/deped-xi-warns-teachers-of-overwork/»](http://davaotoday.com/main/economy/education/deped-xi-warns-teachers-of-overwork/) (July 13, 2016).

<sup>26</sup> Colin Harris, "'Stop killing teachers with planning and marking'," *Tes - Education Jobs, Teaching Resources, Magazine & Forums* [«https://www.tes.com/news/school-news/breaking-views/retain-our-best-teachers-we-need-stop-killing-them-planning-marking»](https://www.tes.com/news/school-news/breaking-views/retain-our-best-teachers-we-need-stop-killing-them-planning-marking) (March 1, 2017).



4. Meetings should be restricted to just two evenings a week and their relevance needs to be recognised.

The Department of Education (DepEd) continuously updates its policies whenever the need arises. One of these is related to the issuing of a department order (DO 9, s. 2005) that provides measures to lessen activities that take teachers and students away from the classroom, maximize the use of the time allotment for every subject and reduce the non-teaching duties of teachers. It also reiterates the policy that the prescribed 205 school days shall be strictly spent on engaged time-on-task and any school day or part of a school day spent otherwise is classified as a disruption.<sup>27</sup> Another measure to improve the tasks of teachers is embodied in a department memorandum (DM 60, s. 2015) that provides for the use of electronic class records which afforded easy computation of total and average scores.<sup>28</sup>

To sum up, the importance of teachers' work can never be underscored enough despite being a potential cause of burdensome work. However, to mitigate the impact of teachers' work to themselves, to their students, and to the education system as whole, steps should be taken by authorities and policy changes should be put in place. Aside from these

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<sup>27</sup> DO 9, s. 2005, *Instituting Measures to Increase Engaged Time-on-Task and Ensuring Compliance Therewith*.

<sup>28</sup> DM 60, s. 2015, *Provision of the DepEd Electronic Class Record Template*.

government- or institution-backed initiatives, it has also been suggested by various studies and literature that teachers can also benefit through time management and task management.

## **Time Management and Task Management**

Time management and task management are two entirely different things that have somewhat similar goals. It might, therefore, be helpful if the two are first defined according to various sources before they are compared.

Wikipedia defines time management as follows:

Time management is the process of planning and exercising conscious control of time spent on specific activities, especially to increase effectiveness, efficiency or productivity.  
x x x

It is a meta-activity with the goal to maximize the overall benefit of a set of other activities within the boundary condition of a limited amount of time, as time itself cannot be managed because it is fixed. Time management may be aided by a range of skills, tools, and techniques used to manage time when accomplishing specific tasks, projects, and goals complying with a due date.<sup>29</sup>

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<sup>29</sup> "Time management," in *Wikipedia* [«https://en.wikipedia.org/wiki/Time\\_management»](https://en.wikipedia.org/wiki/Time_management) (April 19, 2018).

Sima (2017) defines Time Management as “the process of planning and organizing how much time you spend on specific tasks, projects or goals. It involves taking conscious control over how long you spend engaged in any given activity in order to become more effective and more productive.”<sup>30</sup>

On the other hand, Wikipedia defines task management as the process of managing a task through its life cycle. It involves planning, testing, tracking, and reporting. Effective task management requires managing all aspects of a task, including its status, priority, time, human and financial resources assignment, recurrence, dependency, notifications and so on. Task management may form part of project management and process management and can serve as the foundation for efficient workflow in an organization. Project managers adhering to task-oriented management have a detailed and up-to-date project schedule, and are usually good at directing team members and moving the project forward.<sup>31</sup>

Sima (2017) defines Task Management as “the process of managing a task through different stages: planning, development, and completion. It

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<sup>30</sup> Laura Sima, “Time Management & Task Management: Key Differences,” *Teamweek Blog* [«https://teamweek.com/blog/2017/10/time-management-vs-task-management/»](https://teamweek.com/blog/2017/10/time-management-vs-task-management/) (October 26, 2017).

<sup>31</sup> “Task management,” in *Wikipedia* [«https://en.wikipedia.org/wiki/Task\\_management»](https://en.wikipedia.org/wiki/Task_management) (April 6, 2018).

works both on an individual and on a group level by getting people to accomplish their goals."<sup>32</sup>

As can be seen from the definitions, time management and task management both aims for efficiency and effectiveness. However, there are clear differences. According to Sima (2017), time management works on the assumption that, if you learn to spend your time correctly, you will get more done.<sup>33</sup> However, as more things are done, more work awaits. This can result to over scheduling, divided attention, stress, and an overall decrease in effectiveness. With task management, a task is simply "a piece of work that needs to be undertaken... Task management is the process of managing a task. It works both on an individual and on a group level by getting people to accomplish their goals."<sup>34</sup> And besides, tasks "come with clear limits which make them easier to manage," whereas time, "because it's large and clearly undefined, [it] is way more difficult to manage."<sup>35</sup>

Likewise, Ravenscraft (2015) points out that although time management helps get more things done, "the result of getting more done is often having even more to do." As such, he proposes: "Rather than try to

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<sup>32</sup> Sima, "Time Management."

<sup>33</sup> *Ibid.*

<sup>34</sup> *Ibid.*

<sup>35</sup> *Ibid.*

cram as much as possible into one day, focus on managing your tasks first, then dole out your time.”<sup>36</sup>

Even though task management has been proven in the foregoing paragraphs to be superior to time management, the significance of time management still cannot be diminished, particularly in setting priorities. Various web articles provide many tips by which tasks can be more effectively done while using time more efficiently. BusinessTips (2017) proposes 10 tips for better time management while also suggesting that urgent but not so important tasks may be delegated to focus on the important tasks:<sup>37</sup>

1. Decide what tasks must be prioritized and do them first.
2. Focus on one task at a time.
3. Get rid of all possible distractions.
4. Manage tasks in collective groups.
5. Know your deadlines.
6. Do not linger on details too much.
7. Delegate.

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<sup>36</sup> Eric Ravenscraft, “Focus on Task-Management, Rather than Time-Management, to Be Less Busy,” *Lifehacker* [«https://lifehacker.com/focus-on-task-management-rather-than-time-management-1719924368»](https://lifehacker.com/focus-on-task-management-rather-than-time-management-1719924368) (July 24, 2015).

<sup>37</sup> “10 Tips For Better Time Management,” *Business Tips Philippines*, ed. BusinessTips [«https://businesstips.ph/10-tips-for-better-time-management/»](https://businesstips.ph/10-tips-for-better-time-management/) (September 5, 2017) (adapted).

8. Give yourself some break time after finished task.
9. Sleep around 7 to 8 hours a day.
10. The last and most important is to be committed.

According to Madsen (2015), "Not only does effective time management allow you to get better results at work, it also helps you withstand stress and live a more fulfilling life outside of work." She also suggests 7 essential time management strategies:<sup>38</sup>

1. Start your day with a clear focus.
2. Have a dynamic task list.
3. Focus on high-value activities.
4. Minimize interruptions.
5. Stop procrastinating.
6. Limit multi-tasking.
7. Review your day.

Cox (2014) directly gives teachers some tips on time management:<sup>39</sup>

1. **Ask for Help.** This is to save time that can be used for something more productive.

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<sup>38</sup> Susanne Madsen, "7 Essential Time Management Strategies," *LiquidPlanner* [«https://www.liquidplanner.com/blog/7-essential-time-management-strategies/»](https://www.liquidplanner.com/blog/7-essential-time-management-strategies/) (February 16, 2015) (adapted).

<sup>39</sup> Janelle Cox, "Time Management Tips for Teachers," *TeachHub* [«http://www.teachhub.com/time-management-tips-teachers»](http://www.teachhub.com/time-management-tips-teachers) (2014) (adapted).

2. **Prioritize.** Teachers should prioritize to keep on track when something unexpected occurs.
3. **Give Homework.** Leaving all of the assignments that relate to practice for homework helps clear up extra time in class for those important lessons.
4. **Organize Everything.** A well-maintained classroom runs on its own.
5. **Plan for Transition Times.** Quick, five-minute activities for transitions help save time.
6. **Maximize Lesson Planning.** Use apps or go to websites that have lesson ideas already planned.

Cox also suggests the following additional ideas for classroom management that can also help save time:<sup>40</sup>

- Pull out all materials needed for a lesson the day before and keep them together in a tote.
- Make transparencies for all directions to activities.
- Assign a student assistant to help pass out papers and materials.
- Place all materials that need to go to the office in one container so you only make one trip.
- Use apps to help your grading go faster.

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<sup>40</sup> *Ibid.*

- Create a bulletin board for roll call and lunch count that students can complete themselves.
- Divide paperwork into categories: To do, to read, to hold, to grade, etc.

Savara (2018) poses a question about highly productive people: “how were they able to prioritize their work quickly, and get the most done?” He goes on to propose Stephen Covey’s time management matrix<sup>41</sup> (see

	Urgent	Not Urgent
Important	I	II
Not Important	III	IV

**Figure II-1 Time Management Matrix**

Figure II-1), also called the Eisenhower method,<sup>42</sup> which makes it easy to figure out what you “need” to be doing with your time and attention. Quadrant 1 represents important, urgent items that **need to be dealt with immediately**. Quadrant 2 represents important, but not urgent items that

<sup>41</sup> Stephen Covey, *The 7 Habits of Highly Effective People: Restoring the Character Ethic* (New York: Rosetta Books, LLC, 2012), adapted from Part II, Habit 3.

<sup>42</sup> “Time management,” in *Wikipedia*.



are important but do not require your immediate attention, and **need to be planned for**. Quadrant 3 represents urgent but unimportant items which **should be minimized or eliminated**. Quadrant 4 represents trivial time wasters, unimportant items that are also not urgent which don't have to be done anytime soon, perhaps add little to no value, and also **should be minimized or eliminated**.<sup>43</sup>

For task management, Sima (2017) offers the following tips for task management:<sup>44</sup>

1. **Prioritise** to make sure that important things get seen to right away.  
This works for both time management and task management.
2. **Do the hardest task first**. Getting down to the thing you dread the most will help you cut procrastination. Also, completing important work will allow you to feel that you've made progress. It can also provide a push for getting more done.
3. **Use the appropriate tools** to manage your tasks as effectively as possible.

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<sup>43</sup> Sid Savara, "Time Management Matrix by Stephen Covey – Urgent vs Important," Sid Savara <https://sidsavara.com/coveys-time-management-matrix-illustrated/> (March 11, 2018).

<sup>44</sup> Sima, "Time Management."

Cooper (2015), from her research through a Reddit discussion, also suggests the following methods for task management:<sup>45</sup>

1. **Tag tasks with a time allotment.** Tags add a context, time allotment sets a definite deadline.
2. **Start every day with a new piece of paper.** This adds focus and keeps to-do lists short.
3. **Focus on your current task, covering up the others.** This helps focus on current task.
4. **Contrast long- and short-term goals.** This includes "Year Milestones", "Month Milestones", and "Weekly Tasks".
5. **Make use of Markdown.** Markdown is a type of markup language. It can also be used to organize tasks with tags.
6. **Combine flexible tools.** It helps in filling gaps in the workflow.
7. **Pony up and pay for a robust tool.** A non-free tool often has a lot of features.
8. **Regularly reflect on completed tasks.** This aids in setting goals and priorities.

Another form of time management that humans can benefit learning from is the way processors handle tasks. CPU scheduling affords computers

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<sup>45</sup> Belle Cooper, "8 Time-Tested Task Management Methods," *Zapier* [«https://zapier.com/blog/best-task-management-method/»](https://zapier.com/blog/best-task-management-method/) (May 12, 2015).

a way to manage different tasks and keeping the CPU busy as possible while maintaining the fair allocation of its resources. GeeksforGeeks (2017) lists the different scheduling algorithms, some of which might mimic real-life task management.<sup>46</sup> These may be used to suggest optimal ways by which a person might go about in performing tasks.

- **First Come First Serve (FCFS):** Schedules according to arrival times of processes.
- **Shortest Job First (SJF):** Process which have the shortest burst time are scheduled first.
- **Shortest Remaining Time First (SRTF):** A preemptive mode of SJF algorithm in which jobs are scheduled according to the shortest remaining time.
- **Round Robin Scheduling:** Each process is assigned a fixed time in cyclic way.
- **Priority Based scheduling (Non Preemptive):** Processes are scheduled according to their priorities, i.e., highest priority process is schedule first. If priorities of two processes match, then schedule according to arrival time.

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<sup>46</sup> "Operating System | Process Management | CPU Scheduling," GeeksforGeeks [«https://www.geeksforgeeks.org/gate-notes-operating-system-process-scheduling/»](https://www.geeksforgeeks.org/gate-notes-operating-system-process-scheduling/) (October 24, 2017) (adapted).

- **Highest Response Ratio Next (HRRN):** Processes with highest response ratio are scheduled. This algorithm avoids starvation.
- **Multilevel Queue Scheduling:** Processes are placed in different queues according to the priority of process. Generally high priority process are placed in the top level queue. Only after completion of processes from top level queue, lower level queued processes are scheduled.
- **Multilevel Feedback Queue Scheduling:** It allows the process to move in between queues to separate processes according to the characteristics of their CPU bursts. If a process uses too much CPU time, it is moved to a lower-priority queue.

## Task Management Software in the Market

The following is a list of 12 good task management apps for teaching.<sup>47</sup>

1. Microsoft To-Do
2. Things 3
3. Wunderlist
4. Totoist

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<sup>47</sup> Educatorstechnology, "12 Good Task Management Apps for Teaching," *Educational Technology and Mobile Learning* [«https://www.educatorstechnology.com/2017/06/12-good-task-management-apps-for.html»](https://www.educatorstechnology.com/2017/06/12-good-task-management-apps-for.html) (June 3, 2017) (adapted).

5. Google Keep
6. Any.do
7. Simpli
8. TickTick
9. Workflow
10. Trello
11. Remember The Milk
12. Google Calendar

The apps mentioned appear very functional and has very useful features, however, none are specifically designed for teachers. Various apps for teachers can also be found in software app stores, however these appear to be very specialized for use by teachers only. Likewise, extensibility is quite rare.

### **Related Studies**

Various studies and special problems were reviewed in order to gain further insight about time and task management, stress, work, classroom management, recordkeeping, and mobile app development, among others.

Mingoa (2017) is a published local study that explores the stress level, vulnerability to stress, and the most common sources of stress, and the

coping strategies of teachers. It has found that the top five most common sources of stress for teachers includes: (1) having too much paperwork; (2) high cost of living; (3) insufficient salary; (4) oversized classes; and (5) being too busy, although a combination of work-related, personal, and economic factors are at play. Additionally, having too much paperwork can possibly be a consequence of oversized classes. The study has found out that the teachers' stress levels and vulnerability to stress are relatively high. It has also found that the most common ailments the teachers in the study complain about are: (1) fatigue; (2) aching neck and shoulder muscles; (3) lower back pain; (4) sleep disturbances and insomnia; and (5) migraine headaches and menstrual distress or irregularities. Complaints on aching neck and shoulders and lower back pain are associated with the nature of the work. Coping strategies include: (1) watching television; (2) window shopping at malls; (3) watching sports on television; (4) going to movies; and (5) doing deep breathing and relaxation exercises. Although the methods mentioned are positive, most are sedentary.<sup>48</sup>

The foreign study, Sahito, et al. (2016), explores and investigates the importance of time management in the professional life of teachers and the performance of the students. It uses a qualitative research design to

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<sup>48</sup> Thelma Rabago-Mingoa, "Filipino teachers' stress levels and coping strategies," *DLSU Research Congress 2017* <http://www.dlsu.edu.ph/conferences/dlsu-research-congress-proceedings/2017/LLI/LLI-I-020.pdf> (June 20-22, 2017).

collect data from the sample through interviews. The proponents compared public schools and private schools in their locale and found the performance of students in the private schools better because of better time management and good system of planning lessons.<sup>49</sup>

Khan, et al. (2016) is another foreign study that aimed to explore the relationship of time management with teacher's performance:

This study was conducted to measure the relationship with teachers' time management techniques and their class performance... A positive relationship between teachers' time management techniques and their class performance was found. The study also inferred that teachers' lesson planning technique were very effective for their class performance due to affective time management. It was recommended that time management skills may be included in teacher training programmes to improve teachers' managerial and administrative activities.<sup>50</sup>

It is also interesting to know that Khan, et al. also reflected on why the most important tasks should be prioritized:

In managing the time, prioritizing the daily tasks is also an effective method of time handling. For this purpose, one should have to separate and categorize his all activities according to their importance. It is more suitable to handle less important tasks intermittently in order to complete the major tasks... For

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<sup>49</sup> Zafarullah Sahito, et al., "Teachers' Time Management and the Performance of Students: A Comparison of Government and Private Schools of Hyderabad, Sindh, Pakistan," *World Journal of Education* 6, no. 6 (December 12, 2016): 42-50.

<sup>50</sup> Hafiz Muhammad Ather Khan, et al., "Exploring Relationship of Time Management with Teachers' Performance," *Bulletin of Education and Research* 38, no. 2 (December 2016): 249-63.

most important tasks, suggestion is that do them in your best time. The reason for this is quite clear. This is because most important task requires more energy and the less important tasks require less energy or to finish the intended goals.<sup>51</sup>

The preceding studies show that teachers indeed have a lot of work on their hands that, when combined with personal and economic factors, can cause them a lot of stress and health issues that come along with it. Teachers are able to cope with stress, however, valuable strategies like time management can help teachers and even the classes they teach have better performance.

Several unpublished studies and special problems were also reviewed:

Ros (2016) is a study that aimed to develop an Android-based college planner that is customized for college students. It also aimed to integrate different organizational apps in order to provide additional features related to scheduling. The application was tested successfully according to overall ease of use, user interface design, satisfaction, and usefulness. The study pointed out that there are underlying problems with the use of paper planners in terms of efficiency. Creating a software version of the paper planner would obviously afford more features for the user. The features added allowed a user to: (A) create a list of instructors and a

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<sup>51</sup> *Ibid.*



timetable of consultation schedule; (B) create a list of courses taken for the semester; (C) record the number of absences for each course; (D) create a note for each course; (E) create a photo note taken from camera or gallery for each course; (F) create a task/to-do-list for each course; and (G) import, export, and Bluetooth transfer of a database file.<sup>52</sup> Of all the features listed, the task list is the main feature. This can be used to create a task for every course. There would be three lists where tasks would go, depending on marked status: upcoming, late, and completed tasks. The student can filter the tasks by course, due date, weight (assignment, exam, quiz, group meeting, etc.), or priority. Once a task is completed, the students must then mark it as done. The users can also view a status bar and setup an app widget for easier access.<sup>53</sup>

Garcia & Lapitan (2012) to develop a personalized and user-friendly Android application that will improve the organization of tasks of users by employing a modified Earliest Deadline First Scheduling Algorithm to handle cases with same deadline tasks. The application should also be able to generate a schedule either manually or automatically based on user input and task deadlines:

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<sup>52</sup> Donne Lorenzo C. Ros, "Android-Based College Planner," (special problem, Institute of Computer Studies Reading Center at the University of the Philippines - Los Baños, June 2016).

<sup>53</sup> *Ibid.*

Time management has always been a problem especially for most students as they often tend to forget, cram, or fail to finish up a given task. Using the most common belonging of students, a mobile phone, an application that would serve as an aid to the time management problem will be developed. The application is to be developed specifically for smartphones running on Android OS and through the Earliest Deadline First algorithm, tasks would be scheduled and viewed in a tabular form. With the user being able to visualize the weight of his workload and notified of his upcoming tasks, it is expected that there would be a lesser risks of time management problems and tasks left unfinished.<sup>54</sup>

Aside from a choice between manual and automatic schedule generation, the system also features a tabular schedule generation, showing schedules generated manually or automatically. Different colors signify the differences in priorities or difficulties of each task. As the proponents recognized that proper time management is the key to keeping in sync with one's daily activities, they have suggested that a way to achieve proper time management is through task scheduling<sup>55</sup>, similar to how computers manage CPU time for running tasks. If tasks are treated like OS tasks, existing algorithms for task scheduling can be used for schedule generation. However, they also note that, as of the time of their writing, there is not

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<sup>54</sup> Jehaziel Jeiel A. Garcia and Fermin Roberto Lapitan, "SKEDGEN: An Android Task Scheduling Application Using the Modified Earliest Deadline First Algorithm" (special problem, Institute of Computer Studies Reading Center at the University of the Philippines – Los Baños, April 2012).

<sup>55</sup> *Ibid*, Background of the Study.

much literature available for scheduling real-world tasks. They also note that applications, both in the mobile devices and over the internet, are available for this need, although there are not enough documentation on which algorithm they used and how they are developed.<sup>56</sup> As such, the proponents imply that there is a lot to be desired when it comes to the use of algorithms in real-world tasks.

Garcia & Gocoyo (2016) states that “Information has now attained its rightful place as a strategic resource... x x x Information is very decisive in any and whatever decision-making an organization has to make in dealing with all the transactions that are transpiring inside and within its bound...”<sup>57</sup> One of the decisions that a university needs to make is the class schedule. As such, it presents a system that can be used in class scheduling in a university. It makes use of Genetic Algorithms (GAs) combined with the Queen Bee Algorithm (QBA) for a more efficient and effective scheduling.<sup>58</sup> In generating the specifications of the scheduling system, the hard and soft constraints that could affect the scheduling are first determined. These includes University policies, instructors' preferences, the number of classrooms, and the total number of students. Significant features have

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<sup>56</sup> *Ibid.*

<sup>57</sup> Shiela Garcia and Marie Gocoyo, “Batangas State University Enhanced Automated Class Scheduling System Using Modified Genetic Algorithms (Gas)” (master's thesis, Foster Wheeler Library at Batangas State University – Alangilan Campus, May 2016), 1.

<sup>58</sup> *Ibid*, vi-vii.

been added such as allowing users to print or download a specific schedule in PDF format, to merge classes, to manage rooms and building, to detect class schedule conflicts, manage room types, assign faculty, and manage subject specialization.<sup>59</sup> The proponents of the study have used several frameworks and development tools which include NGINX for the server side, Silex PHP as the primary programming tool and back-end software, Semantic-ui and uikit for the front-end, and AngularJS via AJAX and JSON for communicating with the current system's Application Programming Interface (API).<sup>60</sup>

Comia, et al. (2013) develops a class record for Android to help the instructors manage their class records based on their desired strategy. The system provides student profiles for the ease of access in student's information. The application also affords both a seat plan view and a recitation view. It also allows an efficient way of recording and computing student grades as opposed to manual recording and calculation. To proceed with the development, the proponents first surveyed for other similar systems and analyzed their design and development according to interface and the database management components. After

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<sup>59</sup> *Ibid*, 5.

<sup>60</sup> *Ibid*.

implementation, the system is then evaluated according to functionality, compatibility and user acceptance.<sup>61</sup>

In the foregoing special problems, different issues such as time management, task planning, class scheduling, and class record maintenance are all addressed through Android-based or mobile-device-based apps. The developers all look to the currently commonplace smartphones as functional management tools. All apps feature at least a sort of automation, especially in generating schedules or maintaining records. Each app also affords different views of the same information and different ways in manipulating them. Some of these studies have carried out surveys of similar systems in order to analyze their design and development. The apps are also evaluated after their implementation. However, it will be interesting to note that, in the design endeavors, CPU scheduling algorithms are considered for scheduling real-life tasks and special algorithms describing real-life, naturally-occurring events or processes, such as genetic algorithms and the queen bee algorithm, are applied to automation. Another thing worth mentioning is how the

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<sup>61</sup> Lysa V. Comia, Mary Grace M. Manalo, and Reena A. Silva, "Design and Development of a Mobile Class Record Android Application" (baccalaureate's thesis, Foster Wheeler Library at Batangas State University – Alangilan Campus, March 2013).

developers paid attention to personal, organizational, and activity-related factors in the design of their respective systems.

Regarding development tools, a list of frameworks on the web can be found at the page Mobile Frameworks Comparison Chart (n.d.)<sup>62</sup> Many frameworks and development tools are listed, but Xamarin is deemed by the proponents of the current study as a very suitable option, particularly as Xamarin can be used with Visual Studio and C# to produce apps that can target Android, iOS, and Windows UWP (Universal Windows Platform) while sharing code among the different platform implementations. However, there are other tools that might still be worthy of consideration during the design phase of this study, such as Android Studio.

In order to select the best framework for the purposes of the proponents, the proponents also reviewed the suggestions of Srivastav (2015). The article points out the importance of choosing the programming language that the programmers prefer especially when there are time constraints. Likewise, the user interface, the UX, and the responsiveness of a resulting app should also be another consideration in choosing the appropriate framework particularly as these can directly affect the app

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<sup>62</sup> "Mobile Frameworks Comparison Chart", [«http://mobile-frameworks-comparison-chart.com/»](http://mobile-frameworks-comparison-chart.com/) (Accessed April 30, 2018).

structure, usability, and overall user experience. Finally, a framework that has ample documentation and a large community of developers can provide more benefits than a framework that has otherwise.<sup>63</sup>

## **Plugin-Based Architecture**

As the proponents are planning to create an extensible system, a plugin-based architecture will be most suitable as the system's main architecture. According to Paul (2011), a plugin architecture app has three components: (1) the plugin container; (2) the plugin interface; and (3) the plugins. The plugin enabled application also provides the following flexibilities: (1) reduced size in initial deployment; (2) incrementing the modules as plugins; and (3) customers can be benefitted by choosing plugin modules, thus, reduction in cost.<sup>64</sup>

## **Ergonomic Design and Emotional Design**

In designing a system that is meant to fit the needs and characteristics of target users, it is very important to first understand the user. This is the role of ergonomic design.

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<sup>63</sup> cf. Shivam Srivastav, "How To Choose The Best Framework For Your Mobile App?," Appinventiv Official Blog for Mobile App Development [«https://appinventiv.com/blog/choose-best-framework-mobile-app»](https://appinventiv.com/blog/choose-best-framework-mobile-app) (August 13, 2015).

<sup>64</sup> Jean Paul, "Creating a Plugin enabled Application: Part 1 of 2," C# Corner [«https://www.c-sharpcorner.com/uploadfile/40e97e/creating-a-plugin-enabled-application-part-1-of-2/»](https://www.c-sharpcorner.com/uploadfile/40e97e/creating-a-plugin-enabled-application-part-1-of-2/) (May 4, 2011).

The website of the International Ergonomics Association defines ergonomics as “the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.” It also identifies three domains of specialization:<sup>65</sup>

- **Physical ergonomics** is concerned with human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity.
- **Cognitive ergonomics** is concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.
- **Organizational ergonomics** is concerned with the optimization of sociotechnical systems, including their organizational structures, policies, and processes.

Wikipedia defines Human Factors and Ergonomics as the application of psychological and physiological principles to the engineering and design of products, processes, and systems. The term “human factor” is a

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<sup>65</sup> “Definition and Domains of Ergonomics,” *International Ergonomics Association* «<https://www.iea.cc/whats/index.html>» (Accessed on April 26, 2018).



physical or cognitive property of an individual or social behavior specific to humans that may influence the functioning of technological systems. When taken to refer to the field, the terms “human factors” and “ergonomics” are often used interchangeably. The goal of human factors is to reduce human error, increase productivity, and enhance safety and comfort with a specific focus on the interaction between the human and the thing of interest. In essence, it is the study of designing equipment, devices, and processes that fit the human body and its cognitive abilities. It accounts for the user's capabilities and limitations in seeking to ensure that tasks, functions, information, and the environment suit that user. Some of the methods for evaluation of human factors include ethnographic analysis, focus groups, surveys and questionnaires, task analysis, user analysis, time studies, cognitive walkthrough, and HITOP (High Integration of Technology, Organization, and People), among others.<sup>66</sup>

In the book *Introduction to Human Factors and Ergonomics for Engineers* (Lehto and Buck 2008) ergonomics is defined as the study of people at work. The field got its name in 1949 when a group of interested individuals assembled in Oxford, England to discuss the topic of human performance. The group decided to adopt the term ergonomics from the

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<sup>66</sup> “Human factors and ergonomics,” in Wikipedia «[https://en.wikipedia.org/wiki/Human\\_factors\\_and\\_ergonomics](https://en.wikipedia.org/wiki/Human_factors_and_ergonomics)» (April 18, 2018).

Greek words *ergos* (work) and *nomos* (natural law) and called themselves the Ergonomics Research Society. Some time later, the term *human factors* was coined in the U.S. for a society of similar purpose. Ergonomics can also be described as the study of human-machine systems, with an emphasis on the human aspect. Ergonomists study people and how they operate equipment in the home, in commerce, in factories, and in governmental activities.<sup>67</sup>

Lehto & Buck (2008) also identify some traditional principles in ergonomic design:<sup>68</sup>

1. Eliminate unnecessary elements. Unnecessary design features add to the cost of the design without benefitting the user.
2. Simplify elements. Simple solutions to a design problem are elegant because they satisfy the need at lower cost and frequently produce longer life cycles.
3. Keep things natural. Natural activities are compatible because people intuitively avoid actions that feel awkward.
4. Combine compatible elements where possible. Combining activities can often improve operations, provided that the activities being combined are compatible.

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<sup>67</sup> Mark R. Lehto and James R. Buck, *Introduction to Human Factors and Ergonomics for Engineers* (New York: Taylor & Francis Group, LLC, 2008), 2-3.

<sup>68</sup> *Ibid*, 97-99.

5. Group elements in their sequence of use. Revise operational sequences to reduce incompatibilities between successive activities.
6. Locate those elements with the most frequent use in the most favorable locations. Keep the flow of work moving long smooth curves over space, minimizing backtracking, extra movement, delays, and needless inventory.

In many cases the designer needs to determine the attitudes, concerns, objectives, and goals of various subpopulations of people on the use of a particular product. In most cases the questionnaire can be used to gather such information economically. In other cases, questionnaires are used after experiments to collect subjective opinions of the experimental subjects during or subsequent to the experiment.<sup>69</sup>

Nielsen (1993) defines five usability attributes: learnability, efficiency, memorability, errors, and satisfaction. He also identifies ten usability principles that should be followed by all user interface designers. These are as follows:<sup>70</sup>

1. Simple and natural dialogue
2. Speak the users' language

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<sup>69</sup> *Ibid*, 414.

<sup>70</sup> Jakob Nielsen, *Usability Engineering* (San Diego, CA: Academic Press, 1993), 20.

3. Minimize the users' memory load
4. Consistency
5. Feedback
6. Clearly marked exits
7. Shortcuts
8. Good error messages
9. Prevent errors
10. Help and documentation

In formulating preference tests, Karlin (as cited in Lehto & Buck, 2008) provides many practical suggestions in order to determine what customers wanted:<sup>71</sup>

1. Preferences and opinions from people without actual use experience are unreliable.
2. Users should try out equipment under normal, real-life conditions in order to find out what their preferences really are.
3. Initial preference opinions based on brief experience with the product may be reversed by subsequent experience.

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<sup>71</sup> Lehto & Buck, *Introduction to Human Factors*, 554.

4. Many people have preconceived biases. Experience with a new device should be extensive enough to overcome those biases, enabling the user to evaluate all of its important properties.
5. Experience with a new device should duplicate the field situation as closely as possible.
6. People cannot artificially generate or imagine needs that are not real. Users should not be expected to ignore certain features in an experimental device that the tested experimental device does not possess but which would be present in the planned future device.
7. Users in an experiment should be allowed to use the device the way they want to use it.

Norman (2013) proposes human-centered design:

... an approach that puts human needs, capabilities, and behavior first, then designs to accommodate those needs, capabilities, and ways of behaving. Good design starts with an understanding of psychology and technology. Good design requires good communication, especially from machine to person, indicating what actions are possible, what is happening, and what is about to happen... Designers need to focus their attention on the cases where things go wrong, not just on when things work as planned. xxx

Human-centered design is a design philosophy. It means starting with a good understanding of people and the needs that the design is intended to meet. This understanding comes about primarily through observation, for people themselves

are often unaware of their true needs, even unaware of the difficulties they are encountering.<sup>72</sup>

Wikipedia also provides some insight on Activity-centered design, an extension of the Human-centered design paradigm in interaction design. ACD features heavier emphasis on the activities that a user would perform with a given piece of technology. When working with activity-centered design, the designers use research to get insights of the users. Observations and interviews are typical approaches to learn more about the user's behavior.<sup>73</sup>

Emotional design is concerned with how emotions have a crucial role in the human ability to understand the world and how they learn new things. Emotional design is an important element when generating ideas for human-centred opportunities. People can more easily relate to a product, a service, a system, or an experience when they are able to connect with it at a personal level.<sup>74</sup>

Norman (2004) suggests taking human emotions into account for design. He proposes three levels of design which form the foundation of emotional design.<sup>75</sup>

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<sup>72</sup> Donald A. Norman, *The Design of Everyday Things* revised and expanded edition (NY: Basic Books, 2013), 8.

<sup>73</sup> "Activity-centered design," in Wikipedia [«https://en.wikipedia.org/wiki/Activity-centered\\_design»](https://en.wikipedia.org/wiki/Activity-centered_design) (April 22, 2018).

<sup>74</sup> "Emotional design," in Wikipedia [«https://en.wikipedia.org/wiki/Emotional\\_Design»](https://en.wikipedia.org/wiki/Emotional_Design) (April 15, 2018).

<sup>75</sup> Donald A. Norman, *Emotional Design: Why We Love (or Hate) Everyday Things* (NY: Basic Books, 2004), 65-89.

1. Visceral design - all about immediate emotional impact, where the appearance, shape, form, size, texture, and feel of products matter.
2. Behavioral design - all about use, where appearance and rationale doesn't matter but performance does; the focus of practitioners in the usability community.
3. Reflective design - all about message, culture, and the meaning of a product or its use. For one, it is about the meaning of things, the personal remembrances something evokes. For another, very different thing, it is about self-image and the message a product sends to others.

Technology is developed to afford its users better ways of doing things. However, to fully achieve this goal, technology should be designed according to its target users' needs, preferences, tasks, abilities, and, possibly, limitations. The field of human factors and ergonomics helps designers deal with this need. Still, as the use of technologies are also influenced by human behavior, it will also be very helpful to design technology in the visceral, behavioral, and reflective levels of emotional design so that the developed technologies will not only be functional and usable, but acceptable and more preferable to its users, as well.

## **Chapter III**

### **Methodology**



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